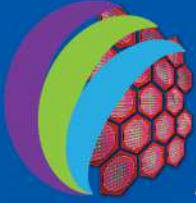




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**2<sup>ND</sup> International  
Invention, Innovation  
and Design Expo  
(INoDEX 2023)**

18<sup>TH</sup> - 19<sup>TH</sup> SEPTEMBER 2023

**E-PROCEEDINGS  
BOOK**

*Innovation Towards a Sustainable Tomorrow*



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## **PREFACE**

2nd International Invention, Innovation & Design Expo (INoDEX 2023), is a sub-event of the 3rd International Conference on Semiconductor Materials and Technology (3rd ICoSeMT 2023) that is jointly organized by Institute of Nano Optoelectronics Research and Technology (INOR), Universiti Sains Malaysia (USM), Universiti Teknologi MARA Cawangan Pulau Pinang (UiTM CPP), National Nanotechnology Centre (NNC), Ministry of Science, Technology and Innovation of Malaysia (MOSTI), MIMOS Berhad and Collaborative Research in Engineering, Science & Technology (CREST) with the Theme “Innovation Towards A Sustainable Tomorrow”.

The primary focus of INoDEX 2023 is to promote positive innovation culture and encourage innovation activities from different walks of life. This sub-event will be a great platform in creating opportunities for local and international participants to present their innovations and inventions. Eventually, both events will lead to interaction and future collaboration among the local and international participants.



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# JUNIOR INNOVATOR

## CATEGORY A *SCHOOL STUDENT*



<b>CONVERTIBLE TOTE BAG</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
	√		
	<b>Local</b>		<b>International</b>
	√		
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<b>Correspondence</b>	Nur Mardhiah Zulaikha Binti Muhd Amir Faiz MRSM Taiping, Jln. Bukit Larut, 34000 Taiping, Perak Tel: 012-8072206		
<b>Abstract</b>	<p>The idea of this project is to make a dual-use bag that can be used in different ways. It is convertible bag that can be changed into both a tote bag and a backpack by turning it inside out. The main objective of this project is to make a dual-use bag and to reduce fabric waste. Fashion trends change often, leading to mass production of clothing. Over time, the amount of fabric scraps and unwanted clothes would increase. This bag is a way to reuse the fabric scraps in an innovative way, since fabric waste is increasing and is hard to biodegrade. During the decomposition proses, fabrics and textiles generate greenhouse methane gas and leach toxic chemicals and dyes into the soil. Thus, it is best to repurpose unwanted clothes instead of sending it to the landfill. A few old clothes were sorted through to find a suitable fabric for the bag. After referring to a few bags, sketching out the design, making a few prototypes, the final made was produced. This bag could turn fabric scraps into a marketable product, in other words, waste to wealth. The advantages of this bag is it is away to reduce way and help save the environment. In addition, the cost for the production of this bag would be cheap as it uses fabric scraps. The convertible tote bag has great market potential to students as it is cheap and is useful.</p>		

<b>Keywords</b>	Tote bag, backpack, dual-use, convertible, fabric waste
<b>Product description</b>	<p>The convertible Tote Bag is a handmade bag with a unique design, made with a purpose to be a bag that can be used in a dual-way. It is a tote bag that be turned inside out to be converted into a backpack and vice versa. The design is suitable for all ages, especially teenagers given the convertible element. In addition, it is made with fabric scraps and old clothes to help reduce fabric waste in the environment.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	

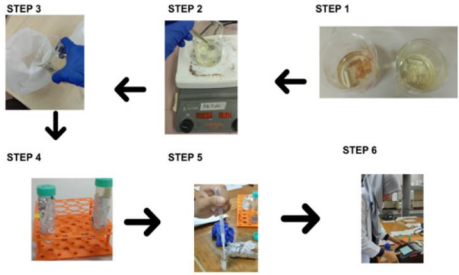
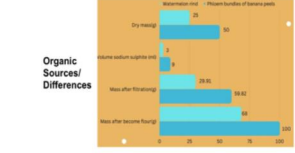
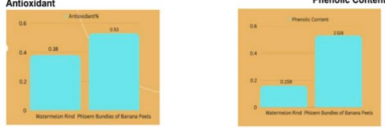


<b>Novelty and uniqueness</b>	<p>The Convertible Tote Bag has uniqueness in terms of the dual-use bag. Instead of using new fabrics to make the bag, the bag is made with fabric scraps and old clothing. Since it is made with fabric scraps, it could reduce fabric waste. Given that it has a dual-purpose, it would be considerably cheap as it has two bags for the price of one. The convertible tote bag can also be used to compliment the outfit of the user.</p>
<b>Benefit to mankind</b>	<p>The Convertible tote bag can reduce mass productions of backpacks and tote bags, thus reducing the waste of bags. In the near future, this bag could be made with unwanted clothes to help reduce fabric waste in the environment. It could also benefit to community as people could donate their old clothes to be made into a convertible tote bag. The convertible would be especially useful to both students and office workers as it is multifunctional.</p>
<b>Potential commercialization</b>	<p>The idea for the convertible tote bag started as a sewing hobby, and it led to the bag being a product that can be sold to people. With the affordable price and suitable fabric, this convertible tote bag can be commercialized. The target market for this bag would be student and office workers as they can convert the bag accordingly for different occasion.</p>
<b>Acknowledgment</b>	<p>The project member acknowledges support from MRSM Taiping from giving her the opportunity to carry this project. Special thanks to her teacher advisor, Nur Faizah Binti Halid @ Malek for her valuable patience and feedback.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; align-items: center;">  <div> <p>Nur Mardhiah Zulaikha Binti Muhd Amir Faiz is a student at MRSM Taiping taking pure science course, She was awarded the second place in the innovation category for the School Enrichment Model (SEM).</p> </div> </div>

<b>FLOUR FROM PHLOEM BUNDLES OF BANANA SKIN</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Nurin Atiqah Binti Jamal <sup>1</sup> , Nur Dina Zulaikha Binti Muhamad Salim <sup>2</sup>		
<b>Affiliation</b>	<sup>1</sup> Maktab Rendah Sains MARA Taiping, Jalan Bukit Larut, 34000 Taiping, Perak		
<b>Email</b>	nurinatiqah1403@gmail.com , dinasalim2006@gmail.com		
<b>Correspondence</b>	Nurul Asyikin binti Md Zaki, Fakulti Kejuruteraan Kimia, UiTM Shah Alam, Seksyen 7 Shah Alam Tel: +60162252587  Siti Julia binti Mustappa, Maktab Rendah Sains MARA Taiping, Jalan Bukit Larut, 34000 Taiping, Perak Tel: +60122827433		
<b>Abstract</b>	The purpose of this study is to preserve bioactive compound in flour phloem bundles of banana skin by filtration and drying technique. The experiment is being done with both flour of phloem bundles of banana skin and watermelon rind to investigate the most suitable waste to produce flour. Firstly, peel the phloem bundles from banana skin. Secondly, soak in sodium sulphite to prevent darkening and then slice thinly. The samples were dried at 210°C until the moisture content reached below 10%. Lastly, the samples were ground to produce flour. Two experiments is carried out to analyze the concentration of phenolic compound and the percentage of DPPH inhibition to detect the percentage of antioxidant that presents in banana phloem and watermelon rind. For the phenolic test, the extractions is being done by adding flour with gallic acid and then analyzed by spectrophotometer. The second experiment, 1g of samples is added to 100ml of ethanol and filtered. The samples extraction is added with DPPH solution and was tested using spectrophotometer to get the percentage of		

	<p>antioxidant. The data is collected from the first experiment which is 2.528 abs for the phloem bundles of banana skin and 0.159 abs for the watermelon rind. This shows that, the concentration of phenolic content in phloem bundles of banana skin is higher than watermelon rind. In antioxidant test, the percentage of antioxidant in flour of phloem bundles of banana skin is 0.53% while in watermelons rind percentage of antioxidant is 0.38%. This shows that antioxidant in banana is the highest. From this investigation, its found that the flour from phloem of banana skin is better than watermelon rind. The production of the flour help the environment by recycle the food waste which also called as waste to wealth. This flour is potentially be an alternative product other than wheat flour.</p>
<b>Keywords</b>	<p>Phloem bundles of banana skin, watermelon rind, Sodium sulphite, concentration, phenolic content, antioxidant, DPPH solution, gallic acid, spectrophotometer, recycle, alternative, food waste</p>
<b>Product description</b>	<p>Flour from phloem bundles of banana skin is an alternative to reduce food waste. It is made from phloem of banana skin to develop an alternative source for starch flour from phloem bundles of banana skin that has lower calories and rich in antioxidants that are beneficial to health. Banana skins have begun to be used in the field of the beauty and health. So, with the use of banana skin, the flour produced will be better quality.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<div style="display: flex; justify-content: space-around;"> <div style="border: 1px solid black; padding: 10px; width: 45%;"> <h3 style="text-align: center;">Methodology</h3> <p><b>Process Of Making Flour From Phloem Bundles Of Banana Skin.</b></p> <p><b>Apparatus:</b> Banana peel, spoon, container, beaker, rice water and salt.</p> <p><b>Procedure:</b></p> <ol style="list-style-type: none"> <li>1. Get banana skin at pisang goreng's stall.</li> <li>2. The skins were washed.</li> <li>3. Peel the phloem bundles of banana skin.</li> <li>4. Soak in diluted rice water with salt.</li> <li>5. Filter it.</li> <li>6. Flour from phloem bundles of banana skin were dried in the oven at 210°C for 10-15 minutes.</li> <li>7. Flour is ready to be pack.</li> </ol>  </div> <div style="border: 1px solid black; padding: 10px; width: 45%;"> <h3 style="text-align: center;">Experiment To Determine Antioxidant And Phenolic Content</h3> <p><b>Antioxidant</b></p> <p><b>Apparatus:</b> Beaker, spatula, pipette, cuvette, spectrophotometer, magnetic laboratory stirrer, drawstring filter net bag and centrifuge tube</p> <p><b>Chemical substances:</b></p> <ol style="list-style-type: none"> <li>1. 2,2' diphenyl-1-picrylhydrazyl radical (DPPH)</li> <li>2. CTFE antioxidant</li> <li>3. Ethanol solution</li> </ol> <p><b>Procedure:</b></p> <ol style="list-style-type: none"> <li>1. 1g of sample was mixed with 100ml ethanol.</li> <li>2. The extract was incubated at 50°C, 130rpm using magnetic laboratory stirrer for 60 min.</li> <li>3. The extract was being filtered by using drawstring filter net bag.</li> <li>4. The sample extract was mixed with 1ml of DPPH solution and 4ml of 80% ethanol using pipette.</li> <li>5. The absorbance was moved from centrifuge tube to cuvette using pipette.</li> <li>6. The absorbance was measured at 501 nm using spectrophotometer.</li> </ol>  </div> </div>



	<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p><b>Phenolic Content</b></p> <p>Apparatus: Beaker, spatula, magnetic laboratory stirrer, drawstring filter net bag, centrifuge tube, cuvette, aluminium foil.</p> <p>Chemical substances:</p> <ol style="list-style-type: none"> <li>Folin-Ciocalteu method</li> <li>Gallic acid equivalent</li> </ol> <p>Procedure:</p> <ol style="list-style-type: none"> <li>1ml of extract was mixed with 0.5ml of Folin-ciocalteu reagent.</li> <li>Kept in 5 min in the dark at 26°C</li> <li>Add 1ml of sodium carbonate with 9ml of distilled water.</li> <li>Measure the absorbance at 760nm after 30min incubation period in the dark.</li> <li>Result were expressed in mg of Gallic Acid Equivalent.</li> </ol>  </div> <div style="width: 48%;"> <p><b>Result and data</b></p>   <p><b>Mineral Composition Of Flour From Phloem Bundles Of Banana Skin</b></p> <table border="1"> <thead> <tr> <th>Parameter</th> <th>Unit</th> <th>Value</th> <th>Standard</th> </tr> </thead> <tbody> <tr> <td>Moisture</td> <td>%</td> <td>18.5</td> <td>10-15</td> </tr> <tr> <td>Protein</td> <td>%</td> <td>1.2</td> <td>1.0-1.5</td> </tr> <tr> <td>Carbohydrate</td> <td>%</td> <td>82.3</td> <td>80-85</td> </tr> <tr> <td>Energy</td> <td>kJ/100g</td> <td>1600</td> <td>1500-1700</td> </tr> <tr> <td>Crude fiber</td> <td>%</td> <td>0.5</td> <td>0.5-1.0</td> </tr> <tr> <td>Cellulose</td> <td>%</td> <td>0.2</td> <td>0.2-0.5</td> </tr> <tr> <td>Hemicellulose</td> <td>%</td> <td>0.3</td> <td>0.3-0.6</td> </tr> <tr> <td>Lignin</td> <td>%</td> <td>0.0</td> <td>0.0-0.2</td> </tr> <tr> <td>Total Fiber</td> <td>%</td> <td>0.5</td> <td>0.5-1.3</td> </tr> <tr> <td>Starch</td> <td>%</td> <td>0.0</td> <td>0.0-1.0</td> </tr> <tr> <td>Phenolic Content</td> <td>mg GAE/g</td> <td>18.5</td> <td>10-20</td> </tr> </tbody> </table> </div> </div>	Parameter	Unit	Value	Standard	Moisture	%	18.5	10-15	Protein	%	1.2	1.0-1.5	Carbohydrate	%	82.3	80-85	Energy	kJ/100g	1600	1500-1700	Crude fiber	%	0.5	0.5-1.0	Cellulose	%	0.2	0.2-0.5	Hemicellulose	%	0.3	0.3-0.6	Lignin	%	0.0	0.0-0.2	Total Fiber	%	0.5	0.5-1.3	Starch	%	0.0	0.0-1.0	Phenolic Content	mg GAE/g	18.5	10-20
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<p><b>Novelty and uniqueness</b></p>	<p>Instead of using wheat as the main ingredient for the production of flour, the phloem bundles of banana skin were used to replace it. Since there is no flour that made from phloem bundles of banana skin, this flour is the one and only that use a phloem from banana as a main source to the production of this flour. This flour also is an effort to change phloem bundles of banana skin from waste to wealth. This effort can prevent a lot of waste that coming from bundles of banana skin to surrounding.</p>																																																
<p><b>Benefit to mankind</b></p>	<p>Flour from phloem bundles of banana skin can reduced the production of waste. This can be proof because the owner from Pisang Goreng's stall can reduce the waste of banana skin. Other than that, this flour also did not use any bleach such as benzoyl peroxide to whiten the flour. This make the flour is safe to use and eat by consumers.</p>																																																
<p><b>Potential commercialization</b></p>	<p>Based on physical appearance, this flour from phloem bundles of banana skin is presence in brown colour. This can attract people to buy and try this flour for their cooking or baking. Since this flour is using waste products that is phloem bundles of banana skin, the price will be reasonable and worth for people. Plus, the flour also is an organic and suitable for people who want to consume healthy and tasty food.</p>																																																
<p><b>Acknowledgment</b></p>	<p>We owe a gratitude debt to numerous people who directly or indirectly, assisted us in accomplishing this research. Firstly, we would like to express our sincere gratitude to Puan Nurul Asikin binti Md Zaki, Senior Lecturer as Chemical Engineering in the UITM Shah Alam, towards completing of</p>																																																

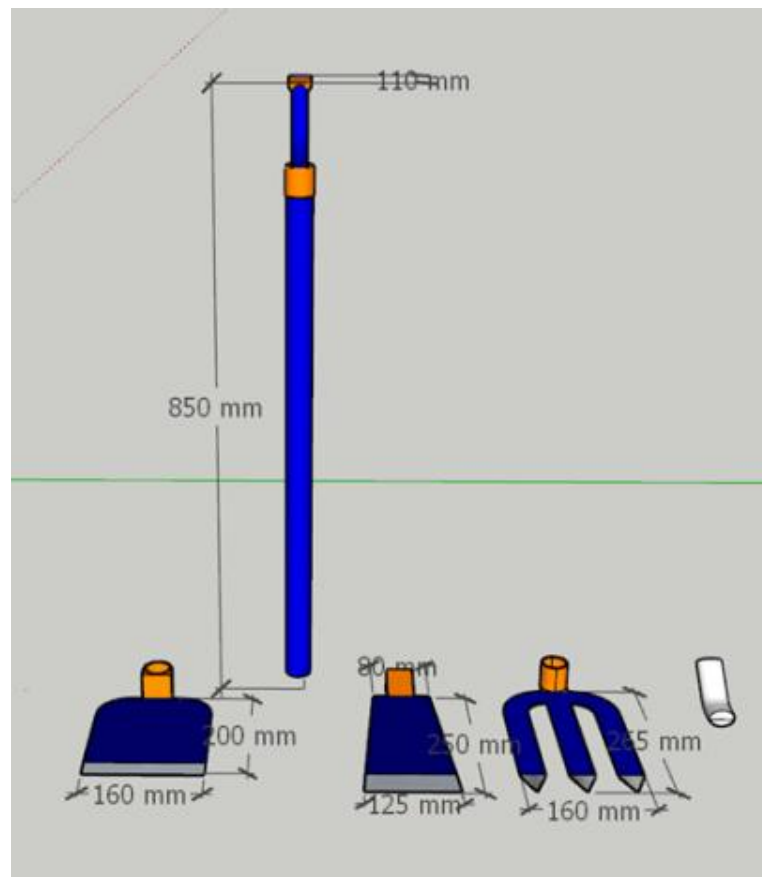
	<p>this research, including her time, commitment, energy, insightful guidance, and their kind advice and support. Following that, we would like to convey our appreciation to our teacher advisor, Madam Siti Julia binti Mustappa, for her understanding, guidance, persistence and constant support during our struggles up to this point for the guidance and wise advice she provided to help us accomplish our thesis and project. The commitment that they gave had helped us a lot throughout in the making of our thesis and project. Last but not least, we want to thank our parents for supporting us with this project, especially in terms of financial support in making our thesis project named "Flour From Phloem Bundles Of Banana Skin".</p>
<b>Researchers Biographical Data</b>	<div data-bbox="495 636 769 1003">  </div> <p>Nurin Atiqah is a student who is currently studying at MRSM Taiping. She won the first place in the program called Schoolwide Enrichment Model (SEM) in Chemistry category for the best thesis and video project.</p> <div data-bbox="495 1073 769 1440">  </div> <p>Nur Dina Zulaikha is a student who is currently studying at MRSM Taiping. She won the first place in the program called Schoolwide Enrichment Model (SEM) in Chemistry category for the best thesis and video project.</p>

<b>MULTIFUNCTION SHOVEL</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Muhamad Danish Haikal bin Yusri <sup>1</sup> , Muhammad Ismadi bin Razak <sup>2</sup> , Putera Umarjihad bin Mohamad <sup>3</sup> , Nur Iman Batrisyia binti Jasri <sup>4</sup> , Nurul Farhanah Ariana binti Huzairien <sup>5</sup> , Umi Nafisah bte Jasni <sup>6</sup> , Nor Azrinna binti Mohd Yusof <sup>7</sup>		
<b>Affiliation</b>	Kolej Vokasional Melaka Tengah, Bukit Katil, Melaka, Malaysia		
<b>Email</b>	azrinna.yusof@moe.edu.my		
<b>Correspondence</b>	Nor Azrinna binti Mohd Yusof <sup>7</sup> Kolej Vokasional Melaka Tengah, Bukit Katil, Melaka, Malaysia		
<b>Abstract</b>	<p>Projek inovasi <i>Multifunction Shovel</i> telah dirancang bagi memudahkan orang awam dan juga untuk memenuhi keperluan Projek Tahun Akhir, Diploma Teknologi Pembinaan Kolej Vokasional Melaka Tengah. Projek ini bertujuan untuk memudahkan kerja bagi penggunaan alatan di tapak bina atau di bengkel. Hal ini, bersesuaian dengan keperluan para pelajar di mana alat ini memudahkan kerja dan menjimatkan masa untuk menyiapkan projek kecil yang diberi oleh para pensyarah. Kesimpulannya, projek ini membantu bagi menjimatkan masa untuk membawa alatan dan juga dapat menjimatkan ruang penyimpanan, di mana <i>Multifunction Shovel</i> ini merangkumi pelbagai alatan menjadi satu. Selain itu, hasil analisis data menunjukkan responden bersetuju terhadap <i>Multifunction Shovel</i> diaplikasikan di dalam bidang pembinaan dan juga dalam proses pembelajaran Teknologi Pembinaan di Kolej Vokasional Melaka Tengah</p>		
<b>Keywords</b>	Multifunction, Shovel, Pembinaan, Kolej Vokasional		
<b>Product description</b>	<p>➤ <i>Multifunction Shovel</i> ini adalah merupakan satu penyelesaian untuk memudahkan dalam kerja-kerja pembinaan kerana Multifunction Shovel mudah dibawa, dikendalikan dan disimpan. Selain itu, inovasi ini disertakan dengan peralatan dan kelengkapan peralatan lain.</p>		

- Masalah yang sering dihadapi oleh para pekerja ialah dimana pekerja terpaksa membawa banyak peralatan.
- Adakalanya pekerja tertinggal alatan yang perlu dibawanya untuk melakukan kerja-kerja
- Jadi dengan adanya “*Multifunction Shovel*” ini dapat memudahkan para pekerja.

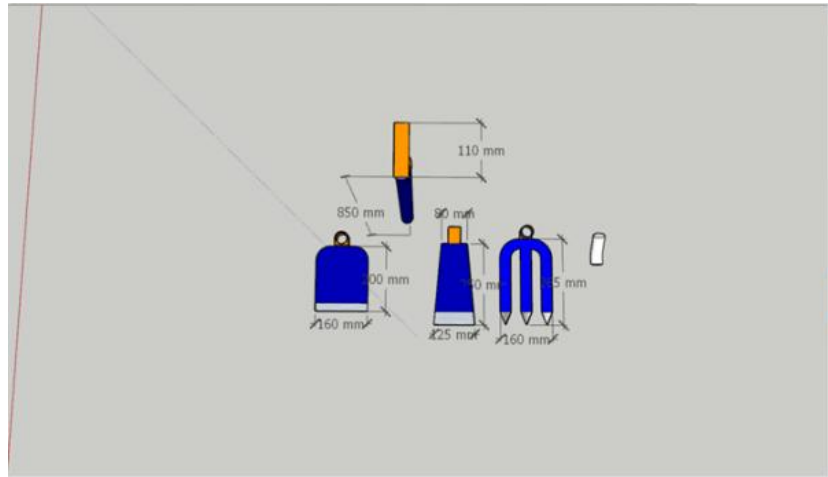
Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.

### METODOLOGI



Lukisan pandangan hadapan





Lukisan pandangan atas

### LANGKAH PENGHASILAN MULTIFUNCTION SHOVEL




1. Kerja mengimpal



2. Kerja membuat ulir



3. Kerja mengecat

<p><b>Novelty and uniqueness</b></p>	<p><i>Multifunction Shovel</i> memiliki keunikan dari segi gabungan 3 jenis alatan penting dalam kerja pembinaan dan pertanian seharian. Selain itu, besi yang digunakan sebagai bahan utama menjadikan inovasi ini tahan lasak dan memudahkan kerja seharian.</p>
<p><b>Benefit to mankind</b></p>	 <p>The infographic details the project's goals, its novelty as a combination of four tools, its benefits such as ease of use and cost savings, and its commercial potential due to low cost and time efficiency.</p>
<p><b>Potential commercialization</b></p>	<p>Kelebihan yang terdapat pada <i>Multifunction Shovel</i> seperti gabungan 3 alatan, ringan dan tahan lasak menjadikan inovasi ini sesuai untuk di pasaran di Malaysia kerana inovasi ini boleh membantu memudahkan kerja seharian, menjimatkan masa dan menjimatkan kos.</p>
<p><b>Acknowledgement</b></p>	<p>Persatuan Ibu Bapa dan Guru, Kolej Vokasional Melaka Tengah, Melaka, Malaysia</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 20px;"> <div data-bbox="516 1325 695 1530">  <p>Muhamad Danish Haikal bin Yusri merupakan pelajar Tahun 1 Sijil Vokasional Malaysia bagi program Teknologi Pembinaan di Kolej Vokasional Melaka Tengah, Melaka.</p> </div> <div data-bbox="529 1610 691 1824">  <p>Muhammad Ismadi bin Razak merupakan pelajar Tahun 1 Sijil Vokasional Malaysia bagi program Teknologi Pembinaan di Kolej Vokasional Melaka Tengah, Melaka.</p> </div> </div>



Putera Umarjihad bin Mohamad merupakan pelajar Tahun 1 Sijil Vokasional Malaysia bagi program Teknologi Pembinaan di Kolej Vokasional Melaka Tengah, Melaka.



Nur Iman Batrisyia binti Jasri merupakan pelajar Tahun 1 Sijil Vokasional Malaysia bagi program Teknologi Pembinaan di Kolej Vokasional Melaka Tengah, Melaka.



Nurul Farhanah Ariana binti Huzairien merupakan pelajar Tahun 1 Sijil Vokasional Malaysia bagi program Teknologi Pembinaan di Kolej Vokasional Melaka Tengah, Melaka.



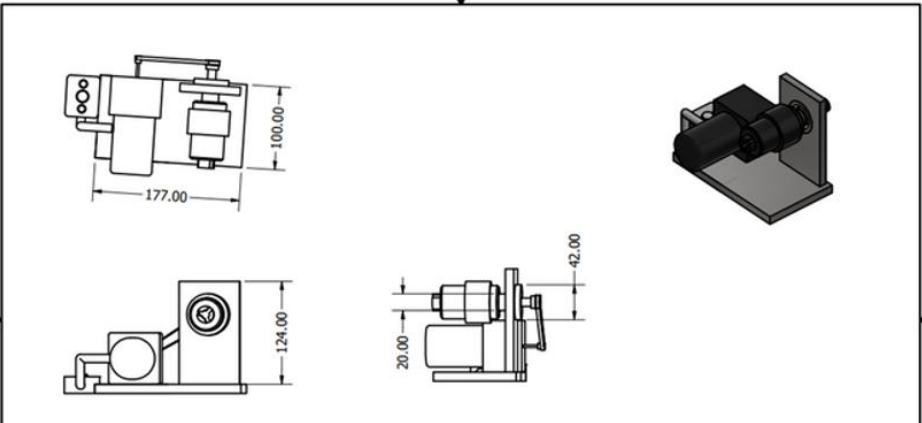



Umi Nafisah binti Jasni merupakan pelajar Tahun 1 Sijil Vokasional Malaysia bagi program Teknologi Pembinaan di Kolej Vokasional Melaka Tengah, Melaka.

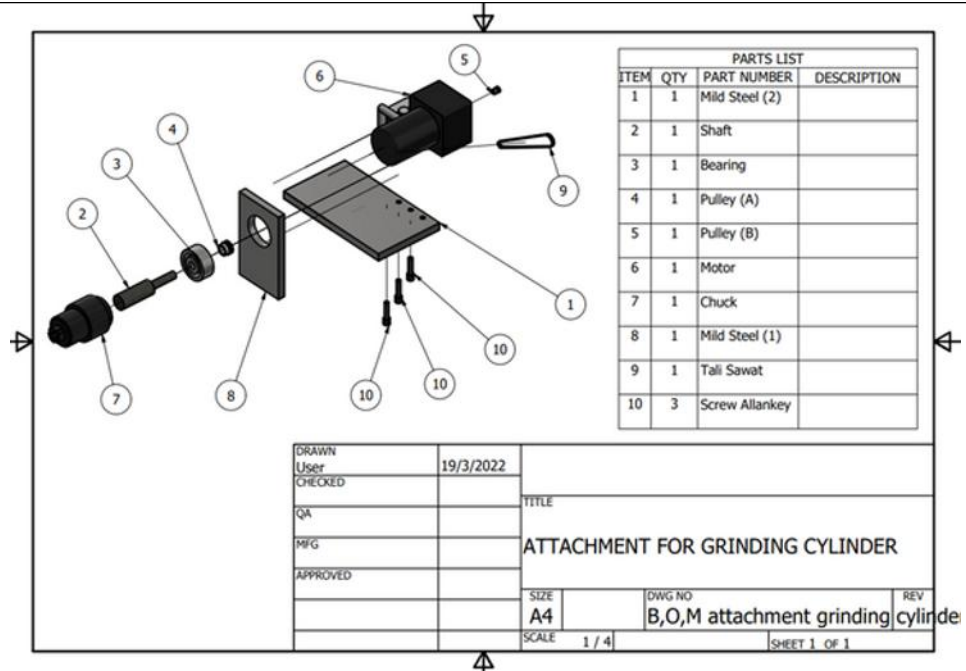


Nor Azrinna binti Mohd Yusof merupakan pensyarah bagi program Teknologi Pembinaan di Kolej Vokasional Melaka Tengah, Melaka.

<b>SMART CYLINDRICAL GRINDING JIG</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Muhammad Danish Aniq Zulkifli <sup>1</sup> , Riaishah Azuwin Mohd Rizuan <sup>1</sup> , Nur Mahsuri Zamri <sup>1</sup> , Muhammad Shahrizal Mohd Razali <sup>1</sup> , Sharveen Raj Vijaya Bhaskar <sup>1</sup> , Syaril Mustapa Kamal <sup>1</sup> and Mohd Fairuz Jaafar <sup>1,*</sup> .		
<b>Affiliation</b>	<sup>1</sup> Industrial Machining Technology Programme, Department of Mechanical and Manufacturing Technology, Kolej Vokasional Melaka Tengah, Jalan Tun Telani, 43650 Bukit Katil, Melaka, Malaysia.		
<b>Email</b>	mfairuzjaafar@gmail.com		
<b>Correspondence</b>	Mohd Fairuz Jaafar Industrial Machining Technology Programme, Department of Mechanical and Manufacturing Technology, Kolej Vokasional Melaka Tengah, Jalan Tun Telani, 43650 Bukit Katil, Melaka, Malaysia. Tel: +606-2326190		
<b>Abstract</b>	Cylindrical grinding is the process of grinding the outside surfaces of a cylinder. The operations resemble lathe-turning operations. They replace the lathe when the workpiece is hardened or when extreme accuracy and superior finish are required. Recently, the cylindrical grinding operation required dedicated costly machinery and oversized lathe machine attachment. A dedicated cylindrical grinding machine is very costly and requires particular space to locate the device in addition to maintenance to ensure its operability. There was no cylindrical grinding machine at Vocational College for students to perform the competency task related to the cylindrical workpiece. Outsourcing training courses to other institution facilities results in a loss of time and money. The main objectives of the innovation were to design and fabricate smart cylindrical grinding jig attachments for the existing surface grinding machine and to analyze the finish product quality of the new innovative product. Yet, still, none of such products in the commercial market could attach to existing surface grinding machines. Thus, the product could penetrate a wide		



	commercialization target involving TVET educational institutions and even SMEs.													
<b>Keywords</b>	Cylindrical grinding, surface finish, grinding machine.													
<b>Product description</b>	Smart Cylindrical Grinding Jig is an innovative attachment jig that could perform cylindrical grinding on an existing surface grinding machine. The product consists of 10 sub-parts and uses a 12V DC motor to rotate the cylindrical part. The total parts cost is RM158.20. Product development consists of qualitative and quantitative research methods which include questionnaires, fabrication, trial run, and product test run to archives remarkable results for surface roughness.													
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	 <table border="1" data-bbox="669 1176 1432 1375"> <tr> <td><b>PENTAKSIRAN BERTERUSAN SESI 2/2020</b></td> <td> <b>KOLEJ VOKASIONAL MALAYSIA TEKNOLOGI PEMESINAN INDUSTRI</b></td> <td rowspan="3"><b>MARKAH :</b></td> </tr> <tr> <td><b>DATE :</b> 18/3/2022</td> <td><b>KURSUS :</b> DMA 2233 LUKISAN CAD 2</td> </tr> <tr> <td colspan="2"><b>NAMA :</b> ATTACHMENT GRINDING CYLINDER</td> </tr> <tr> <td><b>ANGKA GILIRAN :</b></td> <td colspan="2"><b>CHECKED BY :</b></td> </tr> <tr> <td><b>TITLE :</b> LUKISAN ORTOGRAFIK</td> <td colspan="2"></td> </tr> </table>	<b>PENTAKSIRAN BERTERUSAN SESI 2/2020</b>	 <b>KOLEJ VOKASIONAL MALAYSIA TEKNOLOGI PEMESINAN INDUSTRI</b>	<b>MARKAH :</b>	<b>DATE :</b> 18/3/2022	<b>KURSUS :</b> DMA 2233 LUKISAN CAD 2	<b>NAMA :</b> ATTACHMENT GRINDING CYLINDER		<b>ANGKA GILIRAN :</b>	<b>CHECKED BY :</b>		<b>TITLE :</b> LUKISAN ORTOGRAFIK		
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<b>TITLE :</b> LUKISAN ORTOGRAFIK														



Produk akhir

**Novelty and uniqueness**




- None of such products in the market could attach to existing surface grinding machines.
- Chuck for the workpiece holder for Smart Cylindrical Grinding Jig is using "POKA-A-YOKE" techniques to prevent any error and provide a variety of cylinder workpiece capabilities.

<b>Benefit to mankind</b>	Smart Cylindrical Grinding Jig is a universal product that t able to attach to any standard surface grinding machine which is available at many machine shops, especially at TVET institutions. It helps to provide a great alternative to cylindrical grinding rather than buying a new dedicated cylindrical machine which is very costly.
<b>Potential commercialization</b>	Smart Cylindrical Grinding Jig is very practical to be used at any mechanical machine shop to perform cylindrical grinding on variable sizes of cylinder workpieces. This product has a wide commercialization target involves TVET educational institutions and also SMEs. With low cost and compact size of the product, this innovation provides diversity and effectiveness.
<b>Acknowledgment</b>	The head project member acknowledges financial support from the Persatuan Ibu Bapa dan Guru (PIBG) via the sponsorship by the Kolej Vokasional Melaka Tengah under the Kemenjadian Murid. The financial support provided by the KVMT Persatuan Ibu Bapa dan Guru (PIBG) is acknowledged.
<b>Researchers Biographical Data</b>	Kolej Vokasional Melaka Tengah students'.

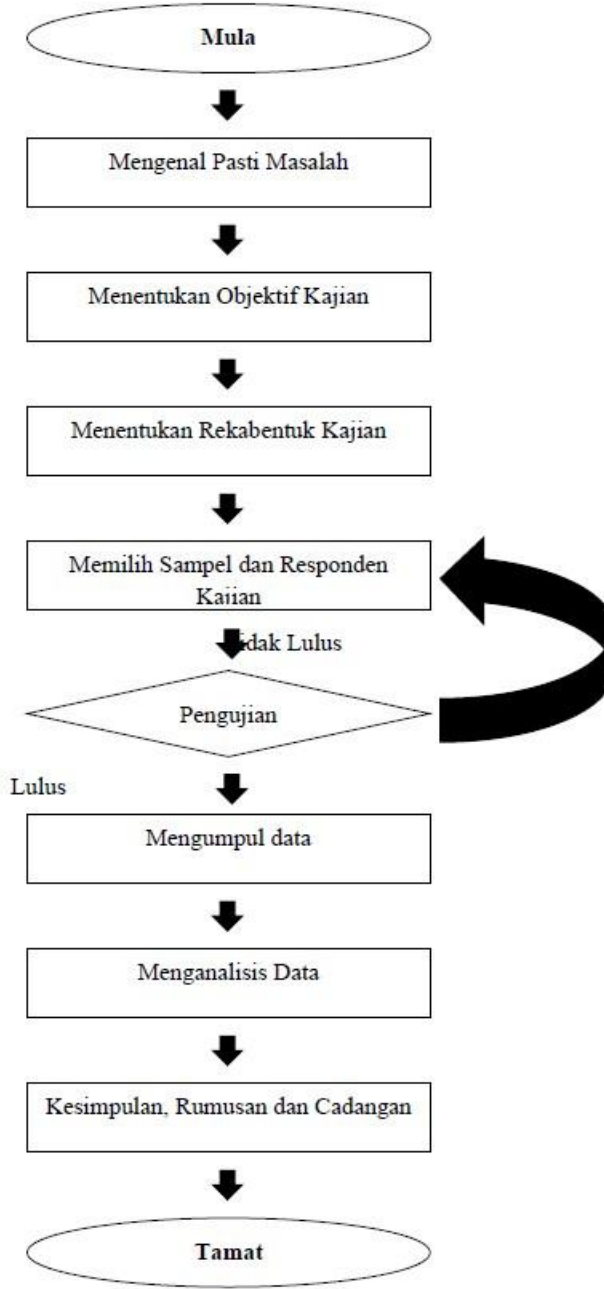
<b>ACCS (AIR COOLED CHILLER SYSTEM)</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Muhammad Haiqal Mohd Fairuz <sup>1</sup> , Muhammad Hazim Lokman <sup>1</sup> , Muhammad Haziq Helmi <sup>1</sup> , Muhammad Qaisy Azmi <sup>1</sup> , Muhammad Razif Mulyadi <sup>1</sup> , Muhammad Faizan Jantan <sup>1</sup> and Mohd Fairuz Jaafar <sup>1,*</sup> .		
<b>Affiliation</b>	<sup>1</sup> Air Cooling and Conditioning Technology Programme, Department of Mechanical and Manufacturing Technology, Kolej Vokasional Melaka Tengah, Jalan Tun Telani, 43650 Bukit Katil, Melaka, Malaysia.		
<b>Email</b>	mfairuzjaafar@gmail.com		
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<b>Abstract</b>	Air Cooled Chiller System adalah Sistem Penyamanan Udara Unit Pusat yang digunakan pada kebanyakan bangunan-bangunan komersil dan bertingkat. Terdiri daripada beberapa komponen asas seperti Pemampat, Pemeluwap, Penyejat, Injap Pengembangan, dan Sistem Kendalian Udara (AHU/FCU). Terdiri daripada 3 kitaran yang berbeza iaitu Kitaran Bahan Pendingin, Kitaran Air Dingin dan Kitaran Udara Dingin. Setiap komponen sistem terletak pada lokasi yang jauh dan berasingan dan disambungkan dengan sistem pemaipan air dan bahan pendingin. Mini Air Cooled Chiller System dibina dengan saiz skala yang lebih kecil bertujuan untuk memudahkan proses Pengajaran dan Pembelajaran berlaku. Hampir mempunyai ciri-ciri Air Cooled System yang sebenar dan banyak membantu pelajar memahami bagaimana sistem beroperasi.		
<b>Keywords</b>	Penyaman udara, domestik, penyejukan.		
<b>Product description</b>	<ul style="list-style-type: none"> <li>• <i>Air Cooled Chiller System</i> adalah Sistem Penyamanan Udara Unit Pusat yang digunakan pada kebanyakan bangunan-bangunan</li> </ul>		


	<p>komersil dan bertingkat.</p> <ul style="list-style-type: none"> <li>• Terdiri daripada beberapa komponen asas seperti Pemampat, Pemeluwap, Penyejat, Injap Pengembangan, dan Sistem Kendalian Udara (AHU/FCU).</li> <li>• Terdiri daripada 3 kitaran yang berbeza iaitu Kitaran Bahan Pendingin, Kitaran Air Dingin dan Kitaran Udara Dingin.</li> </ul>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	<div style="text-align: center;">  <p>Air Cooled Chiller System</p> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  <p>Suis kawalan utama Sistem.</p> </div> <div style="text-align: center;">  <p>Pemampat</p> </div> <div style="text-align: center;">  <p>Pemeluwap Sejuk udara</p> </div> </div>



	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p><b>Termometer Digital :</b></p> <ol style="list-style-type: none"> <li>Suhu udara keluar FCU</li> <li>Suhu air masuk FCU</li> <li>Suhu air keluar FCU</li> <li>Suhu air masuk pam.</li> </ol> </div> <div style="text-align: center;">  <p><b>Fan Coil Unit (FCU)</b></p> </div> </div> <div style="text-align: center; margin-top: 20px;">  <ol style="list-style-type: none"> <li>Low Pressure System.</li> <li>High Pressure System.</li> </ol> </div> <p align="center"><b>Komponen utama produk</b></p>
<b>Novelty and uniqueness</b>	Masih tiada dalam pasaran teknologi system penyejukan yang menggunakan semula cecair bertekanan tinggi sebagai sumber tenaga kitar semula dalam bentuk kompak untuk memudahkan proses PdP.
<b>Benefit to mankind</b>	<ul style="list-style-type: none"> <li><i>Mini Air Cooled Chiller System</i> dibina dengan saiz skala yang lebih kecil bertujuan untuk memudahkan proses Pengajaran dan Pembelajaran berlaku.</li> </ul>
<b>Potential commercialization</b>	Produk kompak sistem penyejukan lengkap ini boleh dipasarkan ke institusi pendidikan Teknik dan vokasional serta sekolah MPAV/MPAK.
<b>Acknowledgment</b>	The head project member acknowledges financial support from the Persatuan Ibu Bapa dan Guru (PIBG) via the sponsorship by the Kolej Vokasional Melaka Tengah under the Kemenjadian Murid. The financial support provided by the KVMT Persatuan Ibu Bapa dan Guru (PIBG) is acknowledged.
<b>Researchers Biographical Data</b>	Kolej Vokasional Melaka Tengah students'.

<b>FIRE EXTINGUISHERS FOR CAR</b>				
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector	
	√			
	<b>Local</b>		<b>International</b>	
	√			
<b>Project Member(s)</b>	Muhammad Haizan Mohd Nazri <sup>1</sup> , Muhammad Akmal Syakir Mazlan <sup>1</sup> , Wan Muhammad Haikal Wan Muhammad Haslizaimi <sup>1</sup> , Muhammad Adie Zhafran Shalihin <sup>1</sup> , Haikal Haris Mohd Redzuan <sup>1</sup> , Sutekno Suratman <sup>1</sup> , Mohd Fairuz Jaafar <sup>1,*</sup> .			
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<b>Email</b>	mfairuzjaafar@gmail.com			
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<b>Abstract</b>	Fire Extinguisher For Car (FEFC) direka sebagai langkah awal untuk memadam kebakaran pada ruangan enjin semasa memandu. Projek ini merupakan sesuatu elemen yang penting untuk keselamatan pengguna kenderaan. Aplikasi projek ini untuk pengguna kenderaan. Apabila berlakunya kebakaran semasa memandu, pemandu hanya perlu menghidupkan suis pada dalam kenderaan bagi memadamkan kebakaran tersebut.			
<b>Keywords</b>	Pemadam api, enjin kereta, kebakaran.			
<b>Product description</b>	Projek "Fire Extinguisher For Car" (FEFC) yang bakal kami jalankan dapat membantu pelajar yang bakal menggunakan projek kami sebagai bahan untuk mereka mengenali dengan lebih terperinci tentang sistem yang berjalan di dalam sistem pemadaman kebakaran dan keselamatan ketika kereta terbakar. Selama ini proses pembelajaran dan pengajaran untuk			

	<p>sistem pemadaman ini masih belum dilakukan atau dijalankan melalui sesi pembelajaran teori ataupun praktikal. Selain itu, masyarakat Malaysia agak kurang untuk memastikan diri mereka selamat ketika membuat perjalanan jauh. Hal ini demikian kerana mereka tidak membuat service kenderaan sebelum membuat perjalanan jauh dan hal ini boleh berlakunya kebakaran jika terdapat kebocoran pada kenderaan.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	 <pre> graph TD     M([Mula]) --&gt; A[Mengenal Pasti Masalah]     A --&gt; B[Menentukan Objektif Kajian]     B --&gt; C[Menentukan Rekabentuk Kajian]     C --&gt; D[Memilih Sampel dan Responden Kajian]     D --&gt; E{Pengujian}     E -- Tidak Lulus --&gt; D     E -- Lulus --&gt; F[Mengumpul data]     F --&gt; G[Menganalisis Data]     G --&gt; H[Kesimpulan, Rumusan dan Cadangan]     H --&gt; I([Tamat])     </pre>

	
<b>Novelty and uniqueness</b>	Masih tiada dalam pasaran teknologi pembuatan otomotif atau pengeluar pihak ketiga yang menyediakan system pemadam api automatik untuk kebakaran bahagian enjin.
<b>Benefit to mankind</b>	<ul style="list-style-type: none"> <li>• Penggunaan “Fire Extinguisher For Car” (FEFC) ini adalah sebagai langkah awal untuk memadam kebakaran yang berlaku pada ruangan enjin semasa memandu.</li> <li>• Sistem ini dapat mengurangkan kerosakan akibat kebakaran tersebut kerana sesebuah kereta hanya mengambil masa sebanyak 10 ke 15 minit untuk musnah keseluruhannya.</li> <li>• Kes kebakaran yang berlaku disebabkan kecuaiannya pengguna kerana tidak diselenggara atau diperiksa terlebih dahulu untuk mengelakkan berlakunya sebarang masalah pada kenderaan seperti terdapat kebocoran pada sistem pancitan enjin dan sebagainya.</li> <li>• “Fire Extinguisher For Car” (FEFC) ini sebagai langkah awal untuk memadam kebakaran sementara menunggu bantuan daripada bomba dan penyelamat.</li> </ul>
<b>Potential commercialization</b>	FEFC merupakan system pemadam api kompak yang diletakkan di bahagian enjin kenderaan dan masih tiada teknologi sebegini. Kebolehpasaran system ini amat tinggi.
<b>Acknowledgment</b>	The head project member acknowledges financial support from the Persatuan Ibu Bapa dan Guru (PIBG) via the sponsorship by the Kolej Vokasional Melaka Tengah under the Kemenjadian Murid. The financial support provided by the KVMT Persatuan Ibu Bapa dan Guru (PIBG) is acknowledged.

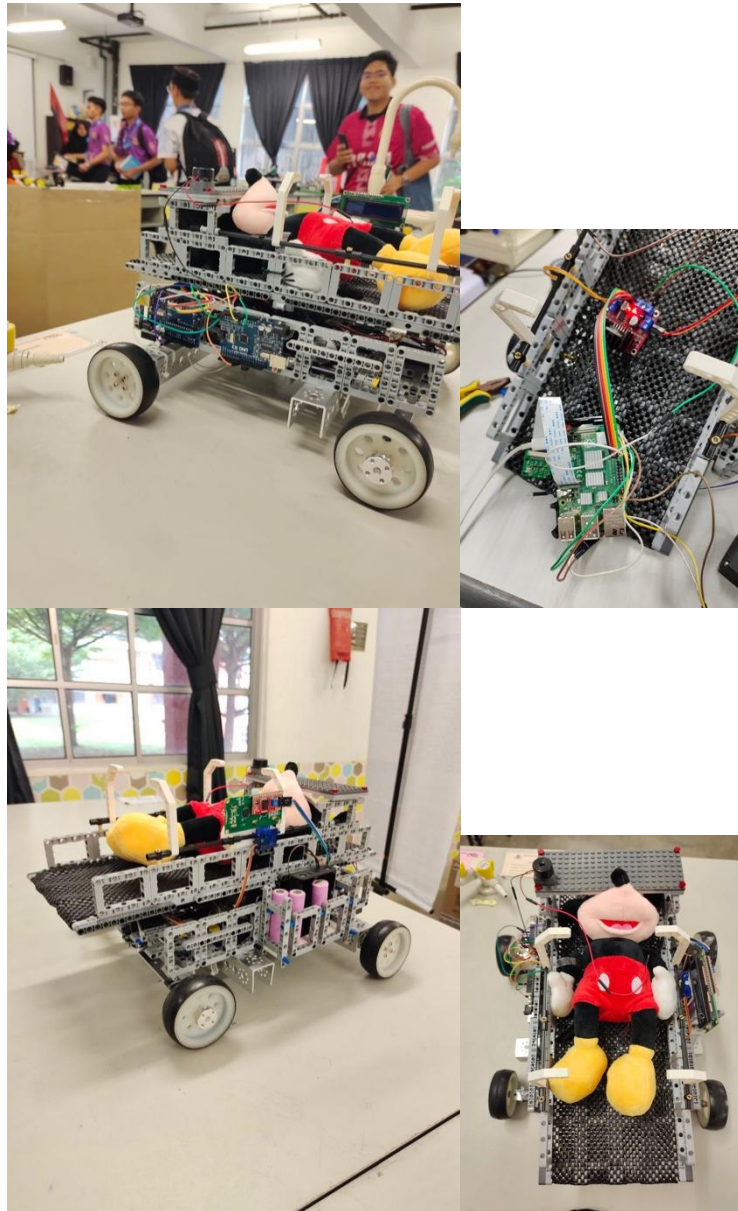
## STRECHIE RES-Q: A SMART STRECHIE MEDICAL ROBOT

Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
	√		
	Local		International
	√		
<b>Project Member(s)</b>	Nur Irdina Insyirah binti Mohamad halimi <sup>1</sup> , Henry Wong bin Jeffery Wong <sup>2</sup> , Muhammad Aiman Hakim bin Zaires <sup>3</sup> , Danial Arif Bin Abdul Halim <sup>4</sup>		
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<b>Abstract</b>	<p>Olympic is one of the biggest sport events in the world, every country in the world will participate either as an athlete or as audience, this kind of event require a systematic flow to enquire this sport event has flawless activity. Athlete injuries have been a consistent occurrence during every Olympic Games. These injuries can range from minor strains and sprains to more serious fractures and ligament tears. A study conducted by the International Olympic Committee found that gymnastics accounted for 18.9% of all injuries sustained during the 2016 Rio Olympics. This was followed by athletics (14.8%), football (9.1%, and cycling (8.9%). Olympic has special team to help the judging system such as referee, helpers, judges, etc. This system has been proven to show that it has low risk to any flaw, but it can be improved to reduce human work, the budget ton pay the helpers team can be a problem for the house team to manage. In addition, the pressure to perform at the highest level and the competitive environment of the Olympics can contribute to athlete injuries. Strechie Res-Q is an unmanned robot that design to help injured, conscious athlete in the field, it can be use in a wide range of type of sport like, running,</p>		



	<p>cycling, boxing etc. This robot focuses on athletes' health condition give medical support in short time and prevented serious injuries by sending data through WIFI to medical team. This robot has installed a device to scale the patient injured and decide itself to bring either the medical bay or ambulance for immediate medical attention. While Stretchie Res-Q has been programme to bring the patient to it destination, the displaying question to record data while driving back, the answer of the patient will scale the patient importance to decide their destination. This helps medical team to receive earlier information about patient's condition. As the result, the robot's control is simple, and athlete can easily operate this intelligent vehicle. To make Stretchie Res-Q commercially useful in sports field systems, a prototype of this robot must be developed.</p>
<p><b>Keywords</b></p>	<p>Olympic, Arduino, Arduino Mega, Internet Of Things, IOT, Rescue, Sports Injuries, Immediate Medical Treatment</p>
<p><b>Product description</b></p>	<p>Arduino Mega coding, Lego pieces for the robot body, HC-SR04 ultrasonic sensor, servo motor, breadboard, and white line sensor is used to control the robot's movement.</p> <p>As a result, the robot's control is simple, and athlete can easily operate this intelligent vehicle. The application was built by using ARDUINO MEGA. This robot focuses on athletes' health condition, give medical support in short time and prevented serious injuries. On count of the task's complexity is reduced and the manned task is converted to an unmanned task, this feature would help run Olympic event smoothly.</p> <p>One of the IOT features added is the autonomous of this robot that can drive by itself to the athlete when the camera sensor that built on <i>Stretchie</i> to detect an injured player.</p> <p>It connected by WIFI to a computer that can display the camera view and can control manually. After that <i>Stretchie</i> will immediately goes out of the field for safety purposes. All this process is powered by Raspberry PI 4, this module helped this robot to connect to the computer by WIFI possible, which make <i>Stretchie</i> implement IOT, that make data storing more efficient. This robot can decide, to bring patient whether straight to the ambulance or the medical bay by sort the data that collect from a device installed to the robot, this device will display question to record data while driving back, the answer of the patient will scale the patient importance to decide their destination.</p> <p>That data, such as body temperature, the live feed showing the patient, and the scale of the patient pain, <i>Stretchie</i> will collect and organise the data for medical report to the medical officer. This way, it would safe more time and make the process more flawless.</p>

Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.



**Novelty and uniqueness**

The *Stretchie Res-Q* ability is autonomously navigate the playing field and quickly reach the athlete in need. The robot can be equipped with sensors and cameras that allow it to detect and avoid obstacles, such as other players, equipment, and even fans, as it makes its way to the injured athlete. Once it reaches the athlete, the robot can provide support and stabilization while the athlete is placed onto the stretcher.

Another novelty of the robot is its ability to providing vital information about the athlete's condition and allowing for quick and efficient treatment. This can be especially valuable in situations where time is of the essence,

	<p>such as in high-stakes games or competitions.</p> <p>Overall, <i>Stretchie Res-Q</i> have the potential to revolutionize the way injured athletes are treated and transported, improving both the speed and quality of care they receive.</p>
<b>Benefit to mankind</b>	<p>In summary, the use of technology equipment has become an essential part of the treatment and prevention of injuries in athletes during Olympic Games. By providing athletes with the best possible care and equipment, organizers can help ensure that athletes can compete at their best and stay safe during the Games.</p> <p>Advanced technology we had used in this project can provide faster, more effective, and safer basic medical treatment for injured athletes during Olympic Games. As technology continues to advance, we can expect to see even more innovative solutions that help ensure the safety and well-being of athletes during one of the world's most closely watched sporting events.</p>
<b>Potential commercialization</b>	<p>For the future upcoming, we will develop a better version of the robot that are more suitable and have more ability so that a better result can be performed. We will improve the robot in many aspects which is adding more functionality in this robot. For instance, detect blood oxygen level, heart rate and atrial fibrillation. Also, we will create a better design so that the robot can withstand tougher situation and can be used in any weather. This future stretchie robot will help medical team to operate at the any sport event, thus increase the need of this robot in any sport competition.</p>
<b>Acknowledgment</b>	<p>The special attribute to Majlis Amanah Rakyat (MARA) and Maktab Rendah Sains MARA Johor Bharu as the opportunity to build the project of rescue robot named Stretchie Res-Q. The appreciation also to Dr Muhammad Ashraf Bin Hairuddin and Puan Fauziati Binti Ab Wahab as our trainers and teachers, parents and all members in the group that make a great work with this project.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Nur Irdina Insyirah Binti Muhamad Halimi is a leader of the group, with the age of 17 years old, this student had made such a great contribution in robotics field at school.</p> </div> </div>

<b>PASSENGER TRACKING ALARM (PASTA)</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Aiman Rafiq Bin Azaman Ayuri <sup>1</sup> , Muhammad Zarith Zikry Bin Mansur <sup>2</sup> , Nur Batriesa Binti Salleh <sup>3</sup> , Muhammad Noor Saufian Bin Jamali <sup>4</sup> , Nurul Athirah Binti Johari <sup>5</sup> , Ts. Mohd Naszri Bin Zainal <sup>6</sup> .		
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<b>Correspondence</b>	Ts. Mohd Naszri Bin Zainal Kolej Vokasional Melaka Tengah, Bukit Katil Melaka, Malaysia.		
<b>Abstract</b>	<p>PASTA adalah alat amaran yang dipasang di dalam kereta yang menggunakan bateri 9V dan suis untuk mengesan keberadaan penumpang ketika kereta dimatikan. Alat ini akan mengeluarkan bunyi amaran jika ada penumpang masih lagi berada didalam kereta jika kereta dimatikan dan akan menghantar mesej pesanan ringkas(SMS) kepada pemandu jika penumpang itu masih berada di dalam kereta setelah 1 minit kereta dimatikan. PASTA ini dibangunkan kerana terdapat kes kematian kanak-kanak yang tertinggal di dalam kenderaan akibat kecuaiannya pemandu. Melalui bedah siasat oleh doktor didapati punca kematian mangsa adalah akibat <i>Heat Stroke Due To Vehicular Entrapment</i> iaitu strok haba akibat terperangkap di dalam kereta. PASTA direka dengan menggunakan kawalan dari Arduino dan GSM modul yang membolehkan PASTA ini menghantar amaran SMS. PASTA ini mudah dibawa, mudah alih dan mudah untuk digunakan. PASTA boleh mengurangkan kes kematian kanak-kanak akibat tertinggal lama di dalam kereta. PASTA ini mempunyai nilai untuk dikomersilkan dengan harganya yang mampu milik.</p>		
<b>Keywords</b>	Heat Stroke, Arduino, Teknologi Elektronik, Kolej Vokasional.		
<b>Product description</b>	PASTA mudah alih dan mudah untuk digunakan. Dengan berbentuk kotak dan berwarna oren terang memudahkan untuk dilihat jika diletakkan di dalam kenderaan. Hanya dengan menyambungkan bekalan kuasa PASTA ke slot bekalan keluar 12V kereta dan ianya terus boleh digunakan. PASTA		

ini kecil dan tidak memakan ruang dan sesuai diletak di dalam kereta.

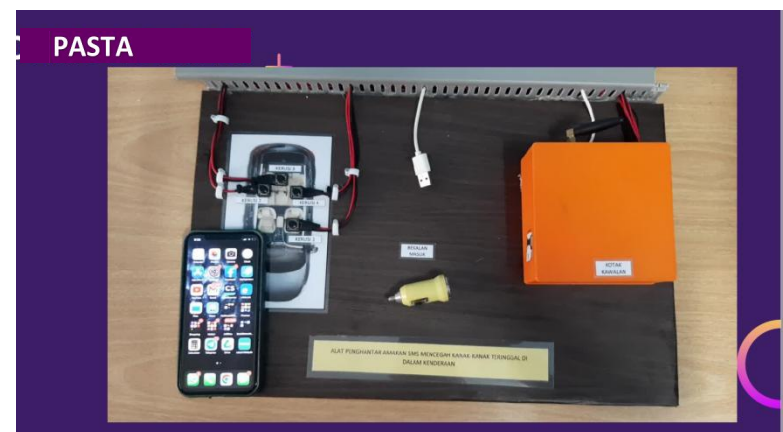
**Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.**



1. Rekabentuk PASTA dibuat menggunakan Thinkercad




2. Pengujian litar bersama aturcara dan pengujian litar di dalam perumah



3. PASTA yang lengkap



	 <p style="text-align: center;">4. PASTA dipasang didalam kereta</p>
<b>Novelty and uniqueness</b>	<p>Produk Ride N Remind Car Alarm telah ada di pasaran dan dijual dengan harga \$149.99 (RM495). Produk ini berfungsi dengan mengeluarkan amaran iaitu hon kereta akan berbunyi apabila ada kanak-kanak tertinggal di tempat duduk belakang selepas 40 saat, secara automatik. PASTA ini telah diinovasikan berdasarkan Ride N Remind Car Alarm ini. Inovasi yang telah dilakukan ialah PASTA akan menghantar amaran menggunakan SMS ke telefon bimbit pemandu yang telah disetkan memberitahu bahawa terdapat kanak-kanak tertinggal didalam kenderaan. PASTA akan terus menghantar SMS setiap 1 minit sehingga pemandu telah mengambil anak yang ditinggalkan dalam kenderaan tersebut.</p>
<b>Benefit to mankind</b>	<p>Kelebihan projek ini kepada masyarakat ialah ianya dapat memberi peringatan kepada kepada pemandu sekiranya ada penumpang yang tertinggal di dalam kenderaan terutamanya kanak-kanak. PASTA ini dapat mengelakkan kemalangan berlaku yang boleh menyebabkan kematian akibat strok haba dengan menghantar amaran SMS kepada pemandu. Banyak kes kematian akibat kemalangan ini kita dengari pada akhir ini yang mengakibatkan kehilangan nyawa akibat kanak-kanak tertinggal di dalam kenderaan.</p>
<b>Potential commercialization</b>	<p>PASTA adalah alat yang mudah digunakan dan dipasang didalam kenderaan. PASTA dijual dengan harga yang lebih murah berbanding alat yang hampir sama di pasaran. PASTA mempunyai amaran buzzer dan penghantaran SMS jika pemandu terlupa tentang keberadaan kanak-kanak di di dalam kenderaan bagi mengelakkan kemalangan kematian kanak-kanak akibat tertinggal didalam kenderaan.</p>
<b>Acknowledgment</b>	<p>Tiada</p>

**Researchers  
Biographical Data**

Ts. Mohd Naszri Bin Zainal is a teacher from Unit of Electronic Technology Kolej Vokasional Melaka Tengah. He is holding Bachelor Degree of Electronic Engineering from University Teknikal Malaysia Melaka.



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<b>MULTI - PURPOSE TOILET ( MPT )</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Nurain Danisya binti Jamaludin <sup>1</sup> , Filzah Nasuha binti Mad Seberi <sup>2</sup> , Nur Danisya Farhana binti Efindi <sup>3</sup> , Hawa Nur Aimuni binti Jasmi <sup>4</sup> , Nur Shareena binti Kamaruzaman <sup>5</sup> , Fariza Najwa binti Ismail <sup>6</sup> , Nurirdina Maisarah binti Othman <sup>7</sup> .		
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<b>Correspondence</b>	Nurain Danisya binti Jamaludin, Secondary School Student, SBP Integrasi Kubang Pasu, Bukit Kayu Hitam, 06050 Bukit Kayu Hitam, Kedah, Malaysia. Tel: +604-9222701, Fax:+604-9222707		
<b>Abstract</b>	This ‘Multi-Purpose Toilet’ (MPT) product is produced with multiple purposes, the light turns on automatically every time someone enters the toilet, it is very helpful for someone with nyctophobia and makes it easier for children to go to the toilet without asking their parents for help to open the light switch. In addition, this toilet also has a fragrance that switches and only needs to be pressed if the smell of the toilet is unpleasant for the user. In addition, the tap water that will flow as soon as it detects the user’s hand is very useful if both sides of the toilet are dirty. Lastly, the automatic flush after the toilet is used can ensure that the toilet is always clean since some users just leave the toilet in a dirty state after use. Through the inventive problem solving process of electronic design, product design and mechanical design have been chosen to be combined to produce an automatic toilet flusher design. This design allows the product to flush the toilet more easily, quickly and effectively.		

<b>Keywords</b>	Multi-Purpose, Automatically, Easier, Detects, Always Clean, Effectively
<b>Product description</b>	MPT is constructed by using three alternative core material known as cardboard, pipe and plywood. The MPT censored was installed at the product before the actual flush test. Through a series of flush test, the results obtained from the tests and evaluations that have been carried out prove that the product is able to meet the original objective of its production.
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	
<b>Novelty and uniqueness</b>	MPT has uniqueness especially in terms of the best facility. Instead of the automatic flush facility can make it easier for users before and after using the toilet. In addition, it can also avoid the problem of excessive toilet odor due to forgetting to flush.
<b>Benefit to mankind</b>	MPT is conducive for contractor. It provides a product which have the best facility in the toilet. It has huge potential in assisting the contractor to help the costumers problem, who always complain with the flusher in their toilet are broke and more than that. MPT be able to solve the problem and help the contractor. It also helps the civil engineering students to study the base material of the toilet flusher.

<p><b>Potential commercialization</b></p>	<p>Based on physical appearance, MPT is the important product to all people in the world. Apart from that, MPT can play an important role as place to throw feces and clean yourself. With suitable equipment such as censored, MPT able to facilitate all people who always forgot to clean the toilet before come out.</p>
<p><b>Acknowledgment</b></p>	<p>The head project member acknowledges financial support from all the group members.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div data-bbox="526 548 732 821">  <p>Nurain Danisya is a secondary school student who is currently study in science stream at SBP Integrasi Kubang Pasu.</p> </div> <div data-bbox="526 869 732 1220">  <p>Filzah Nasuha is a secondary school student who is currently study in science stream at SBP Integrasi Kubang Pasu.</p> </div> <div data-bbox="526 1276 732 1566">  <p>Nur Danisya Farhana is a secondary school student who is currently study in science stream at SBP Integrasi Kubang Pasu.</p> </div> </div>





Hawa Nur Aimuni is a secondary school student who is currently study in science stream at SBP Integrasi Kubang Pasu.



Nur Shareena is a secondary school student who is currently study in science stream at SBP Integrasi Kubang Pasu.




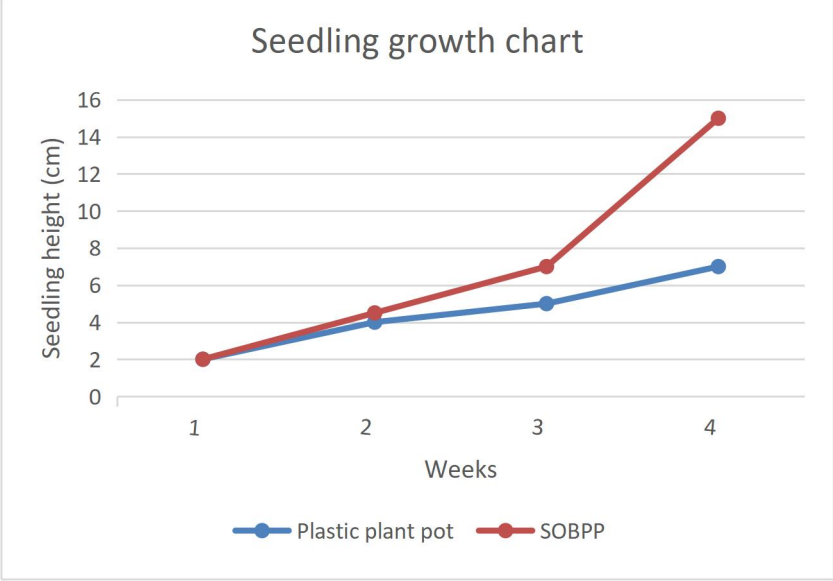
Fariza Najwa is a secondary school student who is currently study in science stream at SBP Integrasi Kubang Pasu.



Nurirdina Maisarah is a secondary school student who is currently study in science stream at SBP Integrasi Kubang Pasu.

<b>SACCHARUM OFFICINARUM BIODEGRADABLE PLANT POT (SOBPP)</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Nor Afisyah <sup>1</sup> , Nur Hanisah <sup>2</sup> , Nur Amni <sup>3</sup> , Nurul Fatiha Aisyah <sup>4</sup> , Nuha Ulya <sup>5</sup> , Nur Farhana Imtiyaz <sup>6</sup> , Insyirah <sup>7</sup>		
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<b>Abstract</b>	Sustainable gardening is a lifestyle choice that focuses on the long-term effects of creating an eco-friendly space focusing on the future of our earth and the soil. <i>Saccharum Officinarum</i> Biodegradable Plant Pot (SOBPP) is an innovative alternative to the use of petroleum-based plant pot by applying green technology towards creating a sustainable environment. The SOBPP is made from a combination of sugar cane waste and eggshells. The idea of producing this plant pot is due to the problem of disposal of waste materials and the widespread use of non-biodegradable materials in agricultural fields that contribute to the formation of greenhouse gases. The objectives of inventing SOBPP are to reduce the amount of solid waste material that goes to the environment, reduce the use of plastic plant pots by producing eco-friendly pots using green technology and create a greener environment. The novelties of this product are eco-friendly products that can be broken down by microorganisms, non-toxic and safe for everyone. The mixture of sugarcane waste and eggshells in a plant pot is		

	<p>economically viable to produce. The benefits of this product to society are using non-toxic substances, helping to reduce the amount of waste material in the environment, biodegradable plant pot that can be broken down into compost that is good for plant growth and reduce greenhouse gases. <i>Saccharum Officinarum</i> Biodegradable Plant Pot has big potential to be commercialised as it is economically low in cost, an easy to use and eco-friendly plant pot that can create a greener environment.</p>
<b>Keywords</b>	Sustainable Development, Biodegradable Plant Pots, Sugar Cane Wastes, Egg shells
<b>Product description</b>	<p><i>Saccharum Officinarum</i> Biodegradable Plant Pot (SOBPP) is an innovative alternative to the use of petroleum-based plant pot by applying green technology towards creating a sustainable environment. The SOBPP is made from a combination of sugar cane waste and eggshells. Lignocellulosic biomass is the non-starch based fibrous part of the <i>Saccharum Officinarum</i> plant. It is a complex biopolymer that is primarily composed of cellulose, hemicellulose and lignin, which gives a strong and solid structure to SOBPP. Eggshells also contain calcium and minerals that help plants grow, which make it a great fertilizer and reduce the acidity of the soil. This product is an eco-friendly plant pot that can be decomposed by microorganisms and return nutrients to the soil and make it more fertile. It is used as a nursery pot and when the seedling is mature, the pot does not need to be moved, it can be planted directly into the ground.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<div style="text-align: center;">  </div> <p style="text-align: center;">Figure 1. <i>Saccharum Officinarum</i> Biodegradable Plant Pot (SOBPP)</p>

	<div style="text-align: center;">  <p>Seedling growth chart</p> <table border="1"> <caption>Data for Figure 2: Seedling growth chart</caption> <thead> <tr> <th>Weeks</th> <th>Plastic plant pot (cm)</th> <th>SOBPP (cm)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>2</td> <td>2</td> </tr> <tr> <td>2</td> <td>4</td> <td>4.5</td> </tr> <tr> <td>3</td> <td>5</td> <td>7</td> </tr> <tr> <td>4</td> <td>7</td> <td>15</td> </tr> </tbody> </table> </div> <p>Figure 2. Seedling growth chart on <i>Saccharum Officinarum</i> Biodegradable Plant Pot (SOBPP) and plastic plant pot.</p>	Weeks	Plastic plant pot (cm)	SOBPP (cm)	1	2	2	2	4	4.5	3	5	7	4	7	15
Weeks	Plastic plant pot (cm)	SOBPP (cm)														
1	2	2														
2	4	4.5														
3	5	7														
4	7	15														
<b>Novelty and uniqueness</b>	<p><i>Saccharum Officinarum</i> Biodegradable Plant Pot (SOBPP) produces four (4) novelties and uniqueness. First, it is a biodegradable product that can be broken down by microorganisms. Secondly, this plant pot is non-toxic, safe for everyone and safe for the environment. Thirdly, it is economically viable to produce. Lastly, there is a new approach of combining sugarcane waste and eggshells in plant pot production.</p>															
<b>Benefit to mankind</b>	<p><i>Saccharum Officinarum</i> Biodegradable Plant Pot (SOBPP) has some advantages for people. For structural design, SOBPP is a very simple design, light and easy to use. For environmental impact, this product uses non-toxic substances that are safe for everyone. It can also help to reduce the amount of waste material in the environment by reusing and recycling the waste materials such as sugar cane waste and eggshells. Furthermore, this innovation is a biodegradable plant pot that can be broken down into compost that is good for plant growth and reduces greenhouse gases. To society, this innovation helps to improve a better environmental and social impact in reducing carbon emissions and controlling global environmental issues, especially waste management, global warming, and pollution.</p>															
<b>Potential commercialization</b>	<p><i>Saccharum Officinarum</i> Biodegradable Plant Pot has a big potential to be commercialised as it is economically low in cost, an easy to use and eco-friendly plant pot that can create a greener environment.</p>															
<b>Acknowledgment</b>	<p>The head project member acknowledges financial and moral support from the Principal of SMKA Syeikh Abdullah Fahim, teachers and parents in realizing this innovation.</p>															

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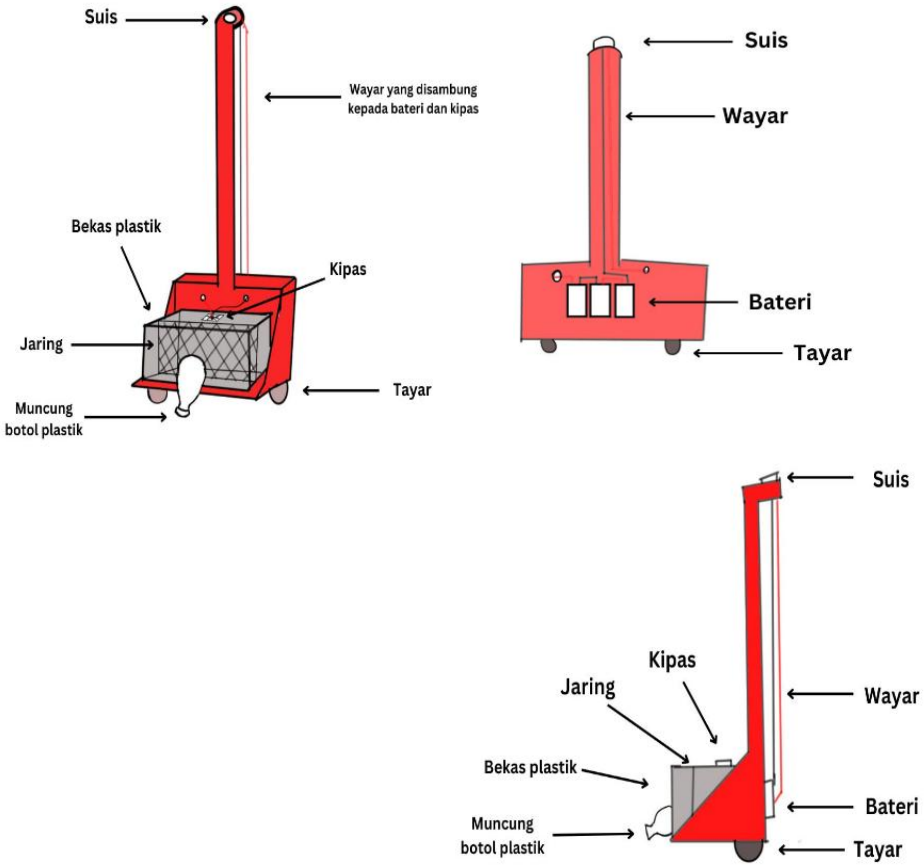



<b>NAPPING PILLOW</b>				
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
	<b>School</b>	<b>University</b>	<b>Academician</b>	<b>Industry</b>
	√			
	<b>Local</b>		<b>International</b>	
	√			
<b>Project Member(s)</b>	Ezzatul Najwa binti Mohd Rasid <sup>1</sup> , Siti Nor Bahyah binti Jamil <sup>2</sup> , Nurbalqis Qistina binti Zainal Abidin <sup>3</sup> , Thia Batrisyia binti Mohd Arman <sup>4</sup> , Nur Adlin Sofiya binti Khairul Anuar <sup>5</sup> .			
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<b>Abstract</b>	<p><i>Napping Pillow</i> ini diwujudkan daripada dua bahan yang telah digabungkan menjadi satu. <i>Napping Pillow</i> ini dibuat menggunakan bantal berbentuk ‘U’ dan jam yang banyak kegunaannya seperti pembesar suara, radio, <i>Bluetooth</i> dan boleh digunakan untuk menjawab telefon. Produk ini diinovasikan untuk pelajar yang sering terlelap semasa berehat. Disebabkan itu, kami mencipta produk <i>Napping Pillow</i>, dimana produk ini dicipta menggunakan bantal dan jam digital yang dilengkapi pembesar suara supaya pelajar lebih mudah untuk terjaga dan menepati masa. <i>Napping Pillow</i> diinovasikan bagi memudahkan pelajar untuk berehat seketika dengan selesa. Seterusnya, <i>Napping Pillow</i> juga memudahkan ibu bapa untuk menidurkan anak-anak mereka. Kaedah yang digunakan dalam menghasilkan produk <i>Napping Pillow</i> ini adalah produk yang dihasilkan dengan gabungan bantal yang berbentuk “U” dan juga jam digital yang mengandungi pembesar suara. Dapatan daripada produk ini adalah dapat membantu menyelesaikan masalah pengguna yang sukar menepati masa. Selain itu, mereka dapat merehatkan minda dan badan sambil mendengar zikir. Akhir sekali, produk ini dapat menjimatkan ruang dan mudah di bawa kemana-mana sahaja. Penambahbaikan yang boleh kami lakukan ialah kami perlu mencari jam digital yang dilengkapi dengan pembesar suara yang ringan agar bantal tersebut lebih mudah dibawa kemana-mana dan selesa digunakan. <i>Napping Pillow</i> ini dipasarkan kepada pelajar dan pekerja yang bekerja di pejabat</p>			

	<p>kerana mereka sangat memerlukan nya semasa mereka ingin berhenti membuat sesuatu kerja. Mereka dapat menetapkan masa berapa lama mereka ingin berehat, kemudian barulah mereka boleh meneruskan kerjanya semula.</p>
<p><b>Keywords</b></p>	<p>Napping Pillow, Pengurusan Perniagaan, Kolej Vokasional</p>
<p><b>Product description</b></p>	<ul style="list-style-type: none"> <li>▶ <i>Napping Pillow</i> ini adalah merupakan satu penyelesaian untuk menghilangkan rasa mengantuk ketika belajar kerana <i>Napping Pillow</i> mudah dibawa, dikendalikan dan disimpan.</li> <li>▶ Masalah yang sering dihadapi oleh para pelajar ialah dimana pelajar sentiasa mengalami masalah mengantuk semasa belajar.</li> <li>▶ Adakalanya pelajar tertidur ketika mengulang kaji kerana merasa bosan.</li> <li>▶ Jadi dengan adanya “ <i>Napping Pillow</i> ” ini dapat memudahkan para pelajar .</li> </ul>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	<p style="text-align: center;">LANGKAH PENGHASILAN NAPPING PILLOW</p> <div style="display: flex; justify-content: space-around;">   </div>

<p><b>Novelty and uniqueness</b></p>	<p>Napping Pillow memiliki keunikan dari segi gabungan 2 jenis alatan penting dalam kehidupan seharian pelajar. Selain itu, bantal yang digunakan sebagai bahan utama menjadikan inovasi ini menarik minat para pelajar pada masa kini.</p>
<p><b>Benefit to mankind</b></p>	 <p><b>POTENSI PASARAN</b></p> <ul style="list-style-type: none"> <li>• Sasaran utama bagi produk ini adalah pelajar pejabat.</li> <li>• Berpotensi dijual kepada semua golongan masyarakat.</li> </ul> <p><b>OBJEKTIF</b></p> <ul style="list-style-type: none"> <li>• Memudahkan pelajar dan pekerja untuk berehat seketika dengan selesa.</li> <li>• Dapat mengurangkan rasa sakit leher ketika berehat di dalam kereta.</li> </ul> <p><b>KEASLIAN</b></p> <ul style="list-style-type: none"> <li>• Cetusan idea daripada salah seorang ahli kumpulan.</li> <li>• Reka bentuk yang diilhamkan bersama dengan ahli kumpulan lain.</li> </ul> <p><b>APLIKASI</b></p> <ul style="list-style-type: none"> <li>• Menghidupkan peranti pada bantal kemudian menyambungkan peranti dengan telefon pintar.</li> <li>• Hanya boleh dikawak menggunakan telefon pintar dengan jarak 10 meter.</li> </ul>
<p><b>Potential commercialization</b></p>	<p>Kelebihan yang terdapat pada <i>Napping Pillow</i> seperti gabungan 2 alatan, mudah dibawa kemana-mana menjadikan inovasi ini sesuai untuk di pasaran di Malaysia kerana inovasi ini boleh membantu memudahkan kerja seharian, menjimatkan masa dan menjimatkan kos.</p>
<p><b>Acknowledgment</b></p>	<p>Tiada</p>

<b>INNO-VACUUM CLEANER</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Zaim <sup>1</sup> , Muhammad Iman <sup>2</sup> , Muhammad Hazim <sup>3</sup> , Munirah <sup>4</sup> , Nur Fatin Nadhirah <sup>5</sup> , Putri Nuralya Aziana <sup>6</sup> , Nur 'Aisyah 'Aqilah <sup>7</sup>		
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<b>Abstract</b>	<p>Green technology is one of the methods to reduce human impacts on the natural environment. Through recycling and waste management, Inno-Vacuum cleaner (IVC) is an innovative product that up-cycle the plastic bottle towards creating a sustainable environment. The idea of producing this Inno-vacuum is due to the problem of disposal of waste materials like plastic bottles and widespread use of non-biodegradable materials on the land and sea, resulting in land pollution and water pollution. It is also increasing the amount of micro plastic in the water body. It is very dangerous if the micro plastics are in the bodies of aquatic organisms, because the micro plastics will be transferred to the human body through a food web.</p> <p>The objective of inventing IVC from shovels and a plastic container is a step in reducing the daily pile of solid domestic waste. Secondly, to reduce micro plastics in the water body and lastly, to reduce global environmental issues, especially waste management and pollution.</p>		

	<p>This Inno-vacuum cleaner is recommended for individual daily use, such as being easy to clean the floor, saving time and being environmentally friendly. The garbage in the vacuum can be recycled properly.</p>
<p><b>Keywords</b></p>	<p>Sustainable Development, Up-cycle Plastic Container, Green Technology</p>
<p><b>Product description</b></p>	<p>Inno- Vacuum Cleaner (IVC) is an innovative product that up-cycles the container plastic by applying green technology towards creating a sustainable environment. The IVC is made from two main materials, a shovel and two sides of a container. This product will work when the switch is turned on and start cleaning the floor. The net between side one and side two does not allow garbage to enter the big side one. Therefore, the garbage is trapped in container two only when sucked. On one side is to place the fan so that it can work properly.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	
<p><b>Novelty and uniqueness</b></p>	<p>The Inno-vacuum cleaner produces three (3) novelty and uniqueness.</p> <ol style="list-style-type: none"> <li>1. The new approach of alternative design is a combination of shovel and container plastic.</li> </ol>

	<p>2. 3D response surface model of Eco-efficiency for Inno-vacuum cleaner.</p> <p>3. Up-cycle the container plastic into eco-friendly product.</p>
<b>Benefit to mankind</b>	<p>The Inno-vacuum cleaner has some advantages for people, especially students. For designers, the Inno-vacuum cleaner clearly helps in cleaning the floor, saves time and is environmentally friendly. Towards Go Green Penang, this product will help to reduce the amount of plastic products which toxic waste to the environment. Additional materials in the manufacture of this vacuum are fan blades, tires, nets, switches, and wires. Furthermore, this innovation proves that not all waste material is considered useless without examining the content of its composition.</p> <p>To society, this innovation is helping better environment and social impact in reducing garbage and controlling global environmental issues especially waste management, global warming and pollution.</p>
<b>Potential commercialization</b>	<p>The Inno-vacuum cleaner has a big potential to be commercialised as it is economically low in cost, an easy to use and eco-friendly vacuum that can create a greener environment.</p>
<b>Acknowledgment</b>	<p>The head project member acknowledges financial and moral support from the Principal of SMKA Syeikh Abdullah Fahim, teachers and parents in realizing this innovation.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: center;">  <div> <p>Zaim bin Zulkefli President of Kelab STEM Form 5 student at SMKA Syeikh Abdullah Fahim</p> </div> </div> <div style="display: flex; align-items: center;">  <div> <p>Muhammad Iman bin Zaidi Secretary of Kelab STEM Form 5 student at SMKA Syeikh Abdullah Fahim</p> </div> </div> </div>





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Form 5 student at SMKA Syeikh Abdullah Fahim

	 <p>Nur 'Aisyah 'Aqilah bt Sofirudman Committee of Kelab STEM Form 5 student at SMKA Syeikh Abdullah Fahim</p>
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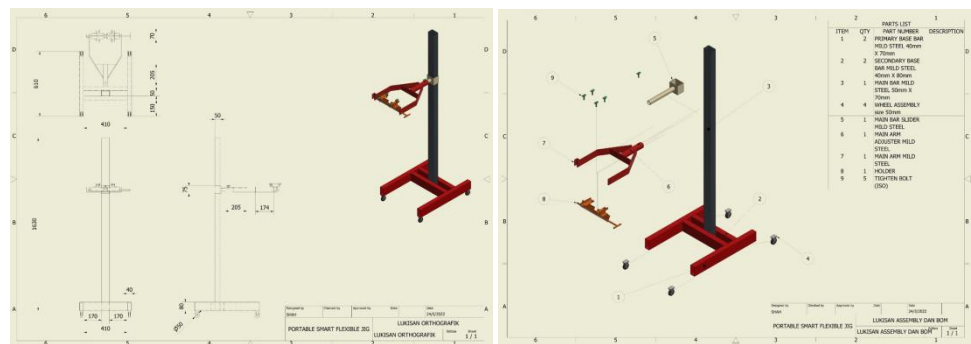
<b>PORTABLE SMART FLEXIBLE JIG</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Muhammad Arieff Farhan Bin Mohd Noor <sup>1</sup> , Ajmal Hakim Bin Ahmad Nazrie <sup>2</sup> , Muhammad Arman Bin Muhammad Ikram <sup>3</sup> , Muhammad Aidil Naufal Bin Zurain <sup>4</sup> , Aiman Zawawi Bin Azizul <sup>5</sup> , Siti Nur Ain Binti Azlan <sup>6</sup>		
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<b>Abstract</b>	Jig kimpalan yang dinamakan PORTABLE SMART FLEXIBLE JIG dibangunkan berasaskan dua objektif utama iaitu jig pemegang plat pelbagai kedudukan plat bagi sambungan temu V tunggal dan mesra pengguna dimana mudah alih serta boleh laras mengikut kesesuaian. PORTABLE SMART FLEXIBLE JIG direkabentuk melalui <i>computer aided design</i> (CAD) bagi menganalisis kebolehfungsian dan mesra pengguna kepada pengguna. Kelebihan produk ini adalah untuk memegang plat pelbagai kedudukan dikhaskan untuk kimpalan temu v tunggal kedudukan 1G, 2G, 3G dan 4G. Ia juga boleh memegang plat semasa memaku kimpal bagi mengelakkan herotan dan salah jajaran. Jig ini juga mudah alih serta mudah laras bagi memudahkan proses mengimpal.		
<b>Keywords</b>	Welding Jig		
<b>Product description</b>	Jig kimpalan yang dinamakan PORTABLE SMART FLEXIBLE JIG dibangunkan berasaskan dua objektif utama iaitu jig pemegang plat pelbagai kedudukan plat bagi sambungan temu V tunggal dan mesra		

pengguna dimana mudah alih serta boleh laras mengikut kesesuaian.


**Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.**




Produk Portable Smart Flexible Jig



Rekabentuk produk menggunakan CAD



### Dye Penetrant Testing



**KAMA: JIG MUDAHI LARAB**

**MANUAL OPERASI**

**SEBELUM DIKEROPASI**

- 1) Pastikan JHM, benda dalam keadaan baik.
- 2) Tempatkan JHM, sebelum mengimpal dalam keadaan yang sesuai.
- 3) Pastikan semua peralatan berfungsi untuk kerja kimpalan telah disediakan.
- 4) Pastikan kawasan sekitar bersih dan tiada halangan untuk kerja mengimpal.

**SEMASA DIKEROPASI**

- 1) Letakkan benda kerja dan katupkan dengan betul.
- 2) Letakkan katupkan jig mengikut kedudukan mengimpal.
- 3) Letakkan jig mengimpal kedudukan kimpalan yang dikehendaki.
- 4) Jalankan proses paku kimpal dan kerja mengimpal sehingga selesai.

**NELAKS DIKEROPASI**

- 1) Pindahkan benda kerja yang telah siap diimpal.
- 2) Bersihkan semua JHM dan kawasan kimpalan.
- 3) Simpan semua JHM, ditempat yang selamat.

**PENGUJIAN PRODUK**


- Pengujian dibuat menggunakan mata serta menggunakan ujian "Visual" dan "Dye Penetrant Test".

**KEMAMPUAN PRODUK**

- Kemampuan produk diuji oleh 30 pelajar dari segi masa mengimpal dari proses paku kimpal sehingga siap.

**MANUAL OPERASI**

- Manual operasi dibuat bagi memudahkan rujukan akan datang



Pengujian produk dalam menguji katahanan produk sebelum digunakan sepenuhnya oleh pengguna



## KOS PROJEK






ITEM	JUMLAH
KOS BAHAN MENTAH	RM 102.90
KOS BAHAN GUNA HABIS	RM 70.00
KOS PEKERJA	RM 205.00
KOS PENGUJIAN	RM 5.50
KOS MESIN	RM 15.00
KOS ELEKTRIK	RM 14.97
<b>JUMLAH KESELURUHAN KOS PROJEK</b>	<b>RM 413.37</b>



Kos pembangunan produk dengan kadar paling minima bajet yang digunakan

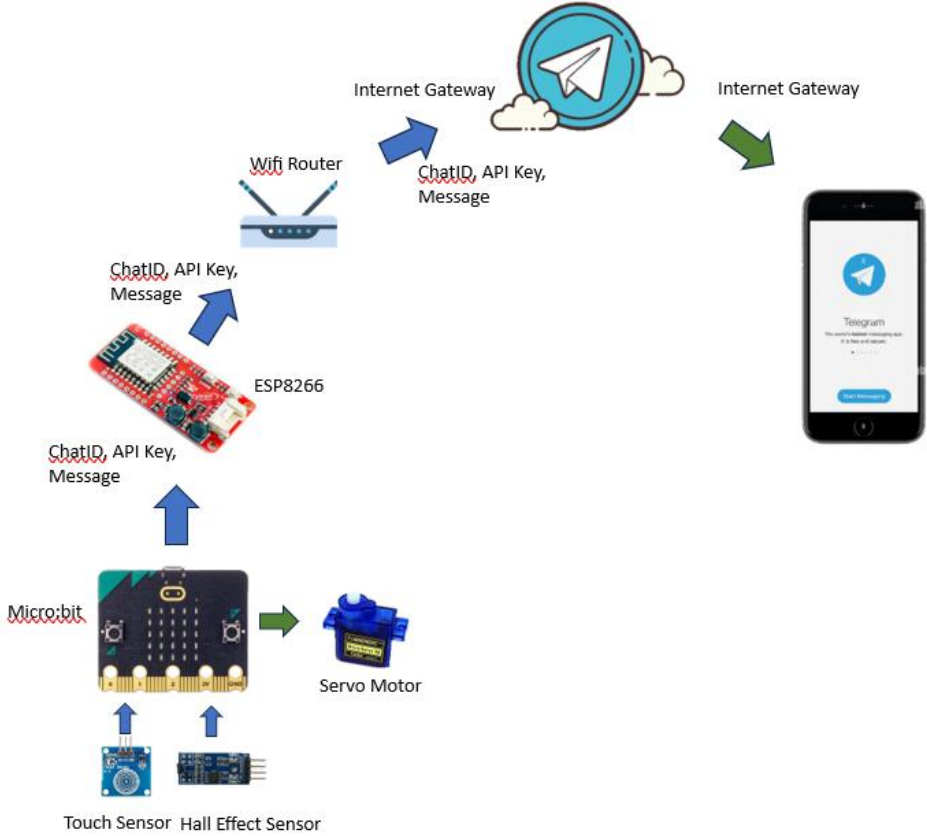
<b>Novelty and uniqueness</b>	Portable Smart Flexible Jig mempunyai keunikan yang tiada pada jig kimpalan yang lain dimana mempunyai kebolehfungsian yang pelbagai dan mesra pengguna serta harga yang murah.
<b>Benefit to mankind</b>	Portable Smart Flexible Jig adalah salah satu jig kimpalan yang memberi kemudahan kepada pengimpal membuat kimpalan temu V tunggal pada kedudukan 1G, 2G, 3G dan 4G. Kebolehfungsian produk ini memberi kelebihan pengimpal menjimatkan masa dalam membuat sesuatu projek. Produk ini juga mesra pengguna mengikut kehendak pengguna menggunakan dimana sahaja kawasan yang perlu untuk mengimpal serta menjimatkan ruang.







<b>Potential commercialization</b>	<p>Mengikuti rekabentuk dan kebolehfungsian Portable Smart Flexible Jig ini lebih mengutamakan kepada pelajar atau calon yang belajar dalam bidang kimpalan di institusi-institusi pendidikan</p>
<b>Acknowledgment</b>	<p>Persatuan Ibu Bapa dan Guru (PIBG) Kolej Vokasional Melaka Tengah, Melaka, Malaysia</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div data-bbox="505 485 748 688">  <p>Muhammad Arieff Farhan Bin Mohd Noor merupakan pensyarah Teknologi Kimpalan di Kolej Vokasional Melaka Tengah. Beliau merupakan pemegang Ijazah Sarjana Muda Pendidikan Vokasional di UTHM.</p> </div> <div data-bbox="505 741 748 961">  <p>Ajmal Hakim Bin Ahmad Nazrie merupakan pelajar Tahun 1 Sijil Vokasional Malaysia dalam bidang Teknologi Kimpalan</p> </div> <div data-bbox="505 999 748 1192">  <p>Muhammad Arman Bin Muhammad Ikram merupakan pelajar Tahun 1 Sijil Vokasional Malaysia dalam bidang Teknologi Kimpalan</p> </div> <div data-bbox="505 1220 748 1434">  <p>Muhammad Aidil Naufal Bin Zurain merupakan pelajar Tahun 1 Sijil Vokasional Malaysia dalam bidang Teknologi Kimpalan</p> </div> <div data-bbox="505 1472 748 1717">  <p>Aiman Zawawi Bin Azizul merupakan pelajar Tahun 1 Sijil Vokasional Malaysia dalam bidang Teknologi Kimpalan</p> </div> </div>

		<p>Siti Nur Ain Binti Azlan merupakan pelajar Tahun 1 Sijil Vokasional Malaysia dalam bidang Teknologi Kimpalan</p>
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<b>KEY BOX SYSTEM WITH TELEGRAM NOTIFICATION (K-BOX)</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Mohd Rashdan Bin Rameli <sup>1</sup> , Adam Fahmy Bin Azrul Erdy <sup>2</sup> , Alya Damia Binti Azrul Erdy <sup>3</sup> , Aisyah Safiyya Binti Mohd Razif <sup>4</sup> , Aufa Sakinah Binti Mohd Razif <sup>5</sup> , Nur Athirah Qalesya Binti Mohd Shahrizal <sup>6</sup> , Nur Amni Fatima Binti Muhammad Fadzly <sup>7</sup>		
<b>Affiliation</b>	Sekolah Rendah Agama Integrasi Pekan Beranang, Beranang, Selangor		
<b>Email</b>	<sup>1</sup> rashdan@pendidikanjais.my, <sup>2</sup> adamfahmysraipb@gmail.com		
<b>Correspondence</b>	Mohd Rashdan Bin Rameli Panitia Rekabentuk dan Teknologi, Sekolah Rendah Agama Integrasi Pekan Beranang (SRAIPB), Lorong Dato Dagang Haji Harun, Kampung Sesapan Kelubi, 43700, Beranang, Selangor, Malaysia. Tel/Faks: +603-8766 8048		
<b>Abstract</b>	Key box system with Telegram Notification (using Telegram Application), is named K-BOX which is constructed by using micro:bit and connected to wireless internet microcontroller known as esp8266. Both materials are easily obtained with economical cost. The K-BOX was designed to record the date and time when the key was retrieved and submitted in real time. The K-BOX system consists of input, processor, and output. The K-BOX input consist of 2 touch sensors which are used to send open and close commands and a hall sensor to detect the presence of a key. Then micro:bit will send message to esp8266 with API key and Chat ID then it will send data throught internet gateway to telegram application. As the output, 5x5 LEDs is used as the indicator of the internet connection between esp8266 and wireless router while a servo output is used to close and open the key box door through movements of 0 and 90 degrees. Each input and output will be displayed in Telegram Apps via Telegram Chatbot. Through a series of test run, the k-BOX system has shown to operate well and maneuverability at low maintenance cost. The K-BOX shall provide tremendously helpful key box system in workplace, school, homestay		

	without the presence of the key owner.
<b>Keywords</b>	Micro:bit, esp8266, API key, Telegram
<b>Product description</b>	KBOX is developed to display date and time in realtime data on telegram app. The Microbit will send unique ChatId, API Key and Message to Esp8266. Esp82 is used to send data through internet to telegram cloud storage. Then will showed on telegram apps.
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	
<b>Novelty and uniqueness</b>	K BOX has uniqueness especially in terms of recording date and time in real-time telegram apps to monitor key retrieved and submitted system.
<b>Benefit to mankind</b>	K BOX an alternative method to developing key box management key in real time using telegram apps. It has huge potential to be applied in school, office and homestay application.
<b>Potential commercialization</b>	Based on physical appearance, K BOX is practically used for school, office and homestay. Apart from that, K BOX can play an important role as teaching and learning equipment especially for Reka Bentuk dan Teknologi (RBT) study. It can use other IOT application that can be controlled or

	monitor using Telegram Apps.
<b>Acknowledgment</b>	The head project member acknowledges financial support from parent and staff from MARA Japan Industrial Institute to help technically and guided teams to complete this product.
<b>Researchers Biographical Data</b>	<div data-bbox="505 438 743 726">  <p>Mohd Rashdan bin Rameli is a teacher and Head of Reka Bentuk dan Technology (RBT) committee for Sekolah Rendah Agama Integrasi Pekan Beranang. He was actively joined innovation competition to gain knowledge and experience to use to teach student in class.</p> </div> <div data-bbox="505 795 743 1125">  <p>Adam Fahmy B Azrul Erdy aged 12 is a school Prefect. Actively joined innovation competition since 2021. Representative for school badminton team and Scout.</p> </div> <div data-bbox="505 1194 743 1478">  <p>Alya Damia Binti Azrul Erdy aged 11. Actively joined innovation competition since 2021. Representative for school volleyball team and Kadet Remaja Sekolah.</p> </div> <div data-bbox="505 1545 743 1833">  <p>Aisyah Safiyya Binti Mohd Razif aged 12 is Pembimbing Rakan Sebaya (PRS). Representative for school badminton team and Pandu Puteri.</p> </div>



Nur Athirah Qalesya Binti Mohd Sharizal, aged 12 is a school Prefect. Active in sports and school activities. Representative for school netball team, played hand ball, members of Persatuan Pengakap Malaysia and represented school for Hafazan AlQuran at zone level.



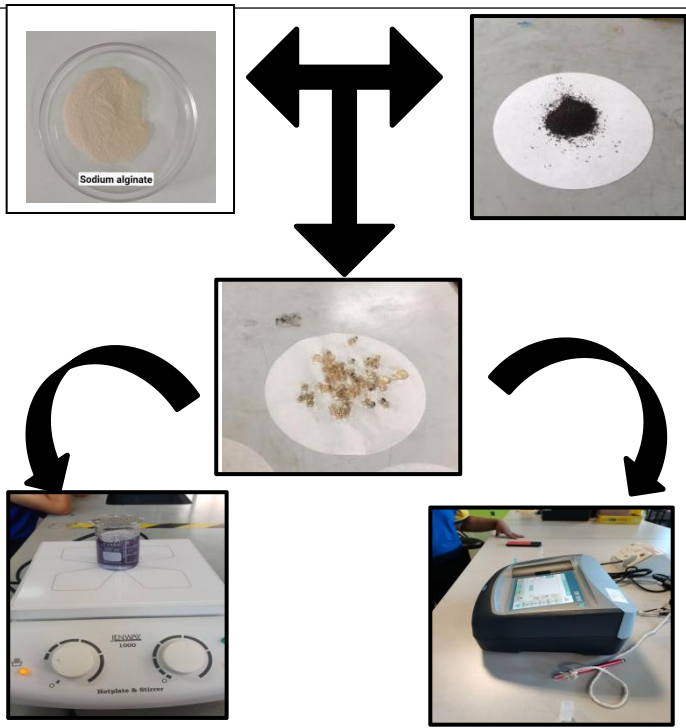
Afa Sakinah Binti Mohd Razif aged 11. Representative for school volleyball team and Kadet Remaja Sekolah.






Nur Amni Fatima binti Muhammad Fadzly is currently Tahun 5 student, a Pengawas SPBT (Skim Pinjaman Buku Teks), AJK for Netball Club and a member for English Club. A cheerful, helpful and independent person, who loves reading and travelling. Active in sports, holding a 3<sup>rd</sup> grade/kup Taekwando, she represented school for state level (SRAI) Chess tournament 2022. She attended Junior School Enrichment Programme (JSEP) for Robotics and Science, in Genius Pintar UKM (2021-2022) to study more on her interest in science. For 2023, she participated in HIPPO English Olympiad 2023 (until Semi-Final round) and a representative for school to State level (SRAI) competition in English Choral Speaking.



<b>TEA WASTE BIOBEADS</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>University and Technical Institutional Students</b>	<b>Academician / Industry/ Professional</b>
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Muhammad Ammar Yazid Bin Mohd Najib <sup>1</sup> , Adi Khushairi Bin Mohd Nasir <sup>2</sup> , Mohamad Ammar Muqri Bin Idris <sup>3</sup> , Muhammad Fairuz Asyraf Bin Azman <sup>4</sup> , Hasnah Taha <sup>5</sup>		
<b>Affiliation(s)</b>	Sekolah Menengah Kebangsaan Tasek, Taman Puteri Gunung, 14120 Simpang Ampat, Pulau Pinang, Malaysia.		
<b>Email of all participant(s)</b>	aimanfiz76@gmail.com, khushairiadii@gmail.com , mohamdammarmuqribinidris@gmail.com , ammxryxzid07@gmail.com, hasnahtaha@gmail.com		
<b>Correspondence</b>	Hasnah Taha, Sekolah Menengah Kebangsaan Tasek, Taman Puteri Gunung, 14120 Simpang Ampat, Pulau Pinang, Malaysia. Tel: +604-5873590, Fax: +604-5873590		
<b>Abstract</b>	Teawaste contains plant materials which are mainly comprised of cellulose materials that can adsorb dyes in aqueous medium. Teawaste is a good adsorbent for removal of dyes from wastewater. The threat of water pollution to environment has aroused widespread concern. Thus, this innovation highlights the development of efficient adsorbents to treat the contaminants such as dyes. Biobeads was made from natural resources of polysaccharide and polyphenolic compound which proposed as green chemistry strategy for the environment. Biobeads was prepared by immobilizing polyphenolic compound into the matrix of sodium alginate beads. Then, the biobeads can be used to remove the target contaminants via adsorption process either by batch or continuous system. This innovation product also has a high commercialization potential due to low-		

	cost of raw material and production.
<b>Keywords</b>	beads, adsorption, dye
<b>Product description</b>	Biobeads is synthesized by using two main natural resources which are sodium alginate and tea waste. The biobeads was prepared in the form of immobilized beads that can be used as adsorbents. The biobeads can be apply in adsorption process either in batch or continuous system for the removal of contaminants.
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	
<b>Novelty and uniqueness</b>	Biobeads has uniqueness especially in terms of greener and eco-friendly material resources. The immobilized beads can be applied as adsorbents in batch and continuous adsorption process. Biobeads in the form of beads is easy to handle as well as separate from the water body. Biobeads have a potential of reusability compared to other forms of adsorbents.
<b>Benefit to mankind</b>	Biobeads have an excellent adsorption capacity of contaminants from aqueous solution such as dyes. Biobeads can be implemented for batch or continuous treatment process. This invention can improve the quality of water and environment by providing facile and low-cost process.

<p><b>Potential commercialization</b></p>	<p>Natural resources such as alginate and polyphenolic produced by renewable organic resources are regarded as greener, sustainable, and eco-friendly materials. It provides an alternatives adsorbent in treating wastewater or water pollution in which easy synthesis process, cost effective, and reusable. This innovation product has a high commercialization potential due to lowcost of raw material and production.</p>
<p><b>Acknowledgment</b></p>	<p>The head project and member acknowledge financial support from Sekolah Menengah Kebangsaan Tasek.Guidance supports by the School of Chemical Engineering, Universiti Teknologi MARA Cawangan Pulau Pinang is acknowledged.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div data-bbox="505 678 730 997">  <p>Muhammad Ammar Muqri is a student who is currently studying in science stream in Sekolah Menengah Kebangsaan Tasek,Simpang Ampat Pulau Pinang.He love to learn something new and challenging.</p> </div> <div data-bbox="505 1066 730 1386">  <p>Muhammad Adi Khushairi Bin Mohd Nasir is a student currently studying in multimedia production in Sekolah Mennengah Kebangsaan Tasek,Simpang Ampat,Pulau Pinang.He is very interested in multimedia production subject.</p> </div> <div data-bbox="505 1476 730 1766">  <p>Muhammad Ammar Yazid Bin Mohd Najib is a student who is currently studying in TVET in Sekolah Menengah Kebangsaan Tasek,Simpang Ampat,Pulau Pinang. He is very interested in innovation and technologies.</p> </div> </div>

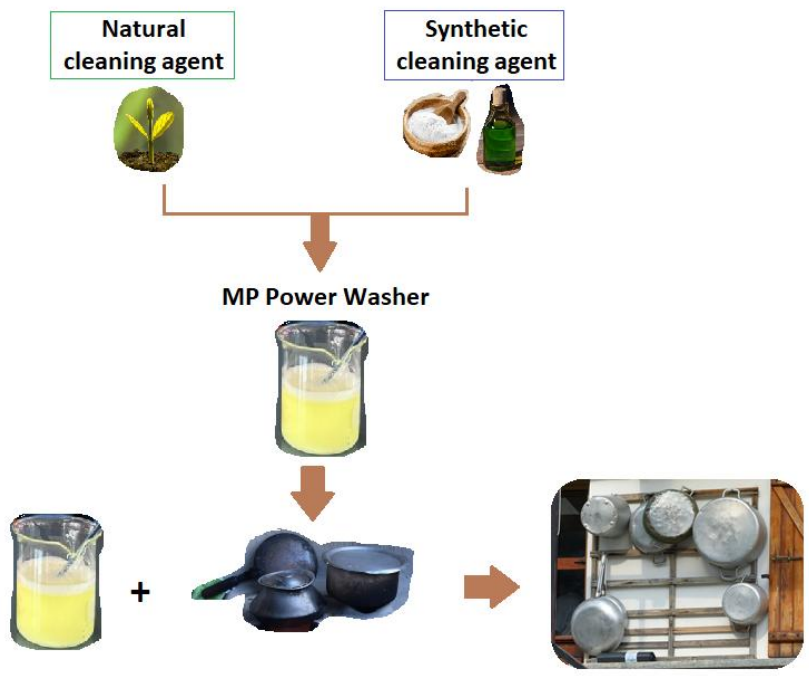


Muhammad Fairuz Asyraf Bin Azman is a student who is currently studying in TVET in Sekolah Menengah Kebangsaan Tasek, Simpang Ampat, Pulau Pinang. He loves science subjects.



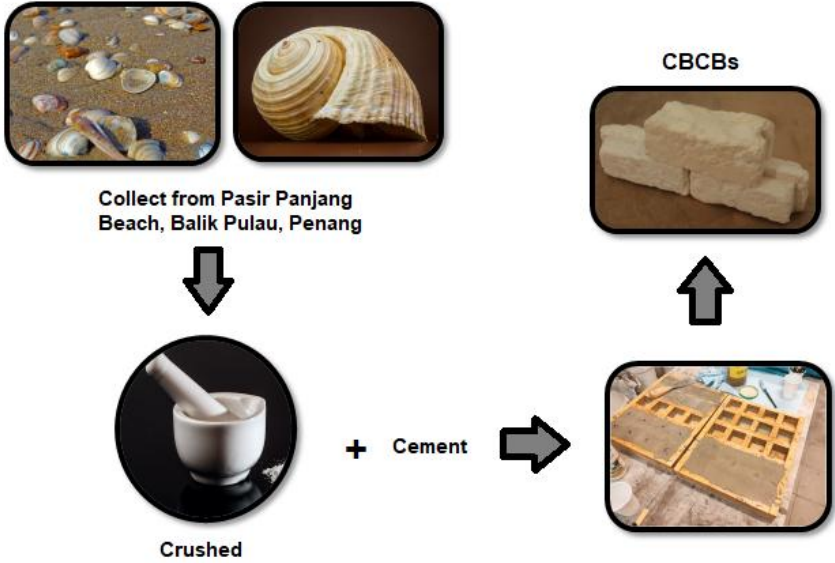
Hasnah Binti Taha is a teacher who is currently teaching Chemistry and Mathematics in Sekolah Menengah Kebangsaan Tasek. She was selected as Duta Guru KPM- Petronas for Cohort 2.

<b>MP POWER WASHER</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Hanif Ab Rahman <sup>1*</sup> , Nur Arisha Qistina Mohd Yusmadi <sup>1</sup> , Norsyamimi Amani Azizan <sup>1</sup> , Wan Ammar Eddin Wan Azlan <sup>1</sup> , Siti Nuramelia Aisyah Amer Aizat <sup>1</sup>		
<b>Affiliation</b>	<sup>1</sup> Sekolah Kebangsaan Mutiara Perdana, Jalan Dato Ismail Hashim, 11900, Bayan Lepas, Pulau Pinang		
<b>Email</b>	*hanifar43@gmail.com		
<b>Correspondence</b>	Hanif Ab Rahman Sekolah Kebangsaan Mutiara Perdana, Jalan Dato Ismail Hashim, 11900, Bayan Lepas, Pulau Pinang Tel: +604-6445500		
<b>Abstract</b>	According to a recent survey reported by the Study Finds, about 80% of millennial moms find themselves calmer when their kitchen is clean. The presence of stubborn grease, stains and burnt cookware make moms feel restless, anxious, and uncomfortable. Thus, it is crucial to find an appropriate cleaning kit for cooking utensils. MP Power Washer is a new innovative dishwashing liquid product to eliminate dirt and tough burnt from stainless pots and pans. It is formulated to provide a better washing experience.		
<b>Keywords</b>	dishwashing liquid, burnt cooking utensils		
<b>Product description</b>	A simple and low-cost dishwashing liquid named MP Power Washer is formulated to eliminate grease and burnt from pots and pans. It is derived from both natural and synthetic cleaning agents. Through a series of cleaning test, the MP Power Washer has shown to clean effectively and hassle-free.		

<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	
<p><b>Novelty and uniqueness</b></p>	<p>A facile and low-cost preparation of new cleaning agent has brought MP Power Washer a unique and essential household item. It is children-friendly and easy to use.</p>
<p><b>Benefit to mankind</b></p>	<p>MP Power Washer provides an alternative and robust approach for cleaning purposes, which is beneficial for everyday use.</p>
<p><b>Potential commercialization</b></p>	<p>MP Power Washer can play important role to not just clean the kitchen utensils but also keep them sparkling. With appropriate approved formulation, this product can be upgraded and serve as a safe, cheap, and powerful dishwashing liquid.</p>
<p><b>Acknowledgment</b></p>	<p>The head project member acknowledges financial support from the Universiti Sains Malaysia via the Division of Industry and Community Network (BJIM) grant, lead by Dr Nurul Syafiqah Rezali.</p>
<p><b>Researchers Biographical Data</b></p>	<p>Hanif Ab Rahman, a Science teacher at SK Mutiara Perdana was graduated from the Institute of Teacher Education (IPG) Cheras Campus, Kuala Lumpur.</p> <p>Nur Arisha Qistina Mohd Yusmadi and Norsyamimi Amani Azizan are Year 6 while Wan Ammar Eddin Wan Azlan and Siti Nuramelia Aisyah Amer Aizat are Year 5. All are from SK Mutiara Perdana.</p>



<b>COASTAL BIO-COMPOSITE BRICKS (CBCBS): SUSTAINABLE CONSTRUCTION FROM LOCAL WASTE</b>				
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector	
	√			
	<b>Local</b>		<b>International</b>	
	√			
<b>Project Member(s)</b>	Rozila Tahir <sup>1*</sup> , Muhammad Zul Zhafran Saad <sup>1</sup> , Muhammad Hanzalah Mahussin <sup>1</sup> , Muhammad Afiq Mikail Noramin <sup>1</sup> , Muhammad Hashif Rosli <sup>1</sup> , Saidatul Irdina Syahrizal <sup>1</sup>			
<b>Affiliation</b>	<sup>1</sup> Sekolah Kebangsaan Sungai Korok Jalan Baharu 11000, Balik Pulau, Pulau Pinang.			
<b>Email</b>	*g-88212924@moe-dl.edu.my			
<b>Correspondence</b>	Rozila Tahir Sekolah Kebangsaan Sungai Korok, Jalan Baharu 11000, Balik Pulau, Pulau Pinang, Malaysia Tel: +604-8661564			
<b>Abstract</b>	<p>The growing amount of shell waste on the coast, coupled with the urgent need to reduce the side effects of the use of construction materials, presents a unique opportunity to develop a sustainable alternative to traditional bricks. This project proposes the development of Coastal Bio-Composite Bricks (CBCBs) from a mixture of clam shells, snail shells, and cement, which are locally sourced from Pasir Panjang Beach, Balik Pulau, Penang. This study explores the utilization of a variety of locally available waste shells for the development of sustainable and environmentally friendly construction material. CBCBs will contribute to the local economy, reduce waste and environmental pollution, as well as provide a practical solution for the local construction industry. It's a proposition that aligns with the growing global demand for sustainable, eco-friendly, and locally sourced materials.</p>			
<b>Keywords</b>	Bio-composite; bricks; coastal; construction industry			
<b>Product description</b>	Coastal Bio-Composite Bricks (CBCBs) are a sustainable and robust construction material. They are made from a unique blend of clam shells,			

	<p>snail shells, and cement. The shells are cleaned, crushed into a fine powder, and mixed with cement to produce the bricks.</p>
<b>Require materials</b>	<p>Locally sourced clam shells, snail shells, cement, cleaning agents, crushing equipment, molds for brick shaping, curing facilities.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots/ Graphs etc.</b>	 <p>The diagram illustrates the production process of CBCBs. It begins with the collection of shells from Pasir Panjang Beach, Balik Pulau, Penang. These shells are then crushed into a fine powder. This powder is combined with cement. The mixture is then placed into a brick mold to produce the final CBCBs (Cementitious Bricks with Clam and Snail Shells).</p>
<b>Novelty and uniqueness</b>	<p>The CBCBs project is novel in its approach to sustainable construction, harnessing local waste resources. It pioneers the use of a mixture of different locally sourced shells in the production of a cementitious material, resulting in an eco-friendly, robust, and locally relevant building material.</p>
<b>Benefit to mankind</b>	<p>By transforming local waste into a valuable resource, the CBCBs addresses several Sustainable Development Goals (SDGs), including responsible consumption and production, innovation, and creating sustainable communities. It not only mitigates waste disposal issues but also contributes to the local economy by providing an affordable, sustainable construction material.</p>
<b>Potential commercialization</b>	<p>With the increasing global demand for sustainable and affordable building materials, the CBCBs holds substantial commercial potential. It offers a unique selling point with its local sourcing and sustainable production methods, making it an attractive proposition for both local and wider construction markets.</p>
<b>Acknowledgment</b>	<p>We express our heartfelt gratitude to Sekolah Kebangsaan Sungai Korok for their continuous support and resource provision throughout this project. We also thank Universiti Sains Malaysia via the Division of Industry and Community Network (BJIM) grant, led by Dr Nurul Syafiqah Rezali for financial support.</p>

**Researchers  
Biographical Data**


The project team consists of Rozila Tahir, Muhammad Zul Zhafran Saad, Muhammad Hanzalah Mahussin, Muhammad Afiq Mikail Noramin, Muhammad Hashif Rosli, and Saidatul Irdina Syahrizal. They are all affiliated with Sekolah Kebangsaan Sungai Korok. Their shared research interests encompass sustainable materials, waste management, and sustainable construction, with a strong focus on aligning these fields with the SDGs.



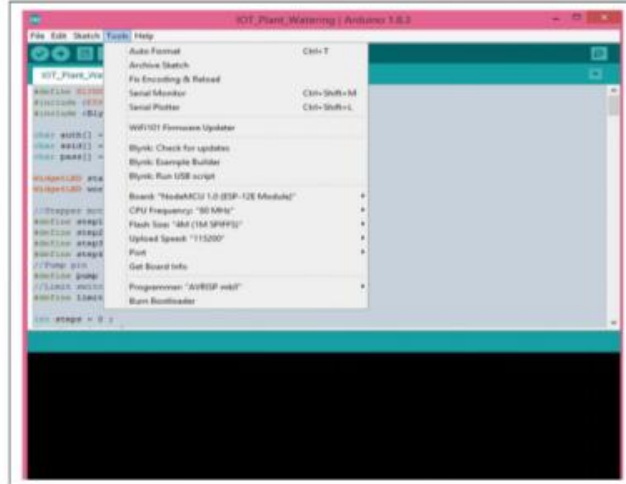
Puan Rozila Tahir

Encik Muhammad Zul  
Zhafran SaadMuhammad Afiq  
Mikail NoraminMuhammad Hashif  
RosliSaidatul Irdina  
SyahrizalMuhammad Hanzalah  
Mahussin

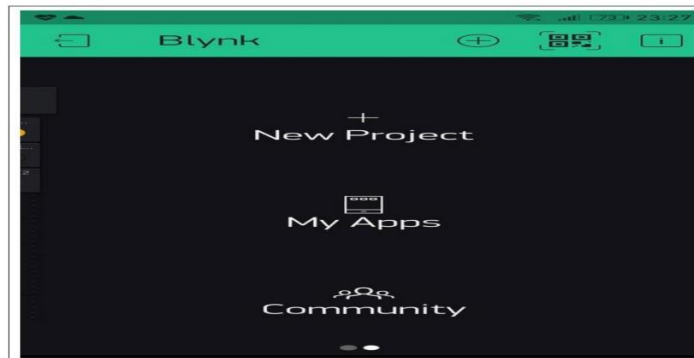
<b>SMART URBAN GARDEN WATERING SYSTEM (i-Watering)</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Hairunnisa Binti Nordin, Nur Qaisarah Binti Ahmad Zahid, Nur Alya Athirah Binti Mohd Shukor, Hareshvaran A/L Sugumar, Muhammad Adam Hariz Bin Zainurin, Muhammad Adib Bin Mohd Tarmizi, Muhammad Ammar Bin Jalil		
<b>Affiliation</b>	SMK Tanjong Puteri, Kuala Ketil, Kedah		
<b>Email</b>	<sup>1</sup> chikanessa008@gmail.com		
<b>Correspondence</b>	Hairunnisa Binti Nordin. SMK Tanjong Puteri, 09300 Kuala Ketil, Kedah, Malaysia. Tel: +6019-2432698, Fax:+604-4163853		
<b>Abstract</b>	The aim of this IoT project is to develop a plant watering system that automatically irrigates water or liquid fertilizer based on users' preferences using a smartphone as the remote controller. Plants require water for nutrient transport, photosynthesis, and cell function. Nutrients, including macronutrients and micronutrients, support healthy plant growth and metabolic processes. Therefore, this project is specifically designed for individuals who enjoy traveling but still want to ensure the well-being of their home plants or gardens. The project consists of three main functions: 1) watering the plants using WiFi, 2) monitoring water release with a wireless micro camera, and 3) wirelessly monitoring the water level in the rain tank in real-time. The system utilizes the Blynk app and Nodemcu as a programmable logic circuit to control the motor system and data. The Blynk app enables monitoring of water release time, pump power, water tank level, and irrigation distance. This project is driven by environmental sustainability concerns, with rainwater being recycled as the primary water supply for the irrigation system. The primary goal is to innovate and enhance the existing water irrigation systems in the market, allowing remote control via WiFi even when you are far away from your garden. A survey using a user acceptance test was conducted with 35 respondents		

	<p>who had already tried using i-watering. The obtained data is as follows: 94% responded that this project is easy to use; 97% responded that it saved their gardening time; 91% of the respondents found i-watering convenient for everyday use, and 97% responded that i-watering is capable of releasing water multiple times a day. In conclusion, i-watering is highly beneficial for urban gardeners who do not have enough time to take care of their gardens and can effectively conserve water resources.</p>
<b>Keywords</b>	<p>IOT project, environmental sustainability, Agriculture</p>
<b>Product description</b>	<p><b>i-Watering</b> is specifically designed for individuals who enjoy traveling but still want to ensure the well-being of their home plants or gardens. The project consists of three main functions: 1) watering the plants using WiFi, 2) monitoring water release with a wireless micro camera, and 3) wirelessly monitoring the water level in the rain tank in real-time. The system utilizes the Blynk app and Nodemcu as a programmable logic circuit to control the motor system and data. The primary goal is to innovate and enhance the existing water irrigation systems in the market, allowing remote control via WiFi even when you are far away from your garden. In conclusion, i-watering is highly beneficial for urban gardeners who do not have enough time to take care of their gardens and can effectively conserve water resources.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<p style="text-align: center;"><b>METHODOLOGY</b></p> <p style="text-align: center;"><b>Step 1: Materials and Tools</b></p> 

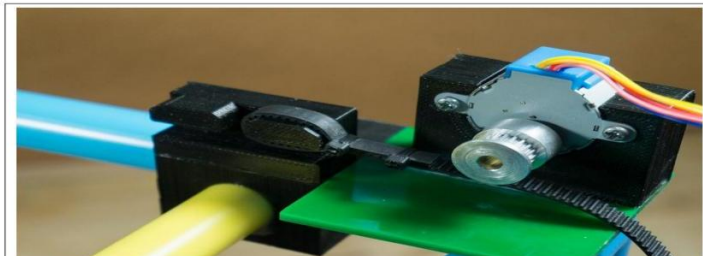
**Step 2: setting computer with arduino IDE and setting up sketch**



**Step 3: Create IoT i-Watering System App using Blynk**



**Step 4: Assemble frame and 3D printed part**





	<p style="text-align: center;"><b>Step 5: Group Electronic Modules</b></p>  <p style="text-align: center;"><b>Step 6: Prepare and test Machine (first testing model)</b></p> 
<p><b>Novelty and uniqueness</b></p>	<p>Through our research, it has come to light that there is a lack of intelligent IoT plant watering systems in the current market that utilize smartphones as controllers. The existing watering devices predominantly rely on timers, resulting in water wastage. In response to this gap, we have developed <b>i-watering</b>—a cutting-edge solution enabling real-time plant watering from anywhere in the world via smartphones. Moreover, i-watering incorporates a micro camera, allowing precise observation of water release quantities during each watering cycle.</p>
<p><b>Benefit to mankind</b></p>	<p><b>i-Watering</b> offers numerous benefits. Firstly, it promotes water conservation by utilizing rainwater as the primary source stored in the tank. Secondly, it optimizes plant growth by providing ideal conditions through prolonged, small increments of watering. Thirdly, it saves valuable time for users through automated watering. Lastly, this system has the potential to significantly increase food production in gardens. With these advantages, our solution revolutionizes gardening practices and contributes to sustainable water usage while maximizing crop yields.</p>
<p><b>Potential commercialization</b></p>	<p>i-Watering offers several advantages. Firstly, it is remarkably lightweight due to its compact design, setting it apart from existing market products. Secondly, it is highly cost-efficient as it eliminates the need for expensive and bulky hardware typically required for implementation. Thirdly, the</p>

	<p>system is adaptable, allowing users to adjust pump power and watering distance to suit changing environmental conditions. Additionally, it boasts user-friendly operation, with a simple push of a button on the smartphone to water the garden or plants. Lastly, our system promotes sustainability by utilizing rainwater as the primary water source.</p>
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<b>COMPREHENSIVE LEARNING SITE (CLS)</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	*Elly Zulaikha Binti Mohd Zabidi <sup>1</sup> , Anis Batrisya Binti Yushasni <sup>2</sup> , Wan Nabihah Aina Binti Wan Mohamad <sup>3</sup> , Wan Amirul Asyraf Bin Yusuf <sup>4</sup>		
<b>Affiliation</b>	<sup>1234</sup> MRSM Gerik		
<b>Email</b>	<sup>1</sup> ellyikha21@gmail.com, <sup>2</sup> anisbatrisya78@gmail.com, <sup>3</sup> wanamirul@mara.gov.my		
<b>Correspondence</b>	Wan Amirul Asyraf Bin Yusuf Jabatan Sains MRSM Gerik 33300 Gerik Perak, Malaysia Tel: 0163416993		
<b>Abstract</b>	<p>Covid-19 endemic has changed the educational learning process whereby online classes, online tuitions and home-based learning are getting popular. Now, education has been integrated with greater accessibility with the help of the latest technologies. This is surely beneficial for students as they can access and explore more through websites and portable applications to search for educational resources. However, there is a crucial aspect lacking in online learning i.e: this is particularly interactions with their teachers and peers. Two ways communication with teachers is the key to improve their learning progression and projections. On top of that, students also lack connection with their peers to discuss and share their ideas regarding subject contents. Furthermore, without a proper gathering information site, students and teachers will have difficulties using multiple sites to search for resources as this method is unorganised. We have collected various learning resources all in one platform to save students' and teachers' time searching for information. We also created forums particularly for students to discuss, change insights and ask questions for topics they're engaging in with peers and teachers to emphasise two-way communication. Features, namely quizzes and games are also gathered in this platform. We also added a learning style test for students to explore their personal learning</p>		

	<p>style. These components will help improve their knowledge and social interaction skills. Our innovation is proposed to help give students and teachers easier access to interesting materials, better accessibility and save more of their storage spaces. Generally, this project is started to help students and teachers to have a better learning experience, teaching resources and sharing information through online platforms. Our innovation is developed through Google Sites which will act as an interface to gather all of these resources in one place. This will ease students and teachers in searching for educational materials. We use Google Groups and Tawk.to as the medium for discussion forums and live chat respectively. Additionally, the notes that we included are designed in Canva. We also create videos of explanations for the subject. The result will show a positive impact, thus benefiting our target users in a lot of aspects. For instance, our project will be time saving (all of the needed learning features are in a single site), data saving (less storage space usage), user-friendly (the site's interface is easy to navigate through) and cost saving (less money spent for tuition fees and workbooks). Our project also acts to promote online education that will help in reducing paper usage. In conclusion, all the problems teachers and students face when they use multiple platforms at once will be solved through our innovation by gathering their needs all in one platform.</p>
<b>Keywords</b>	<p>2 ways online learning; comprehensive learning; online learning; forums; learning resources portal; Google products as learning platform; Group studying.</p>
<b>Product description</b>	<p>CLS is created by using some Google products such as Google Sites as this platform is easy to navigate various learning materials (i.e. notes and videos) games and quizzes to enrich students' understanding and make learning more entertaining; and forums and live chat to help students and teachers to interconnect with each other. We created our interactive notes using Canva slides to make the contents easier to comprehend for students. We also included short explanation videos that precisely explained the subject contents in a short time to make studying more effective. Tawk.to is used to provide a live chat feature where students can directly chat with a teacher to ask questions regarding their subject matters. We also utilise Google Groups as a platform for students to host forums for discussion and asking questions with their peers. These features help encourage 2 ways communication within students and teachers. We also included a test for students to explore their own suitable learning style. Studying using a suitable method would help in increasing their study effectiveness. At the end of the process, 17 students from MRSM Gerik have been selected to test our products to obtain results, review and improve ideas. The review has been conducted to communicate either the problem statement has been solved or vice versa.</p>

Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.

## METHODOLOGY

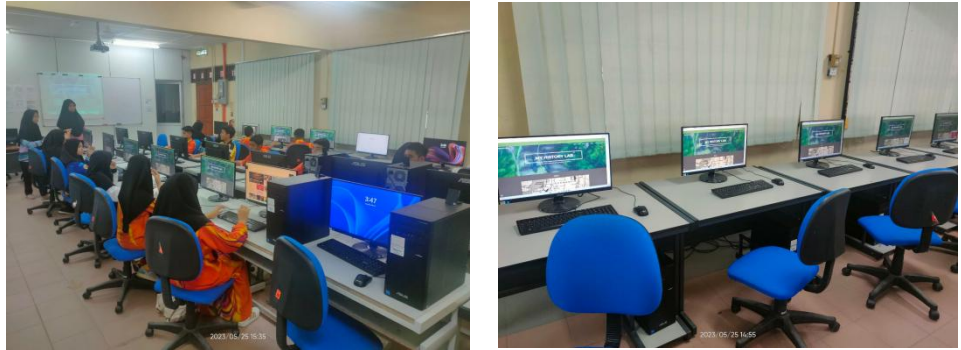


Figure 2. Testing and students review session

## RESULTS

CLS has been through review and pilot run tests by selected MRSM Gerik students. Survey has been done to test website functionality and usefulness to students. 17 respondents have participated to test out features of our website and the results are as follows.

Adakah anda sukai website ini?

17 responses

 Copy

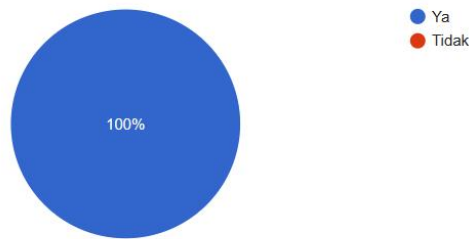


Figure 3. Question: Do you like our website?

The first question is to test the likeness of students towards our website. Survey shows 100% of respondents like the website and its features.

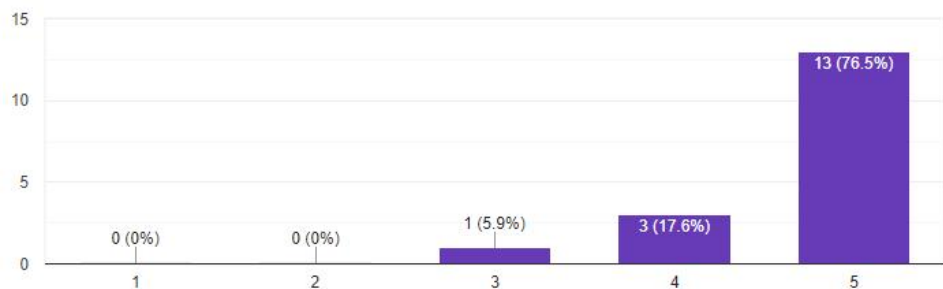


Figure 4. Question: Do you agree on this website being an online learning platform?



Second question is “Do you agree on this website being an online learning platform?” Survey shows 76.5% of respondents strongly agree for this website to be an online learning platform. While 17.6% agree and 5.9% not sure. This shows that the majority of students think the website could be useful for them through online learning.

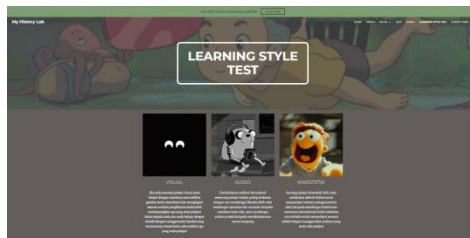
**PRODUCT DESCRIPTIONS**



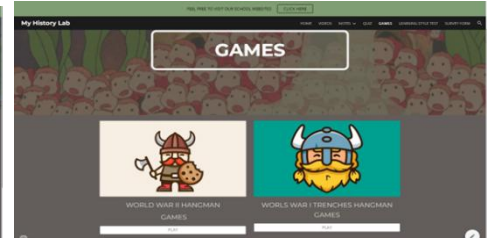
**Image 1. Home page**



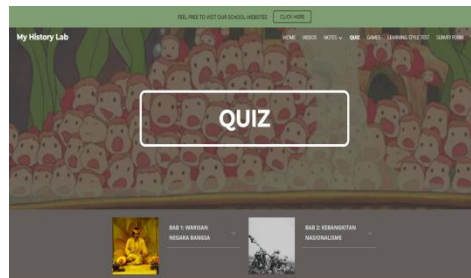
**Image 2. Notes page**



**Image 3. Learning style test page**



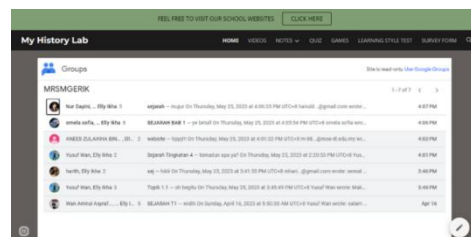
**Image 4. Games page**



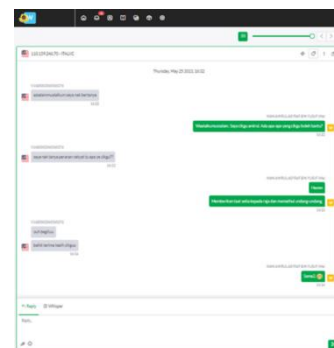
**Image 5. Quiz page**



**Image 6. Videos page**




**Image 7. Forums**



**Image 8. Chatbox**



<b>Novelty and uniqueness</b>	<p>Our invention is to create a comprehensive website whereby it gathers notes, videos and interactive practices to make learning online more accessible and easier for both students and teachers.. Learning style test has been added to the site to help students recognize their suitable learning methods. Our sites also promotes 2 ways communication by using features such as forums and chat rooms between peers and teachers.</p>
<b>Benefit to mankind</b>	<p>To help students obtain resources from multiple platforms such as notes, videos, forums, intervention and interactive quizzes. These resources will help students engage hence helping them in strengthening their knowledge regarding the subject. Forum and chat provides 2 ways of communication during online learning. By discussing and asking questions among peers and to teachers, students will get to polish their social interaction skills.</p>
<b>Potential commercialization</b>	<p>We are aiming forward to also utilise our project as a site where schools can have their own learning resources portal. Through this portal, teachers can upload their teaching materials for students to freely access whenever they need to. This way, students will have reliable sources of information for them to use and teachers will be able to easily share their resources with students and teachers. We'd commercialise this method through making the website accessible only when the school purchased the website. We will provide the website's base template and we'd edit the base according to the school's demands. The school will only have to make the purchase and provide resources and we'd provide the website fully customised according to the school's needs. Some of the site's features will be added as subscribed features such as features that required email access.</p>
<b>Acknowledgment</b>	<p>We would like to acknowledge and give our warmest thank you to our supervisor, Mr Wan Amirul Asyraf who helps and mentors until this project is completed. We would also thank you to our school for supporting us through this project.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; align-items: center;">  <div> <p>Elly Zulaikha is a student who is currently in Form 4, studying pure science stream in MRSM Gerik.</p> </div> </div>



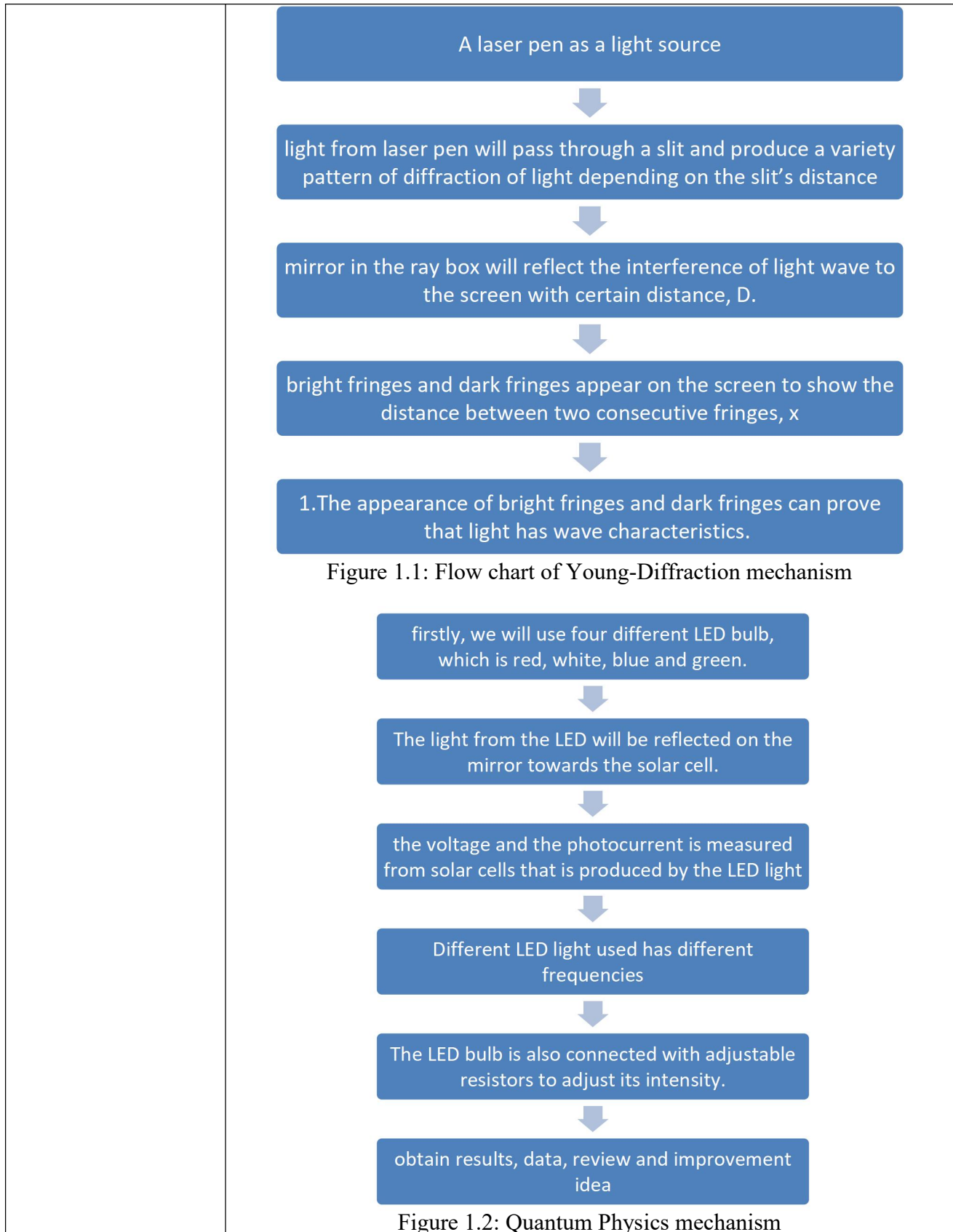
Anis Batrisya is a Form 4 student who is currently studying in pure science stream in MRSM Gerik.



Wan Nabihah Aina is a Form 4 student who is currently studying in pure science stream in MRSM Gerik.

<b>QUANTUM PHYSICS &amp; YOUNG'S DOUBLE SLIT (QP-YD) MODEL KIT</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
	√		
	<b>Local</b>		<b>International</b>
		√	
<b>Project Member(s)</b>	Ornela Nurardini Sofia binti Mohd Firdaus <sup>1</sup> , Najihatul Husna binti Shaputdin <sup>2</sup> , Sofea Imani binti Mohamad Solahuddin <sup>3</sup> , Anees Zulaikha binti Abu Samah <sup>4</sup> .		
<b>Affiliation</b>	MRSM Gerik		
<b>Email</b>	ornelasofiaa@gmail.com <sup>1</sup> , najihanajiha61@gmail.com <sup>2</sup> , sofini1217@gmail.com <sup>3</sup> , m-8885950@moe-dl.edu.my <sup>4</sup>		
<b>Correspondence</b>	Wan Amirul Asyraf Bin Yusuf Jabatan Sains MRSM Gerik, Gerik 33300, Perak Tel: 0163416993		
<b>Abstract</b>	<p>KSSM ( Kurikulum Standard Sekolah Menengah ) Physics has introduced Quantum Physics as a part of the secondary level syllabus since 2021, in which given limitation to student's understanding. This is because of the lack of teacher's time to innovate an interesting learning tool in physics subject. Because of this, teachers and school have no other choice but to buy some all-in-one expensive apparatus for learning process in class. Young Double's Slit Model has been introduced since 1801 by an English physicist and physicians, Thomas Young (1773-1829 ) to prove the wave properties of light. The idea of the wave-particle duality of light all subatomic particles were postulated by De Broglie. Meanwhile, the idea of lights are in a form of discrete energy which is called photon, is proposed by Einstein. Both of their ideas has deliver the principle called photoelectric effects. Our aim is to invent an innovation model kit which combined Photoelectric Effect and Diffraction of Light setup which emphasizes on the study of light diffraction pattern, effect of frequency of light and the intensity of light towards on voltage and photocurrent by solar cell. This project kit is created with alternative material yet effective to</p>		

	<p>deliver the student's curiosity. This project is also designed with simple setup including modules of experiments with data to proof the theories that is proposed by quantum physicists. The result will show a positive impact and benefiting our target users in a lot of aspects, especially in teaching and learning aspects. In conclusion, this QP-YD model kit enables teachers and students to adapt themselves to the new syllabus with better setup to strengthen their understanding with all-in-one light behavior kit.</p>
<p><b>Keywords</b></p>	<p>Learning tools; DIY concept; safe to use; diffraction of light; pattern; laser; slits; ray box; wave; reflection; Quantum Physics; experiment.</p>
<p><b>Product description</b></p>	<p>This project's aim is to shows:</p> <ul style="list-style-type: none"> <li>a) photoelectric effect by solar cells</li> <li>b) the relationship of voltage and photocurrent produced by solar cells towards intensity of the light.</li> <li>c) the relationship of voltage and photocurrent produced by solar cells towards frequency of the light</li> <li>d) threshold frequency and work function of metal used by solar cells</li> <li>e) the relationship between the distance of slit, <math>D</math> and the distance of 2 consecutive fringes, <math>x</math>.</li> </ul> <p>QP: Young's Double Slit kit was created by using mounting board, manila card, mining tape, plain mirror, laser pen, LED blub, switch, resistor variable and we also include a solar cell as the base to test the presence of voltage to prove that light can turn into particles</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	<p><u>1.0 Project mechanisms</u></p>



2.0 Quantum physics simulation for data collection

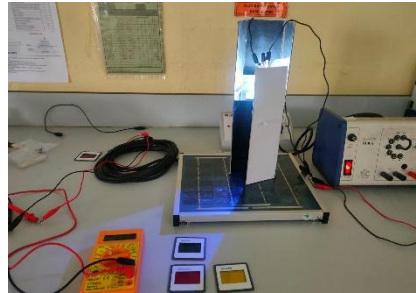


Figure 2.1: Project simulation by using RGB led with blue filter

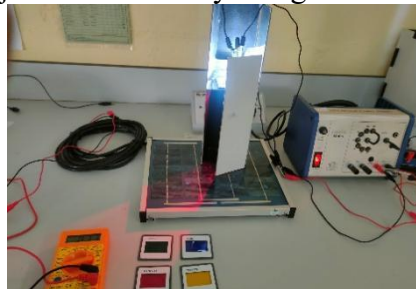


Figure 2.2: Project simulation by using RGB led with red filter

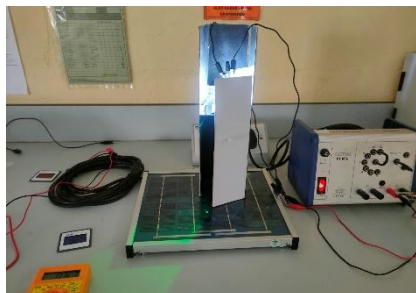


Figure 2.3: Project simulation by using RGB led with green filter

3.0 Young's diffraction simulation for data collection



Figure 3.1: Simulation to produce light diffraction patterns



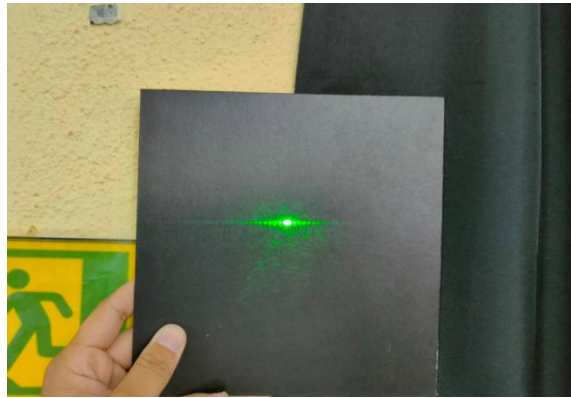


Figure 3.2: Simulation to produce light diffraction pattern (Obvious)

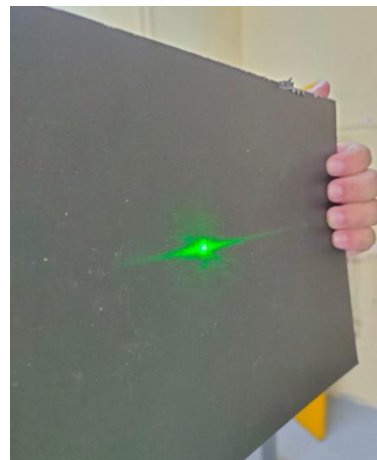
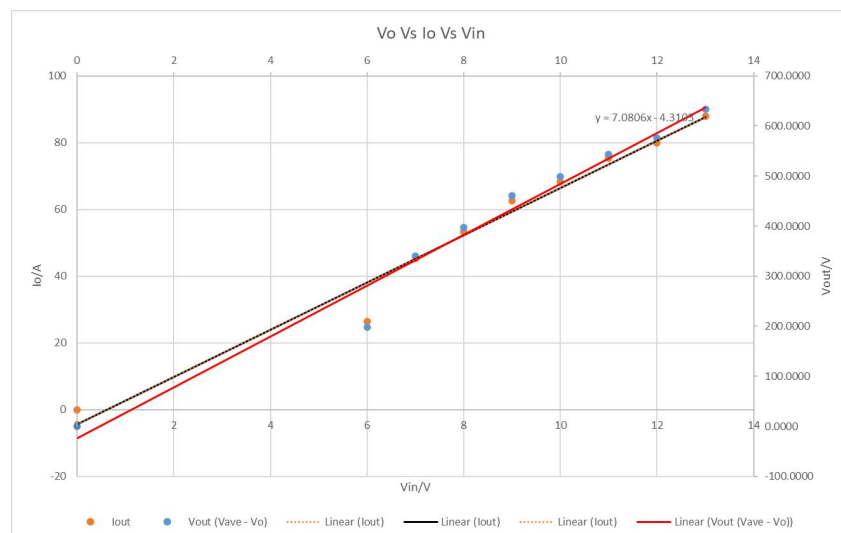


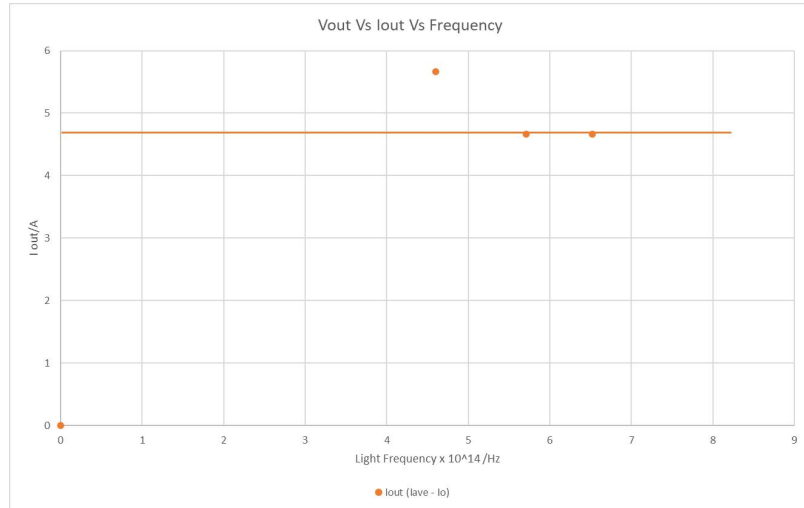
Figure 3.3: Simulation to produce light diffraction pattern (Less obvious)

#### 4.0 Graphs and data for quantum physics experiments



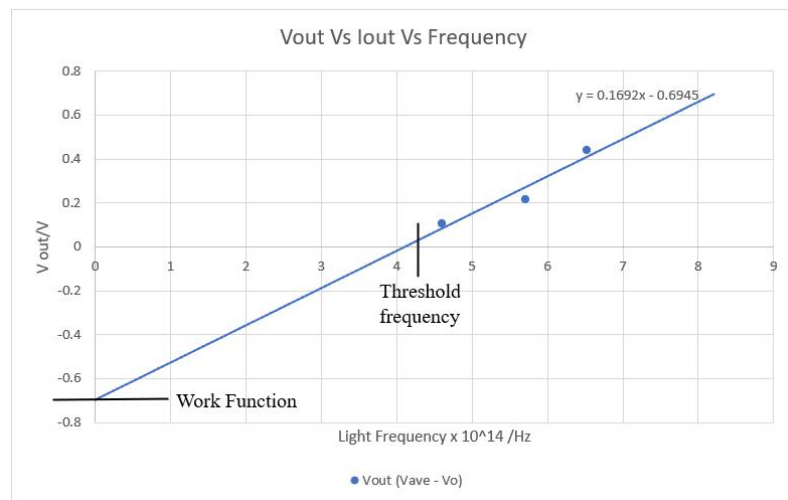
Graph 4.1: Graph of Photocurrent and output voltage and input voltage

Graph 4.1 shows that the photocurrent,  $I_{out}$  and  $V_{out}$  is directly proportional to input voltage,  $V_{in}$ . Thus, this indicates that the photocurrent is affected by the intensity of light. The higher the input voltage, the higher the intensity of light and causes the photocurrent produced by the solar panels is increased.



Graph 4.2: Graph of Photocurrent and light frequency

Graph 4.2 shows that the photocurrent is independent to frequency of light causing the photocurrent graph is decreasing and constant on higher light frequency.



Graph 4.3: Graph of Output voltage and light frequency

	<p>Graph shows the voltage output increases as frequency increases and provide the threshold frequency of the solar cells used which is <math>4.1046 \times 10^{14}</math>Hz.</p> <p>By using formula</p> $\lambda = \frac{c}{f}$ $\lambda = 731\text{nm (Far Infra Red)}$ <p>The threshold wavelength obtained is 731nm.</p>
<p><b>Novelty and uniqueness</b></p>	<p>QP-YD has uniqueness in terms of cheaper alternative material development to emphasize students' understanding. Furthermore, all-in-one light experiments and comprehensive data and analysis collections enable students to simulate and increase their understanding in diffractions and quantum physics phenomena.</p>
<p><b>Benefit to mankind</b></p>	<p>QP-YD is suitable for secondary students who struggles to simulate the new syllabus in KSSM Physics, quantum physics and light diffraction phenomena. Simple setup and giving some good analysis technique could increase students understanding in quantum physics and could increase their exam performance.</p>
<p><b>Potential commercialization</b></p>	<p>We make this QP-YD model using cheaper and easy to get materials. This can be alternative to expensive set-up of QP-YD model. With the differences of the price, you can enjoy using our model with the same usage as the real set-up of QP-YD model. We will provide the model's base and we will build the base according to the school demands. Our product not only offers affordable price but also with safety guarantee and comprehensive tools for all students who have interest to learn the light phenomena. All teachers from all around the Malaysian's schools need this model as a demonstration for their students. We are sure that this model will give you a lot of benefits. We are making sure that this model will give you a lot of benefits. Thus, there's nothing to risk and worry about because this is the safest project you can invest.</p>
<p><b>Acknowledgment</b></p>	<p>We would like to acknowledge and give our warmest thank you to our supervisor, Mr Wan Amirul Asyraf who help and mentoring us until this project is completed. We would also say thank you to our school who supporting us through out this project.</p>

**Researchers  
Biographical Data**

Ornela Nurardini Sofia is a student who is currently in Form 4, studying pure science stream in MRSM Gerik.



Najihatul Husna is a student who is currently in Form 4, studying pure science stream in MRSM Gerik.

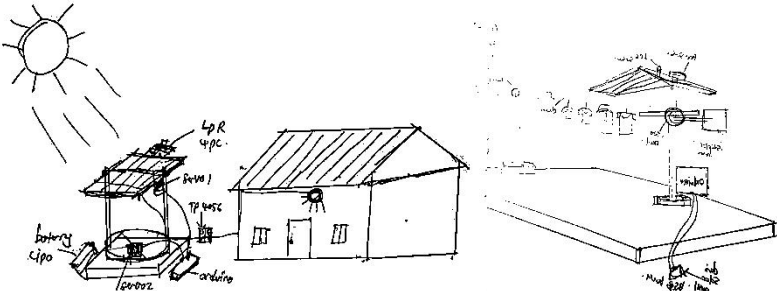
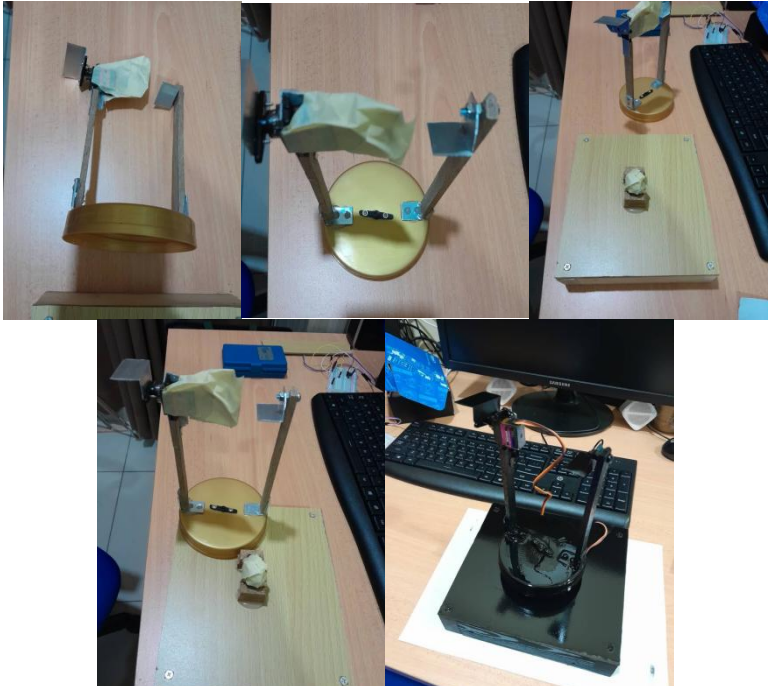


Anees Zulaikha is a student who is currently in Form 4, studying pure science stream in MRSM Gerik.




Sofia Imani is a student who is currently in Form 4, studying pure science stream in MRSM Gerik.

<b>SMART SOLAR SYSTEM – 3S</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Maria A/P Maria Das (Guru Pembimbing) Varshanaa A/P Vasu Thevan Abinayaa Nair A/P Suman Tanussa A/P Naventhiran		
<b>Affiliation</b>	Sekolah Jenis Kebangsaan Tamil Kalaimagal Kampung Rendang, Padang Temusus 08000 Sungai Petani, Kedah, Darul Aman.		
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<b>Correspondence</b>	Samarsi A/P Sallaya Guru Besar Sekolah Jenis Kebangsaan Tamil Kalaimagal Kampung Rendang, Padang Temusus 08000 Sungai Petani, Kedah, Darul Aman. Tel:04-4310910, Fax:04-4310910		
<b>Abstract</b>	Teknologi dalam industri tenaga solar kini berkembang maju dan peningkatan akan terus berlaku pada masa akan datang. Adalah terbukti bahawa penggunaan tenaga solar mampu membantu mengurangkan jejak karbon yang ketara serta dapat mengelakkan penghasilan gas rumah hijau. Maka penggunaan inovasi <i>Smart Solar System</i> iaitu 3S ini dapat memberi sumbangan yang tinggi kepada pemuliharaan alam sekitar serta menjamin konsep mesra alam. Keadaan faktor cuaca bumi yang tidak menentu dan pencemaran alam sekitar yang berleluasa menyebabkan penggunaan tenaga solar amat digalakkan. Dewasa ini, kebanyakan negara termasuk Malaysia berusaha mendidik rakyat agar lebih menjimatkan tenaga elektrik dalam kehidupan seharian dan juga mendidik masyarakat untuk memasang panel solar di rumah agar dapat menyediakan sumber tenaga yang boleh diperbaharui yang mencukupi pada masa hadapan. Sehubungan dengan itu, Inovasi 3S ini amat sesuai digunakan di negara ini kerana negara kita		

	dikurniakan dengan iklim khatulistiwa yang membolehkan cahaya matahari diserap pada tahap optimum berbanding dengan negara-negara Eropah. Inovasi 3S ini berpotensi meningkatkan keberkesanan panel solar dan mampu meningkatkan input elektrik sistem tenaga solar secara berganda.
<b>Keywords</b>	TP4056, motor SERVO, ARDIUNO UNO, Solar System, LDR- Light Dependent Resistor
<b>Product description</b>	<p>Idea 3S iaitu <b>Smart Solar System</b> ini adalah hasil penggabung jalinan antara panel solar dengan teknologi robotik. Smart Solar ini direkapi dengan sensor pengesan cahaya matahari yang berfungsi mengesan dan berputar mengikut cahaya matahari bagi menyerap tenaga suria pada tahap optimum.</p> <p>Sebuah model rumah yang dipasang dengan lampu LED serta 2 contoh penyidai kain automatik yang menggunakan teknologi Smart Solar System tanpa penggunaan tenaga elektrik.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	 



	
<b>Novelty and uniqueness</b>	<p>Sensor pengesanan cahaya akan mengesan cahaya matahari dan menghantar signal kepada ARDIUNO UNO untuk memutarakan motor SERVO mengikut darjah yang sesuai. Seterusnya alat pengecas TP4056 iaitu <i>charging device</i> akan menerima tenaga solar daripada solar panel dan mengecas bateri untuk menyimpan tenaga. Sistem 3S ini mampu menyerap tenaga suria dari waktu matahari terbit sehingga matahari terbenam.</p>
<b>Benefit to mankind</b>	<p>Tenaga yang disimpan dalam bateri dapat digunakan sebagai alternatif tenaga elektrik bagi kegunaan harian seperti mengecas telefon bimbit, lampu rumah dan sebagainya. Dalam projek ini, kami memberikan satu contoh penggunaan tenaga solar istimewa iaitu dua penyidai kain automatik. Ini adalah satu rekaipta dimana penyidai kain ini dapat berfungsi secara automatik untuk menjemur kain sebaliknya bergerak ke</p>

	<p>keadaan asal sekiranya cuaca mendung atau hujan.</p> <p>Penyidai kain ini menggunakan teknologi Smart Solar System kami sepenuhnya tanpa penggunaan tenaga elektrik.</p>
<b>Potential commercialization</b>	<p>Sistem 3S ini dapat menyimpan tenaga solar dalam kapasiti yang tinggi. Kami telah menggunakan konsep ini dalam eksperimen kami dimana bateri yang dicas menggunakan tenaga solar digunapakai untuk menjana kuasa elektrik bagi kegunaan lampu-lampu dalam modal rumah yang dibina serta dua penyidai kain automatik. 3S ini bukan sahaja boleh menjimatkan penggunaan elektrik tetapi jika ia dapat menjana lebih banyak tenaga elektrik kita boleh mendapat pembayaran bonus daripada Tenaga Nasional Berhad (TNB) untuk jumlah lebihan elektrik yang dijana tersebut.</p>
<b>Acknowledgment</b>	<p>Kami, kumpulan inovasi 3S ingin merakamkan jutaan terima kasih kepada pihak penganjur pertandingan ini kerana telah memperkenalkan pertandingan inovasi ini dan mewujudkan satu platform bagi kami iaitu murid-murid sekolah rendah untuk menyalurkan idea dan ciptaan kami berteraskan rekaan &amp; inovasi. Selain itu, kami juga ingin merakamkan penghargaan kami kepada Guru Besar kami iaitu Pn.Samarsi Sallaya dan Guru Penolong Kanan Kokurikulum iaitu Pn.Manimegalai K.Ramasamy yang telah memberikan peluang kepada kami untuk menyertai pertandingan inovasi ini. Seterusnya, kami juga ingin mengucapkan terima kasih kepada guru-guru penolong kanan yang telah memberi sokongan yang berterusan serta kata-kata positif sehingga kami berjaya melaksanakan projek inovasi ini. Kami juga ingin mengambil kesempatan ini untuk merakamkan penghargaan kami yang tidak terhingga kepada guru pembimbing kami iaitu Pn.Maria Maria Das yang telah membimbing dan membantu kami dalam melaksanakan projek inovasi ini dengan jayanya. Beliau juga telah memberikan kata-kata motivasi kepada kami supaya tidak berputus asa sewaktu menghadapi pelbagai cabaran dalam melaksanakan projek inovasi ini. Beliau juga telah membantu kami dalam membuat rakaman video yang kreatif ini dan menggabungkan idea inovasi ini supaya menjadi satu inovasi yang tunggal. Disamping itu, kami juga ingin mengucapkan ribuan terima kasih kepada guru-guru SJKT Kalaimagal yang telah membantu kami secara tidak langsung dalam melaksanakan projek inovasi ini serta ibubapa kami yang telah memberi galakan dan sokongan kepada kami sejak awal pertandingan sehingga selesai pertandingan ini.</p> <p>Akhir sekali, kami juga ingin merakamkan penghargaan yang tidak terhingga kepada pensyarah iaitu En. Saravanakumar terlibat secara langsung atau tidak langsung dalam membantu kami dalam melaksanakan projek inovasi STEM ini.</p>

**Researchers  
Biographical Data**



Maria A/P Maria Das  
Guru siswazah dalam sarjana muda dalam ekonomi di Universiti Kebangsaan Malaysia  
Diploma Pendidikan dalam mata pelajaran Matematik.  
Sarjana dalam pendidikan di Universiti Terbuka Malaysia.  
Penyelaras Kelab Inovasi dan Rekapipta SJKT Kalaimagal.  
Guru pembimbing bagi projek Inovasi Celik Kosa Kata (Pingat Emas dalam kumpulan terbaik PERINGKAT KEBANGSAAN 2020, INO-B 2020)  
Guru pembimbing bagi projek Agro 3S pada tahun 2021. (Tempat kedua Karnival STEM peringkat negeri Kedah)



Varshanaa A/P Vasu Thevan seorang murid tahun 5 SJKT Kalaimagal. Penolong setiausaha Kelab Inovasi dan Rekapipta SJKT Kalaimagal.

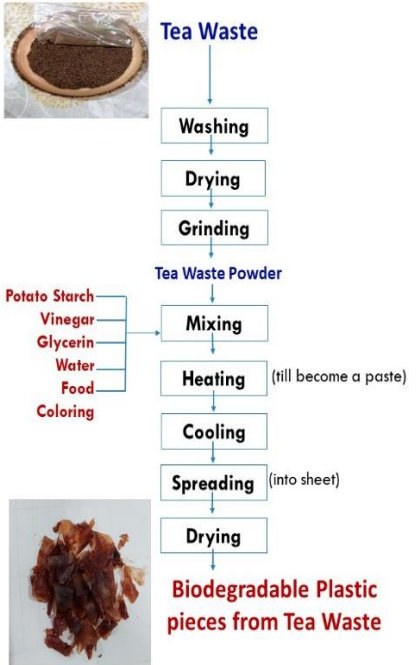
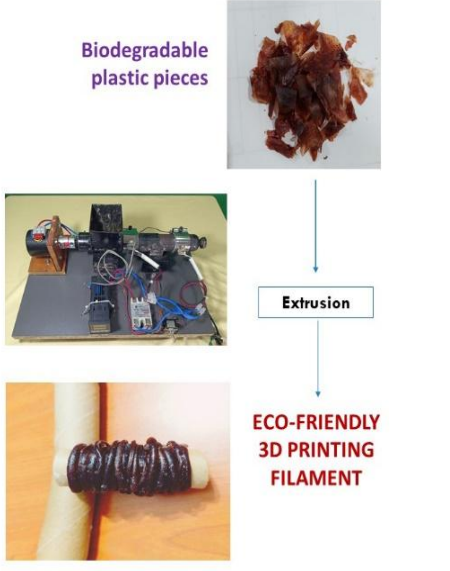


Abinayaa Nair A/P Suman seorang murid tahun 5 SJKT Kalaimagal.



Tanussa A/P Naventhiran seorang murid tahun 5 SJKT Kalaimagal.

<b>ECO-FRIENDLY 3D PRINTER FILAMENT FROM TEA WASTE</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
	√		
	<b>Local</b>		<b>International</b>
	√		
	√		
<b>Project Member(s)</b>	Vadivelan A/L Jeevah <sup>1</sup>		
<b>Affiliation</b>	<sup>1</sup> Sekolah Jenis Kebangsaan (T) Ladang Highlands, Klang, Selangor, Malaysia		
<b>Email</b>	<sup>1</sup> bambli2010@gmail.com		
<b>Correspondence</b>	Vadivelan A/L Jeevah No. 22, Jalan Bendahara 48, Taman Sejati, Kota Raja, 41200, Klang, Selangor, Malaysia Tel: 0163605611		
<b>Abstract</b>	<p>3D printing technology (3D printers) is currently one of the branches of the fourth industrial revolution. The global market is expected to witness exponential growth during the forecast period, mainly because of the high adoption of 3D printed materials, especially filaments, by numerous industry verticals including automotive, aerospace and defense, education, and healthcare. Sadly, using PET or ABS filaments just damages landfills. Due to a sharp rise in demand and a dearth of supply, PLA filament prices have been continuously rising on the market. Therefore, we conducted a study to make filaments using biodegradable plastic. The valorization of tea waste can create opportunities to produce new valuable biodegradable plastics. Tea wastes contain a variety of important organic substances that are released into the environment in large quantities after tea is prepared. Besides, tea waste contains approximately 4.4% nitrogen, 0.24% phosphorus, and 0.25% potassium, the three major nutrients that qualify any compost as a complete fertilizer. We also built a filament extruder to convert the biodegradable plastics into filament for 3D printing. In order to check the final outcome, we have used a printing pen and a hot glue gun. A 3D printing pen or hot glue gun is just like a handheld 3D printer. It uses the same kind of heating element and extruder just like a desktop 3D</p>		

	printer.
<b>Keywords</b>	3D printing filament, tea waste, biodegradable plastic, filament extruder
<b>Product description</b>	<p>There are 2 major procedures to produce our Eco-friendly 3D printer filament from tea waste. We make our biodegradable plastic using tea waste and potato starch. And then we transformed our biodegradable plastic into filament using our own built extruder. Our Eco-friendly 3D printer filament from tea waste will take 6 months to 1 year to decompose fully. The tea waste particles increase the surface area, absorb more moisture, and act as fertilizer during composting. Our Eco-friendly 3D printer filament from tea waste is also in line with Sustainable Development Goals. Goal no 12: Responsible consumption and production and goal no 13: Take urgent action to combat climate change and its impact.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<div style="display: flex; justify-content: space-around;"> <div data-bbox="500 877 946 1625" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>BIODEGRADABLE PLASTIC FLOWCHART</b></p>  </div> <div data-bbox="974 877 1453 1625" style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;"><b>ECO-FRIENDLY 3D PRINTING FILAMENT FLOWCHART</b></p>  </div> </div> <p style="text-align: center;">Flowchart</p>





Biodegradable  
Plastic from  
Tea Waste



Filament from  
Tea Waste



Own built Extruder



In order to check the final outcome, we have used a printing pen and a hot glue gun. A 3D printing pen or hot glue gun is just like a handheld 3D printer. It uses the same kind of heating element and extruder as a desktop 3D printer.



At Institut Kemahiran Tinggi Belia Negara (IKTBN), Sepang with my mentor Mr Tinakaran.



<b>Novelty and uniqueness</b>	<p>The origins of our Eco-friendly 3D printer filament from tea waste lie in the pursuit of sustainable and eco-friendly solutions for 3D printing materials. Tea waste, which is derived from the processing of tea leaves during tea production, has been identified as a potential source for biodegradable filament due to its organic nature. The uniqueness of our Eco-friendly 3D printer filament from tea waste lies in its environmentally friendly attributes. By utilizing tea waste as the raw material, this filament offers a renewable and biodegradable alternative to traditional plastic-based filaments commonly used in 3D printing. As a result, the use of this filament can help reduce plastic waste and its negative impact on the environment. Compared to other available biodegradable 3D printer filaments, the use of tea waste as a raw material offers several advantages:</p> <ol style="list-style-type: none"> <li>1. <b>Renewable Source:</b> Tea waste is a byproduct of tea production, making it a readily available and renewable resource. This sets it apart from other biodegradable filaments that might rely on virgin materials or agricultural crops, potentially competing with food production.</li> <li>2. <b>Reduced Environmental Impact:</b> Tea waste filament is expected to have a lower environmental impact compared to filaments derived from petroleum-based plastics or even certain biodegradable alternatives. Its production and use contribute to reducing greenhouse gas emissions and reliance on non-renewable resources.</li> <li>3. <b>Biodegradability:</b> Tea waste filament is expected to decompose naturally over time, unlike conventional plastic-based filaments, which can persist in the environment for centuries.</li> <li>4. <b>Eco-conscious Appeal:</b> The use of tea waste as a raw material appeals to eco-conscious consumers and businesses seeking more sustainable 3D printing options.</li> </ol>
<b>Benefit to mankind</b>	<p>Our Eco-friendly 3D printer filament from tea waste offers several advantages. Firstly, it is a sustainable and environmentally friendly alternative to traditional plastic-based filaments, reducing the reliance on fossil fuels and decreasing plastic waste. Secondly, tea waste is abundant and easily accessible, making it a cost-effective raw material for filament production. Besides our Eco-Friendly 3D printer filament from tea waste materials are from renewable sources such as potato starch and plant-based materials. This encourages sustainable resource management practices and reduces our reliance on non-renewable fossil fuels, which are typically used to produce traditional plastics. Lastly, our filament is biodegradable, ensuring that discarded prints will not contribute to long-term</p>

environmental pollution.

With a plethora of industries/users using additive manufacturing in their production process, we have identified industries/users that we believe benefit most from our Eco-Friendly 3D Printer Filament from tea waste.

1. Healthcare

Our low-cost Eco-friendly 3D printer filament allow economical 3D models and guides for the creation of anatomically accurate models from patient-specific data. Surgeons can use these models for pre-operative planning, simulating complex procedures, and practicing surgical techniques before performing them on patients. This can lead to reduced surgery times, better precision, and improved patient safety.

2. Education (schools, colleges and universities)

In education, our Eco-friendly 3D printer filament facilitates improved learning, skills development, and increased student and teacher engagement with the subject matter. Furthermore, 3D printing sparks greater creativity and collaboration in solving problems. It helps to prepare students for their future by allowing students to create prototypes without the need for expensive tooling.

3. Product design, prototyping and manufacturing

Product design and rapid prototyping are probably two of the fields that have benefitted from the flexibility of our Eco-friendly 3D printer filament from tea waste. Creating a 3D model of a design and making a mock-up in a matter of a few hours is a dream come true for product development teams across several industries with cheaper price.

4. Engineering and architecture

On a smaller scale, our filament can make architectural modelling much easier, faster and cheaper.


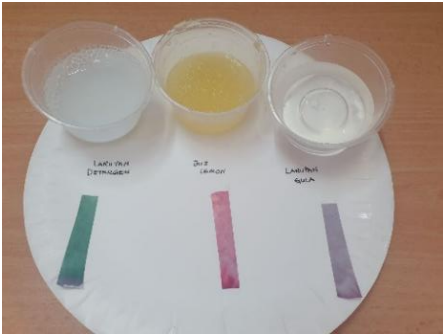
5. Hobbyist

With the cheaper and consumer-grade models available in the market, access to 3D printing has already made available for home use. A lot of hobbyists are using 3D to make action figures, printing our replacements parts from valves to screws and nuts. The thing is that its utility exceeds far beyond printing out smartphone holders and fidget spinners. With our Eco-friendly 3d printer filament, hobbyist can save time and money by printing out what they want.

	<p>6. Food Industry</p> <p>Our Eco-friendly 3D printer filament very suitable for 3D printing material that is safe for food contact such as packaging. It is a perfect material to 3D print project that will not be exposed to the heat of to a too powerful mechanical constraint. Our Eco-friendly 3d printer filament suitable for creating little objects such as cookie cutters and etc.</p>
<p><b>Potential commercialization</b></p>	<p>Once our Eco-friendly 3D printer filament from tea waste successfully can be used in 3D printers, we are planning to get ISO/IEC 17025 from SIRIM. (MS ISO/IEC 17025:2017 specifies general requirements for competence of testing and calibration laboratories. This standard is used by testing and calibration laboratories to develop quality management systems and to assess their own competence)</p> <p>Once we obtain approval, we will start to market our Eco-friendly 3D printer filament from tea waste. It requires a well-thought-out strategy to reach potential customers and showcase the product's unique features. Here are some steps and places we have consider for marketing.</p> <ol style="list-style-type: none"> <li>1. We will utilize popular social media platforms such as Instagram, Facebook, Twitter and LinkedIn to promote our product. We will share engaging content, videos, and images related to our Eco-friendly 3D printer filament from tea waste to attract and engage potential customers.</li> <li>2. We will list our Eco-friendly 3D printer filament from tea waste on popular online marketplaces like Shoppe, Lazada, Amazon, Etsy, or specialized 3D printing platforms. These platforms have a vast user base and can help reach customers who are specifically looking for 3D printing materials.</li> <li>3. Establish a strong online presence by creating a website that showcases our Eco-friendly 3D printer filament from tea waste and its advantages. The website should be user-friendly, visually appealing, and informative. We will include detailed product specifications, FAQs, and customer reviews.</li> <li>4. Participate in relevant trade shows, exhibitions, and maker fairs to showcase our product and directly connect with potential customers, industry professionals, and distributors.</li> </ol>
<p><b>Acknowledgment</b></p>	<p>Mrs. Malarvili Dorasamy from SJK (T) Ladang Highlands, Klang, is my innovation advisor. She has been a great help to guide and support me on this project. Mr. Tinakaran Narayanan is my mentor from Institut Kemahiran Tinggi Belia Negara (IKTBN), Sepang, who helps and assists</p>






	<p>me to complete this project. He has assisted me in making our filament extruder for this project.</p>
<p><b>Researchers Biographical Data</b></p>	<div data-bbox="505 369 737 730" data-label="Image"> </div> <p>Vadivelan Jeevah is a year 6 student who is studying at SJK (T) Ladang Highlands, Klang. He started to have an interest in innovation at 9 years old. He is also very interested in computer programming. He has completed the Arduino and Internet of Things (IOT) Level 1 programmes. He also completed his Basic App Development and Core Concepts of Programming under Purple Tutor at IIT Bombay. He has also obtained several golds, silver, and bronze medals for his various innovation and coding projects, as below:</p> <ol style="list-style-type: none"> <li>1. Magic Herbal Spray       <ul style="list-style-type: none"> <li>- Malaysia Young Scientists Conference &amp; Exhibition MYSCE 2020 (Silver Medal)</li> </ul> </li> <li>2. TADA (Toxic Air Detector &amp; Alert)       <ul style="list-style-type: none"> <li>- GO-GIF 2021 (Gold Medal)</li> <li>- World Youth Invention and Innovation Award WYIIA 2021 Indonesia (Gold Medal)</li> <li>- INODEX2021 (Gold Medal)</li> </ul> </li> <li>3. Techmaker Challenge 2022 Young Coder Challenge (Platinum Award)</li> <li>4. Eco-Friendly 3D Printer Filament From Tea Waste       <ul style="list-style-type: none"> <li>- Global Olimpiad Green Innovation Fair GO-GIF21 (Gold Medal)</li> <li>- 4<sup>th</sup> Advanced Innovation &amp; Engineering Exhibition AINEX 2021 (Bronze Medal)</li> <li>- Virtual Innovation Competition Malaysia VIC22 (Gold Medal)</li> </ul> </li> </ol>

<b>RED CABBAGE PH (RECAPH) INDICATOR PAPER FOR ACID-BASE SOLUTION</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Noorhafizah Binti Rasid <sup>1</sup> , Nuha Uzma Binti Ahmad Badri <sup>2</sup> , Nayli Syazwina Binti Suaib <sup>3</sup> , Nur Aisyah Binti Mohamad Rizal <sup>4</sup> , Abdul Muiz Bin Abdul Halim <sup>5</sup> , Hasyatul Amani Binti Rohaizam <sup>6</sup> , Muhammad Uwais Mukhlis Bin Mohd Nizam <sup>7</sup>		
<b>Affiliation</b>	Sekolah Kebangsaan Kampong Selamat, Tasek Gelugor, Pulau Pinang, Malaysia		
<b>Email</b>	<sup>1</sup> noorhafizahrasid@gmail.com		
<b>Correspondence</b>	Noorhafizah Binti Rasid Sekolah Kebangsaan Kampong Selamat, 13300 Tasek Gelugor, Pulau Pinang, Malaysia. Tel: +6013-4706823		
<b>Abstract</b>	ReCapH indicator paper is an innovative alternative to make it easier for students to test the chemical properties of solutions using environmentally friendly materials. ReCapH indicator paper is constructed by using red cabbage extract. The water-soluble pigment in the red cabbage called anthocyanins give purple colour to the ReCapH indicator paper. The use of litmus paper in acid-alkaline experiments is quite difficult and confusing for elementary school students. The studies that have been carried out on ReCapH indicator paper show that acidic solutions turn ReCapH indicator paper to red, neutral solutions do not change the colour of ReCapH indicator paper and alkaline solutions change the colour of ReCapH indicator paper to greenish. This makes it easier for students to identify the chemical properties of a substance with just one step by using only one type of paper. This product is easy to use, an environmentally friendly product that uses non-toxic materials, uses natural materials that are easily		

	<p>available, low production costs and is a biodegradable material that does not harm the environment. This ReCapH indicator paper has great potential to be commercialized because it is low cost, easy to produce, user-friendly and uses environmentally friendly materials that can create a greener environment. It helps teachers and students to test the chemical properties of materials easily and quickly.</p>
<b>Keywords</b>	Natural pH indicator; acid alkaline properties; purple cabbage pH indicator
<b>Product description</b>	<p>ReCapH indicator paper is an innovative alternative to make it easier for students to test the chemical properties of solutions using environmentally friendly materials. ReCapH indicator paper is constructed by using red cabbage extract. The water-soluble pigment in the red cabbage called anthocyanins give purple colour to the ReCapH indicator paper. The studies that have been carried out on ReCapH indicator paper show that acidic solutions turn ReCapH indicator paper to red, neutral solutions do not change the colour of ReCapH indicator paper and alkaline solutions change the colour of ReCapH indicator paper to greenish.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<div style="text-align: center;">  <p><b>Figure 1. ReCapH indicator paper (Red Cabbage pH Indicator Paper)</b></p> </div> <div style="text-align: center;">  <p><b>Figure 2. Color change of ReCapH indicator paper in three different solutions (alkali, acid &amp; neutral)</b></p> </div>



	<div data-bbox="542 243 1435 606" data-label="Image"> </div> <p data-bbox="496 627 1453 699"><b>Figure 3. Colour change indicators of chemical properties of materials using ReCapH indicator paper</b></p>
<p><b>Novelty and uniqueness</b></p>	<p>ReCapH indicator paper is very special and different from other pH indicators due to its low production cost and reasonable price. It is also easy to produced from an environmentally friendly material which is red cabbage extract which is easily available. This product is user friendly and easy to use by simply dipping the ReCapH indicator paper into the solution to be tested and the results are immediate and fast. This ReCapH indicator paper can help teachers and students to test the chemical properties of a substance easily by using only one indicator paper to identify the chemical properties of a substance without confusion.</p>
<p><b>Benefit to mankind</b></p>	<p>This ReCapH Indicator Paper is produced for the purpose of benefiting teachers, students and researchers who want to study the chemical properties of a substance. In terms of product design, it is very simple and easy to use. Impact on environmental sustainability, this product is environmentally friendly and biodegradable which uses natural and non-toxic materials. From an economic point of view, it has a very positive impact in reducing costs in the use of learning aids in schools and contributes to the development of education and research due to very low production costs. To society, this innovation provides a better environmental and social impact in reducing costs in education and controlling global environmental issues, especially waste management and pollution.</p>
<p><b>Potential commercialization</b></p>	<p>This ReCapH indicator paper has great potential for commercialization due to its low production cost and ease of production. It is also user friendly and very easy to use. ReCapH indicator paper uses environmentally friendly materials that can create a greener environment and can help teachers and students test the chemical properties of materials easily and quickly.</p>
<p><b>Acknowledgment</b></p>	<p>A special appreciation to the Headmaster of SK Kampong Selamat, the administrators, PIBG of SK Kampong Selamat, teachers and parents who</p>

	<p>provided financial support, guidance and moral support to the SK Kampong Selamat Innovation Team.</p>
<p><b>Researchers Biographical Data</b></p>	<div data-bbox="509 331 737 590">  </div> <div data-bbox="764 338 1455 590"> <p>Noorhafizah binti Rasid merupakan seorang Guru Cemerlang Sains yang sedang berkhidmat di SK Kampong Selamat, Pulau Pinang. Mendapat Sarjana Pendidikan Sains daripada Universiti Sains Malaysia. Berminat dalam meneroka bidang inovasi STEM bersama dengan murid yang dapat memberi manfaat dalam bidang pendidikan dan alam sekitar amnya.</p> </div> <div data-bbox="509 642 737 900">  </div> <div data-bbox="764 667 1252 737"> <p>Nuha Uzma Binti Ahmad Badri Murid tahun 6, SK Kampong Selamat</p> </div> <div data-bbox="493 936 737 1209">  </div> <div data-bbox="764 999 1252 1068"> <p>Nayli Syazwina Binti Suaib Murid tahun 6, SK Kampong Selamat</p> </div> <div data-bbox="493 1272 737 1530">  </div> <div data-bbox="764 1335 1252 1404"> <p>Nur Aisyah Binti Mohamad Rizal Murid tahun 5, SK Kampong Selamat</p> </div> <div data-bbox="477 1587 721 1845">  </div> <div data-bbox="764 1650 1252 1719"> <p>Abdul Muiz Bin Abd Halim Murid tahun 5, SK Kampong Selamat</p> </div>

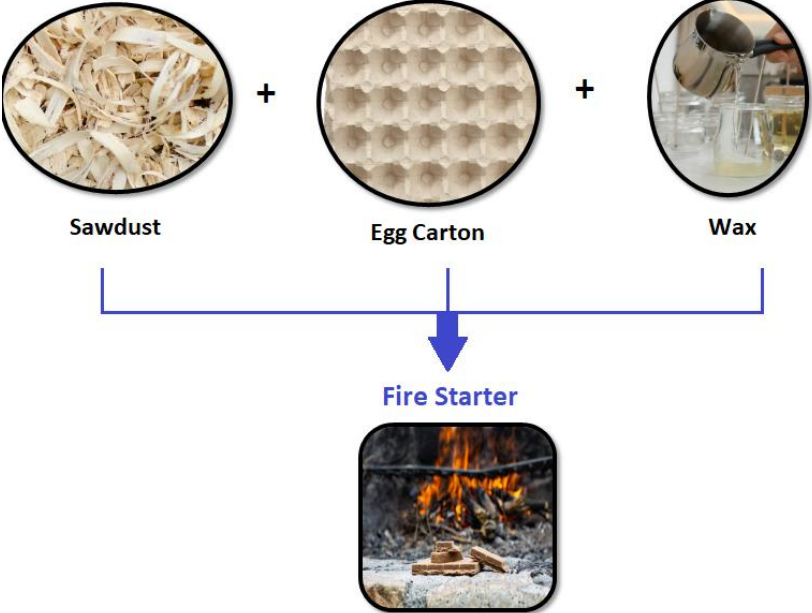


Hasyatul Amani Binti Rohaizam  
Murid tahun 6, SK Kampong Selamat



Muhammad Uwais Mukhlis Bin Mohd Nizam  
Murid tahun 6, SK Kampong Selamat

<b>FIRE STARTER FROM SAWDUST</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
	√		
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Mohamad Adib Mohamad Anuar <sup>1</sup> , Hasya Mursyida Hizzal <sup>1</sup> , Nur Aini Faqehah Ahmad Firdaus <sup>1</sup> , Delisha Nur Safya Abdul Rahim <sup>1</sup> and Mohamed Asmadi Md Nor <sup>1*</sup>		
<b>Affiliation</b>	<sup>1</sup> Sekolah Kebangsaan Permatang Damar Laut, Jalan Batu Maung 11960, Batu Maung, Penang, Malaysia		
<b>Email</b>	*skpdlinovasi@gmail.com		
<b>Correspondence</b>	Mohamed Asmadi Md Nor Sekolah Kebangsaan Permatang Damar Laut, Jalan Batu Maung 11960, Batu Maung, Penang, Malaysia Tel: +604-6261531		
<b>Abstract</b>	When going through camping activities either at school or in the forest, participants need to light a campfire for several purposes such as cooking, body warmers when the weather is cold and for safety purposes. Typically, twigs, charcoal, paper and rubber are used as fire starters, however, some of these materials do not last long. Thus, an innovation which is a fire starter based on sawdust and easily available used materials was introduced. This innovation not only saves costs but it is able to convert sawdust waste into something useful.		
<b>Keywords</b>	fire starter, sawdust		
<b>Product description</b>	Simple and low-cost fire starters have been produced from discarded materials which are sawdust, egg carton and wax.		

<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	
<p><b>Novelty and uniqueness</b></p>	<p>This eco-friendly and portable fire starter is useful for camping enthusiasts.</p>
<p><b>Benefit to mankind</b></p>	<p>Durable and easy to use fire starter.</p>
<p><b>Potential commercialization</b></p>	<p>This small-sized sawdust fire starter offers a very effective fire starter function and it has the potential to be marketed at a low price without harming the environment.</p>
<p><b>Acknowledgment</b></p>	<p>The head project member acknowledges financial support from the Universiti Sains Malaysia via the Division of Industry and Community Network (BJIM) grant, led by Dr Nurul Syafiqah Rezali.</p>
<p><b>Researchers Biographical Data</b></p>	<p>Mohamed Asmadi Md Nor, a Science teacher at SK Permatang Damar Laut is an alumnus of the Institut Pendidikan Guru, Penang Campus. All four students involved are from SK Permatang Damar Laut, which are Mohamad Adib Mohamad Anuar and Hasya Mursyida Hizzal are Year Six, while Nur Aini Faqehah Ahmad Firdaus and Delisha Nur Safya Abdul Rahim are Year Five and Four, respectively.</p>



# SCIENCE, TECHNOLOGY AND ENGINEERING

## CATEGORY B

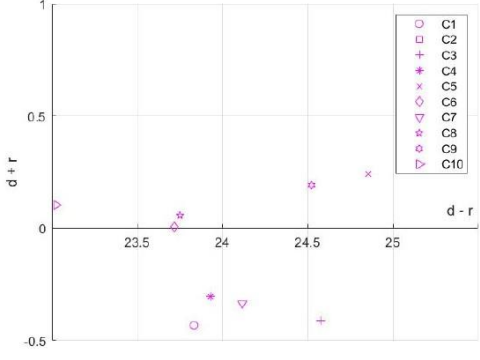
*UNIVERSITY AND TECHNICAL INSTITUTION STUDENT*



**ON THE APPLICATIONS OF MULTI-ATTRIBUTE DECISION  
MAKING APPROACH FOR ECONOMICAL SUSTAINABLE  
ENERGY SYSTEMS – EMERGING TRENDS IN THE  
SUSTAINABLE FRAMEWORK**

<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
		√	
	<b>Local</b>		<b>International</b>
			√
<b>Project Member(s)</b>	Hanin Izzeldin <sup>1</sup> , Senthil Arumugam Muthukumaraswamy <sup>2</sup> .		
<b>Affiliation</b>	<sup>1</sup> School of Engineering and Physical Sciences, Heriot-Watt University Dubai, Dubai, UAE  <sup>2</sup> Faculty of Engineering and Physical Sciences, Heriot-Watt University Dubai, Dubai, UAE		
<b>Email</b>	<sup>1</sup> haki2000@hw.ac.uk, <sup>2</sup> m.senthilarumuga@hw.ac.uk.		
<b>Correspondence</b>	Hanin Izzeldin School of Engineering and Physical Sciences Heriot-Watt University Dubai Campus Building-B, Al Ma'refa Street Dubai Knowledge Park Dubai, UAE		
<b>Abstract</b>	Multi-Attribute Decision Making (MADM) is a well-known method of operations in sustainability due to the many complex factors that come into play. This paper proposes a data-driven non-custom methodology for the purposes of increased accessibility in the age of big data and removal of expert opinion, leading to a reduction in biases when assigning weights to criteria and shortening the process. Rough Set Theory and Decision-Making Trial and Evaluation Laboratory (DEMATEL) and the Analytic Network Process (ANP) – combining as the DANP method - are used for generating the degrees of influence between criteria and their weights and the PROMETHEE-II for ranking. The entire process is performed in MATLAB-2021b. Three case studies are considered to test the model. The first case study is based on ranking of countries with their HDI values using eight environmental criteria. The second case study is analysed based on the ranking of buildings through energy efficiency using eight dimensions while		

	<p>the third case study is investigated on ranking of countries with their MPI values using ten environmental and sustainable criteria. The results presented an improved level of accuracy with greater data entries (case studies 2&amp;3) as it suffers when ranking very close alternatives (case study 1). Despite the derived weights not matching those set by experts (case study 3) the model was able to correctly rank the presented options. Overall the model is functional but suffers from precision ranking.</p>
<p><b>Keywords</b></p>	<p>MADM, Rough Set Theory, DANP, PROMETHEE, Data-Driven.</p>
<p><b>Product description</b></p>	<p>The model is a combined Rough Set Theory, DANP, and PROMETHEE-II evaluation code built and compiled using MATLAB2021b. The only addition it requires is the user's data set to be processed and the assigning of attributes as either beneficial or non-beneficial in the PROMETHEE-II section.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	<div style="text-align: center;"> <p>Figure 1: ISNRM of Case Study 1 Criteria</p> </div> <div style="text-align: center; margin-top: 20px;"> <p>Figure 2: ISNRM of Case Study 2 Criteria</p> </div>

	 <p align="center">Figure 3: ISNRM of Case Study 3 Criteria</p>
<p><b>Novelty and uniqueness</b></p>	<p>Most MADM models apply to specific problems in a specific field and situation but this designed model can be applied to anything as long as there is enough data to be processed by the Rough Set Theory method to allow it to extract the influential degrees between attributes. Additionally it runs and evaluates in seconds which can extend to minutes if the amount of data processed is large but is still much faster than having to consult with experts and consolidate their inputs.</p>
<p><b>Benefit to mankind</b></p>	<p>The MADM method can be time consuming and inaccessible to people not connected to experts on the matter at hand for their input therefore this project aimed to remove them from the equation to shorten the overall process, reduce subjective influences, and increase accessibility to allow anyone interested in ranking alternatives in a given situation as long as they have data which can be processed.</p>
<p><b>Potential commercialization</b></p>	<p>Given that the entire point of the project was to increase accessibility, commercialization was not a focal point at any stage. The aim was to make available the method of ranking options to anyone who would require it and is unable to obtain specialist input for weighting.</p>
<p><b>Acknowledgment</b></p>	<p>The head project member acknowledges the support and guidance of Dr. Senthil Muthukumaraswamy as the dissertation advisor. Special thanks to the creators of the data sets used as case studies: the UNDP and Tsanas and Xifara.</p>
<p><b>Researchers Biographical Data</b></p>	<p>Hanin Izzeldin is a student who is currently undertaking her Msc in Energy in the School of Engineering and Physical Sciences of Heriot-Watt University Dubai, UAE. She holds a Bachelor's of Engineering from University of Wollongong in Dubai.</p>



Dr Senthil Arumugam Muthukumaraswamy is an Associate Professor of Heriot-Watt University Dubai's School of Engineering and Physical Sciences.

<b>SMART BLIND WALKING STICK</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		√	
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Wei-Jing See <sup>1</sup> , Tania Khatun <sup>2</sup> , Emeer Asyraaf Bin Mohamad Jeffery <sup>3</sup> , Yew-Keong Sin <sup>4</sup> .		
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<b>Email</b>	11171203448@student.mmu.edu.my, 21181302927@student.mmu.edu.my, 31181302888@student.mmu.edu.my, 4yksin@mmu.edu.my		
<b>Correspondence</b>	Yew-Keong Sin Faculty of Engineering, Multimedia University, Persiaran Multimedia, 63100 Cyberjaya, Selangor, Malaysia Tel: +603-8312 5334		
<b>Abstract</b>	<p>Sometimes individuals with visual impairment still face challenges in navigation when they are using the conventional white cane because the conventional white cane has its limits. White cane acts as a mobility aid, but it cannot detect certain obstacles or provide the conditions of the surrounding, especially when individuals with visual impairment are navigating in the unfamiliar or complex places. Hence, our group proposed a smart mobility aid for individuals with visual impairment called 'Smart Blind Walking Stick'. It is built on an Arduino Uno R3 board. Two ultrasonic sensors are used to detect the head-level and trunk-level obstacles. A mobile phone dashboard is connected through Bluetooth for location tracking purpose. module with a Bluetooth module and sensors connected to an external doughnut board. The 'Smart Blind Walking Stick' is a retractable attachment device. Hence, the foldability, collapsibility or retractability of the white cane can be remained. We believe the 'Smart Blind Walking Stick' can be beneficial to the individuals with visual impairments, the elderly and those need mobility aids in terms of their safety and independence while navigating in the unfamiliar or complex places. The 'Smart Blind Walking Stick' has a great potential in commercialization because there is a growing</p>		

	demand for assistive technology that can help individuals with disabilities to live more independently and participate more fully in their communities.
<b>Keywords</b>	Blindness, Visually impaired, White Cane, Object Detection, Smart Guide Extension, Arduino, Bluetooth, Internet of Things.
<b>Product description</b>	The 'Smart Blind Walking Stick' is built on an Arduino Uno R3 board, with a Bluetooth module and sensors connected to an external doughnut board. It is a retractable attachment device on the white cane. Hence, the foldability, collapsibility or retractability of the white cane will not be sacrificed. Two ultrasonic sensors are used in this device to detect the head-level and trunk-level obstacles, respectively. A vibration motor is attached to create alert signal to the user when obstacles are detected or the improper holding position. A dashboard, which is connected to 'Smart Blind Walking Stick' system using Bluetooth module, is developed using MIT App Inventor to allow users or guardians to collect walking stick data and track the user's location.

**Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs etc.**

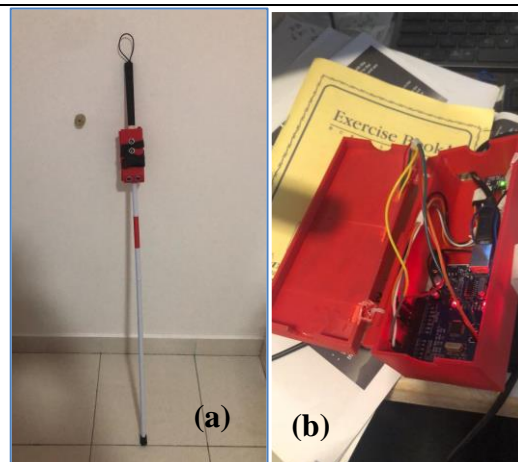


Figure 1 (a) Photo image of the 'Smart Blind Walking Stick' and (b) photo image inside the casing.

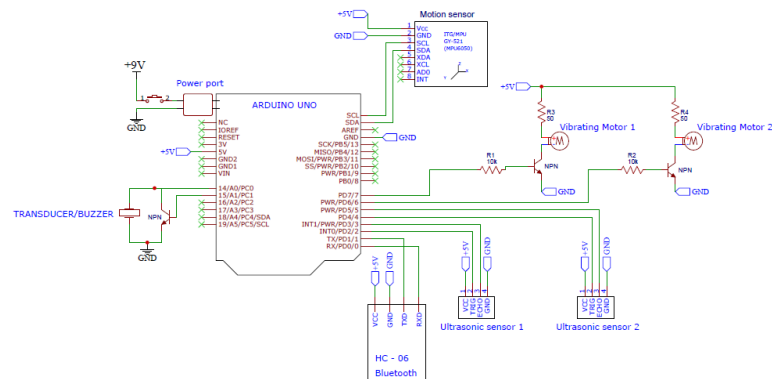


Figure 2 Schematic diagram of the circuit for 'Smart Blind Walking Stick' system.



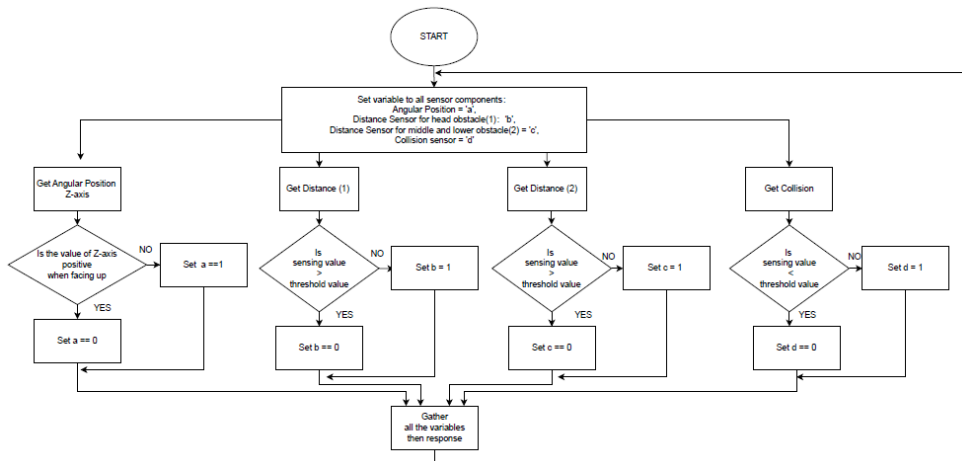


Figure 3 Flow chart of the operation of the 'Smart Blind Walking Stick'.

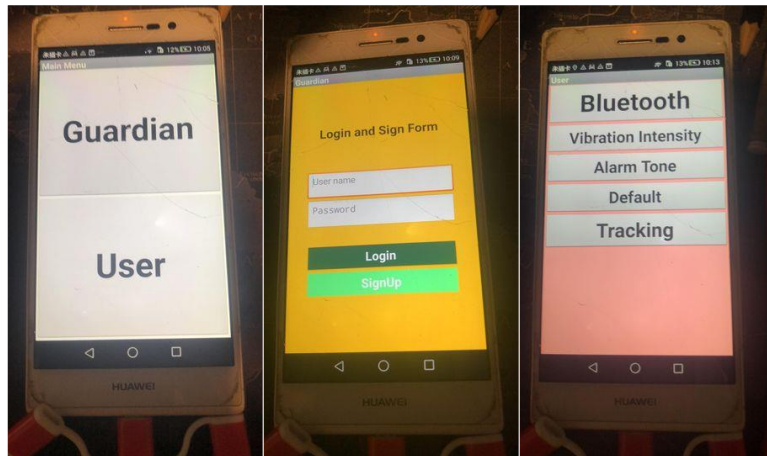




Figure 3 Mobile user interfaces of the dashboard for 'Smart Blind Walking Stick' which are displayed on an Android phone: (a) role selection page, (b) login page and (c) function selection page.



Figure 4 User experienced the 'Smart Blind Walking Stick'.

<b>Novelty and uniqueness</b>	<p>Compare to other smart mobility aids for persons with visual impairments, our 'Smart Blind Walking Stick' system is a retractable device. Users can easily turn a conventional white cane into a smart mobility aids by installing our device onto their white cane. Furthermore, the white cane can remain its foldability, collapsibility or retractability.</p> <p>Our 'Smart Blind Walking Stick' system is designed to detect the head-level and trunk-level obstacles. The conventional white cane can help the persons with visual impairments to find out the leg-level obstacles only. By installing our device onto the conventional white cane, the shortcoming of white cane in detecting the head-level and trunk-level obstacles can be solved.</p> <p>A dashboard is connected to our 'Smart Blind Walking Stick' system. It can be used by the guardians to track the user's location and the condition of our 'Smart Blind Walking Stick'. If an external impact onto our device is detected, our device will assume it is caused by the fall of user. Hence, the guardian of the user is called.</p>
<b>Benefit to humankind</b>	<p>The 'Smart Blind Walking Stick' can be beneficial to the individuals with visual impairments, the elderly and those need mobility aids. The device can improve the safety and independence of these individuals, allowing them to navigate their surroundings with greater ease and confidence. The benefits of this product to the target persons and society are numerous. For individuals with visual impairments, the 'Smart Blind Walking Stick' can improve their safety and independence, allowing them to participate more events in their communities. For society, this technology can help promote greater inclusivity and accessibility, creating a more equitable and just society for all. Also, this technology could inspire further innovations in assistive technology, improving the lives of individuals with disabilities in other areas.</p>
<b>Potential commercialization</b>	<p>The smart walking stick prototype has significant potential in terms of marketability and commercialization possibilities. There is a growing demand for assistive technology that can help individuals with disabilities to live more independently and participate more fully in their communities. In particular, the market for assistive devices for individuals with visual impairments is expected to grow significantly in the coming years. There are also potential opportunities for partnerships and collaborations with organizations and institutions that serve individuals with disabilities, such as rehabilitation centers, schools for the blind, and advocacy groups. These partnerships could help to promote the device and increase its visibility and accessibility to those who could benefit from it. Commercialization possibilities for the 'Smart Blind Walking Stick' include licensing agreements, manufacturing partnerships, and direct-to-consumer sales. Licensing agreements could allow for the technology to be incorporated into existing assistive devices, while manufacturing partnerships could help to scale up production and reduce costs. Direct-to-consumer sales could also be a viable option, particularly for individuals who may not have access to traditional distribution channels or who prefer to purchase products directly.</p>

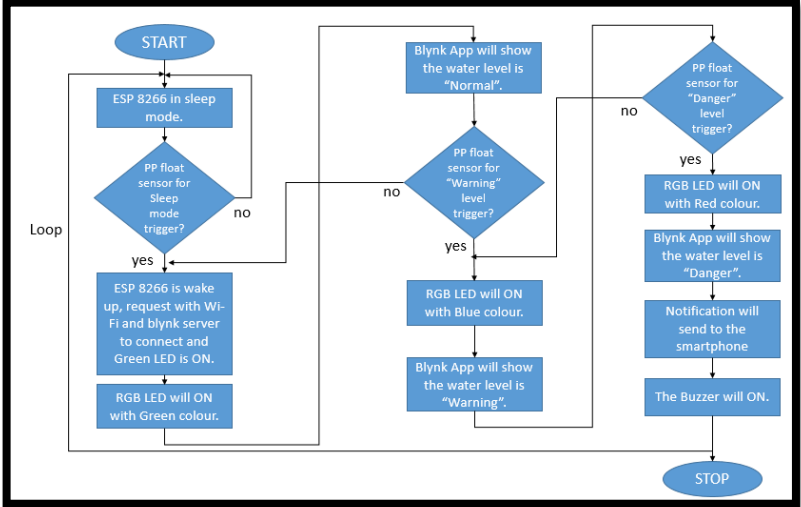
	<p>Overall, the smart walking stick prototype has significant potential in the assistive technology market and could offer significant benefits to individuals with visual impairments, as well as other groups who could benefit from its advanced features and safety capabilities.</p>
<p><b>Acknowledgment</b></p>	<p>The project leader expresses gratitude for the financial assistance provided by the Faculty of Engineering at MMU. The team is grateful for the valuable input and motivation provided by Ts. Dr. Sin Yew Keong throughout the project. The team would also like to extend their appreciation to all the members who contributed to the project.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div data-bbox="508 632 773 957">  <p>Wei-Jing See is a current student pursuing Bachelor of Engineering (Hons.) Electrical at the Faculty of Engineering in MMU, Cyberjaya.</p> </div> <div data-bbox="508 999 773 1325">  <p>Tania Khatun is a student who is currently undertaking her Bachelor of Engineering (Hons.) Electronics under the Faculty of Engineering at Multimedia University, Cyberjaya.</p> </div> <div data-bbox="508 1367 773 1713">  <p>Emeer Asyraaf is an undergraduate student who is currently pursuing Bachelor of Engineering in Electronics majoring in Telecommunications at Multimedia University in Cyberjaya.</p> </div> </div>



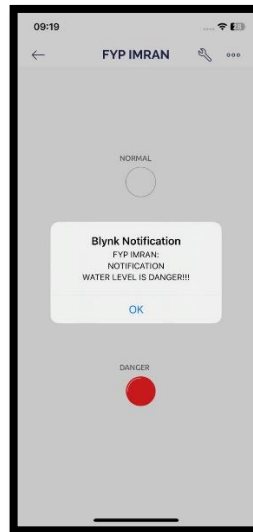
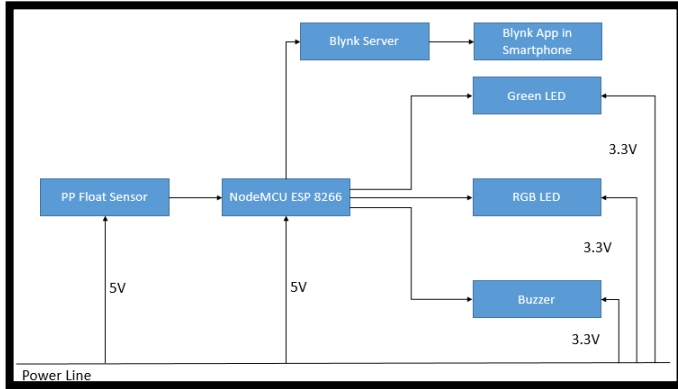
Ts. Dr. Yew-Keong Sin graduated his Diploma in Laboratory Technology, Bachelor of Applied Science in Applied Physics and obtained his PhD. from Universiti Sains Malaysia in 2000, 2003 and 2010, respectively. He joined Multimedia University since July 2010. He is actively involved in projects like nanoparticles synthesis, simulation of electronic devices, sensor fabrication and smart product design. He taught subjects like Electronics I, Circuit Theory, Semiconductor Devices, Nano-Science and etc. Ts. Dr. Sin started facilitating Capstone Project since 2014 which involves smart product design. He is a certified HRDF Trainer. Furthermore, he is active in promoting STEM (Science, Technology, Engineering and Mathematics) activities among secondary schools. He was invited as a speaker for the webinars during the Minggu Sains Negara in 2020 and 2021 on the topic related to Industry Revolution 4.0 and Internet-of-Things (IoT).


**PORTABLE WATER LEVEL MONITORING SYSTEM WITH  
NOTIFICATION FOR OUTDOOR BUILDING AREA USING  
ARDUINO ESP 8266 V3 NODEMCU AND BLYNK**





Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector	
			√	
	<b>Local</b>		<b>International</b>	
	√			
<b>Project Member(s)</b>	Zaid Bin Yaakob <sup>1</sup> , Muhammad Imran Bin Rosli <sup>2</sup> , Muhammad Zarif Hilman bin Zamzuri <sup>3</sup> , Nik Aizzat Shahmin bin Nik Mohd Kamal <sup>4</sup> , Muhammad Najmi Bin Mohd Suhaimi <sup>5</sup> .			
<b>Affiliation</b>	<sup>1</sup> Department of Embedded System, MARA Japan Industrial Institute, Beranang, Selangor, Malaysia			
<b>Email</b>	<sup>1</sup> zaid.yaakob@mara.gov.my, <sup>2</sup> imrannrosli00@gmail.com, <sup>3</sup> zarifhilman02@gmail.com, <sup>4</sup> nikaizzatshahmin2002@gmail.com, <sup>5</sup> mnajmisuhaimi@gmail.com			
<b>Correspondence</b>	Zaid Bin Yaakob Department of Embedded System, MARA Japan Industrial Institute, 43700 Beranang, Selangor, Malaysia. Tel: +6012-7313603			
<b>Abstract</b>	This project introduces Portable water level monitoring system with notification for outdoor building area to help people that have problem and ever impressed with the flood because of they cannot alert with the raised of the water that we know have been raised very quick. The main problem for these people is they cannot be prepared with the flood because they cannot constantly monitor the level of potential flood area near them like drains, ditches and rivers. Not all the building like apartment or parking area have 24- hour security guard to report if there are any dangerous raising water in that area and the most water level detector location is in major drainage or river and own by department or irrigation and drainage. It does not include			


	<p>drainage or river closer to people property. The project will detect the raised of the water in three level which is normal, warning and danger by using polypropylene float switch sensor. The Rgb LED will change by the water level between green, blue or red. The project will also emit the sound when the water level reach the danger level by using the buzzer to make people more alert about the water level in that area. User also can monitor the water level by only look at the user interface in Blynk application on their smartphone and the user also will receive the notification when the water level reach the danger level. This project is light and easy to bring anywhere make the project portable and easy to recharge the battery.</p>
<p><b>Keywords</b></p>	<p>Portable water level monitoring system, notification, outdoor building area, flood, constant monitoring, water level, polypropylene float switch sensor, RGB LED, Blynk application, user interface, smartphone, light and easy to carry, Buzzer</p>
<p><b>Product description</b></p>	<p>The Portable Water Level Monitoring System with Notification for Outdoor Building Areas is a groundbreaking project that enables real-time water level monitoring and alerts for individuals in flood-prone regions. Utilizing a polypropylene float switch sensor, the system categorizes water levels into normal, warning, and danger levels, visually indicated by an RGB LED. An integrated buzzer provides an audible alert when the water level reaches the danger threshold. Through the Blynk smartphone application, users can remotely monitor the water level and receive timely notifications. Lightweight and portable, the system is designed for easy deployment and comes with a rechargeable battery. By offering continuous monitoring and alerts, this project aims to enhance preparedness and minimize the impact of floods, keeping individuals safe and informed.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	 <pre> graph TD     Start([START]) --&gt; Sleep[ESP 8266 in sleep mode.]     Sleep --&gt; SleepTrigger{PP float sensor for Sleep mode trigger?}     SleepTrigger -- yes --&gt; WakeUp[ESP 8266 is wake up, request with Wi-Fi and blynk server to connect and Green LED is ON.]     SleepTrigger -- no --&gt; WarningTrigger{PP float sensor for "Warning" level trigger?}     WakeUp --&gt; GreenLED[RGB LED will ON with Green colour.]     GreenLED --&gt; WarningTrigger     WarningTrigger -- yes --&gt; BlueLED[RGB LED will ON with Blue colour.]     WarningTrigger -- no --&gt; NormalApp[Blynk App will show the water level is "Normal".]     BlueLED --&gt; WarningApp[Blynk App will show the water level is "Warning".]     WarningApp --&gt; DangerTrigger{PP float sensor for "Danger" level trigger?}     NormalApp --&gt; DangerTrigger     DangerTrigger -- yes --&gt; RedLED[RGB LED will ON with Red colour.]     DangerTrigger -- no --&gt; NormalApp     RedLED --&gt; DangerApp[Blynk App will show the water level is "Danger".]     DangerApp --&gt; Notification[Notification will send to the smartphone.]     Notification --&gt; Buzzer[The Buzzer will ON.]     Buzzer --&gt; Stop([STOP])   </pre>



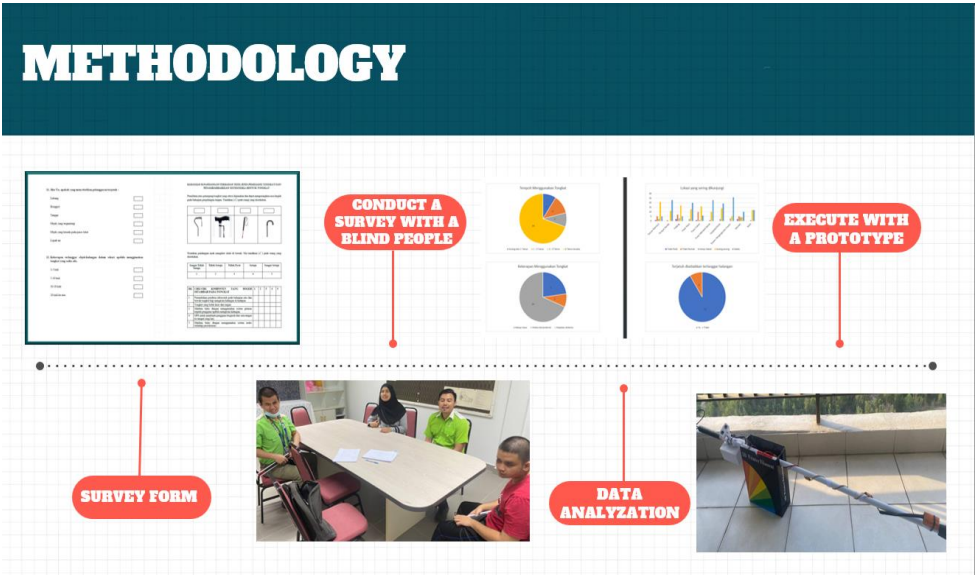


	
<p><b>Novelty and uniqueness</b></p>	<p>This project lies in its combination of portable water level monitoring, real-time notifications, and user-friendly features. By integrating a polypropylene float switch sensor, RGB LED indicator, and buzzer, the system offers a comprehensive solution for monitoring water levels and alerting individuals to potential floods. The integration with the Blynk smartphone application enhances accessibility and convenience, allowing users to remotely monitor water levels and receive timely notifications. Additionally, the project's lightweight and rechargeable battery design ensures portability and ease of use, making it a standout solution for outdoor building areas.</p>
<p><b>Benefit to mankind</b></p>	<p>The Portable Water Level Monitoring System with Notification brings significant benefits to mankind by enhancing flood preparedness and safety in outdoor building areas. By providing real-time water level monitoring, visual indicators, and audible alerts, the project enables individuals to stay informed about potential floods and take necessary precautions. The integration with the Blynk smartphone application ensures remote access and timely notifications, allowing people to monitor water levels even when they are away. This project empowers individuals to protect their lives and properties, minimizing the risks and damages caused by floods, and ultimately contributing to the overall safety and well-being of communities.</p>
<p><b>Potential commercialization</b></p>	<p>The Portable Water Level Monitoring System with Notification has significant potential for commercialization as a comprehensive and user-friendly solution for flood-prone areas. It can be marketed to individuals living in outdoor building areas, such as residential complexes, parking facilities, and industrial sites. Potential customers include property owners, facility managers, and government agencies responsible for flood management. The system's features, including the polypropylene float switch sensor, RGB LED indicator, buzzer, and smartphone integration,</p>




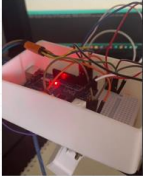

	<p>offer a unique selling proposition in the market. With its portability, easy installation, and rechargeable battery, the project can be positioned as a reliable and convenient solution to enhance flood preparedness and minimize damages.</p>
<p><b>Acknowledgment</b></p>	<p>The project members acknowledge support from the MARA Japan Industrial Institute under the Department of Embedded Systems. The support given to complete the project by Majlis Amanah Rakyat (MARA) is acknowledged.</p>
<p><b>Researchers Biographical Data</b></p>	<div data-bbox="532 548 734 772">  </div> <p>Zaid Bin Yaakob is he is an experienced lecturer for object oriented programming at MJII and he is also an expert in programming with expertise in C++, Php, python and more.</p> <div data-bbox="532 877 745 1163">  </div> <p>Muhammad Imran Bin Rosli a student who is currently undertaking his Diploma in Electronic Engineering (Embedded System), MARA Japan Industrial Institute.</p> <div data-bbox="506 1228 760 1514">  </div> <p>Muhammad Zarif Hilman bin Zamzuri a student who is currently undertaking his Diploma in Electronic Engineering (Embedded System), MARA Japan Industrial Institute.</p> <div data-bbox="514 1577 753 1843">  </div> <p>Nik Aizzat Shahmin bin Nik Mohd Kamal a student who is currently undertaking his Diploma in Electronic Engineering (Embedded System), MARA Japan Industrial Institute.</p>



	 <p>Muhammad Najmi Bin Mohd Suhaimi a student who is currently undertaking his Diploma in Electronic Engineering (Embedded System), MARA Japan Industrial Institute.</p>
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<b>THE FUSION OF ERGONOMIC MASTERY AND INTELLIGENT GUIDANCE CANE FOR THE VISUALLY IMPAIRED</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
		√	
	<b>Local</b>		<b>International</b>
		√	
<b>Project Member(s)</b>	Muhd Aizat Azmi <sup>1</sup> , Norsuzlin Mohd Sahar <sup>2</sup>		
<b>Affiliation</b>	Faculty of Engineering and Build Environment Bachelor of Mechanical Engineering (Honors.), Universiti Kebangsaan Malaysia, Selangor, Malaysia		
<b>Email</b>	<sup>1</sup> aizatazmi2510@gmail.com, <sup>2</sup> norsuzlin@ukm.edu.my		
<b>Correspondence</b>	Muhd Aizat Azmi Fakulti Kejuruteraan Alam Bina, Universiti Kebangsaan Malaysia, Cawangan Bangi, 43600 Bangi, Selangor, Malaysia. Tel: +6019-5697859,		
<b>Abstract</b>	<p>Visually impaired individuals possess an extraordinary resilience that transcends the limitations of their sight. While their eyes may not perceive the world in the conventional way, their other senses become finely tuned, allowing them to navigate and experience life with remarkable depth and sensitivity. The traditional cane helps people who are blind or visually handicapped realise the risks of falling. However, many difficulties can occur in connection with the environmental awareness of the blind. This study focuses on the ergonomic and intelligent design of a visually impaired cane, aiming to enhance functionality, comfort, and safety for improved mobility and independence. The scope of this system is the identification of obstacles in front of the user and preventing the user from falling due to holes or uneven surfaces. The main feature in the development of this product is related to sensor accuracy and cost-effectiveness. This system consist of ultrasonic sensors, microcontrollers, infrared sensors, buzzer and vibrator</p>		


	<p>motor. The sensor component identifies obstacles such as hanging objects, object on path, stairs, holes and drain. The output of this project is a buzzer as the warning for detection of any holes, drain and stairs while vibrator motor is an output for detection any obstacles in front of the user. For the vibrator motor, the triggered distance for the obstacles is 150 cm while for the buzzer, the triggered distance is when the detection of infrared sensor is more than 10 cm. The anticipated outcome is a novel visually impaired cane that combines ergonomic design and intelligent features, providing a user-friendly mobility aid to enhance the quality of life for visually impaired individuals and contribute to advancements in assistive technology.</p>
<p><b>Keywords</b></p>	<p>Ergonomic, smart cane, ultrasonic sensor, infrared sensor, obstacles, blind,</p>
<p><b>Product description</b></p>	<p>Introducing our Intelligence and Ergonomic Cane, specifically designed to empower blind individuals with enhanced mobility and independence. This innovative cane utilizes advanced technology and ergonomic design to cater to the unique needs of the visually impaired. Equipped with intelligent sensors. The ergonomic handle ensures a comfortable grip, reducing strain during use. With built-in features such as obstacle detection, and audible alerts, our Smart Cane enhances safety and confidence while navigating the world. Embrace freedom and navigate with ease using our Intelligence and Ergonomic Smart Cane for the blind.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	 <p><b>METHODOLOGY</b></p> <p>The methodology flowchart illustrates the following steps:</p> <ul style="list-style-type: none"> <li><b>CONDUCT A SURVEY WITH A BLIND PEOPLE</b>: This step involves gathering data through surveys, represented by a screenshot of a survey form and a pie chart.</li> <li><b>EXECUTE WITH A PROTOTYPE</b>: This step shows the implementation of the design, represented by a bar chart and a pie chart.</li> <li><b>SURVEY FORM</b>: A screenshot of the survey form used for data collection.</li> <li><b>DATA ANALYZATION</b>: A photograph of a group of people sitting around a table, engaged in data analysis.</li> </ul> <p>The final product is a smart cane with a colorful handle, shown in a photograph.</p>



	<div style="background-color: #004a6b; color: white; padding: 10px; text-align: center; font-weight: bold; font-size: 1.2em;">METHODOLOGY</div> <div style="display: flex; justify-content: space-around; align-items: center; margin-top: 20px;"> <div style="text-align: center;"> <p style="background-color: #e67e22; color: white; border-radius: 10px; padding: 5px; font-weight: bold;">EXECUTE WITH A PROTOTYPE</p>  </div> <div style="text-align: center;"> <p style="background-color: #e67e22; color: white; border-radius: 10px; padding: 5px; font-weight: bold;">IMPROVING DESIGN WITH AUTODESK INVENTOR</p>  </div> </div> <hr style="border-top: 1px dashed #ccc; margin: 10px 0;"/> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="text-align: center;">   </div> <div style="text-align: center;"> <p style="background-color: #e67e22; color: white; border-radius: 10px; padding: 5px; font-weight: bold;">PERFORM SIMULATION</p> </div> <div style="text-align: center;">  </div> </div>
<p><b>Novelty and uniqueness</b></p>	<p>Experience a novelty in mobility aids with our Intelligence and Ergonomic Smart Cane. It combines cutting-edge technology with unparalleled features like adjustable height and angle adjustment and obstacle detection. The ergonomic design sets it apart, providing a unique and tailored walking experience. Embrace the future of assistive devices and stand out with our one-of-a-kind Smart Cane, redefining independence for users of all abilities.</p>
<p><b>Benefit to mankind</b></p>	<p>The Intelligence and Ergonomic Smart Cane offers a significant benefit to mankind by enhancing the mobility and independence of individuals with visual impairments. By utilizing advanced sensors and ergonomic design, this innovative cane enables visually impaired individuals to navigate their surroundings more safely and confidently. It promotes a sense of freedom and empowerment, allowing them to actively participate in daily activities and engage with the world around them. By promoting greater independence and mobility, this smart cane enhances the overall quality of life for visually impaired individuals, fostering inclusivity and equal opportunities for all.</p>
<p><b>Potential commercialization</b></p>	<p>The potential commercialization of the Intelligence and Ergonomic Smart Cane is vast. This innovative product can be marketed to the visually impaired community, rehabilitation centers, and senior care facilities. It can also be promoted through online channels, assistive technology expos, and medical conferences. Partnering with mobility aid retailers and healthcare providers can help expand its reach. With effective marketing strategies, targeted outreach, and partnerships, the Smart Cane has the potential to become a sought-after assistive device globally, providing independence and improved mobility to individuals with visual impairments. (unmanned aerial vehicle) and serves as surveillance, broadcasting and intelligence jobs.</p>

<p><b>Acknowledgment</b></p>	<p>This project is sponsored by the Ministry of Higher Education and Universiti Kebangsaan Malaysia under grant GP-2021-K016343 and GP-K016343.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 20px;"> <div data-bbox="518 373 760 648">  <p>Doktor Falsafah , Universiti Kebangsaan Malaysia , 2016 Elektrik elektronik dan komunikasi , Sarjana , Universiti Teknologi Malaysia , 2010 Kejuruteraan KomunikasiK , Sarjana Muda , Universiti Islam Antarabangsa , 2006, specializes in communication antenna design, satellites antennas, electromagnetic radiation analysis and microwave device for wireless applications</p> </div> <div data-bbox="518 730 760 1022">  <p>Aizat Azmi a student who is currently undertaking his Degree study program under Faculty Engineering and Building Environment, UKM, Cawangan Bangi.</p> </div> </div>

<b>AQUARIUM MONITORING SYSTEM</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
		√	
	<b>Local</b>		<b>International</b>
		√	
<b>Project Member(s)</b>	Muhammad Ikmal bin Izazi <sup>1</sup> , Asmalia binti Zanal <sup>2</sup>		
<b>Affiliation</b>	<sup>1</sup> Electrical Engineering Studies, College of Engineering, Universiti Teknologi MARA, Cawangan Pulau Pinang, Malaysia		
<b>Email</b>	<sup>1</sup> ikmalmuhd584@gmail.com <sup>2</sup> asmalia978@uitm.edu.my		
<b>Correspondence</b>	Asmalia binti Zanal Electrical Engineering Studies, College of Engineering, Universiti Teknologi MARA, Cawangan Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang, Malaysia. Tel: +604-3823356, Fax:+604-3822819		
<b>Abstract</b>	<p>This project is to develop an aquarium monitoring system for the application of home office aquarium. Many people love to keep fish at home or office as a hobby or for decoration purpose as it is very calm to watch and contemplate the fish swim back and forth. However, fish need to be cared very carefully because a poor environment can lead to unhealthy growth and even worse death. The primary goal of this project is to monitor the temperature and pH water in the aquarium as well as to provide an alarm and mobile notification system for any abnormal environment. Therefore, the project applies temperature sensor and pH sensor to achieve the objective of monitoring and buzzer for the alarm system. In addition, the fish owners can constantly monitor the real time measurement of temperature and pH water through their mobile device even when they are far. To control the input and output for the whole system, ESP32 is utilized as the microcontroller that controls the input sensors to the Wi-Fi connection of the mobile device. ESP32 is simple and easy to use and at the same time it is affordable in the aim of developing a low-cost application. This aquarium monitoring system will reduce the manual and time-consuming way of maintaining the aquarium.</p>		

<b>Keywords</b>	<p align="center">Internet of Things (IoT), Arduino UNO, Aquarium, BLYNK</p>
<b>Product description</b>	<p>The aquarium monitoring system is a project that aims to make life simpler for everyone who owns aquatic pets by allowing them to always monitor the temperature and pH levels in the water. It may also alert users if the temperature and pH levels in the water do not correspond to the aquatic species present. The pH sensor can measure the pH of water between 0 and 14 and the temperature sensor is capable of measuring water temperatures between -40 and 124. Because the aquarium monitoring system uses a power adapter rather than a battery, user don't need to concern if it suddenly loses its power. Users can also anticipate when they will receive information as pH and temperature readings are taken every minute. The ESP32 microcontroller was essentially the primary element in the circuit design to operate the entire system since it links the project to the internet. The prototype of this project is shown in Figure 1.</p>  <p align="center">Figure 1: Prototype of the project</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<p>Figure 2 illustrates a simulation circuit for the aquarium monitoring system project. The temperature sensor and pH sensor are the inputs of the project. The LCD as the first output will display the temperature and pH values. If both values are within the 'specified range' set, the buzzer as the second input will not sound. However, if the temperature value exceeds or falls below or over the set value, the buzzer will begin to make a loud noise, attracting the attention of those nearby. At the same time users can check both sensors value from mobile application and receive notification email for any below and above specified range. Figure 3 depicts the system diagram and flowchart of the project.</p>

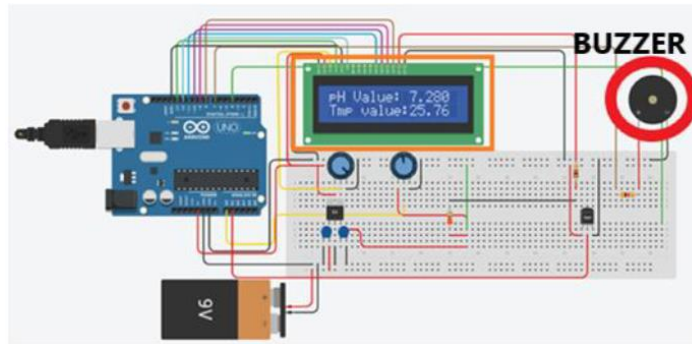


Figure 2: Simulation circuit of the project

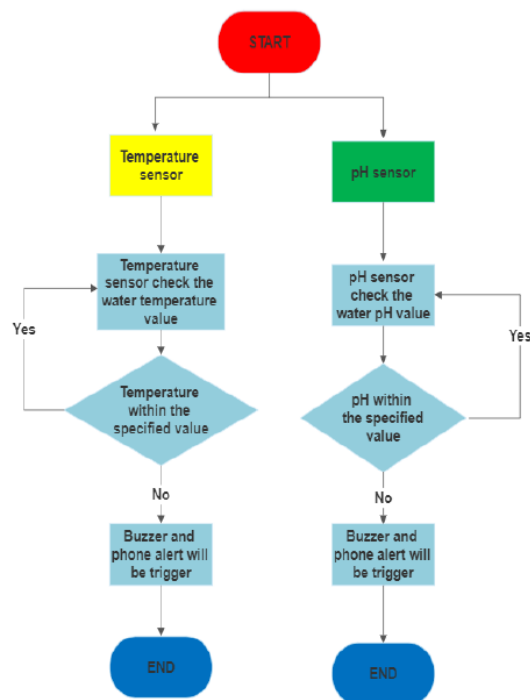


Figure 3: Flowchart of the project

Figure 4 shows the hardware result and view on smartphone based on real time value for an aquarium monitoring system project within the specified range. LCD will display the values for temperature and pH while the simulation is running and because the pH and temperature are within the range that has been set, which is at the temperature value between 18 to 27 degrees Celsius and the pH value between 6.8 to 7.8. The buzzer will not activate and the notification will not be delivered to the user's phone.

The hardware result for the project that is below the set range can be seen in figure 5. The LCD will display the temperature and pH values below the set range. The buzzer will be activated, emitting a loud sound to draw the attention of anyone nearby to do something that will make the pH value and temperature in the aquarium go back to normal. The user can also view the aquarium's pH level and temperature in real time on their smartphones. The notification that is delivered to the user's phone also can be seen in Figure 5.

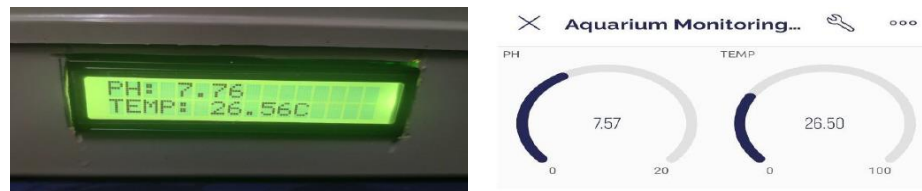


Figure 4: The temperature and pH value within specified range.



Figure 5: The temperature and pH value below specified range.

Figure 6 depicts the hardware result and notification delivered to the mobile phone if the readings fall above specified range. The LCD displays both temperature and pH readings above the defined range. The buzzer will also be activated, signaling that the water in the aquarium is unfit for the fish. A loud sound will also be produced to catch attention.

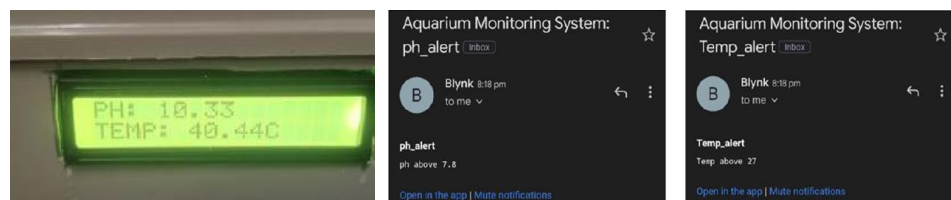

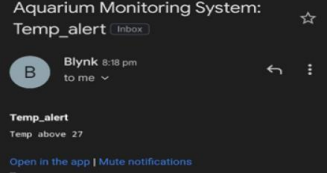


Figure 6: The temperature and pH value above specified range.

This system also can detect if only one sensor reading is outside the specified range. As shown in Figure 7, the pH value is within the specific range but the temperature value is outside the specific value. The buzzer will still produce sound to indicates that the water in the aquarium is not suitable for the type of fish in it but only one notification will be sent to the user's phone stating the value of the temperature is outside the specified range.



	<div style="display: flex; justify-content: space-around; align-items: center;">   </div> <p align="center">Figure 7: Only the temperature is above specified range.</p>
<p><b>Novelty and uniqueness</b></p>	<p>This Aquarium Monitoring System has a few uniqueness compared to other products, especially in terms of sensor and electronic devices used. It uses sensors to detect the suitable condition for an aquarium. Once the sensors detect the current temperature and pH readings, the system will automatically evaluate the condition and give signal for any readings outside the specified range. To make it more unique, this project is based on IoT device. Users can monitor the real time sensors value anywhere through their mobile phone and will receive notification for condition that need quick action.</p>
<p><b>Benefit to mankind</b></p>	<p>The main advantage of this project is to help users to keep the aquarium clean and healthy for the living things inside. Monitoring fish populations is one of the difficulties pet owners must confront, and it is crucial if they want their fish to always be in good health. This aquarium monitoring system can provide users with status updates in real time. Using a temperature sensor and pH sensor, the water quality can be maintained at an optimal level for the growth of freshwater fish.</p>
<p><b>Potential commercialization</b></p>	<p>Aquarium Monitoring System is a hobby concept that combines aquariums with the Internet of Things system. The potential users are hobbyists and organizations that have home office aquarium. Many people love to keep fish at home or office as a hobby or for decoration purpose as it is very calm to watch and contemplate the fish swim back and forth.</p>
<p><b>Acknowledgment</b></p>	<p>Firstly, thanks and gratitude to Universiti Teknologi MARA Cawangan Pulau Pinang and especially to the Electrical Engineering Studies for exposing us an exciting opportunity to show the level of understanding of what have been learned and expand the creativity level. Finally, we would like to dedicate our special appreciation to our beloved family for their support and encouragement. The advice and moral support really help a lot in getting through the hard times.</p>

**Researchers  
Biographical Data**


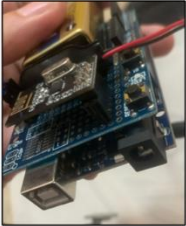

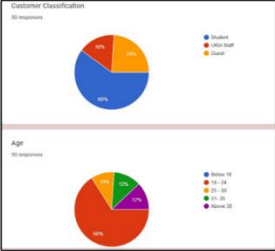
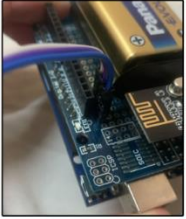
Muhammad Ikmal bin Izazi is a student who is currently undertaking his Diploma in Electrical Engineering (Power) at Universiti Teknologi MARA Cawangan Pulau Pinang.

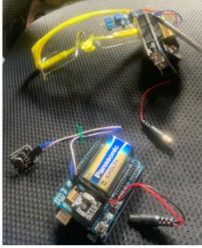





Asmalia Zanal obtained her B. Eng. Hons. in Electrical and Electronics Engineering from Universiti Teknologi Malaysia (UTM) in 2004 and finished MSc. in Electronic System Design Engineering from Universiti Sains Malaysia in 2008. Currently, she is a senior lecturer at Faculty of Electrical Engineering, UiTM Cawangan Pulau Pinang, Kampus Permatang Pauh.

## OPTIMAL LOCATION AND THRESHOLD VALUE OF COMFORTABLE VIBRATION SYSTEM FOR DROWSY DETECTION

Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
		√	
	Local		International
		√	
<b>Project Member(s)</b>	Adam Norman Khusairi <sup>1</sup> , Nor Kamaliana Khamis <sup>2</sup>		
<b>Affiliation</b>	<sup>1</sup> Bachelor of Mechanical Engineering (Honors.), Universiti Kebangsaan Malaysia, Selangor, Malaysia		
<b>Email</b>	<sup>1</sup> a177334@siswa.ukm.edu.my, <sup>2</sup> kamaliana@ukm.edu.my,		
<b>Correspondence</b>	Adam Norman Bin Khusairi Fakulti Kejuruteraan Mekanikal, Universiti Kebangsaan Malaysia, 43600 UKM Bangi, Selangor Malaysia Tel: +60 14 9427 818		
<b>Abstract</b>	As people have become more aware of the significance of sleep for overall health and well-being, the field of sleep detection has gained considerable attention. Monitoring sleep patterns accurately is essential for understanding sleep quality and detecting potential sleep disorders. To improve the precision and effectiveness of sleep monitoring devices, this research project aims to investigate the best vibration level and placement of the system for detecting sleep. The product is constructed from components that includes Arduino Uno, transceiver, vibrators, IR sensor, and back pad support. The study involves creating an eye blinking detector using the IR sensor and Arduino Uno microcontroller connected to vibrators. Vibrations are chosen as the alarm method because they can gently wake individuals from sleep without causing disturbances, allowing for a smooth transition from sleep to wakefulness. Sleep detection is vital for monitoring and enhancing sleep quality, and the eye blinking detector analyses eye movements to identify sleeping individuals. By determining the optimal vibration level and exploring different system placements for the vibrators, the study aims to enhance the accuracy and comfort of sleep detection systems, as well as to prevent accidents, save lives, and also increase productivity. The commercialization prospects for this technology are promising, as it can be		

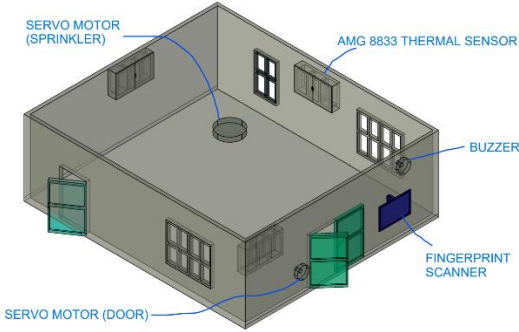
	integrated into existing vehicle safety systems, benefiting automotive manufacturers and fleet management companies.
<b>Keywords</b>	microsleep, drowsy, eye blink, vibration, pad.
<b>Product description</b>	<p>It consists of various components, such as an Arduino Uno microcontroller, a transceiver, vibrators, an IR sensor, and a back pad support. The system utilizes gentle vibrations placed in the back pad support to wake individuals comfortably from sleep. It also incorporates an eye blinking detector that uses an IR sensor to analyze eye movements and detect sleep. The transceiver in the sleep detection system plays a vital role in wireless communication between the IR sensor and the vibrators as it facilitates the transmission of data from the IR sensor, which detects sleep, to the vibrators, which deliver appropriate vibrations. The main goals of this system are to improve the comfort of sleep detection, prevent accidents caused by drowsiness, and enhance productivity. With promising prospects for commercialization, it can be integrated into existing vehicle safety systems, benefiting automotive manufacturers and fleet management companies. Overall, this sleep detection system provides a comprehensive solution for enhancing sleep quality and promoting overall well-being.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; justify-content: space-between; width: 100%;"> <div style="border: 1px solid black; padding: 5px; background-color: #e0f0ff;">CONSTRUCT SURVEY</div>   </div> <div style="margin: 10px 0;">  </div> <div style="display: flex; justify-content: space-between; width: 100%;"> <div style="border: 1px solid black; padding: 5px; background-color: #e0f0ff;">ANALYSING DATA</div> <div style="text-align: center;">  </div> <div style="border: 1px solid black; padding: 5px; background-color: #e0f0ff;">PROTOTYPE BUILDING</div> </div> <div style="margin-top: 10px;">  </div> </div>

	<div data-bbox="560 241 776 283" style="border: 1px solid black; padding: 2px;">PROTOTYPE PROGRESS</div>  <div data-bbox="548 508 1372 541" style="border: 1px solid black; height: 16px; margin-top: 10px;"></div> <div data-bbox="889 590 1105 640" style="border: 1px solid black; padding: 2px; margin-top: 10px;">TESTING AND SIMULATION</div> 
<p><b>Novelty and uniqueness</b></p>	<p>Discover the unparalleled uniqueness of our product, combining cutting-edge features that ensure a truly exceptional experience. Picture yourself gently awakening to the soothing vibrations specifically designed to provide a comfortable start to your day, unlike any traditional alarm you've encountered. Moreover, the system takes sleep monitoring to the next level with an eye blinking detector, delivering reliable sleep detection. With the wireless transceiver module seamlessly connecting the IR sensor to the vibrators, convenience and flexibility are seamlessly integrated. Embrace a new standard of comfort, accuracy, and innovation with this unparalleled sleep detection system, setting it apart from anything else on the market.</p>
<p><b>Benefit to mankind</b></p>	<p>The sleep detection system offers several important benefits that make it stand out. Firstly, it uses gentle vibrations to wake individuals up comfortably, ensuring a pleasant morning experience. Additionally, the system accurately detects sleep patterns through an eye blinking detector, providing precise information for monitoring and diagnosing sleep disorders. Its applications are wide-ranging, benefiting individuals in terms of improved sleep quality and increased productivity. Healthcare professionals can also leverage the system for sleep monitoring and diagnosis. Moreover, the system plays a crucial role in transportation safety, helping prevent accidents caused by drowsy driving and contributing to overall societal well-being, productivity, and safety.</p>
<p><b>Potential commercialization</b></p>	<p>The sleep detection system has excellent potential for market success and commercialization. Its unique features and benefits make it highly appealing to various target markets. In the consumer market, individuals seeking improved sleep quality would be a key audience, while healthcare professionals and sleep clinics can utilize it for accurate monitoring and</p>

	<p>diagnosis. The automotive industry presents a significant opportunity, as integrating the system into vehicle safety systems can enhance driver safety and prevent drowsiness-related accidents. With the growing awareness of sleep health and the demand for effective monitoring solutions, the system is well-positioned to capture a substantial market share. Its promising commercial prospects and potential partnerships make it an attractive investment opportunity.</p>
<b>Acknowledgment</b>	<p>This project is sponsored by the Ministry of Higher Education and Universiti Kebangsaan Malaysia under grant GP-2021-K016343 and GP-K016343</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 20px;">  <p>Nor Kamaliana, PhD, is a senior lecturer in the Faculty of Engineering and Built Environment at Universiti Kebangsaan Malaysia. Her main area of expertise lies in the field of Ergonomics. She is also involved in research related to engineering education.</p> </div> <div>  <p>Adam Norman is a student who is currently undertaking his degree study program under Faculty of Mechanical Engineering, Universiti Kebangsaan Malaysia.</p> </div> </div>



<b>IOT BASED SAFETY &amp; SECURITY SMART HOME SYSTEM</b>			
<b>Category</b>	<b>A School (Primary &amp; Secondary)</b>	<b>B Technical Institutional Students</b>	<b>C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		√	
	<b>Local</b>		<b>International</b>
		√	
<b>Project Member(s)</b>	Joel Laing Luyoh <sup>1</sup> , Muhammad Fariz Ikrimi Bin Nazri <sup>2</sup> , Muhammad Fareeq Bin Khairul Nurial Said <sup>3</sup> , Yusnita Binti Mohd Ali <sup>4</sup> , Anith Nuraini Binti Abd Rashid <sup>5</sup> .		
<b>Affiliation</b>	<sup>1,2,3,4,5</sup> School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA, Cawangan Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang, Malaysia		
<b>Email</b>	<sup>1</sup> 2021149415@student.uitm.edu.my, <sup>2</sup> 2021155941@student.uitm.edu.my, <sup>3</sup> 2021132101@student.uitm.edu.my, <sup>4</sup> yusnita082@gmail.com, <sup>5</sup> anith7657@uitm.edu.my		
<b>Correspondence</b>	Dr. Yusnita Binti Mohd Ali Electrical Engineering Studies, College of Engineering, Universiti Teknologi MARA, Cawangan Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang, Malaysia.		
<b>Abstract</b>	A smart home system that integrates both security and safety measures is the main invention of this project. This is because the security and safety of homes have always been a top priority for homeowners but even with lots of careful planning, incidents like burglaries and fire accidents still happen, highlighting the need of stronger and better security and safety systems. In terms of security, this project emphasizes the need for improvement by pointing out the weakness of conventional keylocks as security systems while in terms of safety, the use of a thermal image sensor is used for more accurate fire detection compared to the common temperature sensor that is used in the market. This project aims to develop a temperature sensing based fire alarm system and send the alert messages, a door lock security system that can be unlocked wirelessly and using fingerprint sensor, and a smart home monitoring and surveillance system. When a fire or break-in occurs,		

	<p>the system will automatically alert the homeowners. The goal of this project is to offer a comprehensive solution that improves home security and safety in which, prevents fatalities and promotes a safer living environment. This project has a great commercialization potential due to aspect of security and safety needed in the residential market.</p>
<p><b>Keywords</b></p>	<p>smart home system, Internet of Things, fingerprint sensor, thermal image sensor, NodeMCU.</p>
<p><b>Product description</b></p>	<p>Internet of Things (IoT) Based Safety and Security is a project that involves the usage of IoT technology to create an extensive smart safety and security system for homes. The main feature of this smart home system is the integration of both system in which, user can monitor the safety and security aspect in just one system. The safety aspect is this product is the fire detection by using AMG8833 thermal image sensor. Real-time accurate temperature reading gives the system a much more better fire detection capability. The security aspect of this project is the door lock system that offers double protection of security by using the fingerprint sensor and also can be unlocked wirelessly using the Blynk software. NodeMCU ESP8266 serves as the main microcontroller, allowing for seamless data processing and communication with the IoT platform in which, all of the components and sensors are connected to this microcontroller. Blynk software will be used in this product as the medium for the IoT where all of the data will be sent to Blynk for monitor purpose and also unlocking wirelessly. This project aims to deliver a strong security and safety solution for smart homes through a seamless fusion of cutting-edge technology and user-centric design, fostering a secure living environment and peace of mind for homeowners.</p> <div data-bbox="737 1346 1252 1675" data-label="Image">  <p>The diagram shows a 3D perspective view of a rectangular room. Five components are labeled with blue lines pointing to their locations: 'SERVO MOTOR (SPRINKLER)' is on the ceiling; 'AMG 8833 THERMAL SENSOR' is on the upper wall; 'BUZZER' is on the lower wall; 'FINGERPRINT SCANNER' is on the door; and 'SERVO MOTOR (DOOR)' is at the base of the door.</p> </div> <p align="center"><b>Figure 1: Prototype of IoT Based Safety &amp; Security Smart Home System</b></p>

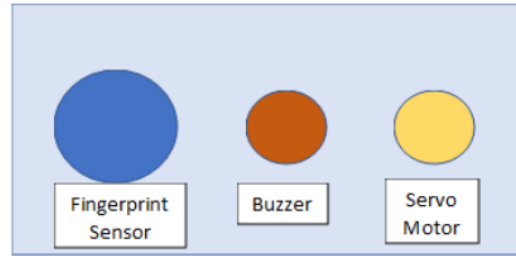


Figure 2: The location of door lock system

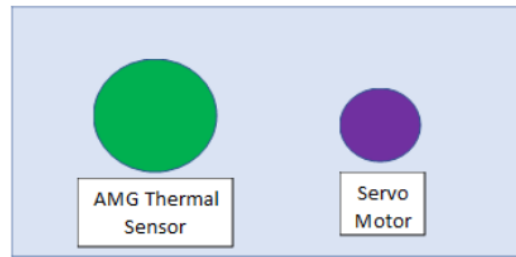


Figure 3: The location of fire detection system



Figure 4: The prototype design of IoT Based Safety & Security Smart Home System

The prototype of the project is showed in Figure 1 to Figure 3 and as for the design of the prototype, it is shown on Figure 4.

Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.

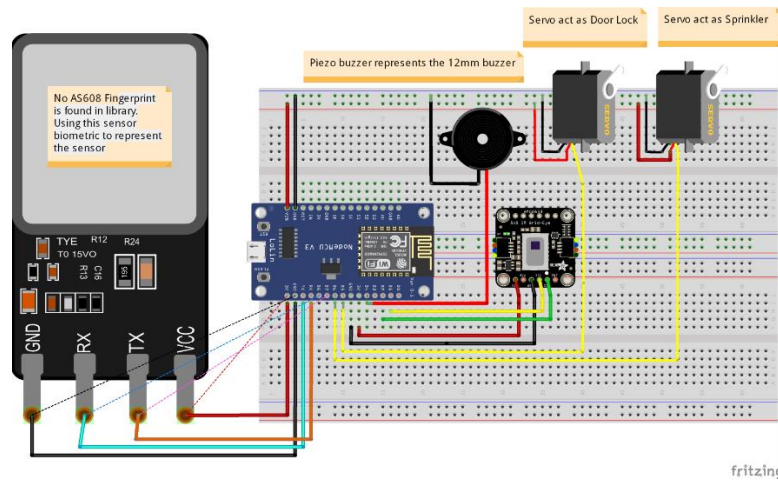


Figure 5: The Breadboard diagram of IoT Based Safety & Security Smart Home System

Figure 5 shows the breadboard diagram of the project which is designed using Fritzing software. The circuit consists of two main systems: a safety system (fire detection system) and a security system (door locking system). To control all the inputs and outputs of this project, a NodeMCU ESP8266 is utilized. The inputs for the IoT Based Safety & Security Smart Home System are an AMG8833 thermal image sensor (temperature sensor), an AS608 Adafruit fingerprint sensor, and a switch widget located inside the IoT Blynk app to control the servo. Meanwhile, there are two outputs used in this project: a buzzer that acts as an alarm and two micro-servos which function as a door lock and a sprinkler, respectively, in both systems. In addition, there are widgets such as charts and gauges to read the temperature value from the AMG8833 in the IoT Blynk app as an output. Finally, the state of the door lock will also be displayed in the Blynk app for the purpose of monitoring.

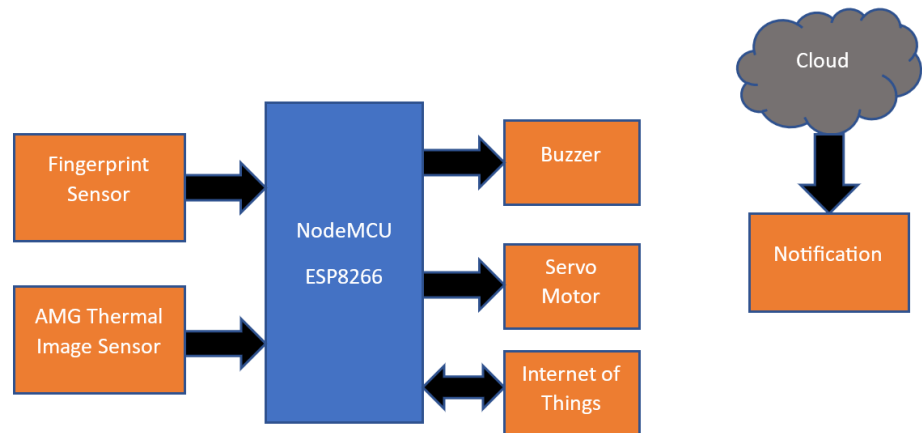


Figure 6: Block diagram

From block diagram above, there are total of two inputs and three outputs which were controlled by the NodeMCU ESP8266 will be considered for the system to work successfully in the project. For AMG8833 Thermal Image Sensor, it functions to detect infrared radiation in which, it will read the temperature of the surrounding. Then, the servo motor is the actuator of the detection of fire. All the data will be sent to the IoT for monitoring and notification if there is any possible fire incident that will happen. Next, fingerprint is the input for security system which cover for door lock system. The outputs are servo motor along with the buzzer whereby the servo motor will turn 180° if unlocking is successful while buzzer will turn ON after several failed attempts in unlocking the door.

As for the flowchart of the project, since this project is a integration of two system, there will be two flowcharts which indicates the door lock system and the fire detection system.

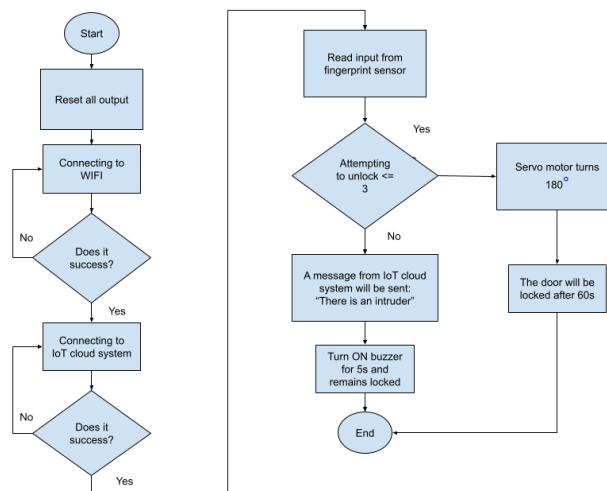


Figure 7: Flowchart of door lock system

Based on Figure 7, it shows the flowchart for user. After the door lock system is well connected to both WIFI and IoT cloud system, the process of unlocking can be done wirelessly (for admin) or using the fingerprint (for user) in which, has a maximum of three tries of unlocking. If three tries of fingerprint end with finger that is not matched, a message of “There is an intruder” will be sent from IoT cloud system and buzzer will be turned ON for 5s and it remains locked. If user can successfully unlock using fingerprint or wirelessly (for admin), the servo motor will turn 180° and door will remain unlocked for 60s before it automatically locked.

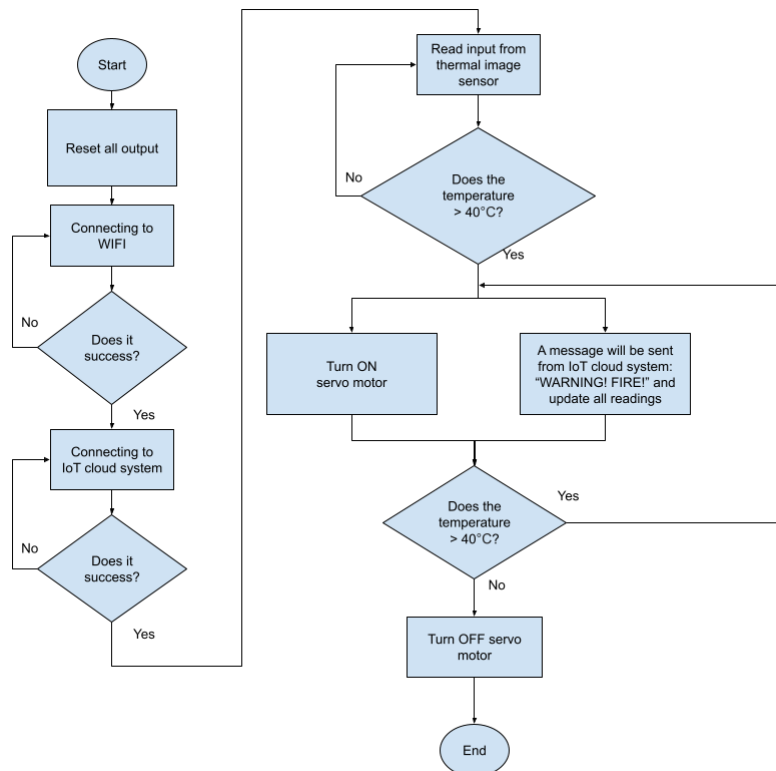


Figure 8: Flowchart of fire detection system

Based on Figure 8 above, after the fire detection system is well connected to both WIFI and IoT cloud system, the system will read input from thermal image sensor where if the thermal sensor detects excessive heat, it will proceed with capturing the colour map. The colour map then will be translated into a readable temperature where if it exceeds 40°C, servo motor will turn ON. This servo motor will act as sprinkler. Then, a message of “WARNING! FIRE!” will be sent to IoT cloud system. If the temperature still exceeding 40°C, servo motor will still be turning on but if the temperature is below 40°C, servo motor will be turn OFF.



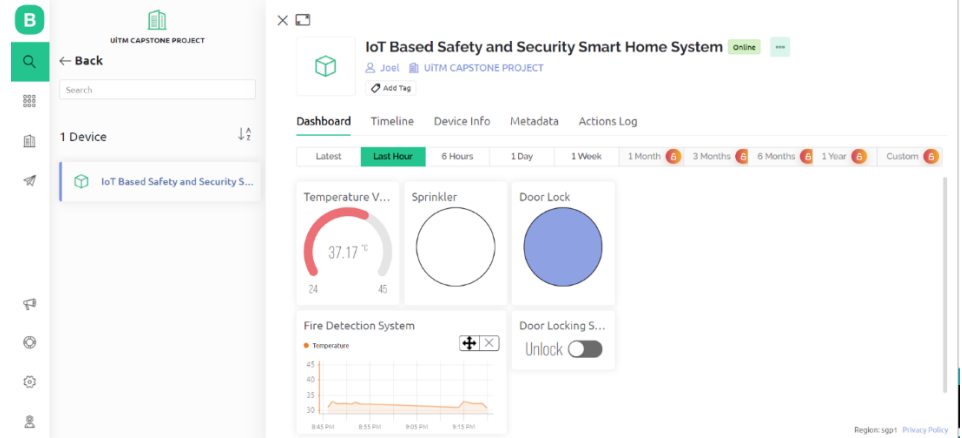
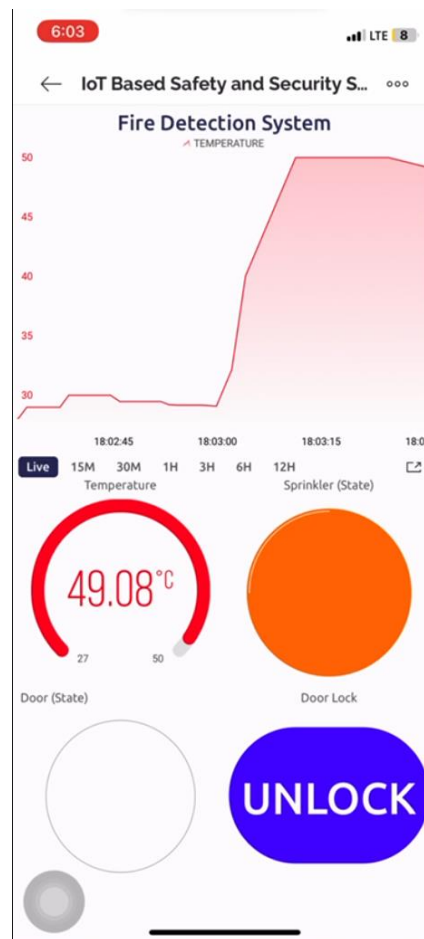


Figure 9: The Blynk website in PC

Based on Figure 9, all the virtual data pins, data streams, events and action logs are mainly edited and added here before users are able to edit the widgets feature in the mobile app to display the required data stream. In the Blynk web, the monitoring and controlling of the input and output also can be done independently without the mobile app.



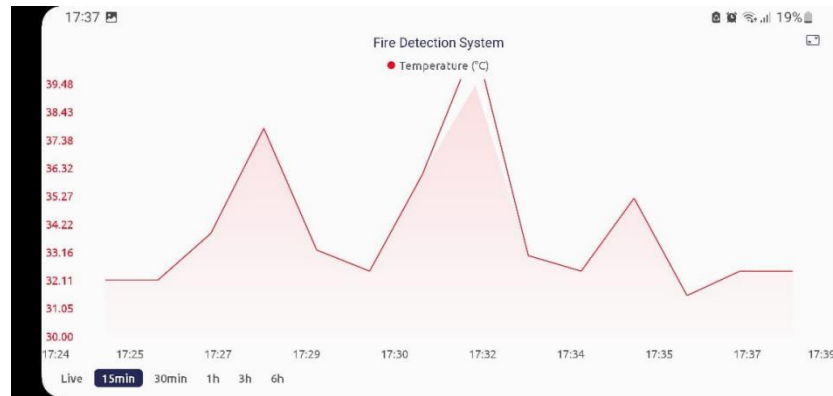


Figure 10: The main display of the IoT Blynk in the mobile App and the full screen view of the chart widget

Based on Figure 10, the main display of the IoT Blynk App is shown above. The widget can be added, edited and removed based on the user's preferences. The full screen view of the chart widget is also shown by tilting the phone for a better visual or reading of the data. Furthermore, the timeline of the chart can vary from live data, to 15min and so on. There are more choices of time setting up to 1 week for future references.

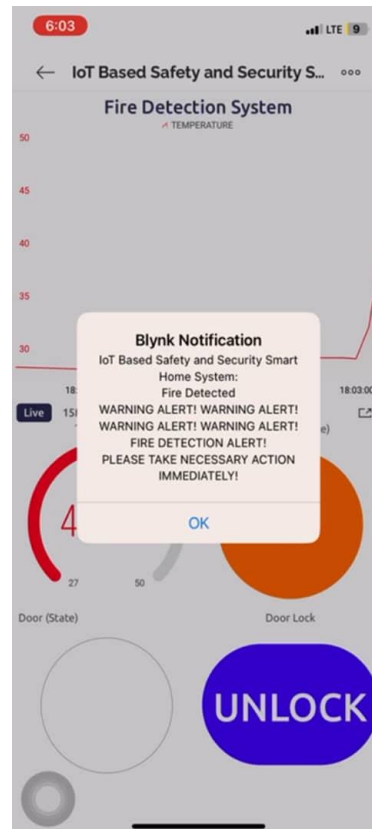


Figure 11: The Blynk notification alert when fire is detected

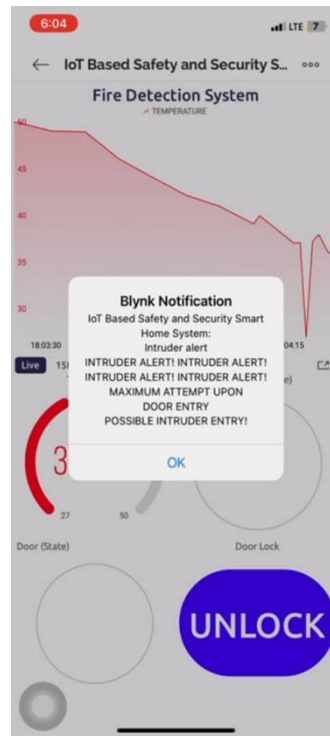


Figure 12: The Blynk notification alert when there is an intruder

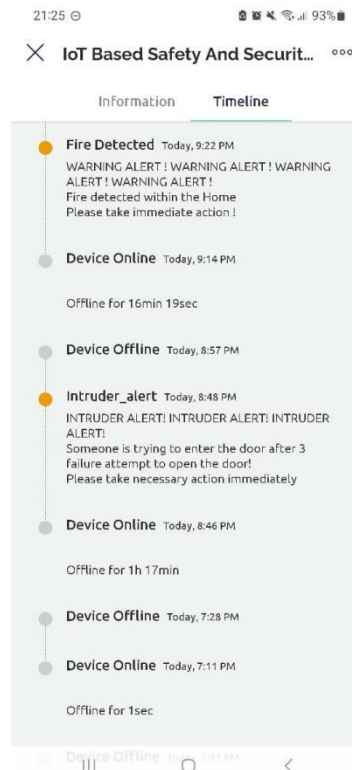


Figure 13: The timeline of Blynk notifications and state of the IoT

Figures 11 and 12 basically show how the notifications appear or pop up in the mobile app when there is an incident of fire or intruders. All the notifications were recorded in the timeline as shown in Figure 13.

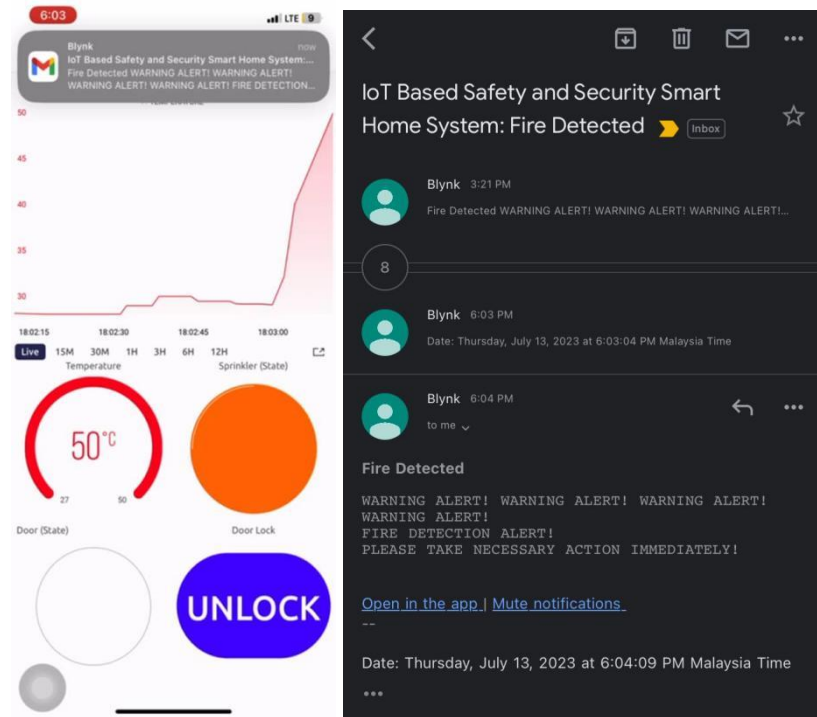


Figure 14: The email notification when fire is detected

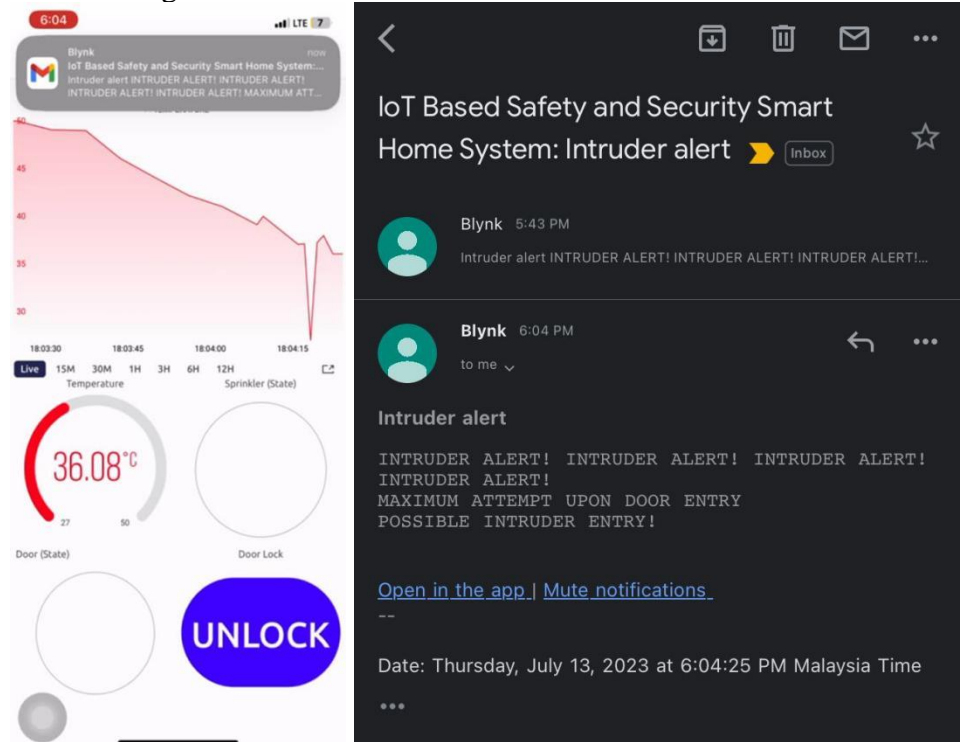
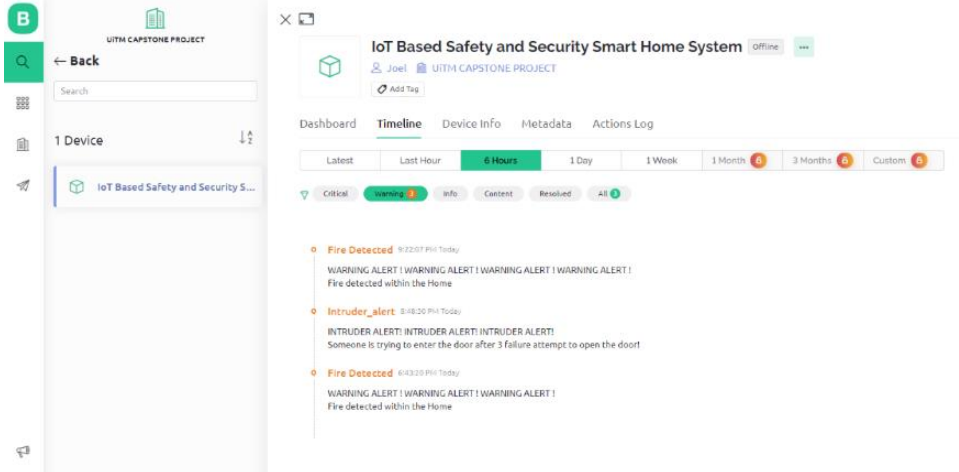




Figure 15: The email notification when there is an intruder

	 <p align="center"><b>Figure 16: The timeline of Blynk notifications</b></p> <p>Figures 14 and 15 show how the notifications are sent to the email of the device owner when there is an incident of fire or intruders. The email also can be sent to related authorities that would take necessary actions to overcome the situation. Same as the mobile app, all the notifications sent via email were recorded in the timeline as shown in Figure 16 in the Blynk web.</p>
<p><b>Novelty and uniqueness</b></p>	<p>This project stands out due to the combination of two essential systems in which, the security (door lock) and safety (fire detection) into one single IoT-based platform without having to worry about the incompatibility between different systems. This integration enables thorough monitoring and defense of the home. Besides, the dual protection mechanism for the door lock that fuses a fingerprint scanner and wirelessly using Blynk software. This feature adds an extra layer of security where one method might have drawbacks to the user. Another difference that differs this project from others is the utilization of the thermal image sensor. Real-time thermal image capture by the sensor provides a more accurate reading of temperature. The effectiveness of this system is increased by the feature of automatic notification where it quickly alerts homeowner during security breaches or fire emergencies. By integrating with an IoT platform, remote monitoring and analysis is possible.</p>
<p><b>Benefit to mankind</b></p>	<p>The dual protection door locks and IoT-based monitoring provide increased protection against intruder and unauthorized access. This can give the sense of security and peace of mind to users. Moreover, by using the thermal image sensor for fire detection in which, provide a more accurate temperature reading in real-time can initiates a quick response and reduce property damage from any fire incidents. The application of this project goes beyond specific residences including gated neighbourhood, apartments and condominiums. The implementation of this project may help in building</p>

	safer neighbourhood due to it improve the quality of life for users as well as society at large by enhancing security and safety aspects.
<b>Potential commercialization</b>	The chance of this project being commercialized is high due to it meets the rising demand for smart home system especially in safety and security. Thanks to the unique characteristics of this project such as system integration, IoT connectivity, dual protection door locks and accurate fire detection, this project can stand out in the market. Strong commercial appeal gets to homeowners because this project provides a complete safety and security solutions. In fact, not only developers that increase the value of their developments with the help of this project but security service provides also can use this project to diversify their product lines.
<b>Acknowledgment</b>	The head project member acknowledges the guidance and support of Dr. Yusnita Mohd Ali as our main supervisor and Pn. Anith Nuraini Abd Rashid as our co-supervisor throughout the conduct of this project. The appreciation also extended to our team members for their tireless efforts and commitment in bringing this project to a reality.
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 20px;">  <p>Joel Laing Luyoh is a student who is currently undergoing his bachelor's degree of electrical and electronic engineering under College of Engineering, UiTM, Cawangan Pulau Pinang. Besides, he came all the way from Sarawak and now having his final year of study. He is keen to enter the industry in Penang to pursue his career grab the opportunities and as well great exposure to current trend technologies available there.</p> </div> <div>  <p>Fariz Ikrimi has graduated on his diploma in electrical and electronic engineering at UiTM Pulau Pinang in 2020 and now he is pursuing in his last year of degree at UiTM Pulau Pinang in Electrical Engineering for EE200 majoring in power elective. During his last internship for Diploma at North M&amp;E Consultant he had gained some knowledge about the company's scope of work and valuable experiences.</p> </div> </div>





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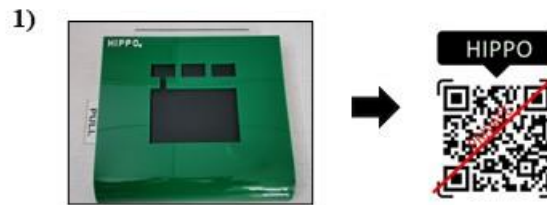
Anith Nuraini Abd Rashid (Ts.) is a lecturer at the Faculty of Electrical Engineering, Universiti Teknologi MARA, Penang Campus, Malaysia. She worked as Engineer at Motorola (M) Sdn Bhd and Intel Technologies (M) Sdn Bhd in between year 2007 until 2011 before joined UiTM as a lecturer. She received her Bachelor Degree and Diploma in Electrical Engineering from Universiti Teknologi MARA. She also obtained her master degree from Universiti Sains Malaysia and currently pursuing her Phd at the same university in Microelectronics Engineering. Her professional interests revolve around diverse areas, including Analog IC Design, Power Management System, RF Energy Harvesting and Computer Vision Systems.

<b>HIPPO: THE HIPPOCAMPUS DISSECTION PLATFORM</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		/	
	<b>Local</b>		<b>International</b>
	/		
<b>Project Member(s)</b>	Norazirah Mat Nayan <sup>1</sup> , Rosfaiizah Siran <sup>1</sup> , Andrean Husin <sup>2</sup> .		
<b>Affiliation</b>	<sup>1</sup> Faculty of Medicine, Universiti Teknologi MARA, Sungai Buloh Campus, Selangor, Malaysia  <sup>2</sup> Faculty of Dentistry, Universiti Teknologi MARA, Sungai Buloh Campus, Selangor, Malaysia		
<b>Email</b>	<sup>1</sup> azirahnayan@gmail.com, <sup>1</sup> rosfaiizah@uitm.edu.my , <sup>2</sup> andrea@uitm.edu.my		
<b>Correspondence</b>	Rosfaiizah Siran Department of Physiology, Faculty of Medicine Universiti Teknologi MARA, Sungai Buloh Campus, 47000, Sungai Buloh, Selangor, Malaysia. Tel: +603-61265000		
<b>Abstract</b>	The hippocampus dissection platform HIPPO was designed to assist in surgical procedures on small tissue, which required precision in collecting samples for research purposes. HIPPO was invented to fulfil the requirements of researchers by improving the surgical process for animal tissue in an ergonomic way during long dissection procedures. HIPPO was designed ergonomically with an elevated platform and wide features for a comfortable position during long dissection procedures. Digital bilingual guidelines were equipped to assist the users by scanning the QR code provided by the platform. The anti-slip surface was provided in the dissection section area to hold the tissue in place during the dissection. Other than that, HIPPO has three useful columns for an easy sample collection process. As most brain surgical procedures need to conduct in a cold environment, HIPPO provides an ice insulator layer with direct contact with the dissection		

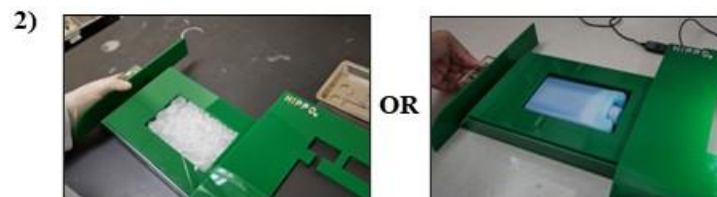
	<p>area so that the procedure can be held in a conducive environment. Apart from that, HIPPO is also furnished with an adjustable phone holder with a flexible USB lamp where researchers can conduct clearer dissection under direct illumination based on the live screen through the phone. Hence, users will save a lot of time and have a convenient way to prepare and conduct dissecting procedures, specifically on soft fragile tissue, as extra care is needed to maintain excellent dissecting skills. This patent product aims to engage customers from different backgrounds, not only offers for universities and research institutes but also in schools in which HIPPO can be used in the lab to gain a better learning experience.</p>
<b>Keywords</b>	<p>Dissection platform; Hippocampus; Ergonomic</p>
<b>Product Description</b>	<p>HIPPO was designed with seven useful features to integrate convenience and comfort in maintaining a conducive dissection setting. To overcome the old demanding procedures, HIPPO has an ergonomic design by providing a wide elevated platform, an anti-slippery dissection area, compartments for tissue collection, an ice insulator layer, and an adjustable phone holder and lamp for a clearer dissection procedure. Most importantly, all the setup and the dissection procedures were also provided with the platform to direct the users with the best practice. The body of HIPPO was made of lightweight strong acrylic materials and easy to clean. Psychologically, HIPPO is available in green color as an initiative to help relax the eyes and avoid the fatigue of eyes from long dissection procedures.</p>

Pictures/ Schematic diagrams/ Flow Charts/Screenshots/ Graphs and etc.

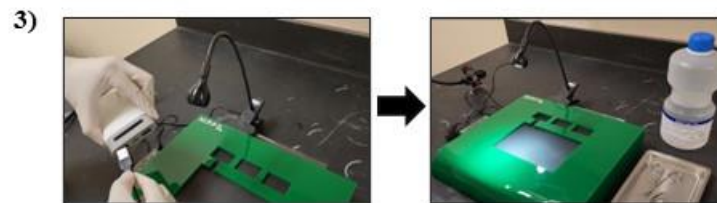
## HIPPO SET-UP



Users should scan the provided QR code to get the full protocol for the setup and dissection demonstration video.







Fill the ice compartment with supplied ice pack or crushed ice



Clip the adjustable lamp to the HIPPO and connect the USB to the power bank or any USB plug to light up the lamp.



Clip the adjustable phone holder to the HIPPO and put the handphone on the holder. Adjust the lamp and phone to get the desired position.

	<p>5)  OR </p> <p>HIPPO is ready to be used for dissection in light or dark conditions.</p> <p>6)  OR </p> <p>Users can start conducting the dissection live by phone or directly from the platform. The phone can act as a magnifier to get a clearer image of small tissue during the dissection.</p>
<p><b>Novelty and uniqueness</b></p>	<p>HIPPO invented the first dissection platform that was up to date and met the demands of the users for handling small tissue dissection such as the hippocampus. HIPPO differentiates itself with better designs and functions to ensure it fulfills its main goal, which is to solve difficulties that arise during critical dissection procedures. The distinctive features of HIPPO are its ergonomic design, which has a curved elevated platform to improve body and hand position. To ensure tissue freshness and good sample quality, this is the first dissection platform that has an ice-insulated and anti-slippery dissection area. Other than that, HIPPO not only has the complete setup guidelines but also has a full demonstration video for the brain dissection protocol from the QR code. This will especially benefit the user to be well-prepared prior to the dissection experience. Further innovation efforts were made such as adjustable lamps and phone holders, to get a clearer and magnified image through the handphone. Overall, HIPPO has its own originality that can achieve the desired standard of future users by conducting the dissection process in a novel way.</p>
<p><b>Benefit to mankind</b></p>	<p>Considering our prior experience, it is rather difficult to maintain a desirable outcome in collecting the samples for our research needs. We find it challenging to maintain the freshness of the tissue with a slippery dissection surface, poor illumination and takes longer time to set up the apparatus. Therefore, there is a growing need to understand that a practical and</p>



	<p>conductive environment is important to achieve good results and skill in dissecting fragile tissue. With new advancements, the seven features of HIPPO have a huge potential to help users make significant improvements in the dissection procedure and reduce the risk of error in handling small and fragile tissue. Other than that, HIPPO is also anticipated to benefit the schools' teachers to improve learning outcomes by providing a better platform for the students' hands-on experience in the science lab.</p>
<b>Potential commercialization</b>	<p>Considering the importance of a good dissection setup, the new advancements by HIPPO look forward in convincing the users to modernize the old procedure and gain a better result. The designs and functions are much easier to handle, ergonomic, lightweight, and portable are thought will secure trust in users when using HIPPO. Generally, this dissection platform is not limited to the hippocampus dissection but also to other soft and small tissue. Considering the profit margin, this product will be marketed at an affordable price and aimed to be promoted to universities, research institutes, and schools to gain the mutual benefits.</p>
<b>Acknowledgment</b>	<p>The project members would like to thank Nur Aqila Syafiqah Salehuddin for the technical support and the Institute of Medical Molecular and Biotechnology, Universiti Teknologi MARA for providing the facilities.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div data-bbox="537 1108 764 1375">  <p>Norazirah Mat Nayan is a PhD student in the Faculty of Medicine, UiTM, Sungai Buloh Campus. Her current research interest is in neurodevelopment. As she is from a science background and has always been interested in scientific innovation. Since her degree level, she was awarded a diamond award, four gold, one silver, and one bronze medal for her innovative products. Email: azirahnayan@gmail.com</p> </div> <div data-bbox="542 1472 769 1738">  <p>Associate Professor Dr Rosfaiizah Siran received her medical degree from University College Cork, Ireland in 2002 and then received her PhD from Universiti Sains Malaysia in 2009. She is working as a lecturer in Physiology Department, Faculty of Medicine, Universiti Teknologi MARA, Malaysia. Her current research interest focuses on neuroscience such as cognitive function, stroke and REM sleep functions. Email: rosfaiizah@uitm.edu.my</p> </div> </div>





Dr Andrian Husin received his medical degree from the University College Cork, Ireland in 1999 and then received his Master's degree in Neurosurgery from Universiti Sains Malaysia in 2009. He is now a senior lecturer in the Oral Maxillofacial Surgery department, Faculty of Dentistry, Universiti Teknologi MARA, Malaysia. His research interest focuses on neuroscience such as cognitive function and stroke.  
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<b>SMART CLASSROOM: FACE RECOGNITION ATTENDANCE SYSTEM WITH CLASS MONITORING USING IOT INTEGRATION (SCR-FRAV1)</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		√	
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Muhammad Haziq bin Mat Nasir <sup>1</sup> , Muhammad Azmi Mustafa bin Abdul Halim <sup>1</sup> , Muhammad Izzat Aiman bin Noor Idzuandi <sup>1</sup> , Noor Azila binti Ismail <sup>1</sup>		
<b>Affiliation</b>	<sup>1</sup> School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA, Cawangan Pulau Pinang, Malaysia		
<b>Email</b>	<sup>1</sup> hazziq42@gmail.com, <sup>1</sup> 2021196541@student.uitm.edu.my, <sup>1</sup> izzataiman4499@gmail.com, <sup>1</sup> noorazila687@uitm.edu.my		
<b>Correspondence</b>	Noor Azila Ismail School of Electrical Engineering, College of Engineering Universiti Teknologi MARA, Cawangan Pulau Pinang, Kampus Permatang Pauh 13500 Permatang Pauh, Pulau Pinang, Malaysia. Tel: +60134882705,		
<b>Abstract</b>	<p>The Smart Classroom - Face recognition attendance system with Class Monitoring using IoT Integration (SCR-FRAV1) is a device designed to enhance the efficiency of classroom attendance systems in academic institutes. By providing real-time information on classroom occupancy, scheduling, and equipment usage, it improves classroom visibility and encourages energy conservation. The system utilizes Raspberry Pi 4 as its central component and incorporates various sensors such as PIR sensor, Time-of-Flight (ToF) sensor, webcam, and light sensor. Outputs include an LCD display, 4x8x8 Dot Matrix Display, buzzer, LEDs, servo motor, and integration with Google Email (IoT).</p> <p>The main feature of SCR-FRAV1 is its face recognition capability, which captures students' images using a webcam and compares them with a saved</p>		

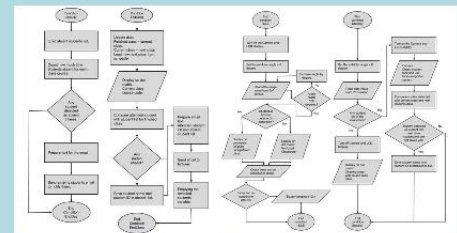
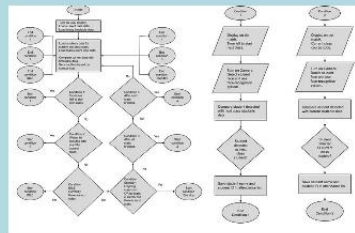
	<p>dataset using deep learning algorithms. The recognized students are then recorded in the attendance list, which is automatically sent to the lecturers via email. Additionally, the system utilizes a dot matrix display to show the current and next class course code inside and outside the classroom. It also detects human presence using the PIR sensor and lecturer/student's presence using the ToF sensor.</p> <p>The SCR-FRAv1 system brings several advantages, including efficient classroom management, timely class scheduling, energy efficiency, and improved record-keeping for lecturers. It promotes a culture of innovation, collaboration, and knowledge-sharing among students through its DIY component design and direct interaction. Furthermore, it contributes to environmental sustainability by monitoring and reducing the use of lighting and air conditioning resources when not necessary.</p> <p>In terms of commercialization prospects, the SCR-FRAv1 system has potential for implementation in educational institutions seeking to optimize attendance tracking, classroom management, and energy conservation.</p>
<b>Keywords</b>	<p>smart classroom, face recognition, class monitoring, classroom attendance system, attendance tracking, deep learning algorithm</p>
<b>Product description</b>	<p>The Raspberry Pi 4 serves as the brain for our innovative Smart Classroom system, which utilizes a range of input and output components to deliver a comprehensive solution. Inputs include the PIR sensor and Time-of-Flight (ToF) sensor, which detect human presence within the classroom. The webcam captures student images for face recognition, while the light sensor monitors the condition of class appliances such as the air conditioner and lamp. The outputs consist of an LCD display for attendance taking, a 4x8x8 Dot Matrix Display to show the class status, a buzzer for alerts and notifications, LEDs to indicate air conditioner status, a servo motor for movement of the sensors, and integration with Google email for seamless communication.</p> <p>The Raspberry Pi 4B acts as the central control unit, utilizing deep learning techniques to train the face recognition system for accurate attendance tracking. The system automatically sends the attendance list to lecturers, ensuring efficient record-keeping. Moreover, it has the capability to send emails to students who have been absent from class too frequently, promoting increased attendance and accountability. With its diverse range of inputs and outputs, the Smart Classroom system offers a comprehensive solution for improving classroom management, enhancing energy efficiency, and facilitating effective communication between students and lecturers.</p>

Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.

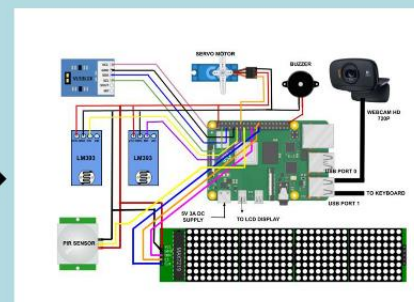
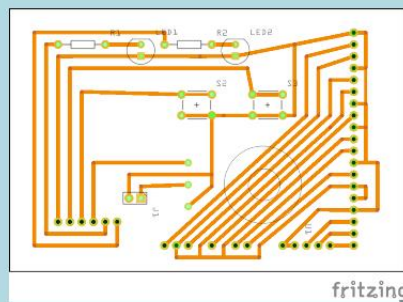
## METHODOLOGY



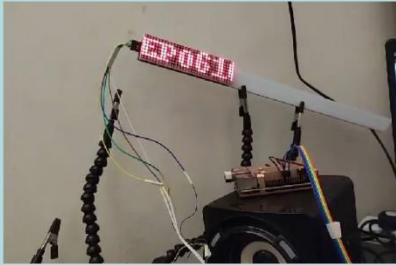
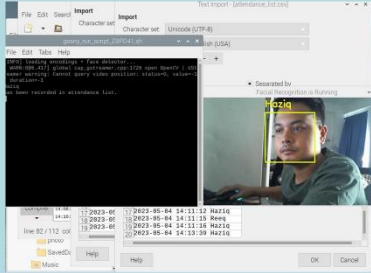
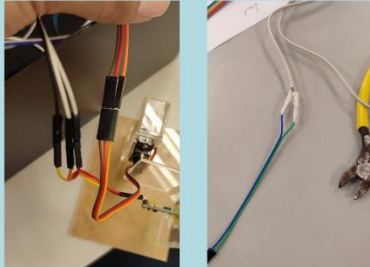

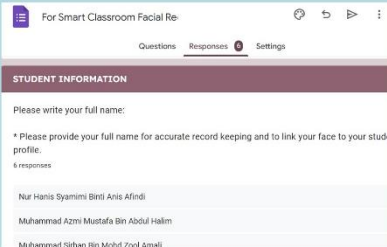

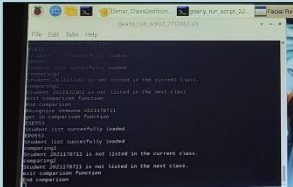

3D modelling for preliminary design.



Designing flowchart of the system operation.







Designing the wire connection and PCB bottom layout.

	  <p align="center">↓</p> <p align="center">Testing programming code for all modules and face recognition attendance system. Then, combine all codes and follow the flowchart.</p>   <p align="center">↓</p> <p align="center">Prepare the wires for connection and soldering the components on the PCB with designed layout.</p>   <p align="center">↓</p> <p align="center">Collecting DataSet from students via Google Form and installing the device in the classroom.</p>   <p align="center">↓</p> <p align="center">Troubleshooting and testing the finished product.</p>
<p><b>Novelty and uniqueness</b></p>	<p>The SCR-FRA v1 utilizes face recognition technology for automated attendance management, saving time and ensuring accuracy. Real-time information on occupancy, scheduling, and equipment usage enhances classroom visibility and efficiency. The system promotes energy conservation by monitoring lighting and air conditioning, reducing costs and environmental impact. Lecturers benefit from streamlined record-keeping and automatic attendance reports. Students can easily view their attendance</p>

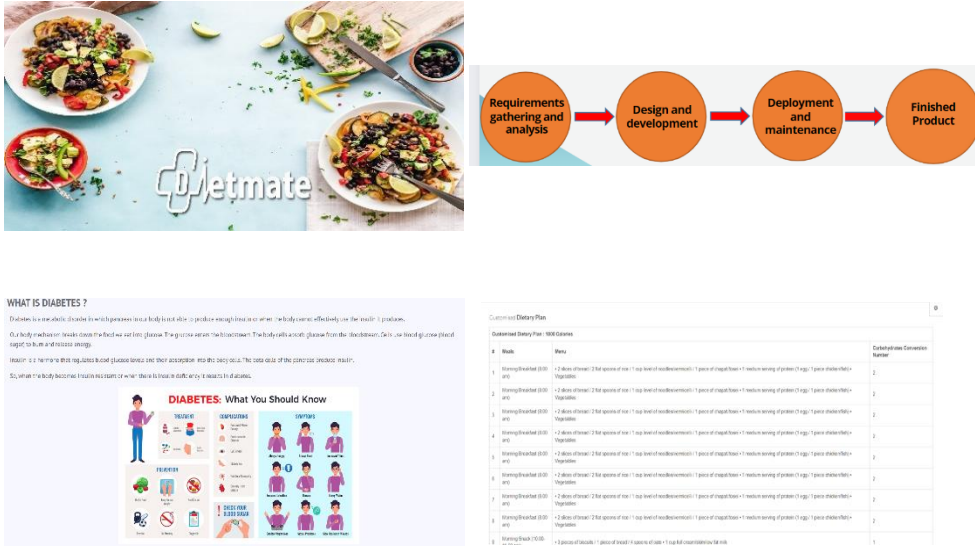


	<p>status and receive notifications for excessive absences, promoting accountability. The Smart Classroom system finds applications in various educational institutions, improving classroom management and creating an engaging learning environment while fostering innovation and collaboration among students.</p>
<p><b>Benefit to mankind</b></p>	<p>The SCR-FRAv1 offers several advantages and benefits. It revolutionizes classroom attendance management by utilizing face recognition technology, eliminating the need for manual tracking and streamlining the record-keeping process for lecturers. Real-time information on classroom occupancy, scheduling, and equipment usage enhances classroom visibility and enables efficient resource allocation. The system promotes energy conservation by monitoring lighting and air conditioning, reducing unnecessary usage and contributing to a sustainable environment. It improves classroom management, ensuring classes run smoothly and on time while fostering a culture of innovation and collaboration among students. The SCR-FRAv1 has a wide application in academic institutes, enhancing attendance tracking and creating an efficient and technologically advanced learning environment. With its unique features and socio-economic impact, the product has promising commercialization prospects.</p>
<p><b>Potential commercialization</b></p>	<p>The SCR-FRAv1 has significant potential for marketability and commercialization. The product addresses the pressing need for efficient classroom management and attendance tracking in academic institutes. By leveraging face recognition technology and IoT integration, it offers a streamlined solution that improves accuracy, saves time, and enhances overall productivity. The system's unique features, such as real-time occupancy monitoring, equipment usage tracking, and energy conservation capabilities, make it highly attractive to educational institutions seeking innovative solutions. Additionally, the SCR-FRAv1's versatility allows for customization and scalability, catering to different classroom sizes and requirements. With its ability to optimize resource allocation and promote sustainable practices, the product aligns with growing societal and environmental concerns. The commercialization prospects for the SCR-FRAv1 are promising, as it addresses critical pain points in the education sector while offering long-term benefits and a competitive edge in the market.</p>
<p><b>Acknowledgment</b></p>	<p>We would like to express our heartfelt gratitude to Hal Ehwal Akademik (HEA) for granting us access to the BKBA 3.6 classroom, allowing us to test our project. Special thanks to Tuan Ahmad Syahmi B Tuan Mohd Rosli, the Head of Administration and Records Unit, for his invaluable involvement in the project proposal phase and his agreement on the project's potential to improve the attendance system at UiTM CPP. We extend our deepest appreciation to Ts. Noor Azila Ismail, our project supervisor, for her unwavering support and guidance. Additionally, we are grateful to Ts. Mohd</p>



	<p>Affandi Shafie and Dr. Mohammad Nizam Ibrahim for their critical comments and constructive feedback during the project proposal presentation. Their contributions, guidance, and encouragement have been invaluable to the success of our project.</p>
<p><b>Researchers Biographical Data</b></p>	<div data-bbox="518 415 764 693">  <p>Muhammad Haziq bin Mat Nasir is a student who is currently undertaking his Bachelor of Engineering (Hons.) Electrical And Electronic Engineering under Faculty of Electrical Engineering, UiTM, Cawangan Pulau Pinang. He was finished his Diploma in Electrical Engineering (Power) in 2020.</p> </div> <div data-bbox="518 730 764 1008">  <p>Muhammad Azmi Mustafa bin Abdul Halim is a student who is currently undertaking his Bachelor of Engineering (Hons.) Electrical And Electronic Engineering under Faculty of Electrical Engineering, UiTM, Cawangan Pulau Pinang. He was completed his Diploma in Electrical Engineering (Electronic) in 2021.</p> </div> <div data-bbox="518 1056 764 1308">  <p>Muhammad Izzat Aiman bin Noor Idzuandi is a student who is currently undertaking his Bachelor of Engineering (Hons.) Electrical And Electronic Engineering under Faculty of Electrical Engineering, UiTM, Cawangan Pulau Pinang. He was completed his Diploma in Electrical Engineering (Power) in 2021.</p> </div> <div data-bbox="518 1383 764 1661">  <p>Noor Azila Ismail is currently a senior lecturer at the School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA, Cawangan Pulau Pinang. She received a B.Eng (Hons). in electrical engineering and an M.Eng. Electrical Engineering in Electrical Energy and Power System from the Universiti Malaya, Malaysia in 2000 and 2006 respectively. Her current research interests include power electronics, machines and drives, and microwave.</p> </div>

<b>DIETMATE (YOUR PARTNER IN DIABETES MANAGEMENT)</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		√	
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	<sup>1</sup> Kamaleshwahran a/l Naidu, <sup>2</sup> Mohamad Izzat Anis Bin Eusoff, <sup>3</sup> Sandhiya a/p Pichan, <sup>4</sup> Sitha a/p Gunasegran, <sup>5</sup> Syifa Binti Izhar Hisham,		
<b>Affiliation</b>	<sup>1</sup> University Malaysia Pahang <sup>2</sup> Faculty Of Computing		
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<b>Correspondence</b>	Dr. Syifak Binti Izhar Hisham Head of Computer Systems and Networking Fakulti Komputer, Universiti Malaysia Pahang, Cawangan Pekan, 26600 Pahang, Malaysia. Tel: +60 11-5126 3012		
<b>Abstract</b>	Dietmate is a customized diabetes management platform aimed at addressing the escalating diabetes epidemic in Malaysia. With diabetes as the leading cause of death in the country, Dietmate offers an accessible and cost-effective solution to make a significant impact. Targeting individuals at risk for diabetes, those diagnosed, and the public, Dietmate provides personalized meal plans, telehealth services for virtual consultations, and appointment booking with dietitians and physiotherapists. Educational resources on diabetes management empower users with knowledge for effective self-care. Dietmate focuses on cost-effectiveness, empowerment, accessibility, prevention, and early detection. By empowering individuals, improving health outcomes, and reducing the burden on the healthcare system, Dietmate strives to combat diabetes.		
<b>Keywords</b>	Dietmate, Diabetes management platform, telehealth services, personalized meal plan.		

<b>Product description</b>	<p>Dietmate is a personalized diabetes management platform that helps individuals with diabetes take control of their health and achieve their fitness goals in a personalized and effective manner. It provides personalized meal plans, appointment scheduling &amp; booking, telehealth services, and education and resources to help patients stay informed and empowered throughout their journey. With Dietmate, managing diabetes has never been easier.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	
<b>Novelty and uniqueness</b>	<p>The novelty of the project lies in its provision of telehealth services encompassing remote monitoring and consultation with healthcare professionals. It offers a single platform for personalized diabetes management, including tips resources, and recommends tailored meal plans based on users' health history. By eliminating the need for multiple separate healthcare visits, it serves as a comprehensive one-stop solution.</p>
<b>Benefit to mankind</b>	<p>The project offers significant benefits to mankind, including cost-effective healthcare, empowering individuals with knowledge and resources, ensuring universal accessibility, preventing serious health complications, and enabling early detection and diagnosis. By promoting equitable access, empowering individuals to actively manage their health, and emphasizing prevention and timely intervention, the project improves overall well-being, reduces healthcare disparities, and contributes to the betterment of mankind through accessible and proactive healthcare solutions.</p>
<b>Potential commercialization</b>	<p>Our potential commercialization opportunities involve partnering with key stakeholders such as the Diabetes Association Malaysia, healthcare facilities, and insurance companies. Collaborating with the Diabetes Association Malaysia would allow us to leverage their expertise and reach to effectively promote and distribute our diabetes management platform. Partnering with healthcare facilities enables seamless integration of our solution into existing</p>

	healthcare systems, while collaborating with insurance companies offers the potential for coverage and incentives for users.
<b>Acknowledgment</b>	The head project member acknowledges financial support from Madam Sithi Asmah Bt. Mohabullasha (Head Technology Compliance, MBSB Bank), Shamshunnisah Binti Abu Bakar (Dr Psychiatric) and Lukman Hakim Bin Mohabullasha (Selfemployed).
<b>Researchers Biographical Data</b>	<div data-bbox="509 575 745 856">  </div> <p data-bbox="764 516 1469 951">Kamaleshwahran Naidu is a student currently undertaking his bachelor's degree program under the Faculty of Computer Science majoring in Cybersecurity at University Malaysia Pahang (UMP), Pekan Campus. He is dedicated to furthering his knowledge and skills in the field of Computer Science, with a particular focus on cybersecurity. As an aspiring cybersecurity professional, Kamaleshwahran has participated in 5 innovation competitions, including 2 international, 2 national and 1 state-level competition. He is always eager to learn new things, and he is always looking for ways to improve his skills.</p> <div data-bbox="509 1073 745 1373">  </div> <p data-bbox="764 999 1469 1398">Mohamad Izzat is a student currently undertaking his bachelor's degree program under the Faculty of Computer Science majoring in Cybersecurity at University Malaysia Pahang (UMP), Pekan Campus. He is dedicated to furthering his knowledge and skills in the field of Computer Science, with a particular focus on cybersecurity. As an aspiring cybersecurity professional, Mohd Izzat is actively engaged in his studies at UMP, Pekan campus, where he is gaining a strong foundation in the principles and practices of securing digital systems.</p> <div data-bbox="532 1482 725 1770">  </div> <p data-bbox="764 1451 1469 1808">Sandhiya is a student currently undertaking her bachelor's degree program under the Faculty of Computer Science majoring in Software at University Malaysia Pahang (UMP), Pekan Campus. She is dedicated to furthering her knowledge and skills in the field of Computer Science, with a particular focus on software engineering. As an aspiring software engineer, Sandhiya is actively engaged in her studies at UMP, Pekan campus, where she is gaining a strong foundation in the principles of web development.</p>



Sitha is a student currently undertaking her bachelor's degree program under the Faculty of Computer Science majoring in Software at University Malaysia Pahang (UMP), Pekan Campus. She is dedicated to furthering her knowledge and skills in the field of Computer Science, with a particular focus on software engineering. As an aspiring software engineer, Sitha is actively engaged in her studies at UMP, Pekan campus, where she is gaining a strong foundation in the principles of web development and software testing.



Dr. Syifak Binti Izhar Hisham is our advisor for this project and have a very strong background in researching, academic writing and presenting in various viva, speech conference and product competitions sessions. Her research concentrations include Data Security, Digital Watermarking, Image Processing, E-learning, Multimedia Technology and Medical Images Authentication. She was a scholarship holder of JPA (degree), KPT (master) and UMP(PhD). Dr. Syifak received gold and bronze medals for watermarking GUI projects and research products in various product competitions held by public universities in Malaysia.



<b>CRent: INTELLIGENT CAR RENTAL SERVICES FOR OPTIMISED RESOURCES AND SAFETY IN IIUM COMMUNITY</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			/
	<b>Local</b>		<b>International</b>
	/		
<b>Project Member(s)</b>	Ts. Dr. Ahmad Anwar Bin Zainuddin <sup>1</sup> , Muhammad Zaid Hazim Johari <sup>1</sup> , Mohamad Amir Syakirin Shafie <sup>1</sup> , Saidatul Izyanie Kamarudin <sup>2</sup> , Ahmad Khairi A'bid <sup>1</sup>		
<b>Affiliation</b>	<sup>1</sup> Kuliyah of Information Communication Technology, Islamic International University Malaysia, Gombak, Selangor, Malaysia  <sup>2</sup> College of Computing, Informatics and Media Universiti Teknologi MARA (UiTM), Shah Alam, Selangor, Malaysia		
<b>Email</b>	<sup>1</sup> anwarzain@iium.edu.my, <sup>2</sup> zaidhazim1@gmail.com, <sup>3</sup> asyakirin8@gmail.com, <sup>4</sup> saidatulizyanie@tmsk.uitm.edu.my, <sup>5</sup> khairiavid689@gmail.com		
<b>Correspondence</b>	Asst. Prof. Ts. Dr. Ahmad Anwar Zainuddin Department of Computer Science, Kuliyah of ICT, IIUM Gombak, Selanor Tel: +603-64215646, Hp:+6019 3750658		
<b>Abstract</b>	Due to cumbersome procedures, traditional car rental systems fail customers and rental companies. This work presents CRent, a vehicle rental system using mobile app administration and IoT technology. Online car rental platform CRent has an IoT-enabled Accident Detection System (ADS) to improve safety. Online car and financial transactions make rental services effective. ADS alerts owners to occurrences and improves safety. Mobile app management and IoT technology provide real-time tracking, compliance, maintenance, and theft. These improvements enhance rental experiences, whereas 96% of IIUM users and 99% of proprietors supported the proposed scheme. Seat belt and accident detection are already available, and IoT technology will improve the convenience and safety of mobile app-based car rental services. CRent aims to change car renting for consumers and companies. It offers a simple smartphone app for online auto rental,		



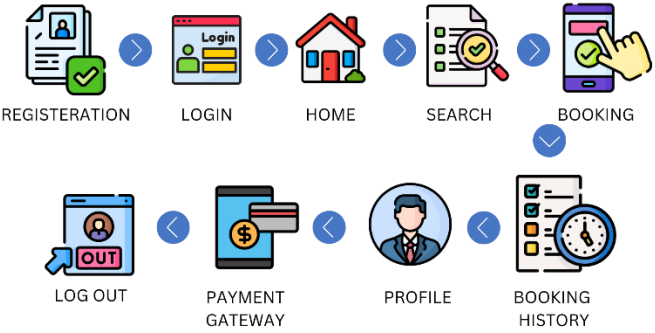
	<p>making it accessible to a wide audience. This accessibility can help attract a larger customer base and increase market penetration, leading to increased customer satisfaction.</p>
<p><b>Keywords</b></p>	<p align="center">E-Commerce, Car Rental, Internet of Things, GPS Module</p>
<p><b>Product description</b></p>	<p>CRent is a mobile application designed exclusively for the IIUM community that enables users to rent vehicles via an online platform. The application is comprised of nine sites, each of which is designed to improve the user experience. List of mobile application display content as shown in Figure 1:</p> <div align="center" data-bbox="662 667 1312 997">  <pre> graph TD     REGISTRATION --&gt; LOGIN     LOGIN --&gt; HOME     HOME --&gt; SEARCH     SEARCH --&gt; BOOKING     BOOKING --&gt; LOG_OUT[LOG OUT]     BOOKING --&gt; PAYMENT_GATEWAY[PAYMENT GATEWAY]     BOOKING --&gt; PROFILE     BOOKING --&gt; BOOKING_HISTORY[BOOKING HISTORY]     </pre> </div> <p align="center">Figure 1: Mobile Apps Design Process</p> <p>Visual Studio Code, a well-known code editor, will be combined with PHP and MySQL to develop the application, the as implemented in [9]. Users will have access to and availability of the codebase, which will be stored with a web hosting service. The app's color scheme will be dominated by shades of blue, which symbolizes serenity and purity and provides a clean and appealing user interface.</p> <p>By adhering to this architecture and implementing the specified technologies, CRent aims to provide a user-friendly and effective mobile application for the IIUM community, allowing seamless car rentals via an online platform and facilitating the administration and management of bookings, users, and cars.</p> <p>For Accident Detection System (ADS) is designed to monitor and detect collisions or crashes in real-time. The system employs a vibration sensor to detect abrupt changes in force or motion. When the Raspberry Pi detects an accident, it initiates an alert mechanism, such as notifying emergency contacts or sounding an alarm. Additional capabilities, such as GPS monitoring, can be incorporated into the device to provide precise location information. Figure 2 indicates the overview of the used IoT components. The purpose of the Raspberry Pi-powered accident detection system is to improve road safety and facilitate prompt response in emergency situations.</p>



Figure 2 : View of the Used IoT Components

**Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.**

Figure 3 depicts the mobile application pages for this work.

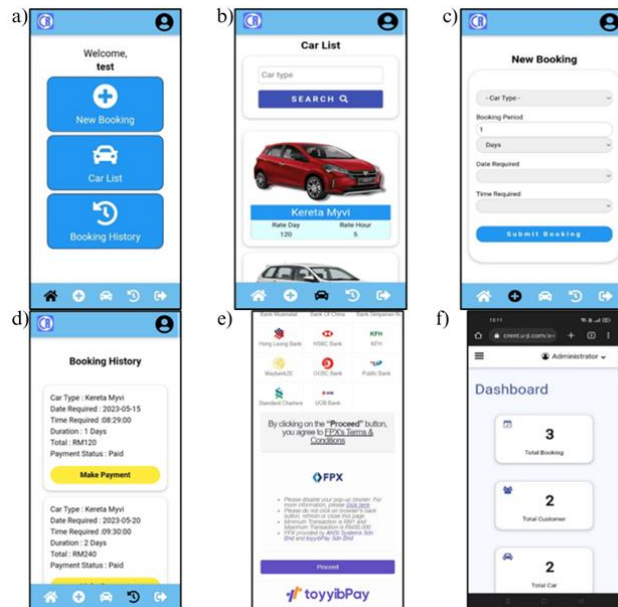


Figure 3: Mobile Application Pages a) Home Page b) Search Page c) Booking Page d) Booking History Page e) Payment Gateway Page f) Admin Dashboard Page.

Figure 4 shows the components used in this work. The system includes several components: Raspberry Pi 3, alarm module, button, LCD panel, infrared sensor, vibration sensor, GSM module, and GPS module. The Raspberry Pi acts as the main processor, collecting data from sensors (like vibration or GPS) and determining if an accident has happened. The Microcontroller is the core of the project because it controls the devices that are interfaced with it and allows them to communicate with each other via this controller in accordance with the written programme. The LCD panel provides information to the user, such as greetings, seat belt status, and car condition. The infrared sensor and buzzer work together to detect if the seat

belt is fastened by sensing its presence. If no seat belt is detected, an alarm is activated, and the LCD displays an alert to the user. The vibration sensor, also referred to as an accelerometer, is then used to detect abrupt changes in motion or vibration. Next, The GPS module determines the vehicle's location, and the GSM module transmits and receives data over a cellular network. In case of an accident, the vibration sensor detects the sudden motion change and signals the Raspberry Pi. This triggers actions like alerting emergency services or contacting a predefined contact using Twilio. Python is used to configure the system's functionality.

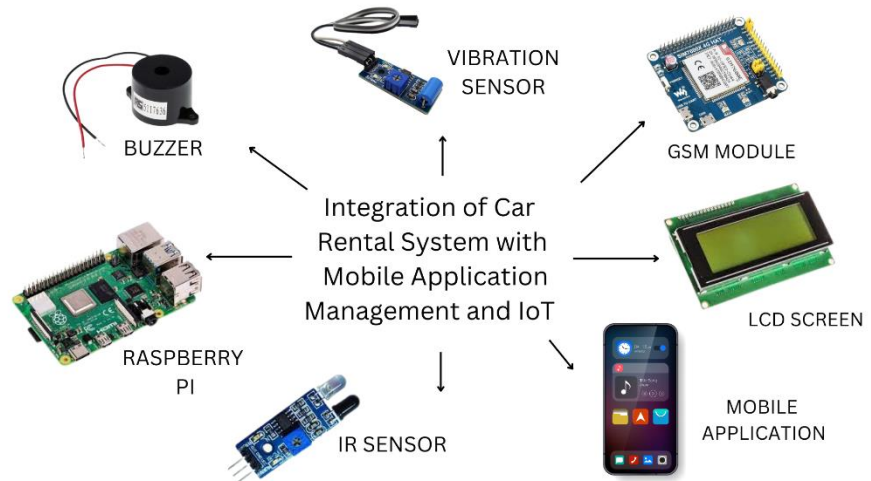
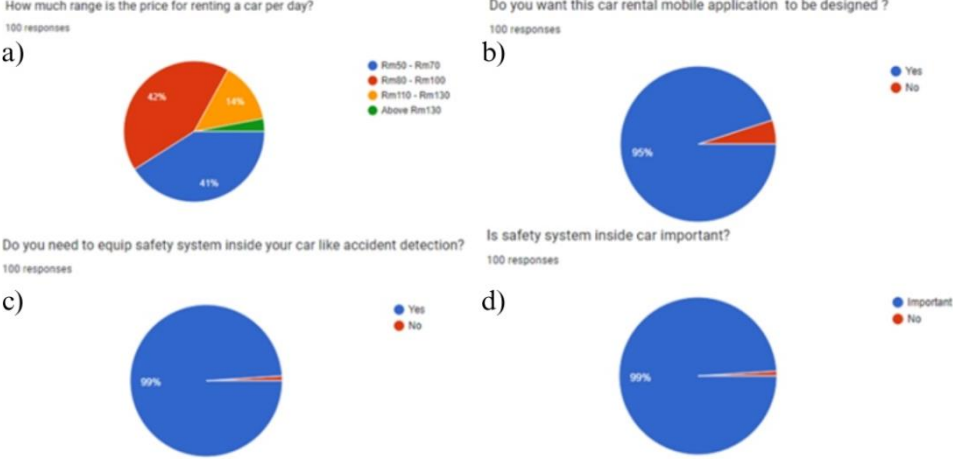





Figure 4: The main components used in this work.

**Novelty and uniqueness**

CRent is a comprehensive car rental system that incorporates mobile app management and IoT has the potential to reveal several benefits, including enhanced efficiency, convenience, and safety for all parties. The use of mobile applications empowers customers with easy rental booking and streamlined administration, making the process more user-friendly and convenient. IoT-enabled accident detection systems further enhance safety measures by enabling prompt response and assistance in the event of an incident by promptly notifying the rental company in real-time. To meet the ever-evolving demands of today's dynamic market, the comprehensive incorporation of these technological advances improves the overall customer experience by placing a significant emphasis on user safety and optimizing car rental efficiency.

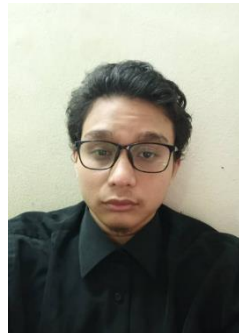
<p><b>Benefit to mankind</b></p>	 <p>FIGURE 5. Survey Conducted on IIUM Community, Pie Chart on a) Price Range of Car Per Day b) Should the Application be Developed c) Employment of Car Safety System d) Opinion on the Importance of Car Safety System</p> <p>Based on the survey that has been conducted, it is shown in Figure 5.a, the majority of the IIUM Community (42%) agreed on the price range of renting a car per day should reside between RM 80 – RM 100 and 41% agreed the price should be around RM 50 – RM 70. While 14% voted the price range of RM 110 – RM 130 and the rest voted the price should be above RM 130. Figure 5.b shows the majority of IIUM Community agrees that the mobile application should be developed as there are numerous reasons why car rental applications are essential for IIUM students and staff. First, they offer a convenient and inexpensive means of transportation around campus and the adjacent community. They can also be used to rent vehicles for short-term trips, such as visiting family for the holidays or a nearby city. Thirdly, they can be used to rent vehicles for long-term endeavours, such as research or volunteer work. The surveys in Figures 5.c and 5.d highlight the importance of a car safety system for rental vehicles. It prioritizes transportation safety by expediting aid in case of a collision and enabling real-time vehicle tracking. This commitment to safety protects company assets and builds customer trust. unauthorized use.</p>
<p><b>Potential commercialization</b></p>	<p><b>General Consumers:</b> By offering an easy-to-use mobile application for online car rental, the system provides convenience and accessibility to a wide range of consumers.</p> <p><b>Car Rental Companies:</b> This can attract more customers and provide a competitive advantage in the car rental market.</p>
<p><b>Acknowledgment</b></p>	<p>The authors wish to extend their profound appreciation to the IIUM community, car rental enterprises, advisors, mentors, and benevolent</p>

	<p>individuals for their invaluable contributions towards the advancement of their research. The Department of Electronic Engineering, Faculty of Electrical and Electronic Engineering, Universiti Tun Hussein Onn, Batu Pahat, Johor, Malaysia, is acknowledged by the authors for their invaluable support and assistance in carrying out the simulations for this study using the software programme Proteus. Their knowledge and resources were a major factor in the research's effective application and evaluation.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div data-bbox="518 554 753 905">  <p>Ahmad Anwar Zainuddin obtained a BSc in Communication Engineering from 2011, an MSc in Electronic Engineering from 2014, and a PhD in Engineering (Computer Engineering) from 2020, all from International Islamic University Malaysia (IIUM). Regarding his professional endeavours, the Malaysia Board of Technologists (MBOT) has recognized him as a Professional Technologist with Practice Certificate (Ts) since 2020. Previously have started working at Manipal International University Malaysia as a lecturer in the field of computer engineering. Recently he is working in International Islamic University Malaysia as an Assistant Professor specifically in Computer Science. He is interested in studying robust distributed systems and digital technologies applied to healthcare.</p> </div> <div data-bbox="518 1140 753 1377">  <p>Muhammad Zaid Hazim Johari is a final year student of computer science in KICT, IIUM. He is interested in studying cybersecurity and IoT.</p> </div> <div data-bbox="518 1478 753 1724">  <p>Mohamad Amir Syakirin Shafie is a final year student of computer science in KICT, IIUM. He is interested in studying software computer and IoT.</p> </div> </div>





Saidatul Izyanie Kamarudin obtained her Bachelor of Engineering in Communication Engineering (Honors) from International Islamic University Malaysia, Malaysia in 2011. She received her Master of Science in Communication System Engineering from the University of Portsmouth, Portsmouth, United Kingdom in 2013. Then, she got her PhD in Network Communication Engineering from Universiti Putra Malaysia in 2021. Currently, she joined the College of Computing, Informatics and Media, in Universiti Teknologi MARA, UiTM as a lecturer. Her teaching includes artificial intelligence, data analytics and machine learning. Her research interest includes intelligent systems, data science, the internet of things, wireless power transfer, RFID, antenna and microwave systems. She can be contacted at email: [saidatulizyanie@uitm.edu.my](mailto:saidatulizyanie@uitm.edu.my).



Ahmad Khairi A'bid Mohd Khairizam is a 3rd year student of Information Technology in KICT, IIUM. He is interested in automation software and IoT.



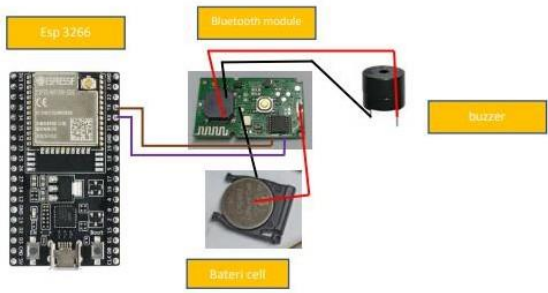
<b>CHILD MISSING DETECTER</b>				
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>	<b>D</b>
	<b>School</b>	<b>University</b>	<b>Academician</b>	<b>Industry</b>
	√			
	<b>Local</b>		<b>International</b>	
	√			
<b>Project Member(s)</b>	Yahya Bin Akelah <sup>1</sup> , Nurul Izzati Nabilah Binti Mahbib <sup>2</sup> , Masila Binti Ismail <sup>3</sup> , Muhammad Syazwan Bin Ismail Najib <sup>4</sup> Mohammed Hafizuddin Bin Mohd Faaruk <sup>5</sup>			
<b>Affiliation</b>	Kolej Vokasional Melaka Tengah, Bukit Katil, Melaka, Malaysia.			
<b>Email</b>	myyahya72@gmail.com			
<b>Correspondence</b>	Tiada			
<b>Abstract</b>	Projek inovasi ini telah dilaksanakan berdasarkan isu keselamatan kanak-kanak . Sering berlaku ibubapa yang kehilangan anak semasa berada di pusat membeli belah yang sesak dengan orang ramai. Lebih teruk lagi berlaku penculikan. <i>Child Missing Detector</i> merupakan satu alatan elektronik yang digabungkan dengan telefon pintar melalui sistem <i>Bluetooth dan GPS</i> .Produk ini bertujuan memberikan amaran penggera kepada ibubapa atau menjaga jika kanak-kanak dalam jagaan telah berada pada jarak yang tidak selamat dan dapat memberikan kedudukan kordinat GPS . Hal ini bersesuaian bagi memberi ingatan kepad penjaga agar tidak leka semasa berada ditempat awam yang sesak.Kesimpulan projek ini dapat memberikan pengawasan keselamatan yang cekap dan juga menjimat kan kos bagi mengupah penjaga khas bagi kanak-kanak. Selain itu, hasil analisis data menunjukkan responden bersetuju terhadap <i>Child Missing Detector</i> diaplikasikan di dalam bidang keselamatan dan juga dalam proses pembelajaran Teknologi Elektronik IOT di Kolej Vokasional Melaka Tengah.			
<b>Keywords</b>	<i>Child Missing Detector, Bluetooth,GPS</i>			
<b>Product description</b>	► <i>“Child Missing Detector”</i> ini adalah merupakan satu penyelesaian untuk memudahkan ibubapa atau penjaga mengawas kanak-kanak di			

tempat awam

- ▶ Masalah yang sering dihadapi oleh para ibubapa ialah kanak-kanak suka bergerak bebas walaupun berada dalam keadaan sesak seperti dipusat membeli belah
- ▶ Oleh itu pada jarak lebih 5-meter kanak-kanak dengan ibubapa “*Child Missing Detector*” akan menghantar isyarat ke telefon untuk menghidupkan penggera. Ibubapa juga boleh lihat kedudukan kordinat GPS melalui telefon pintar.
- ▶ Jadi dengan adanya “*Child Missing Detector*” ini dapat memudahkan pengawasan ibubapa terhadap anak mereka di tempat awam .

**Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.**

METODOLOGI



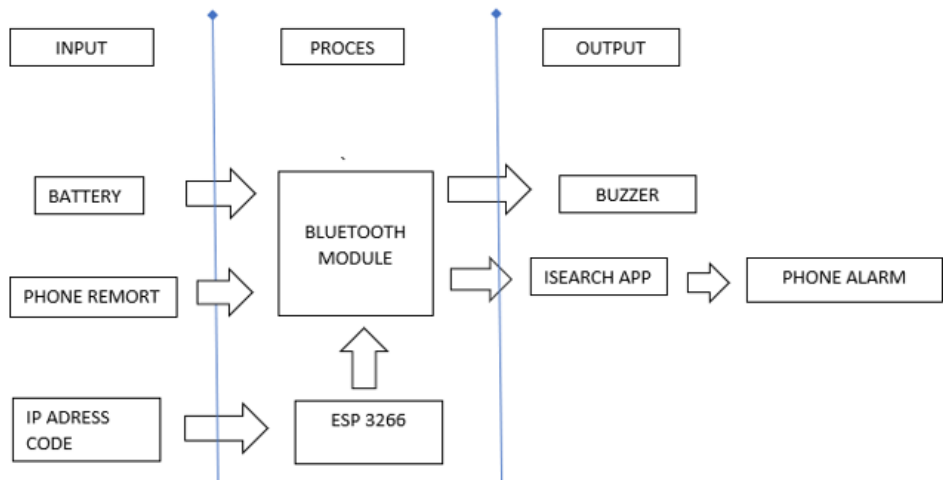
Gambarajah Modul Bluethoohdan GPS



Gambarajah Produk

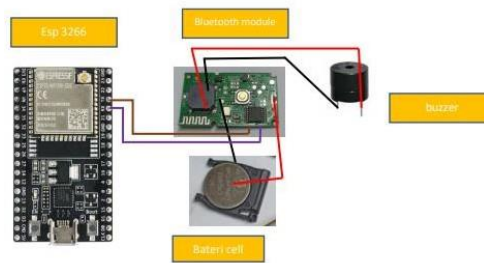


Gambar Rajah Antaramuka di Telefon pintar  
Rajah Blok “*Child Missing Detector*”

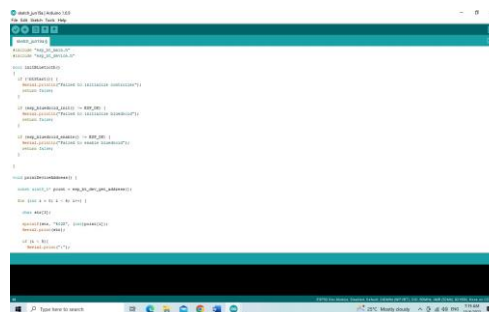



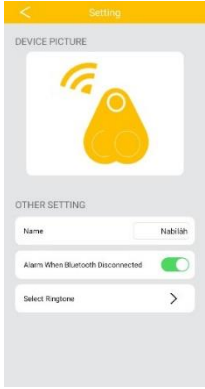
### LANGKAH PENGHASILAN CHILD MISSING DETECTOR




1. Kerja Pemasangan Litar akawalan dengan modul GPS dan Bluethooh.



2. Kerja membuat proses Pengkodan litar kawalan



	<p>3. Kerja Pemasangan Litar Pada Perumah</p>  <p>4. Kerja Pengujian Kefungsian Litar dengan telefon pintar.</p> 
<p><b>Novelty and uniqueness</b></p>	<p><i>Child Missing Detector</i> memiliki keunikan dari segi gabungan 2 iaitu amaran awal dan pengesanan lokasi GPS . Kefungsian alatan ini boleh diluaskan lagi bagi pengawasan warga tua dan haiwan peliharaan. Selain itu kosnya yang rendah.</p>
<p><b>Benefit to mankind</b></p>	<p><b>Objektif Projek Inovasi</b></p> <ul style="list-style-type: none"> <li>i). Mereka bentuk satu pengesan untuk kanak-kanak yang perlu pengawasan yang lebih.</li> <li>ii) Membangunkan satu sistem pengesanan yang baik di telefon pintar anda.</li> <li>iii) Meningkatkan produk pengesanan yang berada di pasaran dengan menggunakan IOT.</li> </ul> <p><b>Kelebihan :</b></p> <ul style="list-style-type: none"> <li>i) Menghindari kanak-kanak hilang .</li> </ul>

	<p>ii) Menghindari kelalaian ibubapa terhadap anak mereka.          iii) Menghindari membazir masa.          iv) Menjimat kewangan .</p> <p><b>Novelty :</b></p> <p>Ringan dan mudah digunakan kerana digabungkan dengan telefon pintar yang telah menjadi keperluan pada semua orang.</p>
<p><b>Potential commercialization</b></p>	<p>Mudah digunakan,serta boleh aplikasikan kepada penjagaan warga tua yang bermasalah ingatan dan juga binatang peliharaan seperti kucing dari kehilangan. menjadikan inovasi ini sesuai untuk di pasarkan di Malaysia kerana inovasi ini boleh membantu memudahkan kerja seharian, menjimatkan masa dan menjimatkan kos.</p>
<p><b>Acknowledgment</b></p>	<p>Persatuan Ibu Bapa dan Guru, Kolej Vokasional Melaka Tengah, Melaka, Malaysia</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div data-bbox="492 911 699 1178">  <p>Mohammed Hafizuddin Bin Mohd Faaruk. Merupakan pelajar tahun 2 Diploma Bagi Program Teknologi Elektronik , Kolej Vokasional Melaka Tengah</p> </div> <div data-bbox="492 1188 699 1472">  <p>Muhammad Syazwan Bin Ismail Najib. Merupakan pelajar tahun 2 Diploma Bagi Program Teknologi Elektronik , Kolej Vokasional Melaka Tengah</p> </div> <div data-bbox="492 1503 699 1766">  <p>Yahya Bin Akelah Merupakan Pensyarah Teknologi Elektronik bagi Program Diploma Teknologi,Kolej Vokasional Melaka Tengah</p> </div> </div>

**Researchers  
Biographical Data**

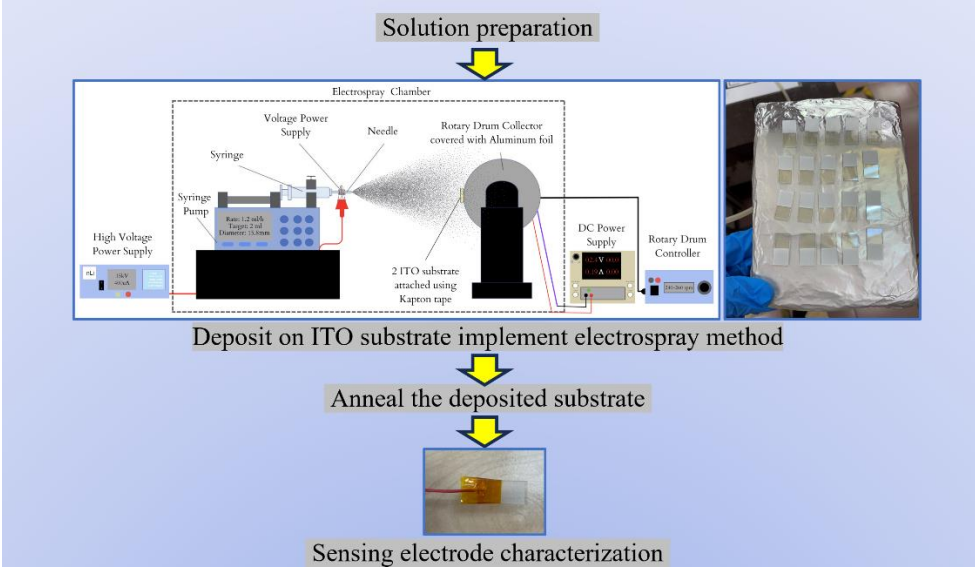
Nurul Izzati Nabilah Binti Mahbib  
Merupakan pensyarah pelatih bagi program Teknologi  
Elektronik dari UTHM

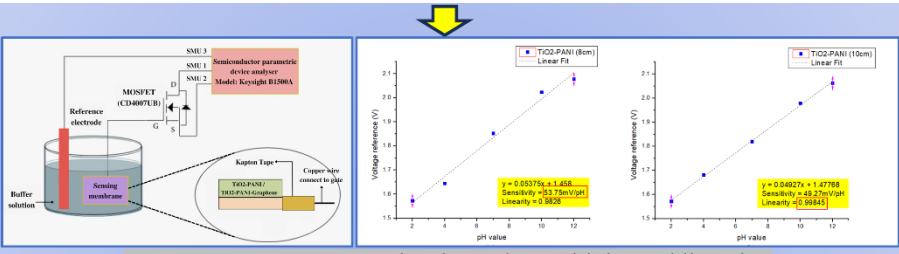
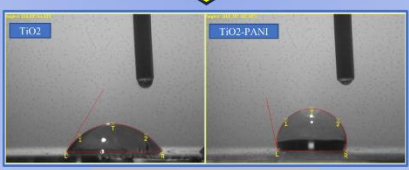
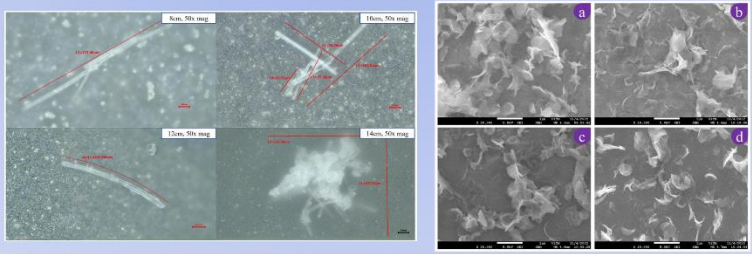





Masila Binti Ismail  
Merupakan Pensyarah Teknologi Elektronik bagi Program  
Diploma Teknologi, Kolej Vokasional Melaka Tengah



<b>FABRICATION OF TiO<sub>2</sub>-PANI NANOSTRUCTURE USING ELECTROSPRAY FOR THE PH SENSING ELECTRODE</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		√	
	<b>Local</b>		<b>International</b>
<b>Project Member(s)</b>	Aina Syakirah Mohd Masri <sup>1</sup> , Nur Syahirah Kamarozaman <sup>2</sup> , Nurbaya Zainal <sup>3</sup> Zurita Zulkifli <sup>4</sup> , Sukreen Hana Herman <sup>5</sup> .		
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<b>Email</b>	<sup>1</sup> syakirahh21@gmail.com, <sup>2</sup> nursyahirahk@uitm.edu.my, <sup>3</sup> nurbayazainal@gmail.com, <sup>4</sup> zurita101@uitm.edu.my, <sup>5</sup> hana1617@uitm.edu.my		
<b>Correspondence</b>	Assoc Prof Dr. Sukreen Hana Herman, School of Electrical Engineering, College of Engineering Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia.		
<b>Abstract</b>	Fabrication of TiO <sub>2</sub> -PANI sensing electrode for pH sensing application enhances the adhesion between the sensing layer and the ITO substrate. The TiO <sub>2</sub> -PANI sensing electrodes were fabricated using the electrospray technique. The deposition distance between the needle tip and collector varied at 8, 10, 12, and 14cm, influencing the surface morphology. FESEM images revealed a nanoflakes structure for the TiO <sub>2</sub> -PANI nanocomposite's surface morphology. The wettability test demonstrated that the TiO <sub>2</sub> -PANI nanocomposite electrodes displayed excellent resistance to peeling, exhibiting a contact angle of 102 degrees and satisfying hydrophobicity. The presence of greater hydrophobicity in pH electrode applications leads to enhanced electrode performance, potentially preventing the peeling off sensing layer in pH devices. This, in turn, ensures the long-term stability and reliability of the device. The fabricated electrode was characterized for the pH sensing performance. An EGFET circuit was constructed by connecting the nanocomposite sensing electrode to a conventional MOSFET		

	<p>(CD4007UB) to evaluate sensitivity and linearity. Among the various deposition distances, at deposition 8cm TiO<sub>2</sub>-PANI exhibited the higher sensitivity of 53.75mV/pH with linearity of 0.9826, and the sample at 10cm has the higher linearity of 0.9985 with a sensitivity of 49.27mV/pH.</p>
<p><b>Keywords</b></p>	<p>TiO<sub>2</sub>-PANI nanocomposite, ITO, wettability, sensitivity, linearity, EGFET.</p>
<p><b>Product description</b></p>	<p>The fabricated electrode was deposited on a 2cm x 1 cm x 0.1cm ITO glass substrate which makes the sensing electrode small enough, portable yet highly sensitive to pH. The glass substrate was sprayed with the nanocomposite TiO<sub>2</sub>-PANI solution, providing excellent pH sensing capabilities. The electrode is designed to be attached to the extended gate of a conventional MOSFET (CD4007UB) using fine wire connections. Its special features include a nanoflake structure observed in FESEM (Field-Emission Scanning Electron Microscope) images, which enhances the surface area for improved pH sensing performance. The TiO<sub>2</sub>-PANI nanocomposite electrode demonstrates high resistance to peeling, ensuring long-term stability and reliability in pH measurement applications. The electrode exhibits hydrophobic properties, as evidenced by a contact angle of 102 degrees in wettability tests. The product is cheap and the sample fabrication is suitable for mass production.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	

	 <p style="text-align: center;">EGFET setup to measure the electrode sensitivity and linearity</p>  <p style="text-align: center;">Contact angle analysis</p>  <p style="text-align: center;">Surface morphology analysis using the Digital microscope and FESEM</p>
<b>Novelty and uniqueness</b>	<p>The sensing layer combination of TiO<sub>2</sub>-PANI nanocomposite material brings together the unique properties of both materials, such as TiO<sub>2</sub>'s stability and PANI's excellent conductivity and pH sensitivity. The electrospay method was implemented resulting in the nanoflake's surface morphology further enhancing its surface area, leading to improved sensing performance. PANI as the polymer believed enhanced the peeling resistance of the sensing electrode which is a crucial factor for long-term stability and reliability in pH measurement devices.</p>
<b>Benefit to mankind</b>	<p>TiO<sub>2</sub>-PANI sensing electrodes offer long-term stability and reliability for pH measurement devices. The electrode's enhanced resistance to peeling, along with its long-term stability, ensures reliable and consistent pH sensing performance over extended periods. This benefit is particularly valuable in continuous monitoring applications where the electrode's durability minimizes maintenance requirements and reduces the risk of measurement errors or failures. It also helps the environmental monitoring agencies, healthcare professionals, industrial and manufacturing sector and research and development community to improve health outcomes and economic productivity.</p>

<p><b>Potential commercialization</b></p>	<p>The TiO<sub>2</sub>-PANI pH sensing electrode product is a unique composition and enhanced peeling resistance giving it a competitive edge in the pH sensing market. A growing demand for accurate pH measurement solutions in various industries, such as environmental monitoring, healthcare, and manufacturing, the TiO<sub>2</sub>-PANI electrode can meet the needs of diverse customers. Its versatile applications offer flexibility and adaptability to cater specific needs of the industry.</p>
<p><b>Acknowledgment</b></p>	<p>The authors would like to acknowledge technical staff from Nano-ElecTronic (NET), School of Electrical Engineering, College of Engineering, UiTM Shah Alam.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div data-bbox="521 632 764 936">  <p>Aina Syakirah Mohd Masri is a student who is currently undertaking her PhD study program at the College of Electrical Engineering, UiTM, Shah Alam.</p> </div> <div data-bbox="521 978 751 1283">  <p>Nur Syahirah Binti Kamarozaman is a student who is currently undertaking her PhD study program under College of Engineering, Universiti Teknologi MARA (UiTM) Shah Alam. She is holding a BSc and MSc degrees in electronic electrical engineering from UiTM Shah Alam in 2011 and 2015, respectively. She joined UiTM in 2015 and presently serves as a lecturer in the School of Electrical Engineering in Cawangan Terengganu.</p> </div> <div data-bbox="521 1356 751 1692">  <p>Nurbaya Zainal is a postdoc at Integrated Sensors Research Group, College of Engineering, UiTM, Shah Alam, Selangor and she is working on microbe soil sensor fabrication. She is holding a BSc and MSc degrees in electronic electrical engineering from Universiti Teknologi Malaysia, Johor, Malaysia in 2009 and 2012, respectively. In October 2019, she received her PhD degree from the Nano Electronic Centre, Universiti Teknologi MARA, Selangor, Malaysia with a thesis on the fabrication of polymeric and ceramic bilayer thin films for capacitor device applications. She worked in MIMOS from 2018 to 2019 as a failure analyst and conducted various material and electronic characterization.</p> </div> </div>



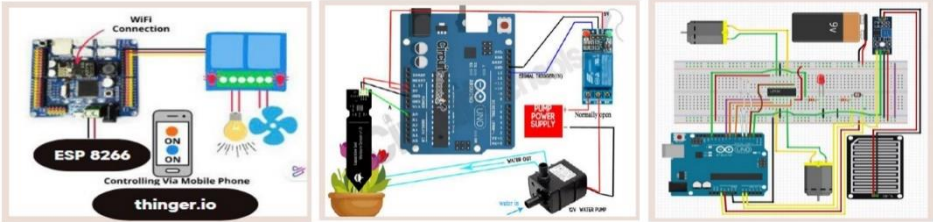
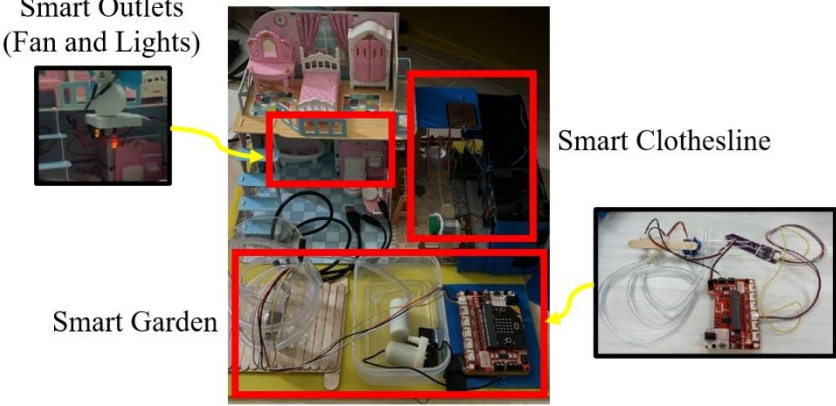
Zurita Zulkifli received her Diploma in Electronic Engineering from Universiti Teknologi Malaysia Kuala Lumpur in 2000. She received her B.Eng in Electrical Engineering from Universiti Teknologi MARA (UiTM), Shah Alam, Malaysia in 2004 and received her MSc in Microelectronic from Universiti Kebangsaan Malaysia in 2007. She received her Doctor of Engineering (Frontier Materials) in 2015 from Nagoya Institute of Technology, Japan. Currently, she serves as senior lecturer at the School of Electrical Engineering, UiTM Shah Alam. Her research interests include circuit development, fabrication and characterization of semiconductor materials and exploring the graphene and metal-oxide composite films for various applications.



Sukreen Hana Herman received her Ph.D. (Materials Science) in 2009 from the Japan Advanced Institute of Science and Technology (JAIST). Sukreen was with Sharp-Roxy before pursuing her Master's. She joined Universiti Teknologi MARA (UiTM) in 2004 and now is a senior lecturer at the School of Electrical Engineering, College of Engineering UiTM. She is a member of the Integrated Sensor Research group at the College of Engineering. Her research interests include Fabrication and Characterization of Semiconductor Materials in general and mainly focused on Sensor Applications.

<b>HOMESMARTRON: EXPLORING THE IOT-POWERED FUTURE OF SMART LIVING</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		√	
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Amirrul Aiman bin Adang <sup>1</sup> , Ong Yew Chuan <sup>2</sup> .		
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<b>Email</b>	<sup>1</sup> 059457@putra.unisza.edu.my, <sup>2</sup> yewchuan@unisza.edu.my.		
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<b>Abstract</b>	The IoT-based smart home prototype, named HomeSmartron (HS) showcases seamless integration of thinger.io, ESP8266, Arduino, and various sensors. HS offers three key functionalities: remote control of fan and light, an automated smart clothesline, and a smart garden system. Unlike conventional IoT projects that typically focus on a single function, HS combines multiple smart home features into one integrated system. This innovation arose from the burgeoning demand for efficient and interconnected smart home solutions, emphasizing comfort, convenience, and resource optimization. HS presents the potential to significantly reduce energy costs for users, thus positively impacting their economic well-being. Additionally, the smart garden function fosters sustainable gardening practices, contributing to water conservation and environmental preservation. As a proof of concept, HS demonstrates the feasibility and functionality of seamless device and sensor integration. This tangible demonstration can captivate the attention of investors, potential partners, and consumers, offering an opportunity to garner support and validation in preparation for the final product.		



<b>Keywords</b>	<p>Smart home, Internet of Things, sensors</p>
<b>Product description</b>	<p>HomeSmartron (HS) is constructed with these main elements: thinger.io, ESP8266, and Arduino. These elements enable real-time communication between users and smart devices, allowing for remote control of fan and light, smart clothesline operation, and smart garden functions.</p> <p>Main components/features:</p> <ul style="list-style-type: none"> <li>• <b>Smart Outlets (Fan and Lights):</b> The prototype offers a user-friendly interface through thinger.io, allowing users to remotely control the fan and light in their home, enhancing comfort and energy management.</li> <li>• <b>Smart Clothesline:</b> The smart clothesline feature incorporates an LDR sensor to adjust drying operations based on ambient light levels, optimizing energy consumption and drying efficiency for reduced environmental impact.</li> <li>• <b>Smart Garden:</b> The smart garden system continuously monitors soil moisture levels and intelligently pumps water to plants when needed, promoting water conservation and sustainable gardening practices.</li> </ul>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<div style="text-align: center;">  <p>Figure 1: Circuit Design of HomeSmartron (HS)</p> </div> <div style="text-align: center;">  <p>Figure 2: Prototype of HomeSmartron (HS)</p> </div>

# HOMESMARTRON

## DESIGN & DEPLOYMENT PROCESS



### 1. REQUIREMENT GATHERING

- Define the requirements and functionalities
- Decide on the specific devices and sensors required.



### 2. HARDWARE SETUP

- Obtain hardware components, including ESP8266 modules, sensor (e.g., light, humidity) and actuators (e.g., relays)
- Connect the sensors and actuators to the ESP8266 using appropriate interfaces.
- Power the ESP8266 and the connected components adequately.



### 3. SOFTWARE CONFIGURATION

- Install the Arduino IDE and the required ESP8266 board package to program the ESP8266.
- Write the Arduino sketch (code) to read data from sensors and control actuators.



### 4. THINGER.IO SETUP & INTEGRATION

- Create a thinger.io account and obtain the necessary credentials, including the device ID, and device credentials (Device ID and Device Credential Token).
- Install the Thinger.io Arduino library to enable communication with the thinger.io platform.
- Incorporate the thinger.io code in Arduino sketch to establish a connection between the ESP8266 and the thinger.io cloud platform.
- Use the thinger.io API to send sensor data and receive commands from the cloud platform.



### 5. REMOTE CONTROL & AUTOMATION

- Use the thinger.io platform to remotely control the actuators connected to the ESP8266.
- Implement automation rules and triggers to control the smart home devices based on specific conditions or events.



### 6. TESTING AND DEBUGGING

- Develop test cases to test the smart home setup (e.g., ensure that sensor data is being transmitted).
- Debug and troubleshoot any issues that may arise during testing.





### 7. DEPLOYMENT

- Deploy the smart home system to the prototype once it is tested and working as desired.

Figure 3: Design and Deployment Process of HomeSmartron (HS)

<b>Novelty and uniqueness</b>	<p>The uniqueness of HomeSmartron (HS) lies in its comprehensive approach. While many IoT-based smart home products in the market focus on a single function, this prototype ingeniously combines multiple smart home features into one integrated system. This all-in-one solution offers remote control convenience for fans and lights, automated clothesline operations based on ambient light levels, and smart garden irrigation, all within the same system. By providing such a diverse range of functionalities in a single product, HS stands out as a holistic solution for modern households. Additionally, its focus on energy efficiency, sustainable gardening practices, and resource optimization further sets it apart as a product that not only enhances convenience but also promotes environmentally conscious living.</p> <p>Furthermore, HS stands out from mere conceptual ideas with its tangible proof of concept, showcasing the feasibility and functionality of seamless device and sensor integration. This real-world demonstration captivates the attention of investors, potential partners, and consumers by allowing them to witness the prototype's capabilities firsthand.</p>
<b>Benefit to mankind</b>	<p>The benefits of HomeSmartron (HS) extend to both individual users and society. The key functionalities of HS enable more efficient energy management, hence, positively impacting their economic well-being. It also contributes to water conservation and environmental preservation, promoting sustainable practices and supporting the broader efforts towards eco-conscious living.</p> <p>As a transformative solution in smart home technology, HS has the potential to enhance comfort, convenience, and resource optimization for users. Its commercialization prospects are promising, attracting consumers seeking holistic smart home solutions by integrating multiple functions into one system. Ultimately, HS addresses the needs of modern living by bridging convenience, efficiency, and sustainability in smart homes, offering benefits to individuals, households, and society.</p>
<b>Potential commercialization</b>	<p>HomeSmartron (HS) holds immense market potential and offers promising commercialization possibilities. Its unique combination of essential functionalities makes it an attractive option for consumers seeking comprehensive smart home solutions. The proof of concept serves as a compelling selling point for investors, potential partners, and consumers alike. This demonstration showcases a working model, capturing attention and building trust in the prototype's capabilities. With the right marketing and strategic partnerships, HS can evolve into a successful commercial product, bridging the gap between convenience, efficiency, and sustainability in modern smart homes.</p>

<b>Acknowledgment</b>	<p>All project members acknowledge the continuous support from the Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin, in accomplishing this project.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column;"> <div style="display: flex; align-items: flex-start; margin-bottom: 20px;">  <div style="flex-grow: 1;"> <p>Amirrul Aiman is a student currently pursuing his Bachelor's degree in Computer Science under the Faculty of Informatics and Computing at Universiti Sultan Zainal Abidin, specializing in Internet Computing. As an avid enthusiast of IoT, Amirrul has undertaken numerous IoT projects, demonstrating exceptional creativity and technical acumen. These projects encompass a diverse range of applications, from home automation to environmental monitoring.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Yew Chuan is a lecturer in Faculty of Informatics and Computing, Universiti Sultan Zainal Abidin. He graduated from University of Sheffield, with a PhD degree in Computer Science. He has experience working in a Managed Security Services (MSS) company, where his last role was leading the 24x7 Security Operation Center. Additionally, he has worked in multiple Higher Education (HE) institutions across the UK, where he served as the module leader for Software Engineering, Statistical Data Analytics &amp; Databases, and MSc Project. Yew Chuan is also an active member of both the Association for Computing Machinery (ACM) and the Institute of Electrical and Electronics Engineers (IEEE).</p> </div> </div> </div>

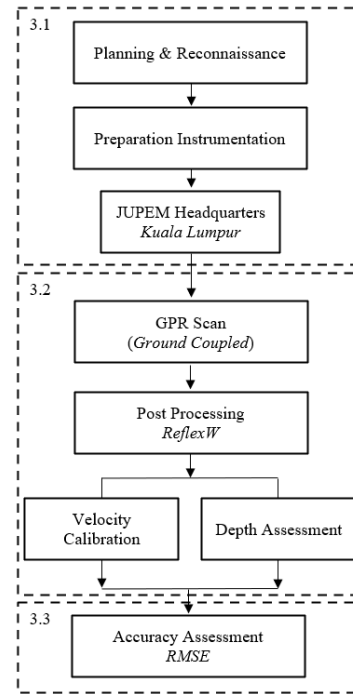
<b>ENHANCEMENT OF GROUND PENETRATING RADAR CALIBRATION PROCEDURE FOR UNDERGROUND UTILITY DETECTION IN MALAYSIA</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
		√	
	<b>Local</b>		<b>International</b>
		√	
<b>Project Member(s)</b>	Mohd Soleh Amin Bin Mat Junoh <sup>1</sup> , Saiful Aman Bin Hj Sulaiman <sup>2</sup> , Mohamad Hezri Bin Razali <sup>3</sup>		
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<b>Email</b>	*2022903345@student.uitm.edu.my, saifulaman@uitm.edu.my, hezrirazali@uitm.edu.my		
<b>Correspondence</b>	*Mohd Soleh Amin Bin Mat Junoh Centre of Studies (Surveying Science & Geomatics), College of Built Environment, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia Tel: +6013-4334348, Fax: +603-55444353		
<b>Abstract</b>	Improving the methodology, techniques, and procedures for detecting underground utilities is critical for developing infrastructure and utility services. Ground Penetrating Radar (GPR) is used in underground utility detection to provide a comprehensive underground utility map. In order to produce a comprehensive utility map, the GPR must be calibrated accordingly to ensure reliability and provide accurate in-depth information. According to the Department of Survey and Mapping Malaysia ( <i>JUPEM</i> ) Circular No. 13-2021, the calibration process is carried out based on a single velocity and the velocity is determined based on the specifications of a specific tool. Many GPR practitioners used a single velocity value during the calibration process to determine the depth for the entire buried pipe at the test base, potentially resulting in inaccurate depth and above the acceptable tolerance. Therefore, an experiment is carried out to enhance the procedure of the GPR calibration in order to improve the quality of the depth calibration at the JUPEM test base. A GPR with a 500 MHz antenna is used, where three		



	<p>points are scanned for each point marked as A, B, and C. In order to improve the quality of the depth accuracy, the actual velocity of each buried pipe is determined through the curve fitting process. The result of single velocity calibration and actual velocity calibration is compared where there are differences in velocity values for Pipes 1, 3, and 6, which affect the depth of the buried pipe and reach up to 0.139 m. The dielectric constant of the test base is defined through a mathematical model, with Pipes 1 and 6 having the lowest values, which indicates the area of those pipes is dryer than the other areas. In terms of depth comparison with the JUPEM, the result indicates that the single velocity calibration depth is less accurate and inconsistent than the actual velocity calibration depth. The results of the RMSE show that the actual velocity calibration depth produces a lower RMSE, which is 0.032 metres below the acceptable tolerance. The author proposed that the GPR calibration procedure must be performed using actual velocity through hyperbola fitting to produce accurate depth information and the result of calibration below the acceptable tolerance. Through the analysis, <i>JUPEM</i> may develop a new circular outlining the GPR calibration procedure, with a specific focus on the calibration form that incorporates the required velocity for each scanned buried pipe. By incorporating the actual velocity information, this improvement will not only enhance the accuracy of depth calculations for each buried pipe but also increase the accuracy of the RMSE to below than acceptable tolerance 0.100m. Therefore, this research offers valuable insights and a novel approach to the calibration's accuracy and provides practical guidance to GPR operators regarding the importance of utilizing actual velocity during the hyperbola fitting process. The findings from this research serve as valuable references for GPR practitioners within the Malaysian Geomatics Community, including organizations such as JUPEM, PEJUTA, INSTUN, SUC, and the education sector.</p>
<b>Keywords</b>	Utility; GPR Calibration; Velocity; GPR; Antennas, Dielectric constant
<b>Product description</b>	<p>The research was carried out at the Utility Test Base, <i>JUPEM</i> Headquarters, Kuala Lumpur, using GPR TriVue. This GPR focuses on a 500 MHz antenna suitable for medium-depth penetration. Six buried pipes of different types and materials are being scanned by applying the ground coupling technique. Basic post-processing and filtering are applied using the ReflexW software. Each buried pipe is fitted based on actual velocity during the curve fitting process. Each velocity is different and must be declared in calibration form to calculate the actual depth of the buried pipe.</p>



Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.

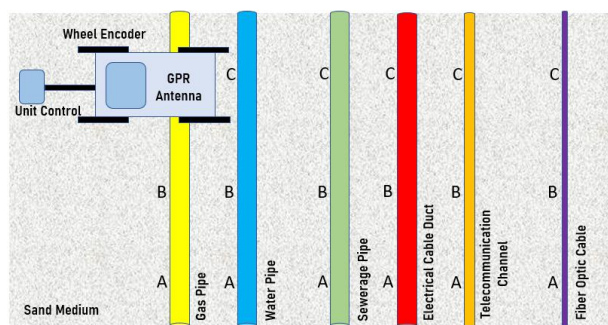


Research Methodology

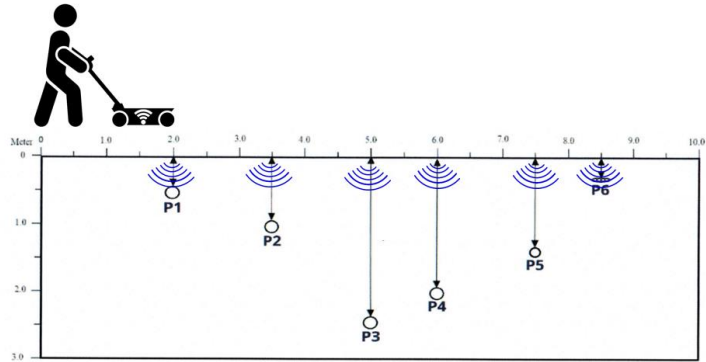
Nama Penguji : \_\_\_\_\_ Model Alat GPR : \_\_\_\_\_  
 Jabatan/Agensi/Syarikat : \_\_\_\_\_ No. Serial : \_\_\_\_\_  
 \_\_\_\_\_ Julat Frekuensi : \_\_\_\_\_  
 \_\_\_\_\_ Velocity : \_\_\_\_\_  
 Tarikh Ujian : \_\_\_\_\_ Time Window : \_\_\_\_\_

Catatan Pengesanan (meter (m))										
			Pengesanan 1			Pengesanan 2			Pengesanan 3	
	Nilai Sebenar		Bacaan Ujian	Perbezaan	Perbezaan*	Bacaan Ujian	Perbezaan	Perbezaan*	Bacaan Ujian	Perbezaan*
△ Jarak dari Pemasangan P1	a	0.38								
	b	0.41								
	c	0.37								
△ Jarak dari Pemasangan	a	1.05								
	b	1.05								

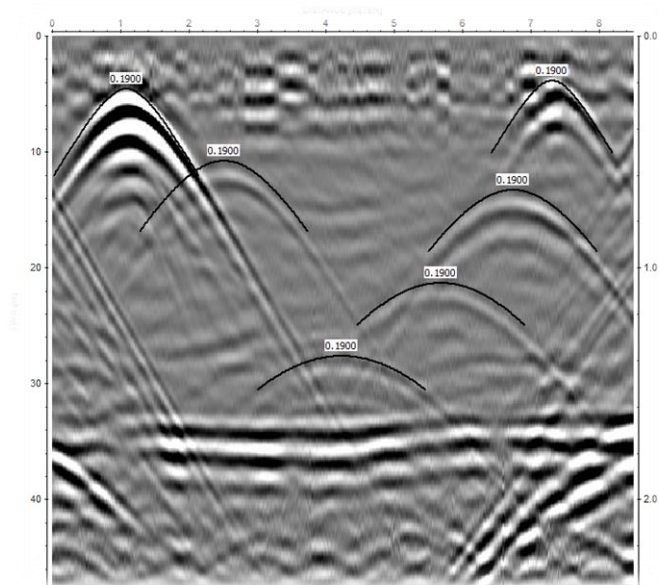
Single Velocity on JUPEM calibration form



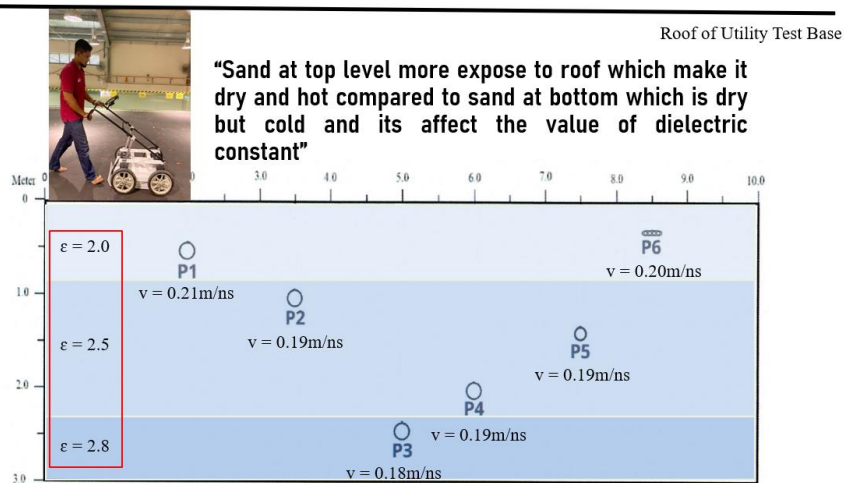
JUPEM utility test base layout



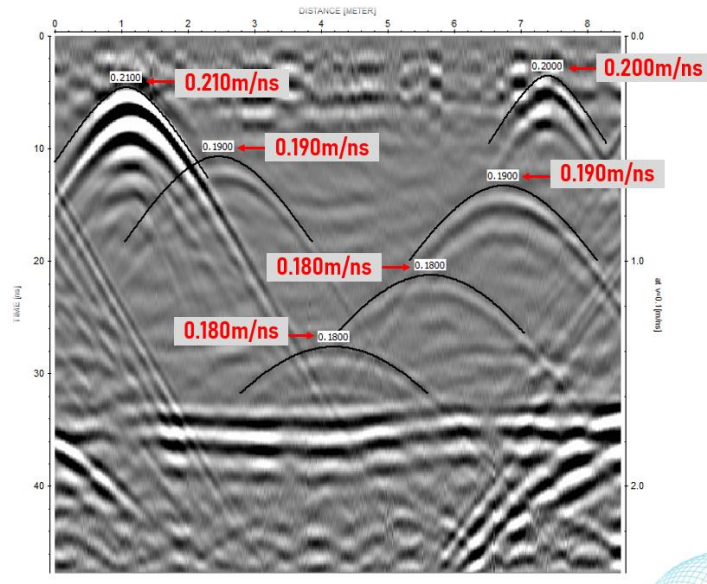
Calibration scanned



Result of Single Velocity Calibration

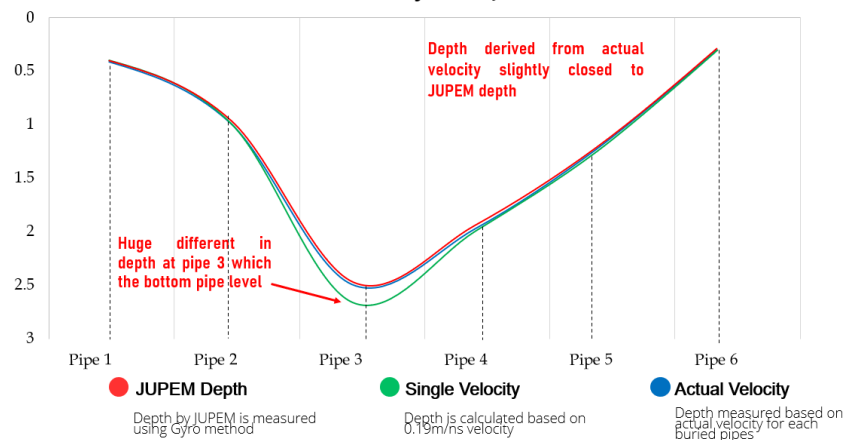


Actual velocity and dielectric constant



Result of Actual Velocity Calibration

**Depth Comparison Between Single Velocity, Actual Velocity and JUPEM**



Depth comparison between Single Velocity, Actual Velocity and JUPEM

**Accuracy Assessment of 500MHz Antenna**

Calibration Technique	Mean (m)	(RMSE) (m)
JUPEM Tolerance		0.100
Single Velocity Calibration	0.013	0.114
Actual Velocity Calibration	0.001	0.032

**Novelty and uniqueness**

The current GPR calibration procedure at the JUPEM Utility Test Base employs a single velocity value to calculate the depth of all buried pipes. However, the calibration results indicate unreliable and inaccurate depth measurements, with some exceeding the acceptable RMSE tolerance of

	<p>0.100m. This research proposes a new calibration approach based on the actual velocity, ensuring precise determination of buried pipe depth during the hyperbola fitting process. The results reveal that each buried pipe has a different dielectric constant, influencing the velocity and subsequent depth. Consequently, this study is important in proposing an improved GPR calibration procedure that incorporates the actual velocity for each buried pipe.</p>
<p><b>Benefit to mankind</b></p>	<p>This research provides valuable insights into GPR scan techniques and presents a novel approach to enhancing the accuracy of underground utility detection. This research aims to improve the procedure and methodology of the GPR calibration, which <i>JUPEM</i> currently supervises. The analysis is beneficial to improve the accuracy of the calibration. Besides, it educates the GPR operators in terms of practicality on the importance of using the actual velocity during the hyperbola fitting process to determine accurate utility depth. The findings from this research serve as valuable references for GPR practitioners, particularly within the Malaysian Geomatics Community, including organizations such as <i>JUPEM</i>, Association of Authorized Land Surveyors Malaysia (PEJUTA), National Institute of Land and Survey (INSTUN), the State Utility Corridor (SUC), and the education sectors.</p>
<p><b>Potential commercialization</b></p>	<p>Most GPR manufacturers are located in the Euro region, resulting in high transportation costs for Malaysian users seeking equipment calibration. <i>JUPEM</i> serves as the certifying authority for GPR calibration conducted at <i>JUPEM</i> Utility Test Base. Therefore, this research aims to enhance the guidelines for underground utility equipment calibration, addressing the identified problem. Through the analysis, <i>JUPEM</i> may develop a new circular outlining the GPR calibration procedure, with a specific focus on the calibration form that incorporates the required velocity for each scanned buried pipe. By incorporating the actual velocity information, this improvement will not only enhance the accuracy of depth calculations for each buried pipe but also increase the accuracy of the RMSE to below than acceptable tolerance 0.100m.</p>
<p><b>Acknowledgment</b></p>	<p>The project member would like to thank the Universiti Teknologi MARA and Department of Survey and Mapping Malaysia for providing equipment and technical supports in completing this research study. Last but not least, the financial support provided by the Malaysia Ministry of Higher Education's through Fundamental Research Grant Scheme (FRGS) UiTM 600-RMC/FRGS 5/3 (018/2022) is acknowledged.</p>

**Researchers  
Biographical Data**



Mohd Soleh Amin Bin Mat Junoh a student who is currently undertaking Master in Built Environment (Research Mode) program under Universiti Teknologi MARA Shah Alam. He received his Bachelor of Science in Surveying and Geomatics (Hons) from Universiti Teknologi MARA Perlis in 2015. In 2017, he was certified by the Land Survey Board (LJT) as Certified Underground Utility Detection and Survey (Operator). In 2018, he is being certified as a Certified Traffic Management Officer (TMO) by CIDB Malaysia. Currently, he is a Graduate Research Assistance under FRGS Research Grant UiTM 600-RMC/FRGS 5/3 (018/2022).



Assoc. Prof. Ts Sr Dr Saiful Aman bin Hj Sulaiman, a Senior Lecturer at Universiti Teknologi MARA in Malaysia, specializes in geodesy, geomatics, geospatial, and geodetic control. With a PhD in the Specialisms of the Built Environment and a Master's degree in GIS and Remote Sensing, his expertise is widely recognized. He is a member of the Royal Institution of Surveyors Malaysia (RISM) and has received awards for his contributions in research publication, innovation and entrepreneurship. He actively engages in consultation and applies his knowledge to address societal challenges, making a positive impact on his field and society as a whole.






Sr Mohamad Hezri Razali is a lecturer at the Centre of Studies for Surveying Science & Geomatics, College of Built Environment at Universiti Teknologi MARA in Shah Alam, Selangor, Malaysia. His areas of expertise include cadastre, utility mapping, 3D cadastre, and engineering survey. He holds a Master's degree in Built Environment (Research) from Universiti Teknologi MARA in 2017. He is a member of the Royal Institution of Surveyors Malaysia (RISM) and actively engages in consultation and expertise sharing. He has also made significant contributions to research publication, innovation, commercialization, and entrepreneurship. His work aims to address societal challenges and positively impact the field of surveying science and geomatics.



<b>INNOVATIVE POULTRY PELLETT DRYER MACHINE</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
		√	
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Amirul Syahir Bin Jamaluddin <sup>1</sup> , Nik Muhammad Amirul Hakim Bin Rosday <sup>2</sup> , Mohd Izzat Bin Ahmad <sup>3</sup> , Siti Nadiah Mohd Saffe		
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<b>Email</b>	<sup>1</sup> amirulsyahir1998@gmail.com, <sup>2</sup> amirulnik6@gmail.com, <sup>3</sup> izzatahmadd@gmail.com, sitinadiah@ump.edu.my		
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<b>Abstract</b>	<p>The poultry pallet dryer machine is an essential component in the livestock industry, providing efficient and controlled drying of animal pallets. The machine utilizes a multi-layer conveyor system, which allows for simultaneous drying of multiple pallets. It incorporates a programmable logic controller (PLC) to control the temperature, conveyor speed, and drying time, ensuring optimal drying conditions for the animal pallets. Additionally, a temperature controller with a precise sensor system is employed to maintain consistent and controlled drying temperatures throughout the process. This animal pallet dryer machine offers several advantages to the livestock industry. Its efficient drying process helps reduce moisture content in the pallets, extending their shelf life and minimizing the risk of spoilage. Moreover, the controlled drying environment contributes to preserving the nutritional value and quality of the animal pallets, ensuring they meet the industry's strict standards. By extending the shelf life and maintaining the quality of the pallets, this machine contributes to the overall efficiency and profitability of the livestock industry.</p>		
<b>Keywords</b>	Pallet Dyer Machine, Multilayer Conveyer, PLC		



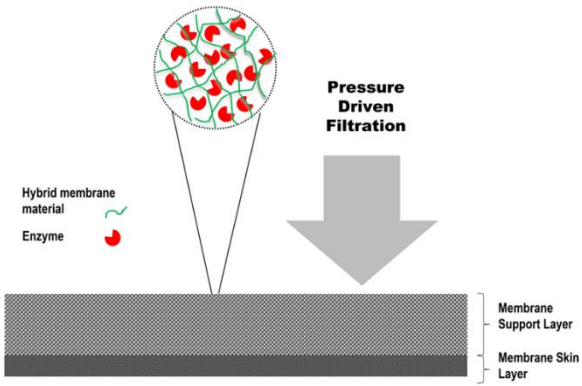
<b>Product description</b>	<p>The Poultry Feed Pellet Dryer Machine with a 3-level conveyor mechanism is a durable and efficient equipment for drying feed pellets. It features a compact design with dimensions suitable for the three-level conveyor system and drying chamber. The machine includes temperature and time controls, a user-friendly control panel, and is constructed using high-quality materials. Its special features include consistent and thorough drying, customizable drying parameters, and a large capacity.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<div data-bbox="695 520 1279 995" data-label="Image"> </div> <p data-bbox="683 999 1295 1031">Figure 1. Outer Design of Pallet Dryer Machine</p> <div data-bbox="683 1100 1295 1465" data-label="Diagram"> </div> <p data-bbox="808 1470 1170 1501">Figure 2. Pallet drying flow.</p>
<b>Novelty and uniqueness</b>	<p>The Poultry Feed Pellet Dryer Machine with a 3-level conveyor mechanism stands out with its unique design and features. Its differentiation lies in the three-level conveyor system, which enables continuous movement of feed pellets, resulting in consistent and thorough drying. This design offers enhanced drying efficiency, better heat distribution, and increased throughput compared to conventional single-level conveyor dryers. The three-level conveyor mechanism sets this machine apart, ensuring optimal drying performance and making it a superior choice for poultry feed drying applications.</p>

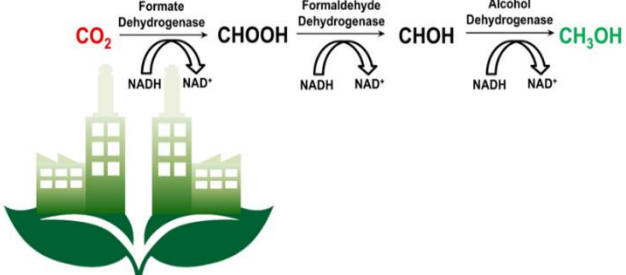
<b>Benefit to mankind</b>	<p>The Poultry Feed Pellet Dryer Machine provides efficient and uniform drying of poultry feed pellets, reducing moisture content and preventing mold growth. It is applicable in poultry farms, feed mills, and animal feed production facilities. The machine benefits feed producers by improving the quality and shelf life of feed pellets, ensuring higher nutritional value for poultry and reducing wastage. It contributes to sustainable and efficient feed production, ultimately benefiting both the target persons (feed producers) and society by promoting healthy and cost-effective poultry farming practices.</p>
<b>Potential commercialization</b>	<p>With its unique design and advantages, it fills a specific need in the poultry feed industry for efficient and thorough drying. The machine's enhanced performance and capacity make it appealing to poultry farms, feed mills, and animal feed production facilities. The market demand for improved feed quality and production efficiency creates a favorable environment for the successful commercialization of this product, making it a promising investment opportunity.</p>
<b>Acknowledgment</b>	<p>This research supported by University Malaysia Pahang, under internal research grant number PGRS210360.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Amirul Syahir Bin Jamaluddin is a student who is currently undertaking his study in Bachelor of Engineering Technology (Manufacturing) program under Faculty of Manufacturing and Mechatronic Technology, Universiti Malaysia Pahang. He is holding a Diploma in Mechanical Engineering from Universiti Malaysia Pahang.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Nik Muhammad Amirul Hakim Bin Rosday is a student who is currently undertaking his study in Bachelor of Engineering Technology (Manufacturing) program under Faculty of Manufacturing and Mechatronic Technology, Universiti Malaysia Pahang. He is holding a Diploma in Mechanical Engineering from Universiti Malaysia Pahang.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Mohd Izzat Bin Ahmad is a student who is currently undertaking his study in Bachelor of Engineering Technology (Manufacturing) program under Faculty of Manufacturing and Mechatronic Technology, Universiti Malaysia Pahang. He is holding a Diploma in Mechanical Engineering from Universiti Malaysia Pahang.</p> </div> </div> </div>



Siti Nadiyah binti Mohd Saffe is currently a senior lecturer in Faculty of Manufacturing and Mechatronic Engineering Technology, Universiti Malaysia Pahang. She is holding a Degree and Master in Mechanical Engineering from Takushoku Universiti Japan, and PhD from Tokushima University Japan.

<b>TRI-FUNCTIONAL MEMBRANE FOR SIMULTANEOUS CAPTURE AND BIOCATALYTIC CONVERSION OF CO<sub>2</sub> (CO<sub>2</sub>BioCat)</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		√	
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Fauziah Othman <sup>1</sup> , Fauziah Marpani <sup>1,2</sup> , Fatin Nasreen Ahmad Rizal Lim <sup>1</sup> , Nur Hidayati Othman <sup>1,2</sup> and Nur Hashimah Alias <sup>1,2</sup>		
<b>Affiliation</b>	<sup>1</sup> School of Chemical Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam, Selangor Darul Ehsan, Malaysia <sup>2</sup> Catalysis for Sustainable Energy and Water Nexus Research Group, School of Chemical Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam, Selangor Darul Ehsan, Malaysia		
<b>Email</b>	fauziah176@uitm.edu.my		
<b>Correspondence</b>	Fauziah Marpani School of Chemical Engineering, College of Engineering Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia. Tel: +603-554365108, Fax:+603-55436300		
<b>Abstract</b>	The abundant amount of CO <sub>2</sub> is being emitted continuously everyday from industrial activities which can results to a major global warming. Global warming can cause a serious climate change that would cause the melting of glaciers and rising of sea levels, which will further impact human health and increase the risks of drought and flood. Post combustion CO <sub>2</sub> capture which includes physical and chemical absorption, pressure swing adsorption and cryogenic distillation processes are the most widely used, features an energy intensive method. Also, the technology to capture and converts CO <sub>2</sub> requires high temperature and pressure since CO <sub>2</sub> is a thermodynamically stabled molecules. The present innovation described a tri-functional membrane which is able to capture, hydrates and convert CO <sub>2</sub> into formic acid, a useful basic chemical precursors at ambient temperature and pressure. A hybrid membrane developed from polyvinylidene fluoride (PVDF), nanocellulose and metal oxide is used as a matrix to immobilize formate dehydrogenase		

	<p>(EC 1.2.1.2), an enzyme which can converts CO<sub>2</sub> to formate. This system set up is appealing because it could represents triple gain in one reactor; 1) the membrane provides hydrophilic environment to ensure enzyme stability; 2) the membrane could capture CO<sub>2</sub> in practice and simultaneously hydrates (solubilization) and 3) the biocatalytic membrane support synchronous redox catalysis of CO<sub>2</sub> and filtration of formate as the end product. The study could derive a new alternative, green approach and sustainable technique with regards to CO<sub>2</sub> capture and conversion in one reactor at ambient conditions.</p>
<b>Keywords</b>	<p>Biocatalytic membrane; Enzyme immobilization, Polymer membrane; Biocatalysis; CO<sub>2</sub> reduction</p>
<b>Product description</b>	<p>The present innovation described a tri-functional membrane which is able to capture, hydrate and convert CO<sub>2</sub> into formic acid, a useful basic chemical precursor at ambient temperature and pressure. A hybrid membrane developed from polyvinylidene fluoride (PVDF), nanocellulose and metal oxide is used as a matrix to immobilize formate dehydrogenase (EC 1.2.1.2), an enzyme which can converts CO<sub>2</sub> to formate.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<p style="text-align: center;"><b>CO<sub>2</sub>BioCat membrane immobilized with enzyme via pressure driven filtration</b></p> 

	<div style="text-align: center; background-color: black; color: white; padding: 5px; margin-bottom: 10px;">                 Multi-enzyme cascade catalysis of CO<sub>2</sub> to methanol             </div> 
<b>Novelty and uniqueness</b>	This system set up is appealing because it could represent triple gain in one reactor; <ol style="list-style-type: none"> <li>1. the membrane provides hydrophilic environment to ensure enzyme stability;</li> <li>2. the membrane could capture CO<sub>2</sub> in practice and simultaneously hydrates (solubilization) and</li> <li>3. the enzymatic membrane reactor support synchronous redox catalysis of CO<sub>2</sub> and filtration of formate as the end product</li> </ol>
<b>Benefit to mankind</b>	Support Twelfth Malaysia Plan (2021-2025): Theme 3 which focuses on advancing green growth as well as enhancing energy sustainability and addressing the issues of climate change. Technology to capture and convert CO <sub>2</sub> is very much needed to reduce the effect of global warming around the world.
<b>Potential commercialization</b>	<ul style="list-style-type: none"> <li>• Simple membrane development process</li> <li>• Mass-produced and small footprint</li> <li>• Enhanced membrane life-span &amp; membrane robustness</li> <li>• Synergistic mechanism, adsorb, filtrate and degrade</li> <li>• CO<sub>2</sub> available abundantly at no cost</li> <li>• Production of formic acid or methanol are important basic chemical precursors</li> <li>• Widely applicable to other process; e.g. water treatment</li> </ul>
<b>Acknowledgment</b>	The head project member acknowledges financial support from Universiti Teknologi MARA via GIP Grant number 600-RMC/GIP 5/3 (085/2021). Fauziah Marpani acknowledges the financial support provided by the Malaysia Ministry of Higher Education's through Fundamental Research Grant Scheme (FRGS) grant number FRGS/1/2019/TK02/UITM/03/5.



**Researchers  
Biographical Data**


Fauziah Othman is a student who is currently undertaking his PhD study program under the School of Chemical Engineering, College of Engineering, UiTM Shah Alam. Her research project is about developing a membrane that is anti-bacterial and can filter and degrade micropollutants from water bodies.



Fauziah Marpani is a senior lecturer who is currently undertaking her fellowship program in Izmir Institute of Technology, Turkiye. She was awarded as a Chartered Engineer by IChemE and Engineering Council, UK in 2021 and a Professional Engineer status by the Board of Engineers Malaysia in 2022. She holds a PhD in Chemical and Biochemical Engineering from the Technical University of Denmark.



Fatin Nasreen Ahmad Rizal Lim a student who is currently undertaking his PhD study under fast-track program in the College of Engineering, UiTM Shah Alam. Her research topic is about developing a membrane that is multi-functional which can simultaneously capture CO<sub>2</sub> and hydrates, act as support for enzyme immobilization, and also separates into basic useful chemicals.

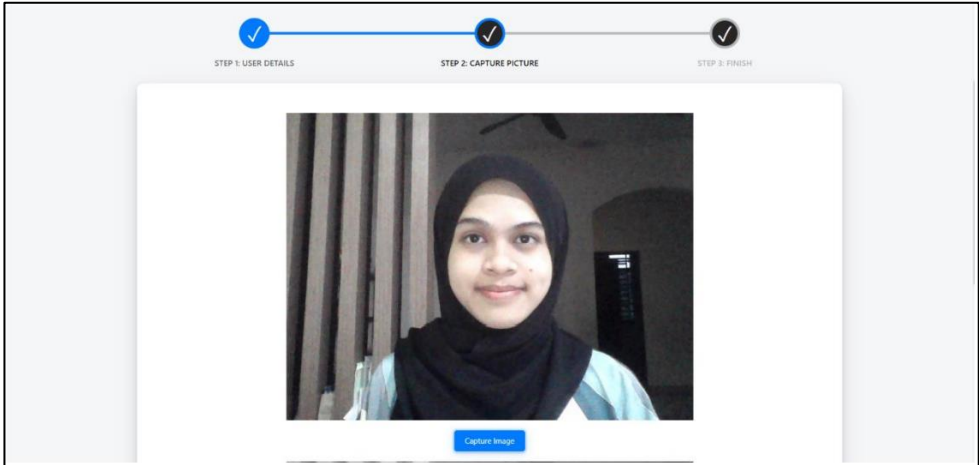
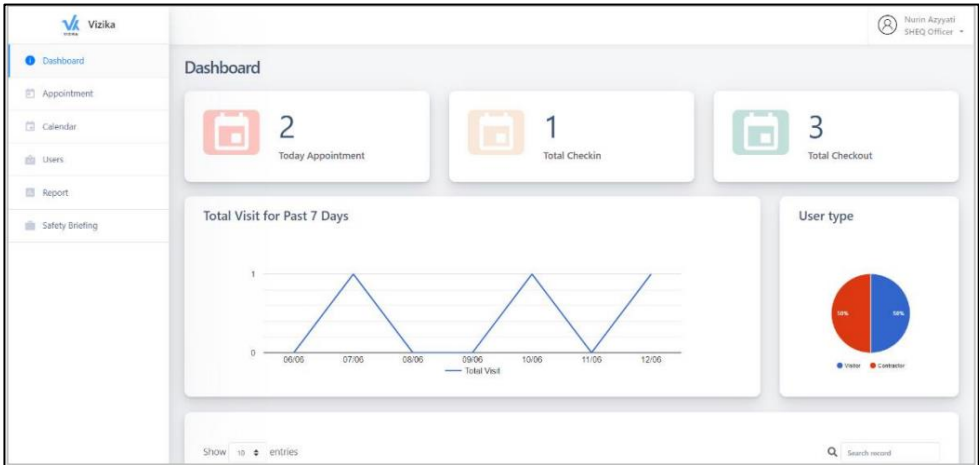


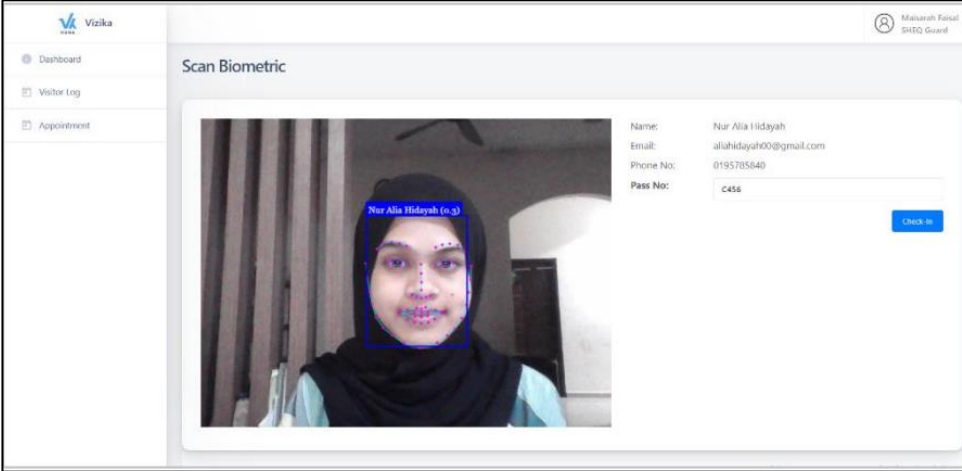
Nur Hidayati Othman is an Associate Professor in School of Chemical Engineering, College of Engineering, UiTM Shah Alam. She holds a PhD from Imperial College, London. Her research interest is in membrane technology, heterogeneous catalyst, methane conversion, wastewater and natural gas treatment, oil and gas.





Nur Hashimah Alias is a senior lecturer who is currently undertaking his postdoctoral program under Nanyang Technological University (NTU), Singapore. She was awarded YSN-ASM Chrysalis Award by Akademi Sains Malaysia in 2019. She is holding a PhD in Chemical Engineering in from Universiti Teknologi Malaysia. her research expertise is in electrospinning of nanofibers, membrane separation, photocatalysis, adsorption and wastewater treatment.

<b>CONTRACTOR AND VISITOR MANAGEMENT SYSTEM USING BIOMETRIC RECOGNITION (VIZIKA SYSTEM)</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		✓	
	<b>Local</b>		<b>International</b>
	✓		
<b>Project Member(s)</b>	Nur Alia Hidayah binti Rohaya Udin <sup>1</sup> , Ts. Dr. Nurzety Aqtar binti Ahmad Azuan <sup>2</sup>		
<b>Affiliation</b>	<sup>1</sup> Faculty of Computing, Universiti Malaysia Pahang, Pekan, Pahang, Malaysia  <sup>2</sup> Faculty of Computing, Universiti Malaysia Pahang, Pekan, Pahang, Malaysia		
<b>Email</b>	<sup>1</sup> aliahidayah00@gmail.com, <sup>2</sup> aqtar@ump.edu.my		
<b>Correspondence</b>	Nur Alia Hidayah binti Rohaya Udin Faculty of Computing, Universiti Malaysia Pahang, 26600 Pekan, Pahang, Malaysia. Tel: +60-3822568		
<b>Abstract</b>	Visitor Management System (Vizika) is a tool that aims to streamline the check-in and checkout process for visitors, improve the authentication process for security purposes, and provide valuable insights for organizations. Vizika helps organizations efficiently track visitors as they enter and exit highly secured premises using face recognition technology. Additionally, Vizika provides a registration module where visitors can register and manage their personal and contact information before entering the site. This module aims to minimize waiting time and ease the check-in and check-out process once visitors are on-site. Vizika also offers features such as appointment scheduling, email notifications, tracking active visitors on-site, and generating analytics reports. These features help organizations enhance the visitor experience and effectively manage the security and safety of the premises. Built using open-source technology, Vizika is able to offer		

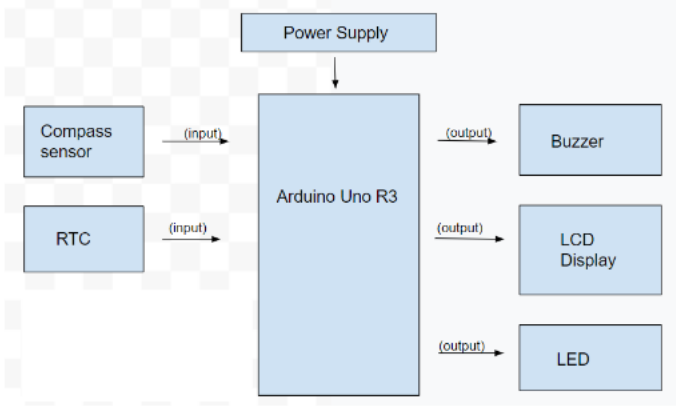
	its services at a fraction of the cost of normal commercial face recognition tools available on the market while maintaining comparable quality.
<b>Keywords</b>	visitor management system, authentication process, face recognition.
<b>Product description</b>	Vizika is a web-based application system developed using open-source technology. One of the most important aspects of the system is the interaction between users, which includes Safety Officers, Safety Guards, Staff, Contractors, and Visitors. The system is developed using the PHP Laravel Framework. It utilizes a state-of-the-art open-source facial recognition algorithm to perform face recognition for visitors once they are on-site.
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	 

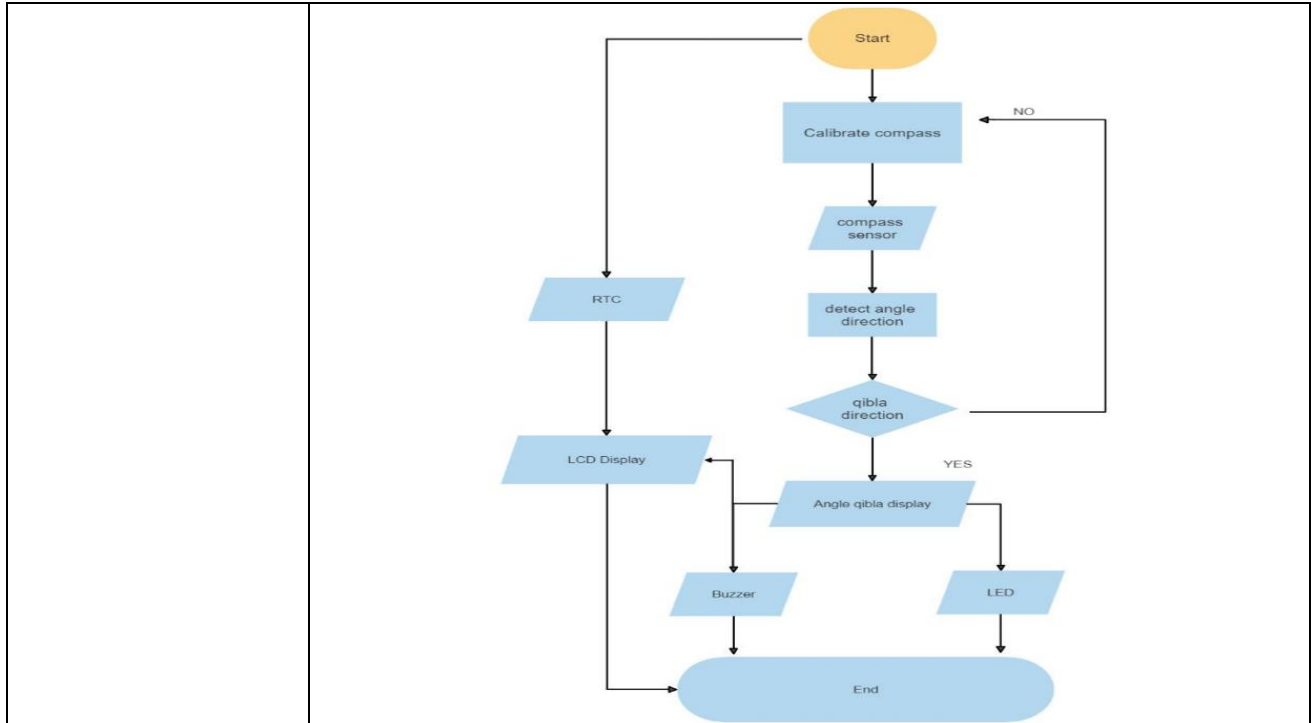
	
<p><b>Novelty and uniqueness</b></p>	<p>Vizika's uniqueness lies in its cost-effective facial recognition feature. The facial recognition implementation utilizes an open-source API called Face-Api.JS, which offers comparable accuracy to licensed facial recognition tools available on the market at a significantly lower price. When using Vizika, users are required to register their information along with an image of their face. Vizika then performs a comparison between the stored image and real-time image scans using internal/external or IP webcams.</p>
<p><b>Benefit to mankind</b></p>	<p>Vizika is a comprehensive system designed for industries, offering numerous advantages in the areas of authentication and security. It enhances security measures by ensuring authorized access, protecting sensitive information, and mitigating potential threats. Vizika streamlines the visitor registration process, saving time and minimizing human effort. Furthermore, it helps in maintaining accurate visitor records, reducing long waiting times, and addressing potential bias in the authentication process. This improves overall organizational productivity and fosters a safe and welcoming environment for both employees and visitors.</p>
<p><b>Potential commercialization</b></p>	<p>The Vizika system for industries holds significant potential for commercialization. Its advanced features and capabilities provide industries with a comprehensive solution for data visualization and analysis, specifically tailored for reporting purposes. By offering real-time insights and intuitive visual representations, Vizika empowers businesses to make informed decisions and optimize their operations. The system's scalability and adaptability, combined with its integrated facial recognition technology, make it suitable for various industries, including manufacturing, logistics, healthcare, and finance, where premises are often highly secured. With its ability to uncover valuable patterns and trends, Vizika has the potential to improve efficiency, drive innovation, and deliver substantial value to organizations seeking to leverage data for a competitive advantage.</p>

<p><b>Acknowledgment</b></p>	<p>This work was partially supported by RDU Grant from Universiti Malaysia Pahang. We thank our colleague Prof Madya Dr Mazlina Abd Majid, Dr Anis Farihan Mat Rifae and Mr Sabri Ahmad Hisham, who provided insight and expertise that greatly assisted the design and development stages of this work.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 20px;">  <p>Nur Alia Hidayah is a student who is currently undertaking her Bachelor of Computer Science (Software Engineering) with Honours study program under Faculty of Computing, Universiti Malaysia Pahang, Pekan, Pahang. She is holding a Diploma in Computer Science from Universiti Malaysia Pahang.</p> </div> <div>  <p>Ts. Dr. Nurzety Aqtar Ahmad Azuan is a lecturer currently employed by the Faculty of Computing at Universiti Malaysia Pahang in Pekan, Pahang. She holds a PhD in Computer Science from The University of Manchester, United Kingdom.</p> </div> </div>

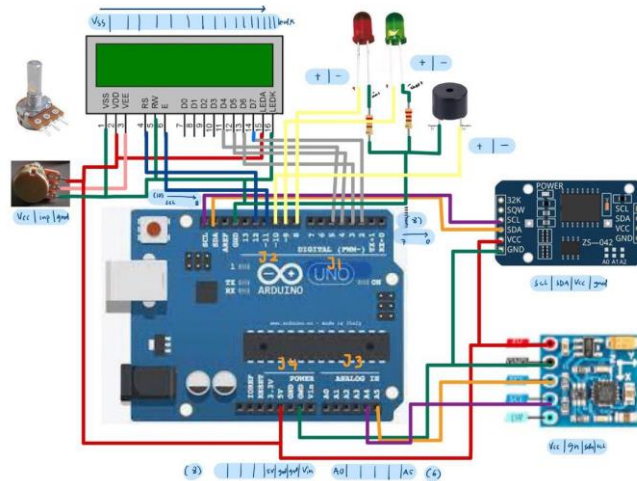
<b>DESIGN OF QIBLA DIRECTION ASSISTANT USING ARDUINO</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
		√	
	<b>Local</b>		<b>International</b>
		√	
<b>Project Member(s)</b>	Nur Arina Syazana Azrul Azhan <sup>1</sup> , Nur Idawati Md Enzai <sup>2</sup> .		
<b>Affiliation</b>	<sup>12</sup> School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA Terengganu Branch, Dungun Campus, Malaysia		
<b>Email</b>	<sup>1</sup> nrrnsyzn@gmail.com <sup>2</sup> nurid333@uitm.edu.my		
<b>Correspondence</b>	Nur Idawati Md Enzai School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA Terengganu Branch, Dungun Campus, Malaysia Tel: +6019-9247418		
<b>Abstract</b>	<p>In the early 11th or 12th century, an instrument called a compass was created to help people determine navigation, location, and direction. Year by year, the world is evolving and technology has become more sophisticated. That makes a compass almost obsolete in this era. This qibla direction assistant prototype project helps Muslims determine the Qibla direction easily to perform their daily prayers anywhere. The prototype will produce an output that can help the Muslim find the qibla direction. The compass sensor can sense the magnetic poles of the earth and point in the direction of Qibla with the Arduino Uno's assistance. This project is expected to assist those who are unsure about using a compass to determine the qibla. In addition, there is no need for an internet connection to use this Qibla direction assistant, making it attractive to various types of people.</p>		
<b>Keywords</b>	Qibla, Compass, Prayer, Arduino, Muslim		



<p><b>Product Description</b></p>	<p>The Arduino Uno R3, compass sensor, buzzer, and LED (Light Emitting Diode) are the main components that make this project. The compass sensor plays an important role in indicating the qibla direction. Other features, such as the LCD (Liquid Crystal Display) and buzzer, assist people in quickly determining the qibla direction. The display will also indicate the current time. The real-time clock components will display the date and time on the display. When users calibrate the compass, the display will show whether the degree of angle of the direction that they have been standing in matches with the qibla direction or not. They need to move until the buzzer and green LED turn on to find the right qibla.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	<div style="text-align: center;">  <pre> graph TD     PS[Power Supply] --&gt; AR[Arduino Uno R3]     CS[Compass sensor] -- input --&gt; AR     RTC[RTC] -- input --&gt; AR     AR -- output --&gt; BU[Buzzer]     AR -- output --&gt; LCD[LCD Display]     AR -- output --&gt; LED[LED]             </pre> </div> <p align="center"><b>Fig. 1.</b> Block diagram of system.</p>



**Fig. 2.** Flowchart of system.




**Fig. 3.** Circuit of project.


**Novelty and uniqueness**

Qibla direction assistant does not require internet connectivity in order for it to operate. Furthermore, it doesn't require the skills needed to read the conventional compass. This makes it easier to use compared to online compass and conventional compass.

**Benefit to mankind**

This project is beneficial to help Muslims fulfill the obligation of performing salah. Muslims can effortlessly determine the qibla direction by using this project. The output that has been set in this project has made the

	determination of qibla direction less of a hassle. This project provides detection of the qibla direction by producing outputs on LED and LCD which are clearly visible.
<b>Potential commercialization</b>	By knowing the qibla direction, Muslims can perform the prayer anywhere and anytime. The angle direction will be displayed to users as shown in Fig. 4 below. <div style="text-align: center;">  </div> <p style="text-align: center;"><b>Fig. 4.</b> Prototype appearance.</p> <p>This project could be expanded with some other features, such as prayer time reminders with Adhan. Worldwide qibla detection can also be achieved through more comprehensive databases of qibla angles.</p>
<b>Acknowledgment</b>	We would like to express our gratitude to everyone involved in the project: Universiti Teknologi MARA (UiTM), Cawangan Terengganu, Kampus Dungun and the School of Electrical Engineering in the College of Engineering.
<b>Researchers Biographical Data</b>	<div style="display: flex; align-items: center;">  <div style="margin-left: 20px;"> <p>Nur Arina Syazana Azrul Azhan is a student who is currently undertaking her Diploma study program under School of Electrical Engineering, College of Engineering, UiTM Terengganu Branch.</p> </div> </div>

	 <p>Nur Idawati Md Enzai is currently a lecturer in School of Electrical Engineering, College of Engineering, UiTM Terengganu Branch. She is holding a Master of Science in Computer and Information Engineering from International Islamic University Malaysia.</p>
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<b>HOSPITAL E-TICKET SYSTEM USING ANDROID STUDIO</b>				
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector	
			√	
		<b>Local</b>		<b>International</b>
		√		
<b>Project Member(s)</b>	1) Muhammad Nurharraz Bin Ahmad Ridzwan 2) Muhammad Syamil Basyar Bin Mohd Faizal			
<b>Affiliation</b>	MARA-Japan Industrial Institute			
<b>Email</b>	asiq@mara.gov.my muhdnurh4rr4z@gmail.com			
<b>Correspondence</b>	Mohd Asiq Bin Hamdi Jabatan Sistem Terbenam, MARA-Japan Industrial Institute, 43700 Beranang, Selangor, Malaysia. Tel: +60 19-665 0566, Fax: +6 (03) 872 49275			
<b>Abstract</b>	<p>This project presents a comprehensive study of The Hospital E-Ticket System, an Android application developed using Android Studio that aims to streamline the process of patient registration and improve the overall efficiency of hospital operations. The system provides a user-friendly interface for patients to register themselves electronically, eliminating the need for manual paperwork and reducing waiting times.</p> <p>The application enables patients to register and queue by entering essential personal information, such as name, contact details, and identity card number. By automating the registration process, the system minimizes errors caused by manual data entry and ensures accurate record-keeping.</p> <p>The Hospital E-Ticket System also benefits healthcare providers by simplifying patient management. Hospital staff can access the system to view and manage medical services efficiently. The system facilitates seamless communication between patients and healthcare professionals, enhancing the overall patient experience and enabling timely delivery of healthcare services.</p> <p>The development of this system involved utilizing Android Studio, a powerful integrated development environment (IDE) for Android app development. The system utilizes various Android components and</p>			

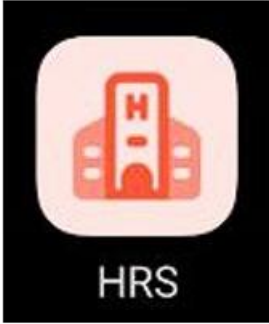
	<p>technologies, including user interface design, database management, and network communication, to create a robust and user-friendly application. Through the implementation of the Hospital E-Ticket System, hospitals can enhance their operational efficiency, improve patient satisfaction, and optimize resource allocation. The system provides a reliable and convenient platform for patient registration, offering a step towards digitizing healthcare processes and embracing technological advancements in the medical field.</p>
<p><b>Keywords</b></p>	<p align="center">E-ticket,Android Studio,Hospital.</p>
<p><b>Product description</b></p>	<p>Introducing our innovative Hospital E-Ticket System, developed using the cutting-edge technology of Android Studio. This revolutionary application is designed to streamline and enhance the patient experience in hospitals, ensuring a seamless and efficient process from check-in to receiving medical attention featuring,</p> <p><b>Real-Time Queue Updates:</b> Stay informed with real-time updates on your position in the queue. The application displays live queue information, ensuring patients have an accurate estimate of their wait times. This transparency empowers patients to plan their day effectively.</p> <p><b>Smart Notification System:</b> Patients receive timely notifications and reminders about their appointments, ensuring they don't miss or forget important medical consultations.</p> <p>Our Hospital E-Ticket System represents a significant step towards modernizing healthcare facilities and enhancing patient care. Embrace the future of healthcare by integrating this user-friendly and efficient Android application into your hospital system today.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	<div align="center" data-bbox="852 1266 1118 1587">  </div> <p align="center">Figure 25 App Icon</p>









Figure 26 Main Screen



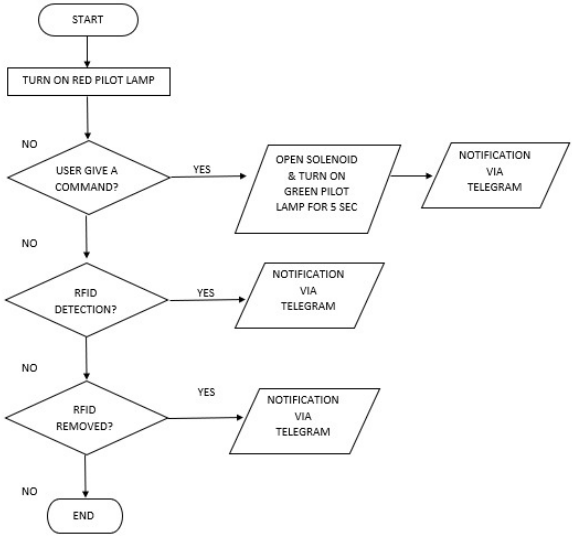
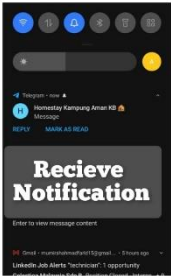
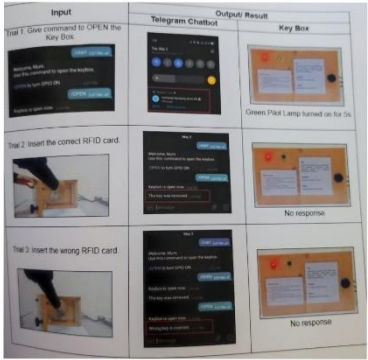
Figure 27 Registration Screen

	 <p>Figure 28 Queue Waiting Screen</p>  <p>Figure 29 When Your Number Is Up</p>
<p><b>Novelty and uniqueness</b></p>	<p>The Hospital E-Ticket System developed using Android Studio stands out with its exceptional novelty and uniqueness, revolutionizing the way patients access healthcare services. Here are the key aspects that set it apart from conventional hospital management systems:</p> <p>Seamless Mobile Experience: Unlike traditional systems that may rely on web-based interfaces, our E-Ticket System is built natively for Android smartphones. This means patients can enjoy a smooth, optimized, and responsive mobile experience, allowing them to access healthcare services on the go.</p>

	<p>Real-Time Queue Updates: The application provides real-time queue updates, keeping patients informed about their current position in the queue. This transparency empowers patients with accurate wait time estimates, enabling them to plan their day effectively.</p>
<p><b>Benefit to mankind</b></p>	<p>The Hospital E-Ticket System using Android Studio offers several significant benefits to mankind, revolutionizing the healthcare experience for both patients and healthcare providers:</p> <p>Reduced Waiting Times: the E-Ticket System minimizes physical queues and reduces waiting times. Patients can arrive at the hospital at their appointed time, leading to a more efficient and streamlined process.</p> <p>Enhanced Patient Experience: The system empowers patients to take control of their healthcare journey by providing them with real-time updates, and notifications. This enhanced experience fosters a sense of satisfaction and trust in the healthcare facility.</p>
<p><b>Potential commercialization</b></p>	<p>The potential commercialization of the Hospital E-Ticket System Using Android Studio is promising, as it addresses critical challenges in the healthcare industry and offers tangible benefits to both healthcare providers and patients. Here are some potential avenues for commercialization:</p> <p>Licensing to Hospitals and Healthcare Facilities: The Hospital E-Ticket System can be licensed to various hospitals and healthcare facilities, providing them with a comprehensive digital solution to manage patient queues. Hospitals can integrate the application into their existing systems or use it as a standalone solution to optimize patient flow and improve overall operational efficiency.</p> <p>White Label Solution for Healthcare Providers: Offer the Hospital E-Ticket System as a white-label solution, allowing healthcare providers to rebrand and customize the application according to their specific branding and requirements. This approach caters to larger healthcare networks and chains that want a consistent user experience across their facilities.</p>
<p><b>Acknowledgment</b></p>	<p>I would like to express my deepest gratitude and appreciation to the following individuals who have contributed to the completion of this thesis: My supervisor, Mohd Asiq bin Hamdi, for his invaluable guidance, expertise, and unwavering support throughout the entire research process. Their mentorship and constructive feedback have been instrumental in shaping this work. I am indebted to the participants of this study, whose willingness to share their time and experiences has made this research possible. Their contributions have provided a valuable foundation for understanding the topic and have given this thesis real-world relevance. I would like to express my gratitude to MARA-Japan Industrial Institute, for providing the necessary resources, facilities, and support that facilitated the execution of this research project. To my family and friends, thank you for your constant encouragement, understanding, and love throughout this journey. Your unwavering support has been a source of strength, and I am</p>

	<p>truly grateful for your presence in my life. Lastly, I would like to acknowledge all those who have played a part, however small, in shaping my academic and personal growth. Your influence aspiration, and encouragement have been invaluable in shaping my intellectual curiosity and passion for learning.</p> <p>Thank you all for your contributions, guidance, and support. This project would not have been possible without each one of you.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 20px;">  <p>Muhammad Nurharraz is an Embedded System student at MARA-Japan Industrial Institute. A great student that always passionate to create something that can help the community become better.</p> </div> <div>  <p>Muhammad Syamil Basyar is an Embedded System student at MARA-Japan Industrial Institute. A great student that always loves to overcome challenges in the electronic and coding world.</p> </div> </div>

<b>PHYSICAL KEY COLLECT AND RETURN BOX FOR HOMESTAY APPLICATION USING NODEMCU ESP8266 WITH TELEGRAM MONITORING INTERFACE</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		√	
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Azrul Erdy Bin Zakaria <sup>1</sup> , Murnirah Binti Ahmad Farid <sup>2</sup> , Siti Nur Dhuha Binti Zainalabidin <sup>3</sup> , Fatin Izzati Binti Abu <sup>4</sup> , Siti Aisyah Nasuha Binti Izham <sup>5</sup>		
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<b>Email</b>	<sup>1</sup> erdy.zakaria@mara.gov.my, <sup>2</sup> murnirahahmadfarid15@gmail.com, <sup>3</sup> sitinurdhuha1109@gmail.com, <sup>4</sup> Fatinizzati909@gmail.com, <sup>5</sup> aisyah.nasuha94@gmail.com		
<b>Correspondence</b>	Azrul Erdy bin Zakaria Electronics Measurement & Control, Mara-Japan Industry Institute, Beranang, 2333, Jalan, LEKAS, Bandar Sri Kesuma, 43700 Semenyih, Selangor, Malaysia. Tel: +6013-699 3657, Office Tel: 03-8724 9344		
<b>Abstract</b>	Physical Key Collect and Return Box for Homestay Application using NodeMCU ESP8266 with Telegram Interface is a key equipped with NodeMCU ESP8266 microcontroller that enable wireless communication and control. The purpose is to develop a system that simplifies the key management process for both hosts and guests in homestay environments. The Physical Key Collect and Return Box can manage key access permissions, track key transactions, receive notifications regarding key collection and return. Guests can access assigned keys and receive real-time updates on key availability. All this controlled by a long range distance. It is serves as a centralized, automated key storage and retrieval system and eliminating the need for hosts to personally hand over keys to guests. RFID (Radio Frequency Identification) technology is used for efficient and reliable key identification and authentication. This Physical Key Collect and Return		

	<p>Box benefits the advancement of key management systems in the homestay industry, providing a practical and scalable solution that improves operational efficiency and enhances the overall homestay experience.</p>
<p><b>Keywords</b></p>	<p>NodeMCU, ESP8266, Telegram, Efficient, Management, System.</p>
<p><b>Product description</b></p>	<p>Keyguard was created for a system that simplifies the key management process for both the host and guests in homestay environment using Nodemcu ESP8266 with Telegram Monitoring Interface allowing hosts to monitor and manage the key with convenience.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	<div style="text-align: center;"> <p><b>FLOW CHART</b></p>  </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  </div> <div style="text-align: center;"> <p><b>TELEGRAM MONITORING INTERFACE</b></p>  </div> </div>



<b>Novelty and uniqueness</b>	<p>The proposed solution, the "Physical Key Collect and Return Box for Homestay Application using Nodemcu ESP8266 with Telegram Monitoring Interface," introduces a novel and centralized system for key management. It eliminates manual handovers, incorporates wireless communication and control, and utilizes RFID technology, offering a unique and practical solution that improves operational efficiency and enhances the homestay experience.</p>
<b>Benefit to mankind</b>	<p>The essay proposes a system, the "Physical Key Collect and Return Box for Homestay Application using Nodemcu ESP8266 with Telegram Monitoring Interface," which simplifies key management in the homestay industry. It automates the process, improves efficiency, and enhances the overall homestay experience, benefiting hosts and guests worldwide.</p>
<b>Potential commercialization</b>	<p>There is potential for its application in other industries beyond the homestay industry. The key management challenges faced by the homestay industry, such as secure and efficient key storage and retrieval, are also relevant to various other sectors. For example, the system could potentially be adapted for applications in hospitality, rental services, co-working spaces, or any scenario where secure and automated key management is required. With appropriate modifications and customization, the system's underlying concept and technological components could be extended to address key management needs in different industries.</p>
<b>Acknowledgment</b>	<p>The head project member acknowledges to MARA Japan Industrial Institute for given support to complete this project.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; align-items: center;"> <div style="display: flex; justify-content: space-between; width: 100%;"> <div style="text-align: center;">  </div> <div style="text-align: center;"> <p><b>Azrul Erdy Bin Zakaria</b> a senior lecturer at Electronics Engineering Control &amp; Measurement Department, MARA-Japan Industrial Institute. He was actively joined innovation competition to gain knowledge and experience.</p> </div> </div> <div style="display: flex; justify-content: space-between; width: 100%; margin-top: 20px;"> <div style="text-align: center;">  </div> <div style="text-align: center;"> <p><b>Murnirah Binti Ahmad Farid</b> a student, who is currently undertaking her Diploma in Electronics Engineering Control &amp; Measurement at Mara-Japan Industry Institute. She was appointed as a Research Assistant under MARA Innovation and Research Fund.</p> </div> </div> </div>



Siti Nur Dhuha Binti Zainalabidin, a student, who is currently undertaking her Diploma in Electronics Engineering Control & Measurement at Mara-Japan Industry Institute



Fatin Izzati Binti Abu, a student, who is currently undertaking her Diploma in Electronics Engineering Control & Measurement at Mara-Japan Industry Institute. She is already holding a Diploma in Business Studies from UiTM Segamat.



Siti Aisyah Nasuha Binti Izham, a student, who is currently undertaking her Diploma in Electronics Engineering Robotics & Automation at Mara-Japan Industry Institute.

<b>SMART SWITCH</b>				
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector	
			√	
		<b>Local</b>		<b>International</b>
		√		
<b>Project Member(s)</b>	Muhammad Amirullah Bin Hamdan <sup>1</sup> , Mohammad Imran Bin Noor Hisam <sup>2</sup> , Muhammad Rajaei Bin Dzulkifli <sup>3</sup> .			
<b>Affiliation</b>	Electrical Engineering Studies, College of Engineering, Universiti Teknologi MARA, Johor Branch, Pasir Gudang Campus, Malaysia			
<b>Email</b>	<sup>1</sup> 2021895382@student.uitm.edu.my, <sup>2</sup> 2021483986@student.uitm.edu.my, <sup>3</sup> rajaei4411@uitm.edu.my			
<b>Correspondence</b>	Muhammad Rajaei Bin Dzulkifli Electrical Engineering Studies, College of Engineering Universiti Teknologi MARA, Johor Branch, Pasir Gudang Campus Jalan Purnama, Bandar Seri Alam 81750 Masai, Johor Darul Ta'zim, Malaysia. Tel: + 607-381 8000 Fax:+607-381 8141			
<b>Abstract</b>	<p>The smart switch aims to improve the existing electrical switch technologies so that it can improve the lives of people with mobility and visual difficulties. The switch allows switching electrical appliances by using apps on smartphones or website through the Internet. This capability is provided using ESP32 WiFi microcontroller which enables the switch to be connected to the Internet through WiFi technology. The switch also has an ultrasonic sensor with buzzer to help those with visual impairment to know the physical location of the switch. The work presented is a simulation of the proposed system using an online simulator, WOKWI, with integration of Blynk, an IoT platform to control microcontrollers using the Internet. In this project,</p>			

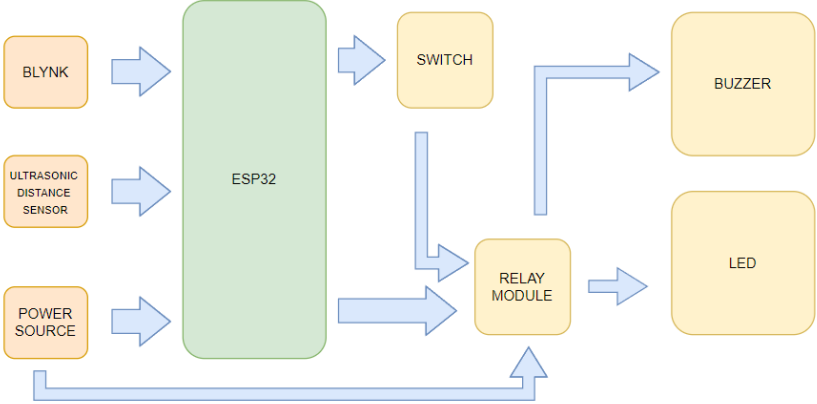
	<p>the combination of WOKWI and Blynk allows complete successful simulation of the proposed system. Results show that electrical appliances turn on and off using the Internet while at the same time detecting presence of human through the ultrasonic sensors.</p>
<p><b>Keywords</b></p>	<p align="center">ESP32, WOKWI, BLYNK and Smart Switch</p>
<p><b>Product description</b></p>	<p>Smart switch consists of ESP32, ultrasonic distance sensor and buzzer which are controlled using Blynk app. This enables the system to be controlled using tablet, smartphone, or other network-connected device. This smart switch allows users to control and monitor their appliances from far away by using their devices or other. User can also check whether their switch from home is switched on or off.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	<div style="text-align: center;">  <p>Figure 1 :Block Diagram</p> </div>



Figure 2 :Flowchart

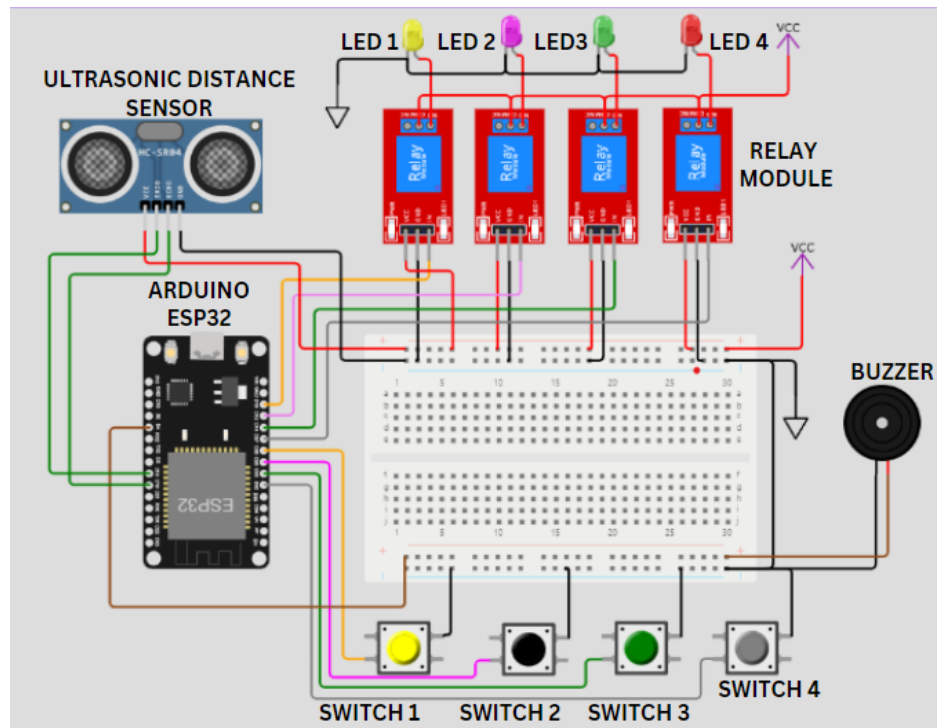


Figure 3 :Schematic Diagrams

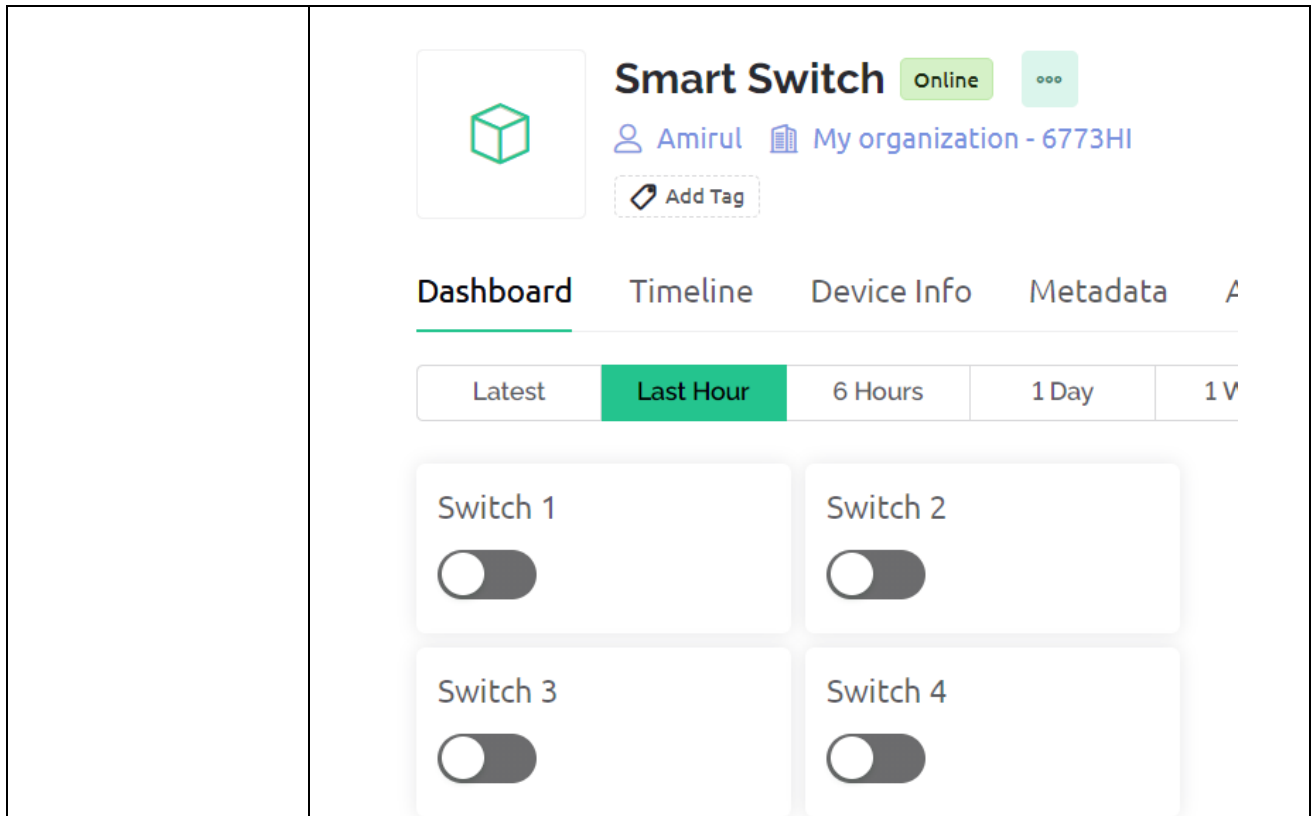


Figure 4 :Blynk Webside

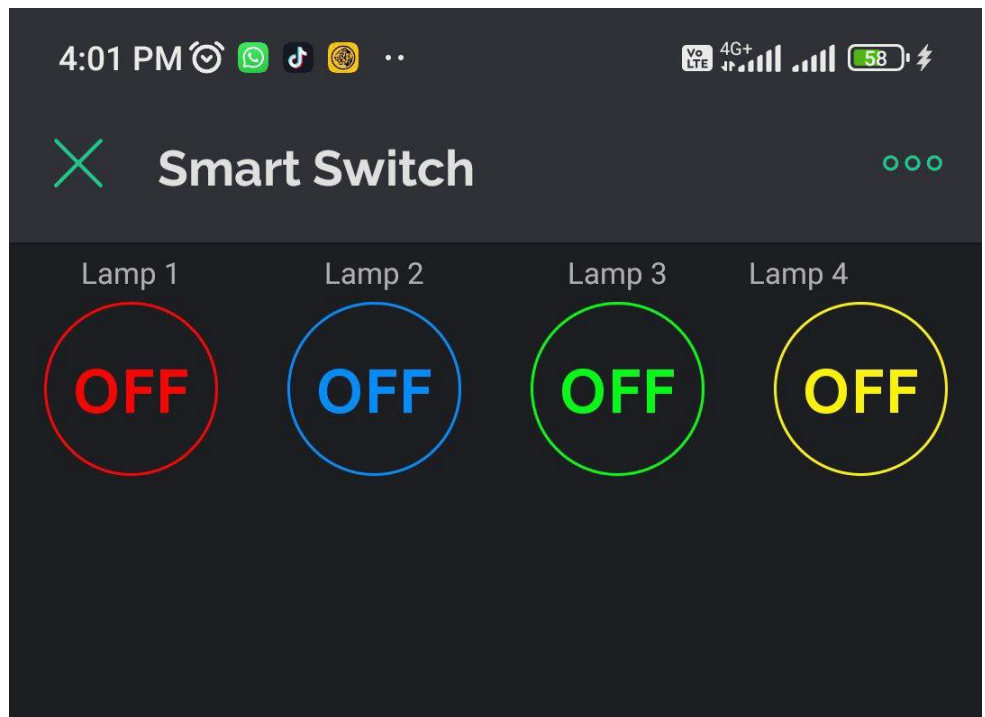


Figure 5 :Blynk Phone Application



	<p>Figure 1 show the block diagram of the smart switch project that use Arduino ESP32 as main component. The input is manual switch, ultrasonic distance sensor and Blynk as online switch. The output is buzzer and led. Figure 2 is the flowchart of the project and it show how the project working step by step. Figure 3 is the schematic diagram and this project use “WOKWI” as the platform to run the simulation. This platform also can be connected to another online platform such as Blynk based on figure 4 and figure 5. Smart switch can be control to any devices that has been access. Based on figure 4 is online switch that used in laptop and figure 5 using application on the phone.</p>
<b>Novelty and uniqueness</b>	<p>The uniqueness of the smart switch is it consists of ultrasonic distance sensor and buzzer which the ultrasonic sensor will help the user to find the switch. For example, the user is blind and this can help the user to find the manual switch easily. The buzzer also will sound when the user is on or off the switch. But, the tone of the buzzer will be different between the user on or off the switch. This way the user will know the if the switch is turn on or off.</p>
<b>Benefit to mankind</b>	<p>Sometimes the user forgets to turn off the light as they busy and need to hurry. The user can use smart switch to monitoring and turn off the light even they in the work place. This can help the society to reduce the overall energy demand and carbon emission. the government has established safety standards and regulations to protect citizens from potential hazards and ensure the well-being of society. The smart switch project was also created to ensure the safety of the user. By avoid the physical touch of the manual switch can prevent incidents from happen such as electrical fires, electrical shock, and burns.</p>
<b>Potential commercialization</b>	<p>Smart switches can be used to all house and it play important roles to help the user to control their house. For example, physically disabled individuals may use mobility aids such as wheelchairs or crutches, making it challenging to reach and operate switches located at inconvenient heights or distances. This smart switch will be advantages for disabled people, the elderly even individuals that need to walk far away to press the button manually because this project focuses to reduce their burden by making a switch that can control all the appliances using any gadgets that have an excess. This project can be upgrade by insert the monitor and optimize energy in real time. This can lead to effective energy usage which can lower utility costs and save the environment from carbon emission.</p>
<b>Acknowledgment</b>	<p>The authors would like to express the gratitude to Electrical Engineering Studies, College of Engineering, Universiti Teknologi Mara (UITM), Johor Branch Pasir Gudang for providing financial and equipment support throughout this project.</p>

**Researchers  
Biographical Data**



Muhammad Amirullah Bin Hamdan is a student who is currently undertaking his Diploma study program under Faculty of Electrical Engineering, UiTM, Cawangan Pasir Gudang.


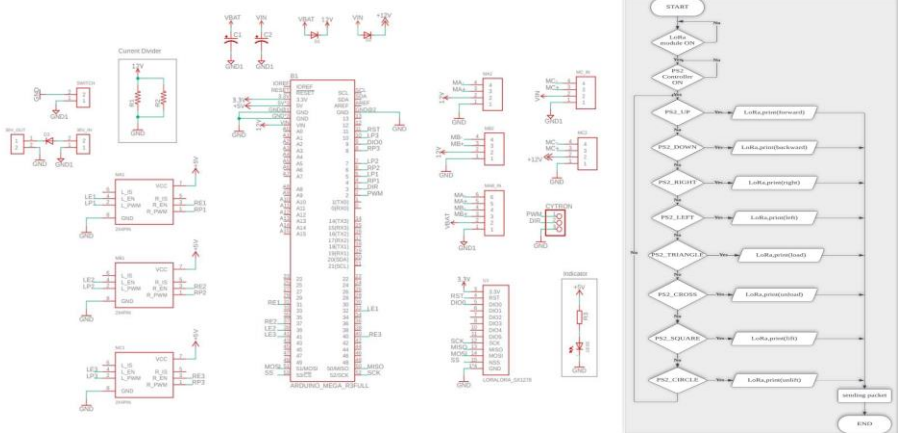


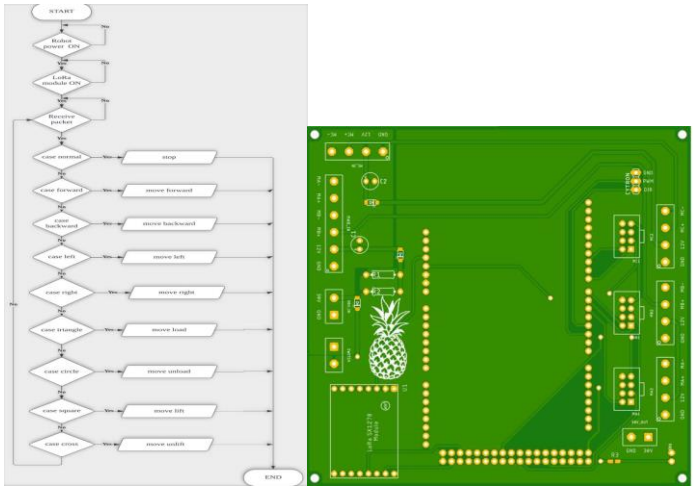
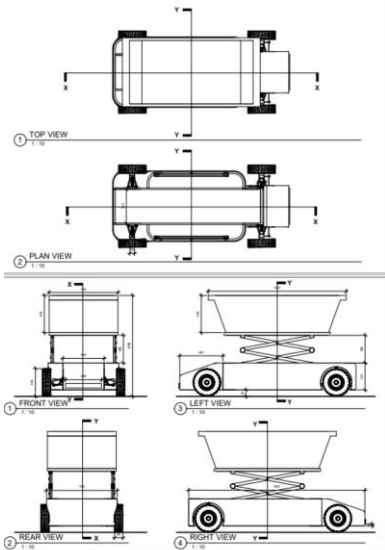
Mohammad Imran Bin Noor Hisam is a student who is currently undertaking his Diploma study program under Faculty of Electrical Engineering, UiTM, Cawangan Pasir Gudang.





Muhammad Rajaei Bin Dzulkifli is a lecturer in Electrical Engineering Studies, College of Engineering, UiTM Johor Branch Pasir Gudang Campus. He teaches computer engineering courses with research interests in IoT, data analytics, wireless communication and network.


<b>PINEAPPLE UNLOADER WITH ADJUSTABLE HEIGHT CONTROLLED BY USING PS2 CONTROLLER VIA ARDUINO MEGA 2560 OVER POINT TO POINT LORA COMMUNICATION</b>			
Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
		√	
	Local		International
	√		
<b>Project Member(s)</b>	AKMAL SAFIY SYAHMI BIN ASPAR MUHAMMAD ALIFF THOHA BIN MOHAMAD FAUZI MUHAMMAD FAWWAZ BIN IBRAHIM		
<b>Affiliation</b>	MARA-JAPAN INDUSTRIAL INSTITUTE (MJII) BERANANG		
<b>Email</b>	<sup>1</sup> safisyahmi123@gmail.com, <sup>2</sup> muhammadallif84@gmail.com		
<b>Correspondence</b>	AKMAL SAFIY SYAHMI BIN ASPAR MARA Japan Industrial Institute Lot 2333 Jalan Kajang Seremban 43700 beranang selangor Tel: +6011-10747173		
<b>Abstract</b>	<p>Malaysia's population is growing every day, so it is critical to meet the agricultural sector's needs for food modernization. Researchers and developers created a variety of strategies to guarantee enough food production for human population as food has become important in our lives. Although crops can be produced with the help of people, the production is inconsistent and is often constrained by human strength and abilities. This is where technology steps in to support people. The technology of today has produced countless tools and pieces of equipment designed to assist farmers in the production of food. The electric wheelbarrow, which is one of the most popular pieces of equipment and is used to transport bulky loads of agricultural product, serves as an illustration.</p> <p>In addition to being able to increase agricultural harvest, this equipment can also help increase crop productivity. The primary purpose of this project is to bring in crops like pineapples. The LoRa protocol idea is used in our endeavor. We also offer a program that will facilitate and improve machining</p>		

	<p>control. This implies that even those who are technologically illiterate can use the device, reducing workloads and boosting output.</p>
<p><b>Keywords</b></p>	<p align="center">NANAS Robot</p>
<p><b>Product description</b></p>	<p>NANAS Robot, the innovative robotic wheelbarrow that makes manual handling a breeze. With its smart design and Lora communication, controlling NANAS Robot is easy and responsive. Effortlessly navigate across various terrains, reducing strain on your part.</p> <p>What sets NANAS Robot apart is its ability to self-lift and unload cargo with a wireless controller. No wires, no hassle, just seamless operation. Lora communication ensures reliable control even over long distances, making NANAS Robot perfect for all kinds of tasks.</p> <p>Whether you're gardening, landscaping, or tackling construction projects, NANAS Robot is your dependable companion. The future of wheelbarrows with NANAS Robot, where smart technology simplifies your work and boosts productivity.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	 

	  <p>The top section of the image contains a flowchart on the left and a green PCB layout on the right. The flowchart starts with 'START', followed by a decision diamond 'Lora module is on?'. If 'Yes', it goes to 'Initialize Parameters', then a loop of 'Lora received?' leading to 'stop', 'move forward', 'rotate back/forward', 'move left', 'move right', 'move forward', 'move backward', 'move left', and 'move right', before reaching 'END'. The PCB layout features a pineapple logo and various electronic components.</p> <p>The middle section contains technical drawings of the robot, including a top view, a plan view, a front view, a rear view, a left view, and a right view, all with dimensions and coordinate axes.</p>
<p><b>Novelty and uniqueness</b></p>	<p>Presenting NANAS Robot, the one-of-a-kind robotic wheelbarrow that blends cutting-edge features with Lora communication for unrivaled performance. This unique marvel showcases effortless movement, self-lifting, and seamless unloading through an intuitive controller powered by Lora technology. With Lora's seamless integration, users experience unparalleled control, enabling NANAS Robot to glide effortlessly and navigate diverse terrains with precision. Gone are the days of manual strain, as NANAS Robot's smart design and advanced Lora communication create an exhilarating user experience. Reliability becomes second nature, even over long distances, making NANAS Robot adaptable to various tasks. Embrace the future of wheelbarrows with NANAS Robot, where innovative robotics and Lora communication unite, transforming manual labor into a streamlined and convenient endeavor. Discover the exceptional blend of practicality and efficiency that only NANAS Robot can provide, a true game-changer in the world of wheelbarrows.</p>

<b>Benefit to mankind</b>	<p>The NANAS Robot project brings natural benefits to mankind by offering increased efficiency, convenience, and safety in manual handling tasks. With its user-friendly design and Lora communication, this innovative robotic wheelbarrow simplifies material transportation, reducing physical strain and saving time. Its versatility caters to various applications, ensuring widespread accessibility and contributing to a safer working environment.</p>
<b>Potential commercialization</b>	<p>With its mechanical design, NANAS is best used to substitute wheelbarrow in moving pineapples around the plantation parameter remotely. Ideally, it complements workers in streamlining the harvesting process by collecting them in piles of several at a time. Additionally, only minor modifications will be necessary to be used for other similarly heavy fruits such as coconuts and durians.</p>
<b>Acknowledgment</b>	<p>Project leader in contact with a lot of researchers, academicians, and practitioners as I prepare this project. They have helped him to understand and think more clearly. He especially like to thank our principal project supervisor, Mr. Mohd Khairil Helmi Bin Tarmizi, for his support, direction, criticism, and friendship. He also grateful to Mr. Ja'aris Bin Samsudin, our department's head of robotics and automation, for his direction, counsel, and inspiration.</p> <p>Project leader also owe MARA Japan Industrial Institute money for paying diploma fees, monthly stipend, and a small portion of the costs associated with our project.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Akmal Safiy Syahmi bin Aspar is a student who is currently undertaking his diploma study under MARA-Japan Industrial Institute, Beranang. He is now pursue his study in electronic engineering under robotic and automation. Currently he is taking internship at Multicode Electronic, Johor. He was awarded as best presenter in MJII Innovation Project Expo.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Muhammad Aliff Thoha bin Mohamad Fauzi is a student who is currently undertaking his diploma study under MARA-Japan Industrial Institute, Beranang. He is now pursue his study in electronic engineering under robotic and automation.</p> </div> </div> </div>



	 <p>Muhammad Fawwaz bin Ibrahim is a student who is currently undertaking his diploma study under MARA-Japan Industrial Institute, Beranang. He is now pursue his study in electronic engineering under robotic and automation.</p>
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<b>WATER TRANSFER SYSTEM TRAINER USING SIEMENS S7 1200 PLC AND SIMATIC IOT2000 CONTROLLED VIA DESKTOP &amp; ANDROID DASHBOARD</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
	/		
	<b>Local</b>		<b>International</b>
	/		
<b>Project Member(s)</b>	Mohd Ismail Bin Jusoh, Muhammad Faiz Ridzuan Bin Mohamad, Wan Nur Ezzah Binti Wan Atzwa, Nur Irdiena Natasya Binti Barni.		
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<b>Correspondence</b>	Wan Nur Ezzah Binti Wan Atzwa Jabatan Robotik dan Automasi, Kejuruteraan Elektronik, MARA Japan Industrial Institute, Jalan Kajang-Seremban, 43700 Beranang, Selangor, Malaysia. Tel: +6011-13171688		
<b>Abstract</b>	The Water Transfer System Trainer is an innovative project aiming to revolutionize PLC education in Technical and Vocational Education and Training (TVET). Integrating Programmable Logic Controller (PLC) and Internet of Things (IoT) technologies, this trainer enables hands-on learning through a water flow control system. With cost-effectiveness, remote monitoring via a smartphone interface, and a focus on industry-relevant skills, the project equips students with practical knowledge for the demands of Industry 4.0. Its potential commercialization offers opportunities for educational institutions, training centers, and automation companies, contributing to a skilled workforce and technological progress.		
<b>Keywords</b>	Water Transfer Trainer, PLC, Siemens.		

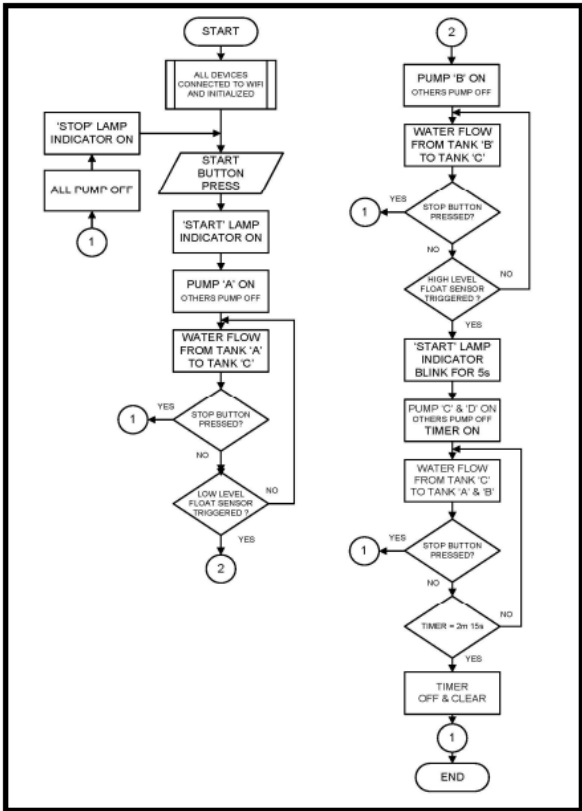
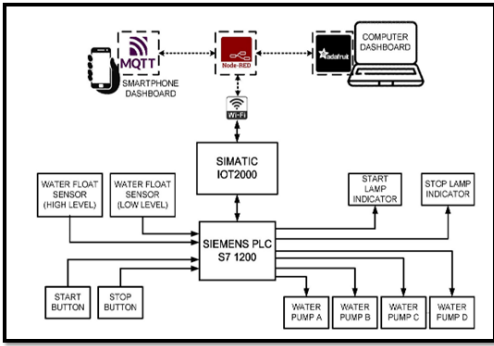
<p><b>Product description</b></p>	<p>The Water Transfer System Trainer is a practical and educational tool designed to provide hands-on experience in working with Programmable Logic Controllers (PLC) and Internet of Things (IoT) technologies. This trainer is specifically tailored for Technical and Vocational Education and Training (TVET) centers and educational institutions to enhance the teaching and learning of automation technologies in line with Industry 4.0.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	<div style="text-align: center;">  <p><b>Figure 1: FLOWCHART OF THE PROJECT</b></p>  <p><b>Figure 2: Block Diagram of How the Project Works</b></p> </div>



Figure 3: The Project



Figure 4: PLC that used in the project



**Novelty and uniqueness**

Integration of PLC and IoT: The trainer combines two cutting-edge technologies, Programmable Logic Controllers (PLC) and Internet of Things (IoT). This integration allows students to learn how to control and monitor the water flow system using both PLC programming and IoT connectivity, which is a rare combination in traditional training setups.

	<p><b>Real-world Simulation:</b> The trainer provides a practical learning experience by simulating a real-world water flow control system. Students can work with physical tanks and water flow mechanisms, gaining hands-on experience in a controlled and safe environment.</p> <p><b>Smartphone Monitoring Interface:</b> The development of a smartphone-based monitoring interface using MQTT dashboard via the Simatic IOT2000 PLC enables remote monitoring and control of the water transfer system. This feature is not commonly found in conventional PLC trainers, making the system more user-friendly and accessible.</p> <p><b>Cost-effectiveness:</b> By designing the trainer in-house and incorporating cost-effective materials like acrylic sheets for the tanks, the system offers a more budget-friendly alternative compared to outsourcing PLC training or using expensive industrial-grade equipment.</p> <p><b>Emphasis on Industry 4.0 Skills:</b> With the focus on Industry 4.0 and IoT technologies, the trainer prepares students to adapt to the demands of modern industries in Malaysia and beyond. The inclusion of IoT components in the training aligns with the current industry trends, making graduates more job ready.</p> <p><b>Limited IoT Feeds:</b> While the system incorporates IoT capabilities, the limitation of only 10 I/O (Input/Output) for the IoT stream challenges students to optimize their designs and consider resource constraints, fostering creativity and problem-solving skills.</p>
<b>Benefit to mankind</b>	<p><b>Enhanced Technical Education:</b> The project aims to improve the quality of Technical and Vocational Education and Training (TVET) by providing students with hands-on experience in working with advanced automation technologies like PLC and IoT. This equips them with practical skills and knowledge, making them better prepared for careers in the rapidly evolving industrial landscape.</p> <p><b>Cost-Effective Training:</b> By developing an in-house water transfer system trainer, the project reduces the reliance on expensive outsourcing for PLC training. This cost-effectiveness allows TVET centers and educational institutions to allocate resources more efficiently, making education accessible to a broader range of students.</p> <p><b>Industry-Relevant Skills:</b> As the project aligns with Industry 4.0 and the widespread adoption of IoT in various industries, students who undergo training on the Water Transfer System Trainer gain skills that are directly relevant to the demands of the modern job market. This increases their employability and contribution to the workforce.</p>

	<p><b>Sustainable Learning:</b> The limited IoT feeds and the focus on efficiency in the project's scope promote a sustainable approach to learning and resource management. Students learn to optimize processes and utilize technology responsibly, contributing to environmentally friendly practices in the industry.</p> <p><b>Technological Innovation:</b> The integration of PLC and IoT technologies within the water transfer system represents a novel and innovative approach to training. By fostering technological advancements at the educational level, the project contributes to the overall growth and progress of automation technologies in society.</p> <p><b>Empowering Future Innovators:</b> The project encourages students to think critically and creatively in designing, building, and controlling the water transfer system. This empowerment of young minds cultivates a culture of innovation and problem-solving, fostering the next generation of engineers and inventors.</p>
<p><b>Potential commercialization</b></p>	<p><b>Educational Institutions:</b> TVET centers, technical schools, and universities can commercialize the trainer by incorporating it into their curriculum. They can offer specialized courses in PLC and IoT training using the water transfer system trainer, attracting students who seek practical learning experiences in automation technologies.</p> <p><b>Training Centers and Workshops:</b> Specialized training centers and workshops that focus on industrial automation and skill development can use the water transfer system trainer to offer short-term training programs to industry professionals. This commercialization can create revenue streams for these centers and cater to the continuous demand for upskilling among the industrial workforces.</p> <p><b>Industrial Automation Companies:</b> Companies involved in the manufacturing and distribution of PLCs, IoT devices, and automation components can explore commercial partnerships with the project team. They could provide support in terms of hardware, software, or expertise in automation technologies, leading to joint commercial ventures.</p>
<p><b>Acknowledgment</b></p>	<p>We would like to express our heartfelt gratitude to all individuals and organizations who have contributed to the successful development of the Water Transfer System Trainer. Their unwavering support and encouragement have been invaluable throughout this project journey.</p> <p>Special thanks go to our mentors and supervisors, Ja'aris Bin Samsudin and Mohd Ismail Jusoh, for their expert guidance, insightful suggestions, and</p>



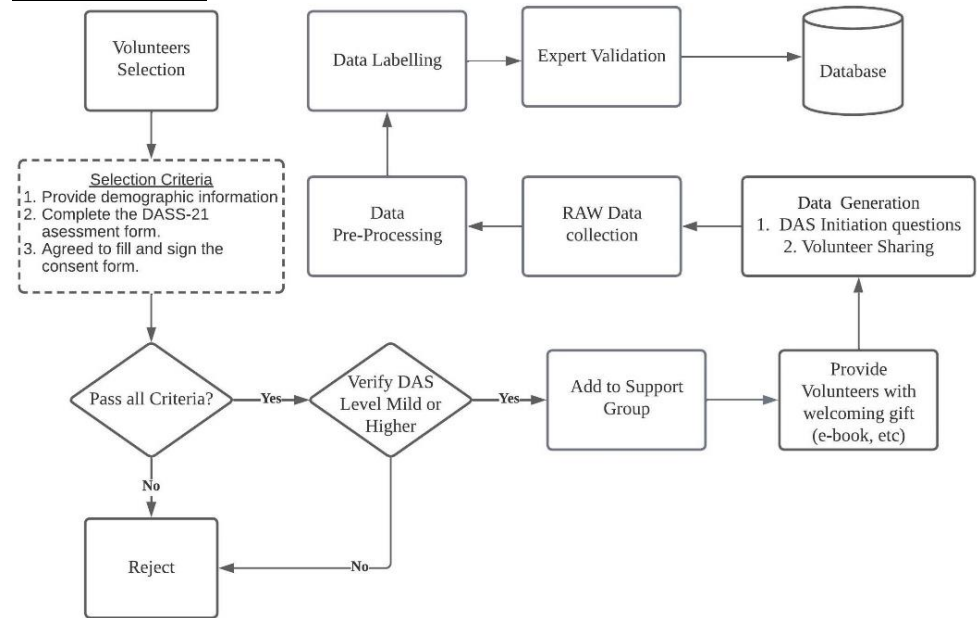
	<p>continuous motivation. Their expertise in the field of automation and PLC technologies has been instrumental in shaping the direction of this project.</p> <p>We extend our appreciation to MARA Japan Industrial Institute, Beranang for providing us with the necessary resources, laboratory facilities, and access to equipment. Their support has been crucial in the realization of this trainer.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div data-bbox="518 520 751 793">  </div> <div data-bbox="776 527 1489 667"> <p>Wan Nur Ezzah Binti Wan Atzwa is a student who is currently undertaking Diploma study program under Department of Electronics Engineering, MARA Japan Industrial Institute, Beranang.</p> </div> <div data-bbox="518 829 751 1117">  </div> <div data-bbox="776 835 1489 976"> <p>Nur Irdiena Natasya Binti Barni a student who is currently undertaking Diploma study program under Department of Electronics Engineering, MARA Japan Industrial Institute, Beranang.</p> </div> </div>

<b>MAYA (MENTAL HEALTH ASSISTANCE FOR YOU ALWAYS) V1 - THE NATURAL LANGUAGE PROCESSING MODEL.</b>			
<b>Category</b>	<b>A School (Primary &amp; Secondary)</b>	<b>B Technical Institutional Students</b>	<b>C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
<b>Project Member(s)</b>	Zaaba Ahmad <sup>1</sup> , Ruhaila Maskat <sup>2</sup> , Azlinah Mohamed <sup>3</sup> , Rozanizam Zakaria <sup>4</sup> , Ramli Musa <sup>4</sup> .		
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<b>Correspondence</b>	Zaaba Ahmad College of Computing, Informatics and Mathematics, Universiti Teknologi MARA, Cawangan Perak Kampus Tapah, Perak, Malaysia. Tel: 0172988287		
<b>Abstract</b>	MAYA V1 is an advanced NLP-powered language model suitable for diagnosing mental health conditions in Malay. It utilizes Bidirectional Encoder Representations from Transformers (BERT), adapting NLP for non-English datasets. At its core, the Domain-Specific Attention Network (DSAN) is tailored for Malay DAS analysis, enhancing the fine-tuned language model's performance. By combining pre-trained Malay embeddings, transformers, and DSAN, MAYA V1 outperforms traditional approaches, achieving an impressive F1-score of 0.86, surpassing Word2Vec's baseline F1-score of 0.67. It aligns with Sustainable Development Goals, enabling accurate and accessible diagnoses for non-English-speaking professionals. MAYA V1's societal impact is profound, supporting early mental health interventions and well-being for the Malay-speaking populace. Its specialized NLP capabilities offer promising commercialization opportunities through collaborations, subscriptions, and		

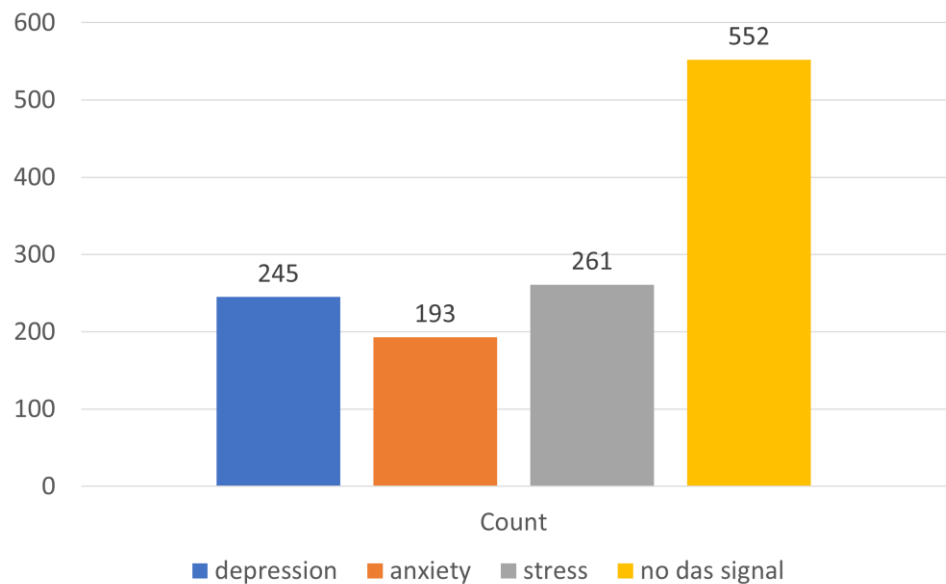
	<p>partnerships with mental health entities. The incorporation of DSAN enriches the deep learning-based mental health diagnosis system, making MAYA V1 a reliable application addressing mental health challenges in Malay-speaking communities.</p>
<b>Keywords</b>	<p>Mental Health, Social Media, Natural Language Processing</p>
<b>Product Description</b>	<p>MAYA V1 is a machine learning-based model that can be used to build a state-of-the-art application for diagnosing mental health conditions in Malay. Powered by Natural Language Processing (NLP), it incorporates advanced transformer architectures like BERT. A standout feature of this application is its Domain-Specific Attention Network (DSAN), developed specifically for the Malay DAS corpus.</p> <p>The DSAN (Domain-Specific Attention Network) architecture is an innovative approach that significantly enhances the performance of the fine-tuned language model in diagnosing mental health conditions in the Malay language. In this approach, the DSAN serves as a feature block that complements and augments the fine-tuned language model to handle better the unique characteristics of the Malay DAS (Diagnosis of Anxiety and Stress) corpus. The baseline architecture forms the model's foundation, which includes an embedding layer with BiLSTM (Bidirectional Long Short-Term Memory) and attention mechanisms followed by dropout and a softmax output layer. This architecture is already an effective NLP model. Still, it may face challenges when dealing with the nuances and complexities of the Malay language and the mental health domain.</p> <p>The DSAN is introduced as an additional feature block to overcome these challenges. The DSAN module incorporates Latent Dirichlet Allocation (LDA) techniques – a probabilistic topic modelling method commonly used in natural language processing – to capture domain-specific information from the Malay DAS corpus. The LDA component of DSAN helps identify latent topics or themes in the mental health data, which can be crucial in understanding the underlying patterns and context of anxiety and stress in the Malay language. These latent topics serve as a valuable source of information that complements the word embeddings and helps the model gain a deeper understanding of mental health-related texts.</p> <p>The combination of DSAN with the fine-tuned language model creates a hybrid architecture that leverages both the powerful language representation capabilities of the fine-tuned model and the domain-specific insights provided by the DSAN. This synergy enables the model to capture and process important context-specific information, leading to more accurate and contextually relevant mental health diagnoses in Malay.</p>

**Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.**

Data collection

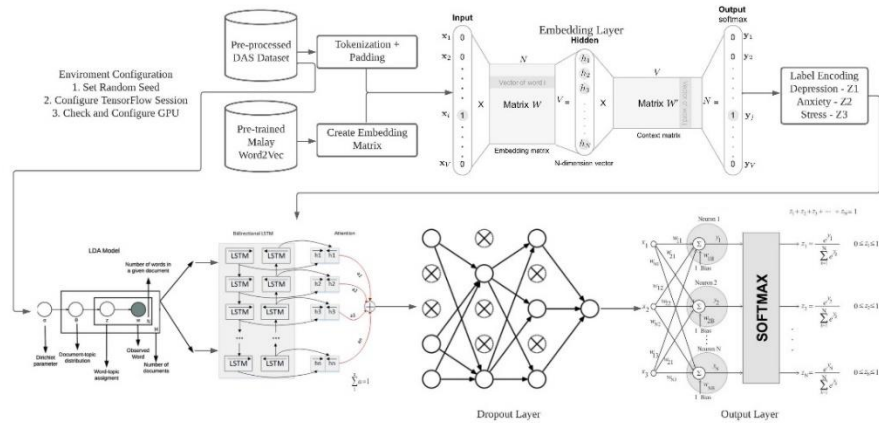


The Data

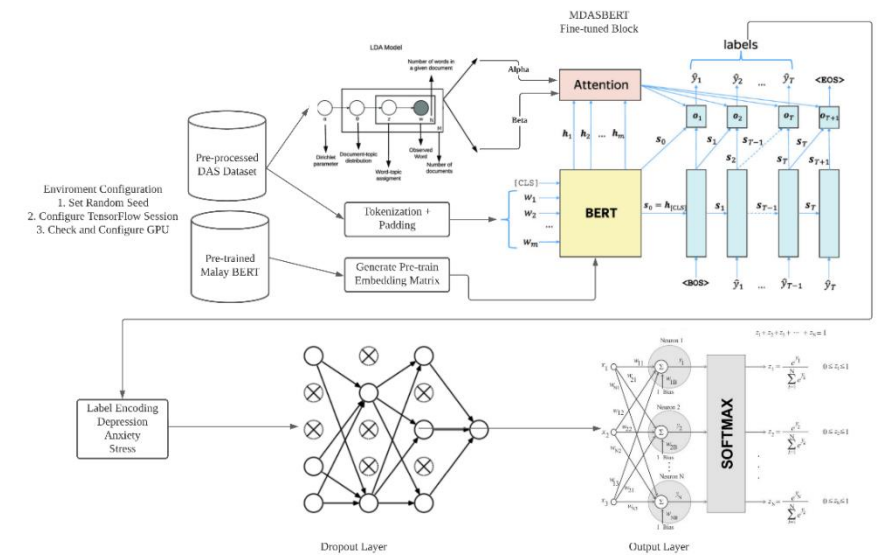


MAYA V1 Fine Tune Language Model Via Domain Specific Attention Network Architecture For Depression, Anxiety and Stress Detection

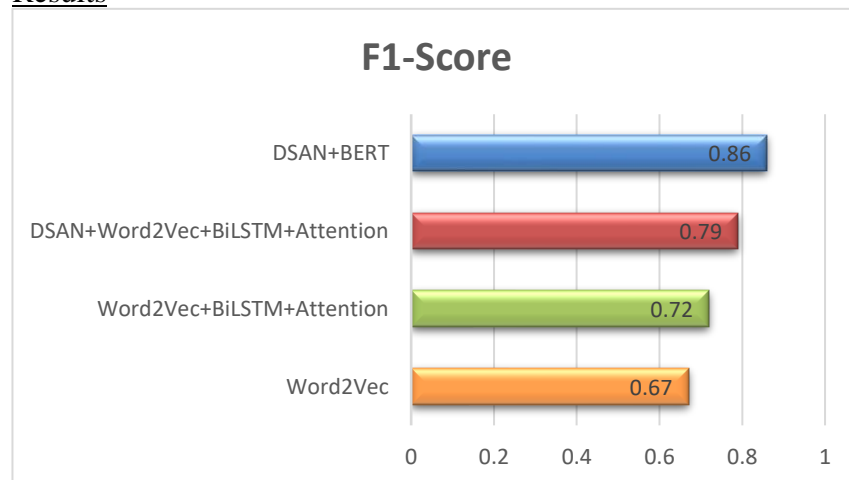
### DSAN+Word2Vec+BiLSTM+Attention



### DSAN+ Bidirectional Encoder Representations from Transformers (BERT)





### Results



<b>Novelty and uniqueness</b>	<p>Domain-Specific Attention Network (DSAN): MAYA V1 incorporates the a specialised architecture explicitly crafted for the Malay DAS corpus. This DSAN feature block enhances the performance of the fine-tuned language model by capturing domain-specific insights and context in mental health-related texts in Malay. The DSAN allows MAYA V1 to better understand the unique linguistic characteristics and nuances of the Malay language in the context of mental health.</p> <p>Adaptation for Non-English Datasets: While many NLP models are primarily designed and trained for English datasets, MAYA V1 is uniquely tailored to address the challenges of non-English datasets, mainly Malay. It employs advanced transformer architectures like BERT, which allow it to adapt and excel in the complexities of the Malay language.</p> <p>Precise Mental Health Diagnoses: By combining pre-trained Malay embeddings with transformers and DSAN, MAYA V1 outperforms traditional approaches, delivering exact mental health diagnoses in Malay. Its remarkable F1-score of 0.86 in the recent evaluation highlights its superiority over conventional methods, providing accurate assessments of mental health conditions for the Malay-speaking population.</p>
<b>Benefit to mankind</b>	<p>Societal Impact and Sustainable Development Goals: MAYA V1 aligns with the Sustainable Development Goals focus on health and well-being. Its societal impact is profound, as it promotes early mental health interventions and combats associated stigmas, ultimately uplifting the well-being of the Malay-speaking populace.</p> <p>Specialized Tool for Non-English Professionals: MAYA V1 is a distinctive asset for professionals working in non-English settings. Its capability to facilitate accurate and accessible diagnosis in Malay empowers mental health practitioners to serve the Malay-speaking community with precision and cultural relevance.</p>
<b>Potential commercialisation</b>	<p>Collaborations with Healthcare Institutions: MAYA V1 can form strategic partnerships with healthcare institutions, mental health clinics, and hospitals. By integrating its cutting-edge diagnostic capabilities into its existing systems, these institutions can enhance their mental health assessment services for Malay-speaking patients.</p> <p>Subscription-Based Model for Professionals: MAYA V1 can adopt a subscription-based model targeting mental health professionals, counsellors, and therapists. Subscribing to the platform would grant professionals access to advanced NLP tools and resources, empowering them to provide more accurate and culturally relevant mental health diagnoses in Malay.</p>



	<p>Partnerships with Mental Health Platforms: MAYA V1 can establish partnerships with existing mental health platforms and applications. By integrating its sophisticated NLP capabilities into these platforms, MAYA V1 can bolster its diagnostic services for Malay-speaking users, enhancing the overall user experience.</p> <p>Consulting and Customisation Services: MAYA V1 can offer consulting and customisation services to mental health organisations and businesses. Tailoring the platform to meet clients' needs and requirements can be attractive for entities looking to leverage advanced NLP technology in the mental health domain. Customisation can involve adapting the DSAN architecture for specific domains or tailoring the platform to different regional variations of the Malay language.</p> <p>Research Collaborations and Data Partnerships: Collaborating with academic institutions and research organizations can offer additional commercialization avenues for MAYA V1. By engaging in research projects and data partnerships, MAYA V1 can further refine its capabilities, staying at the forefront of NLP advancements in mental health diagnosis.</p>
<b>Acknowledgement</b>	<p>We are incredibly grateful to all the participants and members of our research group who took the time to provide constructive feedback and valuable suggestions for improving the research. A special note to our linguist expert, PM Dr. Norizah, for contributing to the linguistic validation part of the work. The Malaysian government is funding this research through the Fundamental Research Grant Scheme (FRGS) at Universiti Teknologi MARA (UiTM) Shah Alam, Malaysia (FRGS/1/2019/SS05/UITM/02/5).</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Ts. Zaaba Ahmad is a student pursuing a PhD program at the College of Computing, Informatics, and Mathematics, Universiti Teknologi MARA. He has been awarded a prestigious scholarship by the Ministry of Higher Education of Malaysia to further his studies in Artificial Intelligence. He holds a Master of Science in Computer Science from Universiti Sains Malaysia. Before his academic pursuits, he was a lecturer at UiTM Cawangan Perak Kampus Tapah and an engineer at Intel, where he gained valuable industry experience.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Dr. Ruhaila Maskat is a Senior Lecturer at the College of Computing, Informatics, and Mathematics, Universiti Teknologi MARA. She obtained her PhD from the University of Manchester, UK. Additionally, she holds certifications as an EMCDSA (EMC Data Science Associate), RapidMiner certified professional,</p> </div> </div> </div>

and a Kaggle BIPOC grantee. Her extensive research focuses on various domains, including Data Science, Text Analytics, Data space, and Data Integration. With her expertise in these areas, Dr. Ruhaila is at the forefront of cutting-edge advancements in the field.



Prof. Dr. Azlinah Mohamed was previously a Senior Lecturer at the College of Computing, Informatics, and Mathematics, Universiti Teknologi MARA and now serves as a consultant to the industry. She earned her Ph.D. from Universiti Kebangsaan Malaysia. Her extensive research spans various domains, including Artificial Intelligence, Big Data Analytics, and Decision Support Systems. With her profound expertise in these areas, Prof. Azlinah leads the way in pioneering cutting-edge advancements.




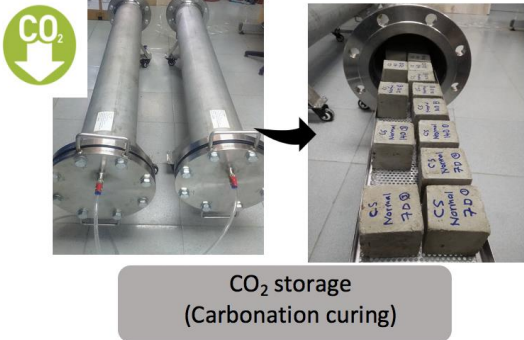
Prof. Dr. Ramli Musa joined International Islamic University Malaysia (IIUM) in 2008 as a senior lecturer and was the HOD of the Department of Psychiatry, Kulliyyah of Medicine IIUM. Prof. Ramli established the Mental Health Information and Research (MaHIR) website, providing a valuable database of translated and validated questionnaires in Bahasa Malaysia. He also actively contributes to various journals as a member of the editorial board, including ASEAN Journal of Psychiatry, Open Journal of Epidemiology, Journal of Community Medicine and Public Health Care, and Journal of Clinical Pathology and Forensic Medicine.



Dr. Rozanizam Zakaria, PM, is a senior lecturer at the International Islamic University Malaysia (IIUM) with expertise in Medical and Health Sciences, specifically Clinical Medicine in Psychiatry. He holds a Master of Medicine (Psychiatry) from Universiti Sains Malaysia (USM). In addition to his academic pursuits, Dr. Nizam is an avid social media influencer and author of best-selling books on Mental Health and well-being. He actively engages in public talks and community support initiatives, focusing on mental health advocacy. Through his online presence and outreach efforts, he aims to raise awareness about mental health and provide valuable support to the community.

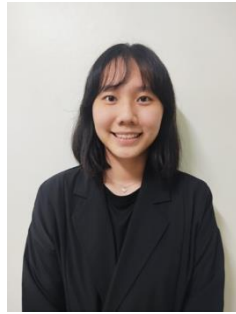
<b>MARBLE WASTE-DERIVED CO<sub>2</sub> CAPTURE PRODUCT AS NATURAL CALCIUM-BASED CARBON SORBENT</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		√	
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	An Hui Teng <sup>1</sup> , Faradiella Mohd Kusin <sup>2</sup> , Nur Fathihah Abu Bakar <sup>1</sup> , Syakirah Khairina Subiyri@Subari <sup>1</sup> , Tang Chi Yi <sup>1</sup>		
<b>Affiliation</b>	<sup>1</sup> Faculty of Forestry and Environment, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia		
<b>Email</b>	<sup>1</sup> faradiella@upm.edu.my		
<b>Correspondence</b>	Faradiella Mohd Kusin Faculty of Forestry and Environment, Universiti Putra Malaysia, 43400 UPM Serdang, Selangor, Malaysia. Tel: +603-97698596, Fax:+603-97696764		
<b>Abstract</b>	<p>Carbon capture and storage (CCS) has become new perspective in reducing CO<sub>2</sub> emissions for revenue generation. This innovation promotes the concept of waste into product via technological approach for environmental sustainability. Carbon capture product (bricks) made of marble waste has been developed as an eco-efficient CO<sub>2</sub> capture product. This innovation has its dual co-benefits; engineering material produced from mining waste and as permanent CO<sub>2</sub> storage product. The novelty resides in the CO<sub>2</sub> capture method via calcium-based minerals and carbonation curing that enables carbon capture and storage during product fabrication. Different proportions of marble waste have been tested for cementitious material production, with a cost reduction of up to 30%. Capacity of CO<sub>2</sub> uptake in bricks has been estimated for long-term carbon storage. This eco-efficient product has met the engineering specifications as green building material that is beneficial to mining and construction industries, environment and society for long-term CO<sub>2</sub> emission reduction.</p>		

<b>Keywords</b>	CO <sub>2</sub> capture, carbon storage, green building material, industrial waste
<b>Product description</b>	<p>This innovation promotes the concept of waste into product through technological approach for environmental sustainability. Carbon capture and storage (CCS) provides a new perspective in reducing CO<sub>2</sub> emissions which can be beneficial in terms of revenue generation. CO<sub>2</sub> utilization is an emerging technology in CCS application. This innovation takes the advantages of its dual co-benefits;</p> <ul style="list-style-type: none"> <li>i) Engineering material produced from industrial waste</li> <li>ii) CO<sub>2</sub> capture product for permanent CO<sub>2</sub> storage</li> </ul> <p>This innovation aims to promote technological approach for CO<sub>2</sub> reduction by means of carbon capture and storage technology and to develop revenue-generating product from mining waste for permanent carbon capture and storage in cementitious material.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	 <p>The diagram illustrates the process of CO<sub>2</sub> capture and storage. It starts with 'Marble waste' (industrial waste) being processed. The process involves 'Carbon Capture' (utilizing CaCO<sub>3</sub> and MgCO<sub>3</sub>) leading to 'Carbon Storage' (CO<sub>2</sub> capture in bricks). A detailed view shows 'CO<sub>2</sub> capture (Mineral carbonation)' using a machine to produce bricks containing CO<sub>2</sub>.</p>

	 <p style="text-align: center;">CO<sub>2</sub> storage (Carbonation curing)</p>
<p><b>Novelty and uniqueness</b></p>	<p>The product has the following uniqueness:</p> <ul style="list-style-type: none"> <li>▪ New material development for permanent CO<sub>2</sub> capture and storage</li> <li>▪ Innovative use of natural calcium-based mineral in marble waste as supplementary cementitious material and as carbonation agent</li> <li>▪ Carbonated material produced via mineral carbonation at low pressure-temperature reactions to reduce energy and operational costs</li> </ul>
<p><b>Benefit to mankind</b></p>	<ul style="list-style-type: none"> <li>▪ Environmental Impact - Reutilization of marble waste as a resource for carbon sequestration in mitigating CO<sub>2</sub> emissions</li> <li>▪ Economic Impact - Green construction material produced from waste would reduce the demand for natural resources</li> <li>▪ Social Impact – Material that meets consumers demand for green product as with the increased public concern about climate change</li> <li>▪ Intended users: Mining and construction industry (revenue generation through circular economy, i.e. waste reutilization)</li> <li>▪ Society: Availability of green and sustainable products &amp; resilient future.</li> </ul>
<p><b>Potential commercialization</b></p>	<ul style="list-style-type: none"> <li>▪ Production of eco-efficient material for building and construction</li> <li>▪ Improved method for carbon capture process using natural calcium-based mineral of marble waste for cementitious material</li> <li>▪ Copyright: Mineral carbonation method for carbon sequestration of mine waste minerals - Filing No: LY2019004475</li> </ul>
<p><b>Acknowledgment</b></p>	<p>The team members acknowledge financial support from the Ministry of Higher Education Malaysia through the Fundamental Research Grant Scheme (FRGS), grant number KPM FRGS/1/2018/TK10/UPM/02/7 (5540081) and Universiti Putra Malaysia IPS Grant Scheme, no 9709500.</p>



**Researchers  
Biographical Data**



An Hui Teng is a student who is currently undertaking her Bachelor study under Bachelor of Environmental Science and Technology program in the Faculty of Forestry and Environment, Universiti Putra Malaysia, Selangor. She is in the third year of the program and is pursuing her Final Year Project.



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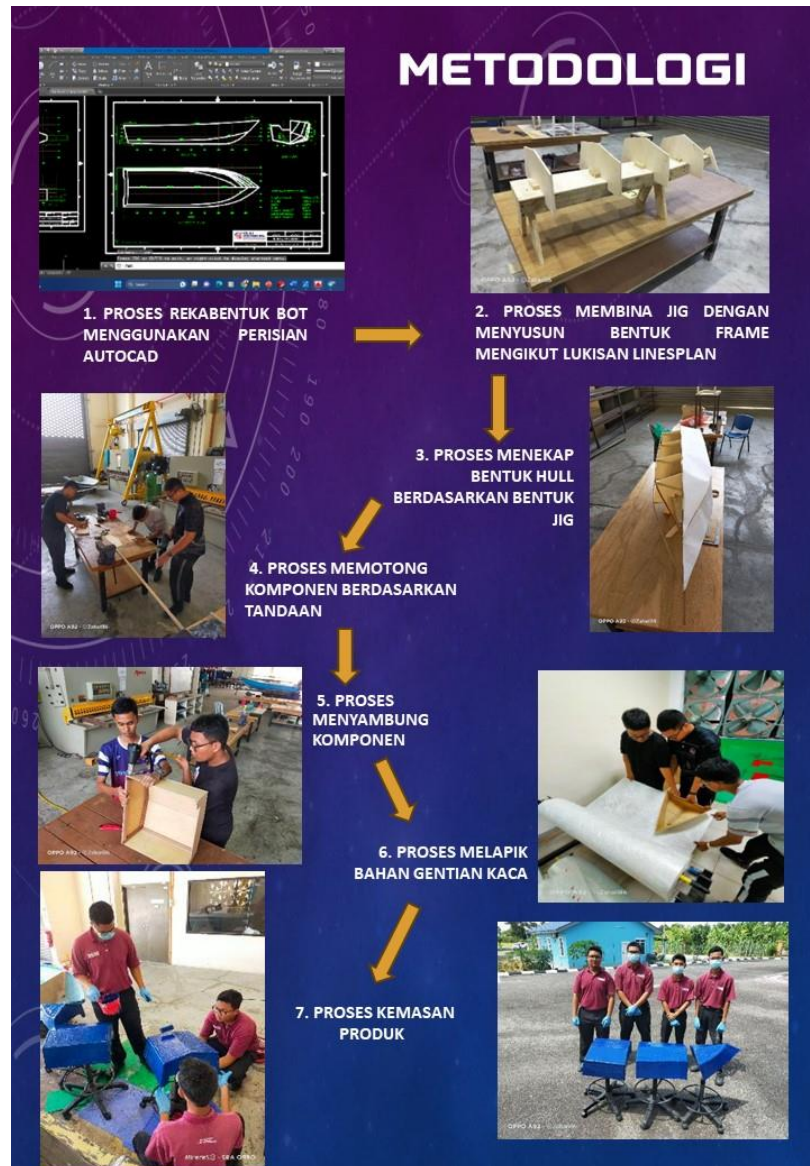


International Innovation, Invention & Design Expo (INoDEX 2023)  
*Project ID: INO\_STE153*

<b>QUICKBOAT</b>				
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector	
			√	
		<b>Local</b>		<b>International</b>
		√		
<b>Project Member(s)</b>	Mohd Zahari bin Sadzali <sup>1</sup> , Muhammad Haidar Hakimi Bin Mohd Hafiz <sup>2</sup> , Muhammad Ammar Naquiddin Bin Bokhree <sup>3</sup> , Muhammad Iskandar Putra Bin Rizaki <sup>4</sup> , Muhammad Danish Bin Kamalrulzaman <sup>5</sup> .			
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<b>Email</b>	<sup>1</sup> zahari86@gmail.com			
<b>Correspondence</b>	Mohd Zahari bin Sadzali Program Teknologi Pembuatan Bot, Kolej Vokasional Pasir Gudang, Jalan Limbungan, Kampung Pasir Putih, 81700 Pasir Gudang, Johor Darul Ta'zim. Tel: +6017-6248894, Fax:+607-2712077			
<b>Abstract</b>	Pembinaan <i>Quickboat</i> menggunakan bahan komposit yang terdiri daripada lapisan papan lapis dan gentian kaca. Bahan ini mudah didapati di pasaran serta mudah untuk dibentuk. Penggunaan bahan yang lasak dan tahan lama adalah sangat penting kerana <i>Quickboat</i> perlu berada dalam keadaan sedia sepanjang masa lebih-lebih lagi ketika musim tengkujuh melanda Malaysia. Proses pembuatan <i>Quickboat</i> bermula daripada proses reka bentuk <i>linesplan</i> bot menggunakan perisian lukisan berbantu komputer, ( <i>computer aided design</i> , CAD), iaitu AutoCAD. Penggunaan perisian AutoCAD mampu memberi gambaran awal mengenai reka bentuk <i>Quickboat</i> yang dibina. Seterusnya proses pembuatan bot dilakukan dengan proses memotong bahan berdasarkan lukisan <i>linesplan</i> , mencantum, melapik komponen dengan bahan gentian kaca serta proses kemas. <i>Hull Quickboat</i> boleh dipisahkan kepada tiga komponen utama dan setiap komponen yang terpisah boleh dimuatkan dalam satu komponen. Ianya bertujuan bagi memudahkan penyimpanan serta mudah dibawa kemana-mana. <i>Quickboat</i> dilengkapi			

	<p>dengan bolt, nat serta pengunci bagi mengukuhkan sambungan setiap komponen. <i>Quickboat</i> mempunyai potensi yang besar untuk dikomersialkan kerana kompak, mudah disimpan, mudah dipasang serta boleh diubah suai mengikut operasi penggunaan. Ianya juga mampu dimiliki kerana kos pengeluarannya adalah rendah. Semoga <i>Quickboat</i> boleh dibekalkan pada setiap keluarga yang berada di kawasan berisiko banjir. Selain itu, dapat membantu mangsa banjir untuk berpindah ke tempat selamat dengan lebih cepat.</p>
<b>Keywords</b>	<p>Bahan komposit, mudah dibentuk, lasak, tahan lama, sedia sepanjang masa, tengkujuh, proses rekabentuk, AutoCAD, boleh dipisahkan, mudah dibawa ke mana-mana, mampu menampung beban, potensi untuk dikomersialkan, kompak, boleh di ubah suai, kos rendah, mampu dimiliki.</p>
<b>Product description</b>	<p><i>Quickboat</i> dibina menggunakan bahan seperti kayu beluti, papan lapis, bahan gentian kaca dan resin. Bahan-bahan ini merupakan bahan yang ringan berbanding membina bot menggunakan logam atau kayu. Prototaip <i>Quickboat</i> dibina dengan saiz 140cm x 46cm x 22cm manakala skala saiz sebenar <i>Quickboat</i> adalah 1:2 iaitu bersamaan 2.8m x 0.92m x 0.44m. Melalui beberapa ujian seperti ujian keapungan, ujian bebanan, ujian rintangan air dan ujian olengan, didapati prototaip <i>Quickboat</i> masih boleh terapung dengan stabil.</p>

Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.






**Novelty and uniqueness**

Keunikan *Quickboat* adalah setiap komponen boleh dilaraikan kepada beberapa komponen dan boleh dimuatkan dalam satu komponen sahaja. *Quickboat* boleh dibawa ke mana-mana apabila dimuatkan di dalam satu komponen. Bentuknya yang kompak menjadikannya mudah disimpan dan dibawa. Selain itu, *Quickboat* juga boleh diubahsuai dengan menambah komponen yang berada di tengah-tengah supaya ianya boleh digunakan untuk menampung penumpang yang lebih ramai. Penggunaan bahan *fiberglass* menambah kekuatan *hull* lalu menjadikannya tahan lasak dan tahan lama. *Quickboat* juga dilengkapi dengan bolt dan nut dimana ianya mudah dan cepat untuk dipasang.

**Benefit to mankind**

Semoga *Quickboat* boleh dibina dalam skala sebenar lalu dapat dibekalkan pada setiap keluarga yang berada di kawasan berisiko banjir. Selain itu, ianya

	<p>dapat membantu mangsa banjir untuk berpindah ke tempat selamat dengan lebih cepat seterusnya mengurangkan jumlah korban banjir yang sering berlaku saban tahun.</p>
<p><b>Potential commercialization</b></p>	<p><i>Quickboat</i> mempunyai potensi yang besar untuk dikomersialkan kerana saiznya yang kompak, mudah disimpan, mudah dipasang serta boleh diubah suai mengikut operasi penggunaan. Proses pembuatannya juga tidak memakan masa yang lama untuk disiapkan. Oleh itu, pengguna tidak perlu menunggu lama untuk mendapatkannya. Selain itu, ianya juga mampu dimiliki kerana kos pengeluarannya adalah rendah.</p>
<p><b>Acknowledgment</b></p>	<p>Jutaan terima kasih diucapkan kepada pihak pengurusan Kolej Vokasional Pasir Gudang yang sentiasa menyokong usaha para pensyarah serta pelajar untuk terus berinovasi. Budaya berinovasi sentiasa diterapkan bagi melahirkan pelajar yang kreatif dan berkemahiran. Para pensyarah sentiasa mencungkil bakat pelajar serta berkongsi idea dalam proses pembuatan <i>Quickboat</i>. Ucapan terima kasih juga diberikan kepada Bengkel Teknologi Pembuatan Bot yang membenarkan kami untuk menggunakan bahan, alatan serta alat pengujian yang terdapat di dalam bengkel. Dengan kelengkapan yang lengkap, kami dapat menghasilkan prototaip <i>Quickboat</i> yang berkualiti dan terbukti fungsinya. Tidak lupa juga ucapan terima kasih kepada ahli keluarga, sanak saudara dan rakan-rakan yang sentiasa memberi semangat dalam menyiapkan projek ini.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 20px;">  <p>Encik Mohd Zahari bin Sadzali merupakan pensyarah Program Teknologi Pembuatan Bot Kolej Vokasional Pasir Gudang. Beliau berpengalaman mengajar Program Teknologi Pembuatan Bot selama 4 tahun dan telah bekerja di industri selama 5 tahun sebagai Jurutera Rekabentuk. Beliau merupakan pemegang Ijazah Sarjana Muda Kejuruteraan Mekanikal - Teknologi Marin dari Universiti Teknologi Malaysia.</p> </div> <div style="margin-bottom: 20px;">  <p>Muhammad Danish Bin Kamalrulzaman merupakan pelajar Sijil Vokasional Malaysia (SVM) Kursus Teknologi Pembuatan Bot di Kolej Vokasional Pasir Gudang yang berada di tahun 2 semester 3 berkemahiran dalam bidang Lukisan Teknik, Linesplan dan Lofting, pengukuran bot, pembinaan bot serta pembuatan bot jenis fiberglass.</p> </div> <div> <p>Muhammad Ammar Naquiuddin Bin Bokhree merupakan pelajar Sijil Vokasional Malaysia (SVM)</p> </div> </div>

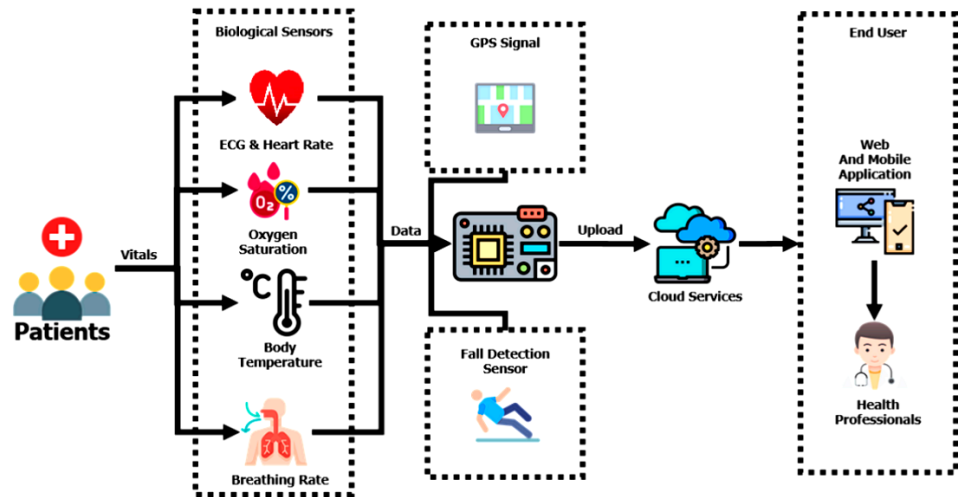
		<p>Kursus Teknologi Pembuatan Bot di Kolej Vokasional Pasir Gudang yang berada di tahun 2 semester 3 berkemahiran dalam bidang Lukisan Teknik, Linesplan dan Lofting, pengukuran bot, pembinaan bot serta pembuatan bot jenis fiberglass.</p>
		<p>Muhammad Iskandar Putra Bin Rizaki merupakan pelajar Sijil Vokasional Malaysia (SVM) Kursus Teknologi Pembuatan Bot di Kolej Vokasional Pasir Gudang yang berada di tahun 2 semester 3 berkemahiran dalam bidang Lukisan Teknik, Linesplan dan Lofting, pengukuran bot, pembinaan bot serta pembuatan bot jenis fiberglass.</p>
		<p>Muhammad Haidar Hakimi Bin Mohd Hafiz merupakan pelajar Sijil Vokasional Malaysia (SVM) Kursus Teknologi Pembuatan Bot di Kolej Vokasional Pasir Gudang yang berada di tahun 2 semester 3 berkemahiran dalam bidang Lukisan Teknik, Linesplan dan Lofting, pengukuran bot, pembinaan bot serta pembuatan bot jenis fiberglass.</p>



<b>IoMT: FALL DETECTION &amp; HEALTH MONITORING SYSTEM</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		√	
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	<sup>1</sup> Raymond Chiam Heng Liang, <sup>2</sup> Wong Guang Xing, <sup>3</sup> Nurul Aimuni Bahiah Binti Selamat, <sup>4</sup> Yew Hoe Tung.		
<b>Affiliation</b>	Faculty of Engineering, Universiti Malaysia Sabah, Kota Kinabalu, Sabah, Malaysia		
<b>Email</b>	<sup>1</sup> bk19110401@student.ums.edu.my, <sup>2</sup> wgxwong98@gmail.com, <sup>3</sup> nurul_aimuni_bk20@iluv.ums.edu.my, <sup>4</sup> htyew@ums.edu.my		
<b>Correspondence</b>	Yew Hoe Tung Faculty of Engineering, Universiti Malaysia Sabah, Kota Kinabalu, Sabah, Malaysia		
<b>Abstract</b>	The lack of supervision in home quarantine processes and deficiencies, such as limited vital assessment and no Internet of Things (IoT) integrated into existing healthcare monitoring devices, were factors in brought-in-dead (BID) cases during the Covid-19 endemic in Malaysia. This research aims to develop an IoMT based fall detection and health monitoring system that monitors vital signs and fall accidents. The proposed system generates alert messages with GPS location when an abnormal vital value or fall is detected. The system is equipped with e-health sensors, triaxial accelerometers, and a GPS module. The collected data are transmitted to an IoT platform via Wi-Fi communication using a message queueing telemetry transport (MQTT) protocol for further processing and analysis. Web and mobile applications are developed for visualizing and receiving alert messages. The performance of the proposed system is benchmarked with the medical devices in the market. The average accuracies of measuring oxygen saturation (SpO <sub>2</sub> ), heart rate, body temperature, and respiratory rate are 98.83%, 98.12%, 98.88%, and 97.61%, respectively. The accuracy, sensitivity, and specificity of fall detection are 95%, 94%, and 96%. The system is a viable solution enabling medical professionals to perform in-time treatment during emergencies and mitigate BID cases and fall problems. Apart from Covid-19, the proposed IoMT system also can be used to monitor patients remotely,		

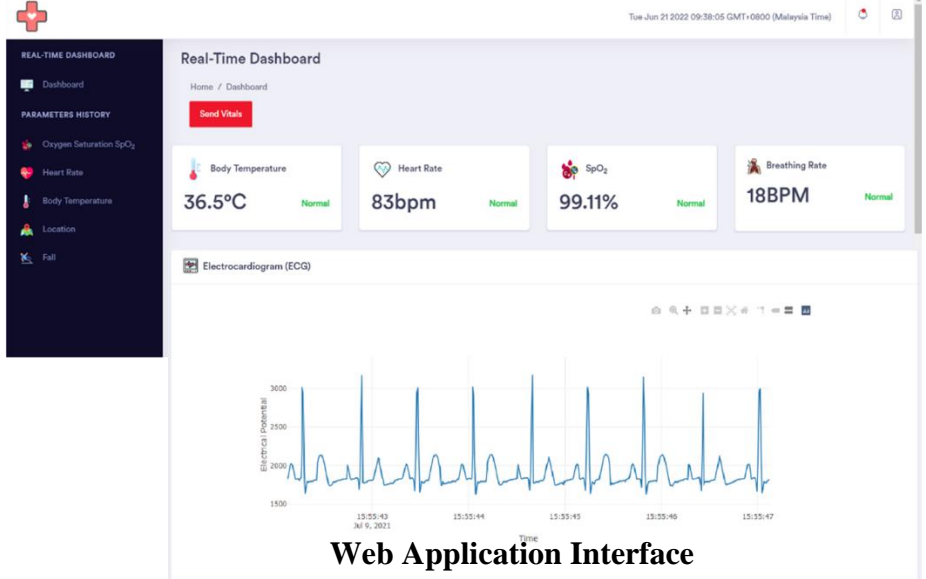
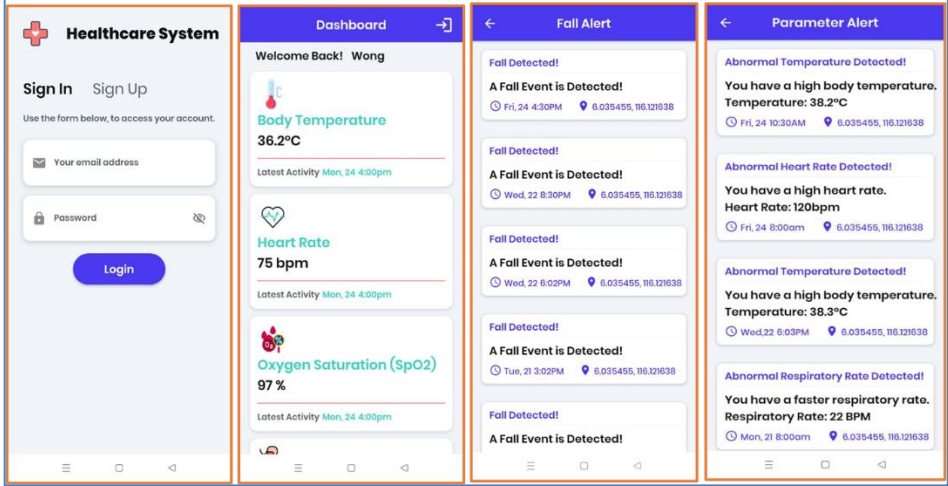
	especially those with comorbidities. It provides personalized, proactive, and patient-centric care, leading to better health outcomes, lower costs, and improved quality of life for patients.
<b>Keywords</b>	IoT, healthcare monitoring system, COVID-19, fall detection, IoMT.
<b>Product description</b>	<p>                     The proposed system consists of four biomedical sensors including a pulse oximeter sensor (MAX30102) to measure the SpO2 and heart rate, ECG sensor (AD8232), wearable respiratory sensor to read the breathing rate and contactless body temperature sensor (MLX90614), and an accelerometer and gyroscope sensor (MPU6050) for detecting fall accidents. The microcontroller packs the collected data in the format of JavaScript Object Notation (JSON) and transmits to the cloud database for storage and analysis via Wi-Fi communication using Message Queueing Telemetry Transport (MQTT) protocol. Patients and doctors can view the real-time or recorded data through web and mobile applications. Any of the sensed parameters are not within the normal ranges; an automated alert message will be generated to notify healthcare professionals and users. The system is equipped with a GPS receiver to track the patient's real-time location during an emergency so that health professionals can respond swiftly and provide appropriate treatment.                 </p> <div data-bbox="776 968 1203 1346" data-label="Image"> </div>





Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.



Proposed IoMT System Architecture.

Physiological Parameters	Alert Threshold
Body Temperature	> 37.9°C
Heart Rate	≤ 50 BPM or ≥ 100 BPM
SpO <sub>2</sub>	≤ 95%
Respiratory Rate	≥20 breaths per minute
Fall Parameters	Threshold
Acceleration	≥ 2.43g
Angular Velocity	≥ 231°/s

	 <p align="center"><b>Web Application Interface</b></p>
	 <p align="center">(a)                      (b)                      (c)                      (d)</p> <p align="center"><b>Mobile Application Interface: (a) Authentication (b) Real-Time Monitoring (c) Fall Detection Alert Message (d) Parameter Alert Message</b></p>
<p><b>Novelty and uniqueness</b></p>	<p>Many healthcare monitoring systems that use IoT technology have been developed. However, most healthcare monitoring systems only measure limited physiological parameters. Furthermore, some systems have no fall detection, location tracking and alert functions. In this work, we proposed an IoMT system that provides five real-time physiological parameters (body temperature, electrocardiogram (ECG), oxygen saturation (SpO<sub>2</sub>), heart rate, and respiratory rate) monitoring, fall detection, location tracking, and alert functions.</p>
<p><b>Benefit to mankind</b></p>	<p>Healthcare workers can monitor patients remotely with greater ease while reducing their exposure time to the pathogen and also optimize the patient</p>

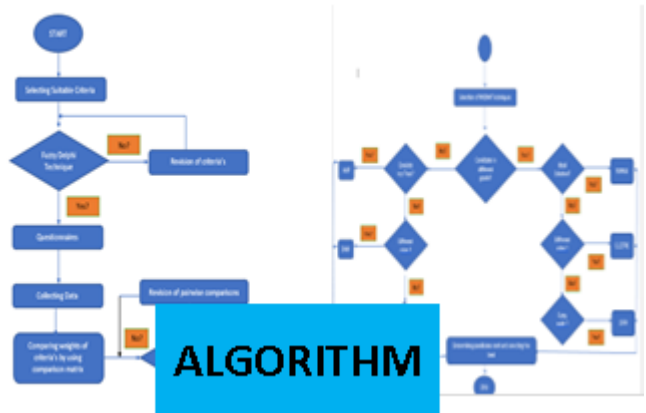
	<p>monitoring through the alert system by providing medical attention on more critical patients first. The real-time location tracking function allows health professionals to respond swiftly and provide appropriate treatment during emergency to avoid the BID cases.</p>
<p><b>Potential commercialization</b></p>	<p>The proposed system plays an important role in the healthcare industry. It can be used by hospitals to provide remotely healthcare to improve the nation healthcare quality especially rural areas.</p>
<p><b>Acknowledgment</b></p>	<p>This research was funded by Ministry of Higher Education Malaysia, Fundamental Research Grant Scheme, grant number FRGS/1/2020/TK0/UMS/02/2, and grants SGI0138-2020 from Universiti Malaysia Sabah.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div data-bbox="521 688 750 997">  <p>Raymond Chiam Heng Liang is a student who is currently undertaking his undergraduate program under Faculty of Engineering at Universiti Malaysia Sabah. He is currently studying Electronic (Computer) Engineering.</p> </div> <div data-bbox="521 1012 750 1285">  <p>Nurul Aimuni Bahiah Binti Selamat is a student who is currently undertaking her undergraduate program under Faculty of Engineering, Universiti Malaysia Sabah. She was awarded a scholarship by Yayasan Telekom Malaysia to pursue her study in Electronic (Computer) Engineering.</p> </div> <div data-bbox="521 1299 750 1535">  <p>Yew Hoe Tung is a lecturer under Faculty of Engineering, Universiti Malaysia Sabah. He obtained his PhD in Biomedical Engineering at Universiti Teknologi Malaysia.</p> </div> <div data-bbox="521 1549 750 1816">  <p>Wong Guang Xing graduated with a Bachelor's degree in Electronic Engineering (Computer) under Faculty of Engineering, Universiti Malaysia Sabah, Kota Kinabalu. Currently, he is working at Greatch Integration Sdn. Bhd. as a Electrical Design Engineer.</p> </div> </div>

## DEVELOPMENT OF MC-TKAF FRAMEWORK FOR ACADEMIC LEADER MANAGER (ALM) ROLES SELECTION USING MULTI CRITERIA DECISION MAKING APPROACH


Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
		√	
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Yau'Mee Hayati Hj Mohamed Yusof <sup>1</sup> , Awanis Romli <sup>1</sup>		
<b>Affiliation</b>	<sup>1</sup> Faculty of Computing, Universiti Malaysia Pahang Al-Sultan Abdullah, Pekan, Pahang, Malaysia		
<b>Email</b>	<sup>1</sup> yaume555@uitm.edu.my, <sup>1</sup> awanis@ump.edu.my		
<b>Correspondence</b>	Yau'Mee Hayati Hj Mohamed Yusof Faculty of Computing Universiti Malaysia Pahang Al-Sultan Abdullah 26600 Pekan, Pahang ,MALAYSIA		
<b>Abstract</b>	<p>This project describes the creation of a novel MC-TKAF selection framework for Academic Leader Managers (ALMs) in educational institutions. Effective leadership in academic settings has become increasingly important in today's dynamic educational environment. Nevertheless, traditional selection methods for ALMs frequently need more objectivity and may correlate with the role's diverse requirements. The MC-TKAF framework incorporates a multi-criteria decision-making approach that integrates multiple dimensions and critical performance indicators, allowing stakeholders to holistically evaluate ALM candidates during talent development intervention programme. The framework incorporates the strengths of multiple decision-making methodologies, such as the AHP, TOPSIS, ELECTRE, WPM, and SAW, to improve the accuracy and robustness of the selection procedure. This project evaluates and incorporates candidates's tacit knowledge competence into the MC-TKAF framework that the candidates acquire through talent development intervention programmes, including efficacy and expertise. By employing this comprehensive strategy, the decision-making process is less susceptible to bias and provides a more transparent assessment of candidates. The project emphasizes the benefits of MC-TKAF over conventional selection methods</p>		








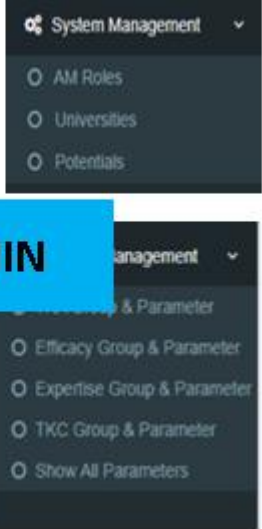
**ALGORITHM**




**ADMIN**

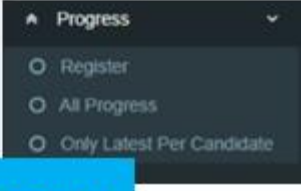



**ADMIN**

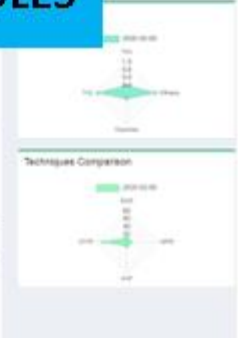





**ALM ROLES**





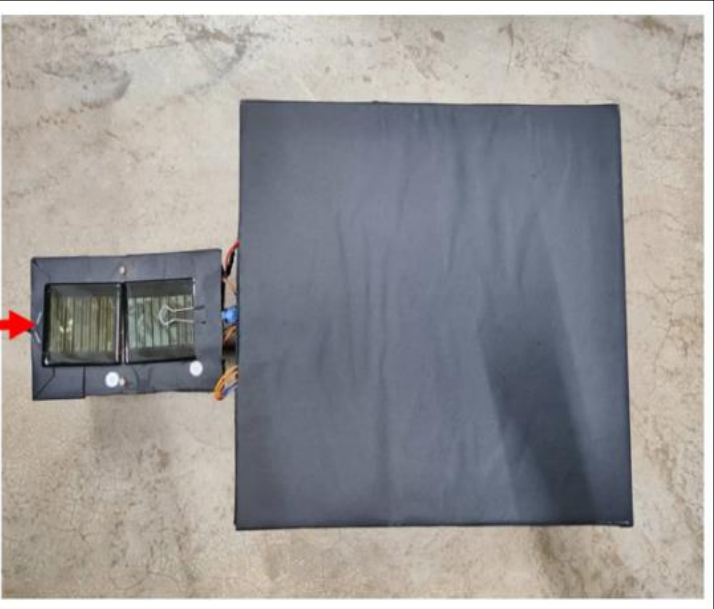


<b>Novelty and uniqueness</b>	<p>A new model developed to determine the criteria's of tacit knowledge acquisition and measure its effect on tacit knowledge competence among academicians during talent development intervention program in Public University. This model help to re-skilling current academicians through talent development intervention program and re-design work processes to reduce the skill mismatch between academic administrator roles and talent among academicians. This model help to maximize cost efficiency for training need analysis for better prediction of talent reallocation and usage among academicians.</p>
<b>Benefit to mankind</b>	<p>There currently needs to research on the utilization of tacit knowledge competence in talent development interventions within the Malaysian higher education system. Implementing talent management strategies can substantially reduce the risk of disregarding potential talents who may be affected by retention issues. As Higher Education Institutions (HEIs) confront the challenges posed by Industrial Revolution 4.0, the adoption of the MC-TKAF framework facilitates more accurate assessments of the effectiveness of talent management.</p>
<b>Potential commercialization</b>	<ol style="list-style-type: none"> <li>1. Educational Institutions Licensing: Offering educational institutions licences for the MC-TKAF framework would enable them to implement a fair and objective ALM selection process. Based on their student population or size, institutions could purchase annual or multi-year licences, making it a scalable and cost-effective solution for both large universities and smaller colleges.</li>   <li>2. Platform for Software as a Service (SaaS): By transforming the MC-TKAF framework into a user-friendly cloud-based SaaS platform, educational institutions would be able to access the utility without an extensive IT infrastructure. The platform could include data entry, analysis, reporting, and candidate evaluation, making it an all-inclusive solution for ALM selection.</li> </ol>
<b>Acknowledgment</b>	<p style="text-align: center;">None</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Yau'Mee Hayati Hj Mohamed Yusof is a student who is currently undertaking her PhD study program under Faculty of Computing, Universiti Malaysia Pahang Al-Sultan Abdullah. She is currently attached as Senior Lecturer in UiTM Cawangan Terengganu. The highest qualification that she obtained is Master of Science in Information Technology from Universiti Teknologi MARA.</p> </div> </div>



Awanis Romli is a Associate Professor from Universiti Malaysia Pahang Al-Sultan Abdullah. She is currently attached to Faculty of Computing, Universiti Malaysia Pahang Al-Sultan Abdullah.

<b>SUSTAINABLE URBAN POULTRY FARMING SYSTEM</b>				
<b>Category</b>	<b>A</b>	<b>B</b>		<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>		<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		√		
	<b>Local</b>		<b>International</b>	
	√			
<b>Project Member(s)</b>	Nuralyafatin Binti Che Hussin <sup>1</sup> , Siti Nursyafiqah Binti Md Isa <sup>2</sup> , Muhammad Luqman Al Hakim bin Rosli <sup>3</sup> , Prof Madya Ir. Dr. Alhan Farhanah Abd Rahim <sup>4</sup> , Dr. Ainorkhilah Mahmood <sup>5</sup> , Siti Hajar Khalid <sup>6</sup>			
<b>Affiliation</b>	<sup>1,2,3,4</sup> Centre for Electrical Engineering Studies, College of Engineering, Universiti Teknologi MARA, Cawangan Pulau Pinang, Malaysia  <sup>5,6</sup> Department of Applied Sciences, Universiti Teknologi MARA, Cawangan Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang, Malaysia.			
<b>Email</b>	<sup>1</sup> nalyafatin@gmail.com , <sup>2</sup> snsyafiqah.mdisa@gmail.com , <sup>3</sup> luqmnalhakim@gmail.com , <sup>4</sup> alhan570@uitm.edu.my <sup>5</sup> ainorkhilah_sp@uitm.edu.my , <sup>6</sup> sitihajar057@uitm.edu.my			
<b>Correspondence</b>	Prof Madya Ir. Dr. Alhan Farhanah Abd Rahim Electrical Engineering Studies, College of Engineering Universiti Teknologi MARA, Cawangan Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang, Malaysia. Tel: +604-3822565, Fax:+604-3822819			
<b>Abstract</b>	The Automatic Solar Tracker and Air Quality Detector for Sustainable Urban Poultry Farms is an innovative project revolutionizing poultry management. It integrates an automatic solar tracker, utilizing an LDR sensor and servo motor to efficiently harness solar energy, optimizing power harvesting, and providing a reliable backup supply for the poultry farm. The system also includes a state-of-the-art air quality detector with an MQ-135 sensor, continuously monitoring and displaying ammonia gas levels, enabling effective ventilation control for a healthier chicken environment. The project's uniqueness lies in its advanced solar tracking system, intelligently adjusting the solar panel to maximize energy absorption from high-intensity sunlight throughout the day. Real-time monitoring of ammonia gas levels sets this system apart, offering timely alerts to prevent potential health hazards for the poultry. The socio-economic and socio-			

	<p>environmental impact is profound. By utilizing renewable solar energy and optimizing electricity consumption, it promotes sustainable practices, significantly reducing operational costs for poultry farms. Accurate monitoring and control of harmful gases like ammonia foster improved chicken health and productivity, leading to higher-quality poultry products. It also contributes to environmental preservation by minimizing air pollution and lowering the carbon footprint associated with traditional power sources. Commercialization prospects are highly promising. Poultry farmers can expect reduced electricity expenses, increased profitability, and a competitive edge by adopting this innovative and eco-friendly solution. The global demand for sustainable and efficient agricultural practices further bolsters its potential success in meeting the growing needs of the poultry industry.</p>
<b>Keywords</b>	<p>Automatic Solat Tracker, Air Quality Detector, Poultry Farms, Solar Energy, Ammonia Gas Monitor</p>
<b>Product description</b>	<p>The Automatic Solar Tracker and Air Quality Detector system for poultry farms features a solar panel with a servo motor, automatically adjusting the panel to capture maximum sunlight (0-180 degrees). It converts sunlight to electrical energy using a lipo battery converter and stores it in a Li-ion battery. LED indicators show the battery's charging status. The system includes an air quality detector with an MQ-135 sensor to monitor ammonia gas levels. An LCD displays the ppm value, enabling timely responses. When gas levels exceed safe limits, ventilation fans activate. This innovative product reduces electricity costs, promotes sustainability, and enhances poultry farm management for healthier and more productive environments.</p>
	<p>Figures 1, 2 and 3 show the top, front and back view of the sustainable urban poultry system prototype.</p> <div data-bbox="415 1224 1511 1829" style="border: 1px solid black; padding: 10px;">  <p>The image shows a top-down view of the hardware prototype. On the left, there is a small rectangular control unit with a screen and buttons. A red arrow points from a text box to this unit. To the right of the control unit is a large, dark, rectangular solar panel. The entire assembly is mounted on a light-colored, textured surface.</p> <div data-bbox="423 1503 704 1598" style="border: 1px solid black; padding: 5px; width: fit-content;"> <p><b>Solar Panel:</b> To absorb the solar energy.</p> </div> </div> <p style="text-align: center;">Figure 1: The top overview of the hardware prototype.</p>



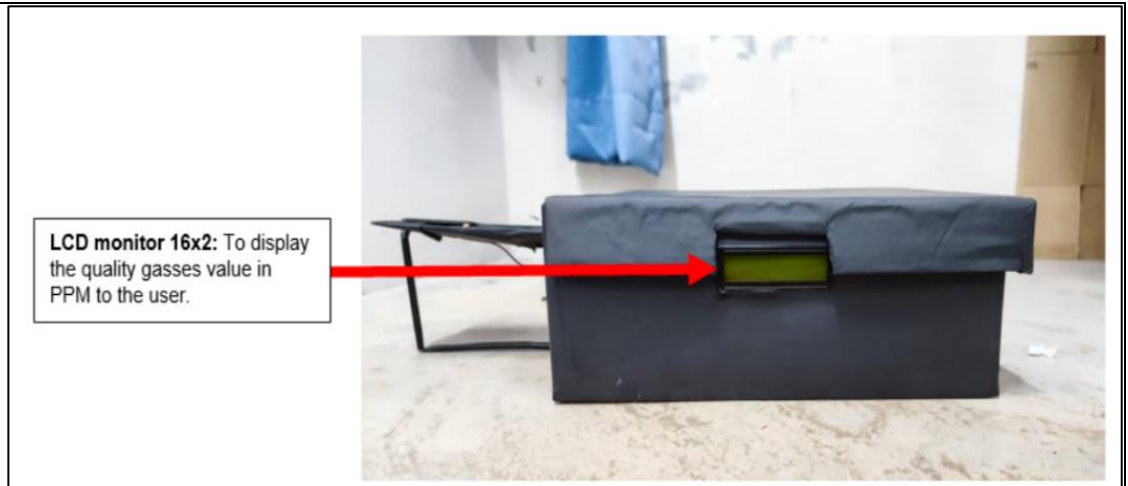


Figure 2: The front overview of the hardware prototype.



Figure 3: The back overview of the hardware prototype.

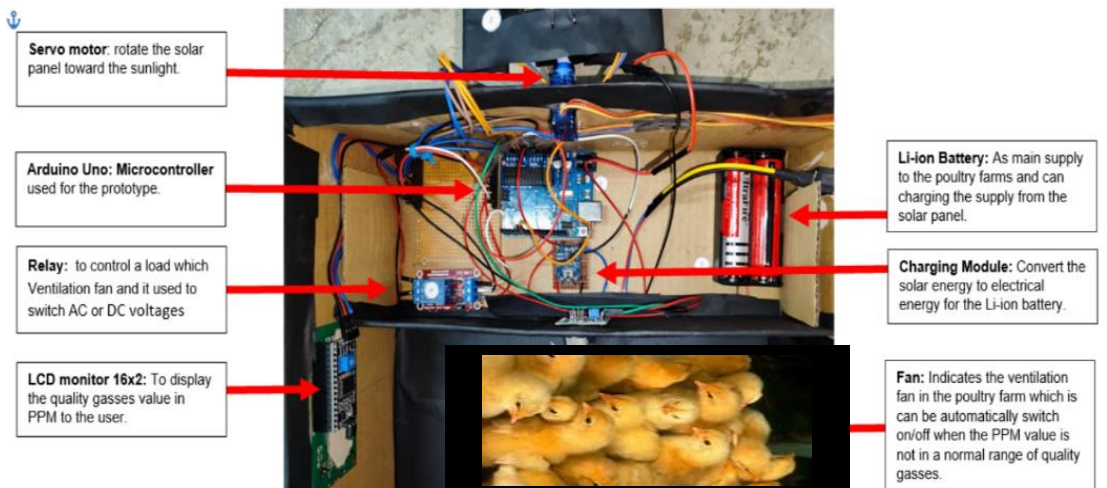


Figure 4: The circuit connection of the hardware prototype.

Figure 4 shows the circuit connection of the parts inside the hardware prototype. Next, Figure 5 shows the flow for the air quality detector system in the Sustainable Urban

Poultry system while Figure 6 shows the result in prototype. When the air quality greater than 300 pm (danger level), the ventilation fan will automatically turn on to release ammonia gas until it reaches below 300 pm then the fan will automatically stop.



Figure 5: Block Diagram of the Air Quality Detector System.

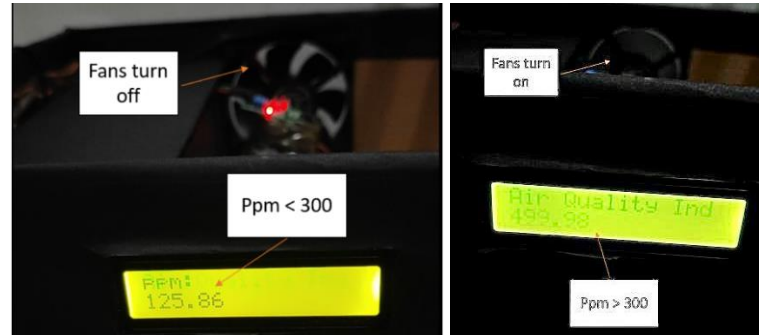


Figure 6 : The result in the Air Quality Detector System prototype.

Figure 7 shows the flow the automatic solar tracker system while figure 8 shows the result in prototype. When left light activates LDR, servo tilts panel to maximize lighting, same goes to right side. The lighting indicates the sunlight.

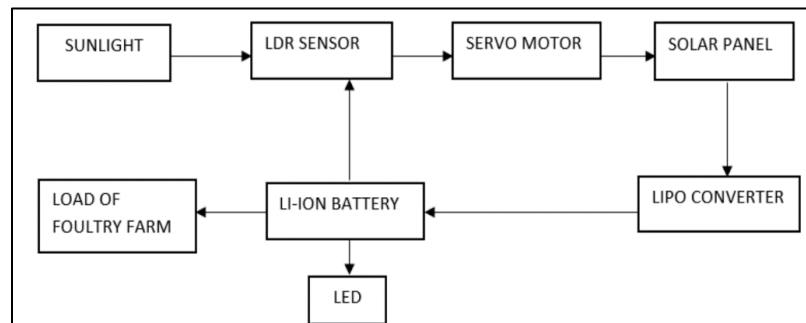


Figure 7: Block Diagram of the Automatic Solar Tracker System



Figure 8: The result in the Automatic Solar Tracker System prototype.

Daily Energy Use									
Item	Quantity	Watt	DC Power (W)	$\eta$ Load	Max Power Demand	Number of Hours Per Day	Energy Per Day (Watt-Hrs)		
	0		0	0.8	0		0		
				1			0		
				1			0		
Item	Quantity	KWATT	AC Power (KW)	PFload	Max Power Demand	Number of Hours Per Day	Surge Factor	Surge Demand	Energy Per Day (kWatt-Hrs)
Vent Fan 1	3	0.035	0.105	0.9	0.117	12	3	0.350	1.400
ven fan 1	1	0.035	0.035	0.9	0.039	24	3	0.117	0.933
lamp	8	0.01	0.08	0.9	0.089	18	1	0.089	1.600
heat lamp	8	0.06	0.48	1	0.48	24	1	0.48	11.52

Total Power of AC	0.7 kW
Inverter efficiency, $\eta_{inv}$	0.95
The Rated Power of Inverter is	0.84 kW
Total Power of DC	0 W
Maximum Demand DC	0 VA
Maximum Demand AC	0.244 KVA
Total AC Energy Used	16.267 kWh
Total DC Energy Used	0 Wh
Total Energy per Day (Watt-Hrs)	16.267 kWh
Maximum Demand (AC + DC)	0.244 KVA
Total Surge Power (AC)	0.556 KVA
Total Energy (AC + DC)	16.267 kWh

Need to calculate 3 items -  
1. Maximum Demand (DC + AC)  
2. Total surge power (AC), (AC+DC)  
3. Total Energy (AC+DC)

System Voltage & Total Load Current		
System Voltage	= 48 V	<1kWh = 12V, <1kWh < 4kWh = 24V, >4kWh = 48V
Nominal Load Current	= 15.351 A	the maximum continuous current being drawn from the battery should not > 120A

Battery Sizing		
Battery Load	= 16266.667 (Total Energy Used)	
The Voltage of the Battery	= 48 V	
A-hr Demand	= 339 Watt-hr / System Voltage	
Battery Capacity	= 339 X 2	Demand X Days of Autono
	= 847.5	Max Depth of Discharge

No. of battery autonomy: how many days battery can supply electricity in absent of PV energy

**Figure 9 Calculation of battery capacity**

Correction Factor as a Function of Cell Operating Temperature	
So That the Battery Capacity is	847.5 Ah
	0.96 Correction Factor
	882.813 Ah
Average Daily Depth of Discharge	330 Daily Load Divide by
	847.500 Battery Capacity
	40 %
	It is recommended to have DOD < 20% to maximize battery life
	882.813 Corrected battery capacity required
	15.951 discharge current
Discharge rate	58 h

Battery Capacity at 25°C		
20h rate	: 54 Ah	
10h rate	: 60 Ah	
5h rate	: 44 Ah	
1h rate	: 32 Ah	
15min rate	: 21 Ah	

The Number of Series Battery is	48 V	System Voltage (V)
	6 V	Nominal Battery Voltage
	8	
The Number of Parallel Battery is	882.8125	Battery Capacity
	315	Ah of Battery at C50
	3	Strings
Quantity of Battery	24 Units	In practice up max for battery is 3 strings only

PV Sizing		
Array Output Required	339 A-hr Demand	Based on this PV module
	0.85 Battery Efficiency (coulombic efficiency)	P: 190 W
	398.8 Ah Array Output Required	isc: 8.288 A
	1.3 over-supply coefficient (typically between 1.3 - 2)	Voc: 28.66 V
	518.4	Vmp: 24.62 V
		Tmax,STC: 75 °C
		bVmp: -0.31 %/°C
		bImp: 0.06 %/°C
		bTemp: -0.38 %/°C
		Vmin = Vmp,STC + [1 + (bVmp/100)(Tmax,STC - 25°C)]
		20.6808 V
		Temperature at ROC: 48 °C
Number of Modules in Series (Ns)	48	Operating Voltage is Sufficient for Battery Voltage
	24	Nominal Operating Voltage of each Module
	3	The Array Must Comprise Series Connected String

**Figure 10 Calculation of PV system**

Figures 9 and 10 provide a comprehensive analysis of the necessary battery capacity to ensure the smooth operation of an actual poultry farming system. These calculations reveal a clever approach that guarantees a continuous and dependable power supply for all farm activities. Additionally, the PV system calculations showcase the efficient utilization of solar energy to meet the energy demands of the entire poultry farm. This sustainable solution not only enhances the farm's efficiency but also contributes to minimizing its environmental impact. The calculations provided serve as valuable references for the chicken poultry owner to implement this innovative and eco-friendly system.

<b>Novelty and uniqueness</b>	<p>The project boasts immense potential in cost reduction, affordability, and future usability. By integrating advanced technologies like the automatic solar tracker and the air quality detector, it presents an economically viable solution for poultry farmers. Harnessing solar energy drastically cuts electricity expenses, making it a cost-effective and sustainable choice. The affordability factor ensures that even small-scale farmers can adopt these solutions. Moreover, as the demand for sustainable agricultural practices continues to grow, the project's emphasis on eco-friendly approaches positions it as a high-potential solution for future widespread use. Its capacity to reduce operational costs and promote long-term sustainability makes it an ideal candidate for enhancing the efficiency and profitability of poultry farming on a global scale.</p>
<b>Benefit to mankind</b>	<p>The innovative Sustainable Urban Poultry Farming Systems with the integrated Automatic Solar Tracker and Air Quality Detector system presented in this project offer numerous benefits to mankind. Firstly, by utilizing solar energy, the system promotes sustainable and eco-friendly practices, reducing greenhouse gas emissions and contributing to a cleaner environment. The solar system's implementation also results in cost savings, making it an economically viable solution for poultry farmers. Moreover, the air quality detector ensures a healthy environment for both chickens and farm workers, mitigating the risk of respiratory issues and promoting animal welfare. Overall, this technology enhances productivity, reduces environmental impact, and fosters a healthier and more sustainable poultry farming industry, positively impacting mankind and our future generations.</p>
<b>Potential commercialization</b>	<p>The potential commercialization of this project lies in offering a comprehensive and eco-friendly solution for poultry farms seeking to optimize their production efficiency and promote sustainable practices. The automatic solar tracker and air quality detector system present a unique combination of renewable energy utilization and real-time monitoring of air quality. By incorporating solar panels and energy-efficient technologies, poultry farmers can reduce operational costs, promote environmentally friendly practices, and enhance the health and growth rate of chickens. This innovative product addresses critical challenges in poultry management and has the potential to be widely adopted by poultry farms worldwide, contributing to a more sustainable and efficient poultry industry.</p>



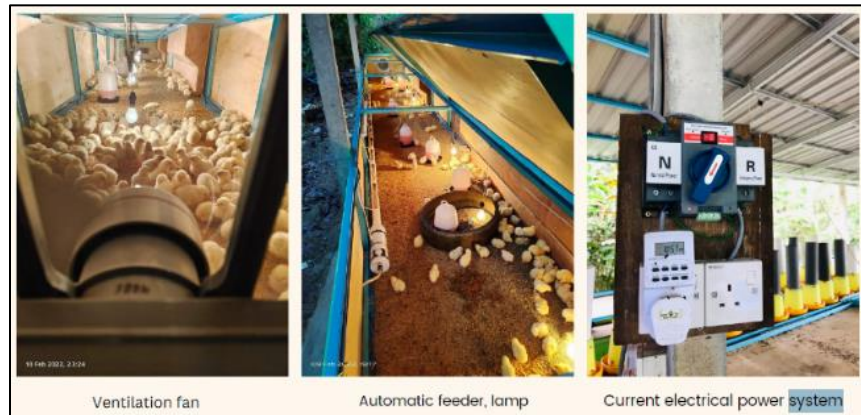
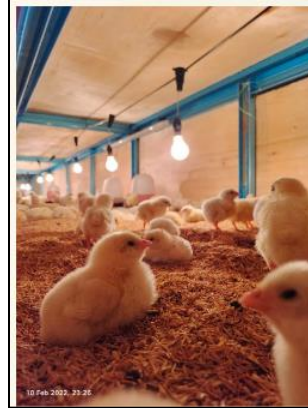






Figure 11: Urban Poultry Farm site visit for potential commercialization of the innovation

Figure 11 shows the Current Urban Poultry Farm with conventional electrical power system and its electrical usage for ventilation fan, automatic feeder and lamp. The current Urban Poultry Farm which our innovation can potentially be implemented. The idea of this innovation has successfully been registered under **MYIPO copyright** no: **CRLY2022P04704** as shown in Figure 12.



Figure 12: Copyright of Automatic Solar Tracker for Poultry Farm.

<p><b>Acknowledgment</b></p>	<p>We extend our heartfelt acknowledgment to our supportive mentor, Prof Madya Ir. Dr. Alhan Farhanah Abd Rahim and Dr Ainorkhilah Mahmood, for their exceptional guidance, unwavering support, and invaluable insights throughout the successful completion of this project at University Technology MARA (UiTM) Pulau Pinang. Their expertise and mentorship played a crucial role in shaping the direction and achievements of our endeavors. We also express our gratitude to all team members for the active involvement, passion, and collaborative spirit, as well as to the faculty members and staff at UiTM Pulau Pinang for continuous support and guidance. Finally, we wish to extend our sincere gratitude to Pn Siti Hajar and Cikgu Hizam for the site visit to their Urban Poultry Farm.</p>
<p><b>Researcher Biographic Data</b></p>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div data-bbox="448 611 646 867">  <p>Nuralyafatin binti Che Hussin, a dedicated student pursuing her Bachelor of Engineering (Hons.) in Electrical and Electronic Engineering at UiTM, Cawangan Pulau Pinang, exhibits exceptional expertise as the project leader. Her focus on ammonia gas detection ensures a safe poultry farm environment. Contributions to the automated fan release system reflect her commitment to safety and welfare.</p> </div> <div data-bbox="431 930 651 1186">  <p>Siti Nursyafiqah Md Isa, an ambitious student of UiTM's Faculty of Electrical Engineering, Cawangan Pulau Pinang, is pursuing her Bachelor of Engineering (Hons.) in Electrical and Electronic Engineering. She contributes significantly to the project, excelling in solar energy calculation and technical prototype development. Her dedication and expertise enhance sustainable energy solutions and project advancements.</p> </div> <div data-bbox="448 1230 613 1493">  <p>Muhammad Luqman Al Hakim bin Rosli is an enthusiastic student pursuing a Bachelor of Engineering (Hons.) in Electrical and Electronic Engineering at UiTM, Cawangan Pulau Pinang. He is a key contributor to the project, focusing on developing the prototype for the solar tracker function. His dedication and passion play a crucial role in advancing the project's solar tracking capabilities.</p> </div> <div data-bbox="423 1524 675 1854">  <p>Alhan Farhanah Abd Rahim earned her B.Eng (Hons) in Electronics Engineering from the University of Southampton, UK, in 1998. She holds an MSc and PhD in Solid State Physics from Universiti Sains Malaysia in 2003 and 2014, respectively. Currently an Associate Professor at Universiti Teknologi MARA, Cawangan Pulau Pinang, Malaysia, her research focuses on synthesizing semiconductor materials (group IV, III-V, porous semiconductors, and metal-oxides) using electrochemical and thermal evaporation techniques for Optoelectronic and gas</p> </div> </div>



sensing applications. She also utilizes SILVACO TCAD for semiconductor modeling and simulation.



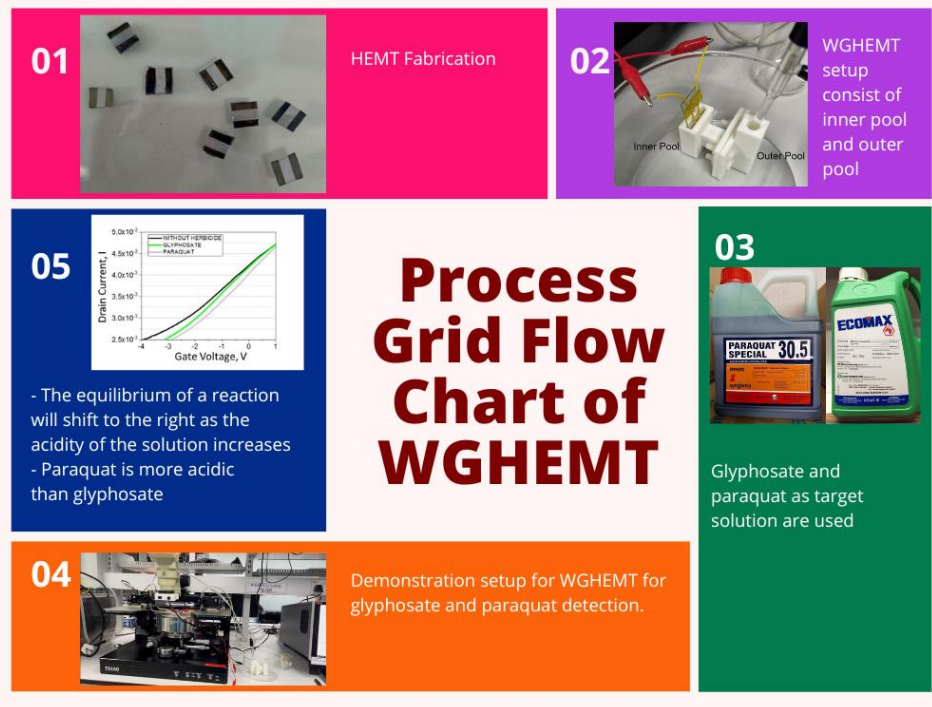
Ainorkhilah Mahmood obtained her B.Sc Hons in Applied Physics, an M.Sc, and a PhD in Solid State Physics from Universiti Sains Malaysia in 1999, 2003, and 2017, respectively. Presently, she serves as the Coordinator of the Research Management Unit at Universiti Teknologi MARA Cawangan Pulau Pinang, Malaysia. Her research revolves around nanostructure fabrication, focusing on III-nitrides and silicon materials, including gas and environmental sensors."






Siti Hajar Khalid obtained her B.Sc (Hons) in Physics & Computer with Education from Universiti Teknologi Malaysia, Malaysia in 2000, MSc in Solid State Physics from Universiti Sains Malaysia in 2010. She is currently a lecturer at the Department of Applied Sciences, Universiti Teknologi MARA, Cawangan Pulau Pinang, Malaysia. Her research interests have focused on the development of new carbon-based materials for supercapacitors to improve their energy whilst maintaining the power density, application of pseudocapacitive materials, asymmetric electrode designs, understanding their internal thermal properties, modeling of their performance and their hybridization with other devices

<b>ADVANCED POTENTIOMETRIC WATER-GATED CONFIGURATION USING ALGAN/GAN HIGH ELECTRON MOBILITY TRANSISTOR (WGHEMT) FOR GLYPHOSATE AND PARAQUAT DETECTION</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
		√	
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Amirul Firdaus <sup>1*</sup> , Najihah Fauzi <sup>1</sup> , Shaili Falina <sup>2</sup> , Hiroshi Kawarada <sup>3,4</sup> , Mohd Syamsul <sup>1,3</sup>		
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<b>Correspondence</b>	Mohd Syamsul Institute of Nano Optoelectronics Research and Technology (INOR), Universiti Sains Malaysia (USM), 11800 Penang, MALAYSIA Tel: +604 653 5658, Fax: +604 653 5639		
<b>Abstract</b>	Advanced potentiometric water-gated configuration using AlGaIn/GaN High Electron Mobility Transistor (WGHEMT) for glyphosate and paraquat detection in water systems is demonstrated for the first time ever. The WGHEMT configuration which consists of HEMT and interchangeable ion-		

	<p>selective membranes (ISMs) offers high electron mobility, thermal stability, and sensitivity, making it an ideal platform for herbicides of glyphosate and paraquat. HEMT is used in this configuration due to its low noise performance which is ideal for a sensor. Interchangeable ISM for glyphosate and paraquat enables simple multiplex target sensing. The ISMs are placed between two pools consisting of an inner pool and an outer pool in the WGHEMT configuration. The inner pool is filled with a reference solution while the outer pool is filled with a target solution. HEMT is inserted in the inner pool while a reference electrode Ag/AgCl that act as a gate is inserted into the outer pool. As with all electrolyte-gated transistors, the potential applied to the gate contact is connected to the semiconductor surface via an interfacial electric double layer (EDL). The results show the potential differences between the inner pool and the outer pool and confirm the EDL presence in the configuration which determines the detection of glyphosate and paraquat.</p>
<b>Keywords</b>	<p>HEMT, AlGa<sub>N</sub>/Ga<sub>N</sub>, WGHEMT, ISM, EDL, sensor.</p>
<b>Product Description</b>	<p>WGHEMT is designed to safeguard agricultural activities and environmental sustainability. Key features of the device are highly sensitive, rapid response time, and high convenience. WGHEMT exhibits exceptional sensitivity, capable of detecting herbicides in the water. It provides real-time monitoring, preventing potential damage to the crops and ecosystem. The main feature of this device is with only changing the ISM, it can detect different herbicides. In the context of detecting glyphosate, the chosen ISM is glyphosate sensitized modified ISM, whereas, for the detection of paraquat, paraquat sensitized modified ISM is chosen.</p>

<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	 <p><b>01</b> HEMT Fabrication</p> <p><b>02</b> WGHEMT setup consist of inner pool and outer pool</p> <p><b>03</b> Glyphosate and paraquat as target solution are used</p> <p><b>04</b> Demonstration setup for WGHEMT for glyphosate and paraquat detection.</p> <p><b>05</b></p> <p><b>Process Grid Flow Chart of WGHEMT</b></p> <p>- The equilibrium of a reaction will shift to the right as the acidity of the solution increases          - Paraquat is more acidic than glyphosate</p>
<p><b>Novelty and uniqueness</b></p>	<p>The novelty of WGHEMT is the use of HEMT in the water-gated system. The simplicity and convenience of detecting herbicides in water by the WGHEMT make it unique. Normally, the sensing element is grown on top of the transistor, in contrast with WGHEMT. The sensing element originated at the ISM. By simply modifying the ISM, targeted herbicides like glyphosate or paraquat can be immediately recognized. This means that the HEMT can be used countless times without the need for device-level modification, which ultimately is cost-saving. This would increase the robustness of the HEMT device tremendously.</p>
<p><b>Benefit to mankind</b></p>	<p>WGHEMT will ensure farmers and agricultural workers apply herbicides effectively and at the right concentrations. This leads to farmer safety, better weed control, reduced herbicide use, and cost savings. Additionally, it helps in preventing accidental overdosing of farmers, harming crops and the environment. The public also will benefit from WGHEMT in food products, such as fruits, vegetables, and grains, and can assure consumers that the products they are purchasing are safe and free from harmful levels of herbicide residues. It can help maintain food safety standards and increase consumer confidence in the food supply.</p>
<p><b>Potential commercialization</b></p>	<p>Agricultural and farming equipment manufacturing companies can integrate WGHEMT into their machinery. This would enable farmers to precisely apply herbicides only where needed, reducing costs, and minimizing environmental impact. The integration of detection technology could be a value-added feature for their products. Agrochemical companies that</p>

	<p>produce herbicides can incorporate detection technologies as a complementary solution to their products. By offering herbicide detection kits or services, they can enhance their customer offerings and differentiate themselves in the market. Additionally, they could develop a new controlled management system for herbicides, thus making them more appealing to the vast majority of farmers.</p>
<p><b>Acknowledgment</b></p>	<p>The head project member acknowledges financial support by the Ministry of Higher Education Malaysia for Fundamental Research Grant Scheme with Project Code: FRGS/1/2022/STG05/USM/02/11</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 20px;"> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Amirul Firdaus received a bachelor's degree in applied physics from Universiti Sains Malaysia (USM), Pulau Pinang in 2022. He acquired the best undergraduate thesis from The Malaysia Solid State Science and Technology Society (MASS) in 2021. He currently is a master's student at the Institute of Nano Optoelectronics Research and Technology (INOR), Universiti Sains Malaysia USM. He is a graduate research assistant at INOR USM. His main research interest is the fabrication of electronic devices as a sensor.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Najihah Fauzi received a bachelor's degree in Physics from Universiti Teknologi Mara (UiTM) in 2017. She acquired the best undergraduate thesis from The Malaysia Solid State Science and Technology Society (MASS) in 2018. She graduated with a Master of Science (Solid State Physics) from Universiti Sains Malaysia (USM) in 2019. Now, she is currently a Ph.D. student at the Institute of Nano Optoelectronics Research and Technology (INOR), Universiti Sains Malaysia (USM). Her main research interest is the fabrication of AlGaIn/GaN High Electron Mobility Transistor (HEMT) as a biosensor.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Shaili Falina received a bachelor's degree in electronic engineering from Universiti Malaysia Perlis Arau, Malaysia, in 2009, and the Ph.D. degree from Waseda University, Tokyo, Japan, in 2019, where she were focusing on diamond and graphene field-effect transistors for pH sensors. Prior to her Ph.D., she was an RF Engineer at Motorola Solutions Penang, Malaysia, for five years. Since 2020, she has been Postdoctoral Fellow at Collaborative Microelectronic Design Excellence Center, Universiti Sains Malaysia, where she was appointed as senior lecturer in 2022.</p> </div> </div> </div>



	<p>Her current research interests are printable and flexible electronics, electrochemical biosensors, and field-effect transistor biosensors.</p> <div data-bbox="516 331 751 611" data-label="Image">  </div> <p>Hiroshi Kawarada received the M.Eng. and Ph.D. degrees from the Waseda University, Tokyo, Japan, in 1978 and 1985, respectively. From 1986 to 1990, he was an Assistant Professor at Osaka University, and an Associate Professor at Waseda University, from 1990 to 1995. Since 1995, he has been a Professor at the School of Science and Engineering, Waseda University. His research interests include diamonds for power field-effect transistors and power inverters, superconductivity, seawater wireless communication, and biosensing. He received the Commendation for Science and Technology Award from the Minister of Education, Culture, Sports, Science and Technology, Research Category, Japan.</p> <div data-bbox="516 884 751 1171" data-label="Image">  </div> <p>Mohd Syamsul is a Researcher in the field of wide bandgap materials, specifically GaN, diamond, and carbon-related materials. He has made several contributions to the research of nanoelectronics, with a particular focus on developing diamond for biosensors and power devices. Previously, he worked as a Postdoctoral Researcher and a Doctoral Student at Waseda University, Tokyo, Japan, where he studied diamonds and their potential applications as power devices. Currently, he is a Senior Lecturer with the Institute of Nano Optoelectronics Research and Technology (INOR), Universiti Sains Malaysia, Penang, Malaysia. He is also currently a Visiting Scientist at Waseda University, as well as a Research Fellow at Institute of Nano Electronic Engineering, Universiti Malaysia Perlis, Arau, Malaysia. He has authored or coauthored multiple articles, conference papers, book chapters, and several patents related to his field. He is a certified Professional Technologist (Ts.), a certified Trainer, and a certified Lead Assessor ISO/IEC 51717025:2017</p>
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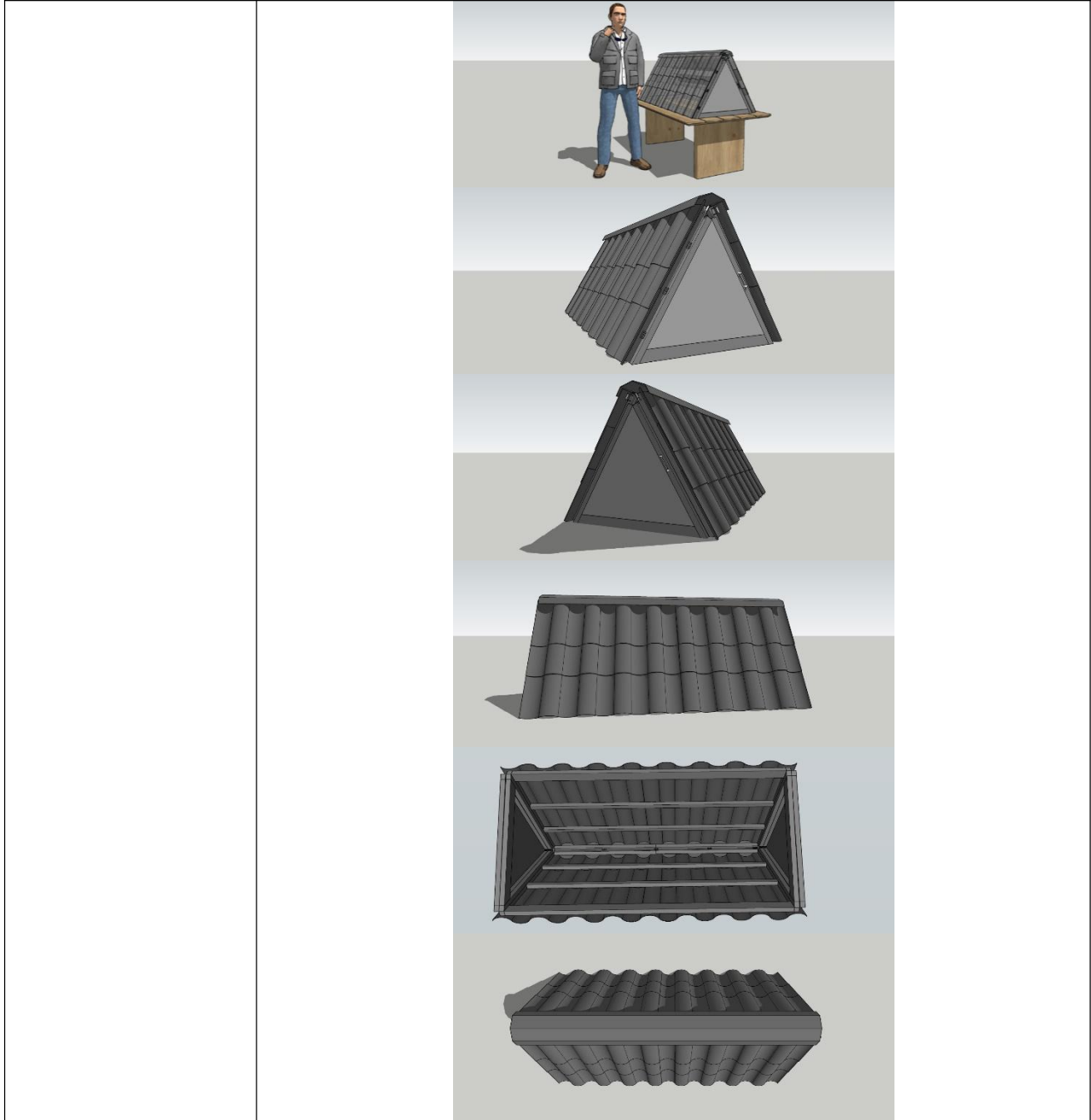
# SCIENCE, TECHNOLOGY AND ENGINEERING


## CATEGORY C

*ACADEMICIAN, INDUSTRY AND PROFESSIONAL*

<b>A SIMPLE INNOVATION FOR A NEW MODEL OF PORTABLE SOLAR DRYER PYRAMID FOR SEAFOOD PRESERVATION</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Dr. Nurhafizah Md Disa <sup>1</sup> , Assoc. Prof. Dr. Nurhayati Binti Abdulah <sup>1</sup> , Amir Amzar Bin Azahar <sup>1</sup> , Anis Amira Binti Ariffin <sup>1</sup> .		
<b>Affiliation</b>	<sup>1</sup> School of Physics, Universiti Sains Malaysia, 11800 USM Gelugor, Penang, Malaysia		
<b>Email</b>	<sup>1</sup> mdnurhafizah@usm.my, <sup>1</sup> nurhaya@usm.my, <sup>1</sup> amir.amzar@student.usm.my, <sup>1</sup> anisamira137@student.usm.my		
<b>Correspondence</b>	Dr. Nurhafizah Md Disa School of Physics, Universiti Sains Malaysia, 11800 USM Gelugor, Penang, Malaysia. Tel: +604-6535304		
<b>Abstract</b>	Drying and moisture reduction in food is an important aspect in the preservation area as it can increase the shelf life tremendously whilst improve on the flavour. Portable Solar Dryer (PSD) is an efficient way to produce preserve foods that became popular in Southeast Asia (SEA) due to its “umami” enhancement. In recent years, B40 community especially seafolk are affected by the Covid-19 pandemic and the economical constraint that follows. Preservation of food possess a huge profitable revenue and being able to meet the demand of the market can increase income within the B40 community. This research aims to provide an innovative portable renewable solar energy dryer that incorporates green product to enhance the drying aspect. In this work, the high thermal conductivity of bio-graphene extracted from bamboo is utilized by mixing it with paint and applying it to the surface of the portable solar dryer to improve the effective absorption of heat. By using the K-thermocouple, the heat within the portable solar dryer is measured during specific and consistent time frame to create infographic heat trend. Bio-graphene are		

	<p>known to be thermally resistant with high heat conductivity necessary for capture and transfer of heat. Characterization of the bio-graphene is done by Thermogravimetric Analysis (TGA), Field Emission Scanning Electron Microscope (FESEM), X-ray diffraction (XRD), Energy Dispersive X-Ray (EDX), RAMAN and Fourier transform infrared spectroscopy (FTIR) to analyse the graphitic quality. The PSD of incorporated bio-graphene and the PSD without bio-graphene are analysed for their statistical performance (maximum value, minimum value, mean value, median value, mode value and heat trend) to provide clarity on the efficiency of incorporated bio-graphene in heat absorption and transfer. Our hygienic and mobile drying system incorporates a graphene layer for enhanced heat absorption and transfer, resulting in improved drying efficiency. It benefits economically constrained B40 seafolk affected by Covid-19 by increasing food shelf life, reducing waste, and creating new revenue streams. The system utilizes solar energy, reducing reliance on fossil fuels and minimizing environmental impact. By leasing the technology to seafolk in Penang and forming partnerships, we can expand its market to all B40 communities.</p>
<b>Keywords</b>	Portable Solar Dryer, Bio-Graphene, Bamboo, Thermal, Surface.
<b>Product description</b>	<p>In this Portable Solar Dryer (PSD), the design will focus on two main processes that have dual functions simultaneously, namely the transfer of heat to the product from the heating source, the transfer of mass moisture from the interior of the product to the surface and from the surface to the environment. Compared to existing designs that are more complex, this PSD involved three process steps which are (i) collecting and converting renewable solar energy into heat, (ii) trapping heat by isolating the moist and ambient air, and finally (iii) heat transfer through air convection from air to the food for the drying process. The PSD structure will be triangle prism shaped of 50cm length, 100cm width and 50 cm height. Additionally, two identical opening compartment is located at the triangular part of the PSD with one 3cm diameter holes at the top of the opening compartment. The holes are covered with a special fabric for moisture escape. Due to the inner side of the fabric being more hydrophobic than the outer side, there is a gradient of hydrophilicity throughout the fabric's thickness (gradation of surface tension). As a result, moisture is pulled by capillaries from the side with high hydrophilicity to the side with low hydrophilicity. Furthermore, the PSD slope roof is covered by homogenous mixture of paint/bio-graphene for heat capture and transfer.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	

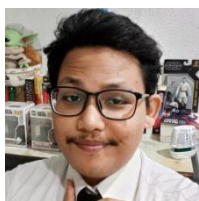


	<p><b>Bio-Graphene Oxide Synthetization</b></p> <p>Bamboo Collection → Grind and Sieve at 0.4mm → Cell Disruption Dipped in HCL 1 hour → Carbonization 1 hour 900C 5C/min → Washing → Biochar: KOH : KCL = 1 : 4 : 4 → Activation 1 hour 900C 5C/min</p> <p><b>Portable Solar Dryer Fabrication</b></p> <p>Metal plate is cut 50cm length, 100cm width and 50 cm height → Metal plate is cut to two identical opening compartment is located at the triangular part of the PSD with one 3cm diameter holes → The holes are covered with a special fabric for moisture escape → BGO Paint is deposited on the exterior surface → Tem is r</p> <p>Hummer's Method → Bio-Graphene Oxide (BGO) Obtained → Mixed BGO + Paint</p>
<b>Novelty and uniqueness</b>	<p>The product is more hygienic and mobile. The straightaway heating system will be more efficient hence the mass production will be easier to produce. The product enhances the effective absorption and transfer of heat, resulting in improved drying efficiency by incorporating graphene layer. The product can help the economically constrained B40 community, especially seafolk affected by the Covid-19 pandemic by providing new revenue streams.</p>
<b>Benefit to mankind</b>	<p>First, the product provides increases the shelf life of food with reducing food waste. Secondly, it drives the potential to economically empowered B40 seafolk by providing a drying system. Thirdly, the drying system utilizes solar energy, a clean and renewable energy source, reducing reliance on fossil fuels and minimizing environmental impact. Lastly, it affects the RnD department by incorporating bio-graphene that contributes to the development of sustainable and efficient food preservation technologies.</p>
<b>Potential commercialization</b>	<p>Based on the drying technologies, the product can be leases off to other seafolk within Penang area. Partnership can also be encouraged to expand its market to all B40 communities.</p>
<b>Acknowledgment</b>	<p>This work is funded by Research University Grant (RUI), USM (Grant code:1001/PFIZIK/8011113), Fundamental Research Grant Scheme (FRGS) (Grant code: 203.PFIZIK.6711771) and BJIM (Grant code: 1001. PFIZIK.AUPSE00207).</p>
<b>Researchers Biographical Data</b>	<div data-bbox="500 1633 748 1885" data-label="Image">  </div> <p>Dr. Nurhafizah Md Disa is a lecturer who is a senior lecturer in School of Physics, Universiti Sains Malaysia (USM). She graduated in 2017 with Doctor of Philosophy Physics, Universiti Pendidikan Sultan Idris, Tg Malim, Perak. She expertise in Nanomaterials, Graphene, Composite Materials &amp; Energy storage. She was acquired 5 grant and</p>

received awarded multiple times such as IBIEC Gold Award in 2022, SILVER MEDAL for MTC 5.0, Canadian Special Award for iCAN2020, Canada, Gold Medal for iCAN2020, Organizer's Choice Award for iCAN2020, Gold Medal for MTC, BITARA. Awarded by UPSI, Silver Medal for ITEC 2014 and Best Oral Presentation for IPCSM' 14. With twenty-six papers published in the last nine years, she has demonstrated a profound commitment to academic excellence.



Assoc. Prof. Dr. Nurhayati Binti Abdullah is a senior lecturer in the School of Physics at Universiti Sains Malaysia (USM), specializing in Pyrolysis, Bioenergy, Biomass, Energy Studies and Solar Thermal. She has established herself as a distinguished researcher by having ASHES Fellowship Awards, Editor for Annual Report of School of Physics, four academics awards, 20 seminars, member of the Institut Fizik Malaysia and 45 various consultation experience. Over her academic years, she has published fifty-four papers, demonstrating her unwavering commitment to academic excellence and her significant impact in the field.



Amir Amzar Bin Azahar is a student who is currently undertaking his MSC study program under School of Physics, Universiti Sains Malaysia. He graduated from Universiti Teknologi Petronas (UTP) in applied Physics. He currently has published 3 papers under SCOPUS.



Anis Amira Binti Ariffin is a student who is currently undertaking her undergraduate study program under School of Physics, Universiti Sains Malaysia, majoring in Applied Physics.

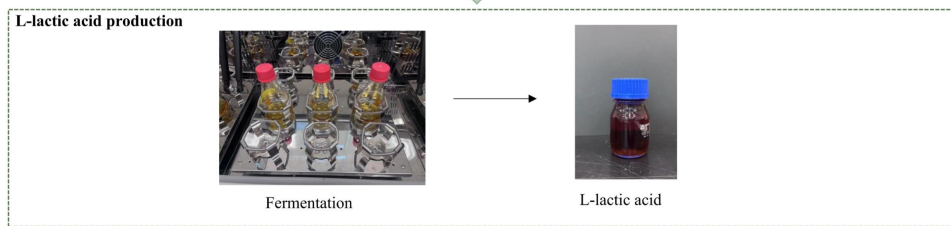
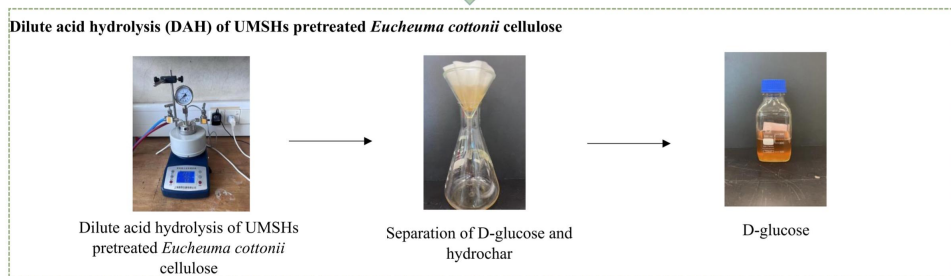
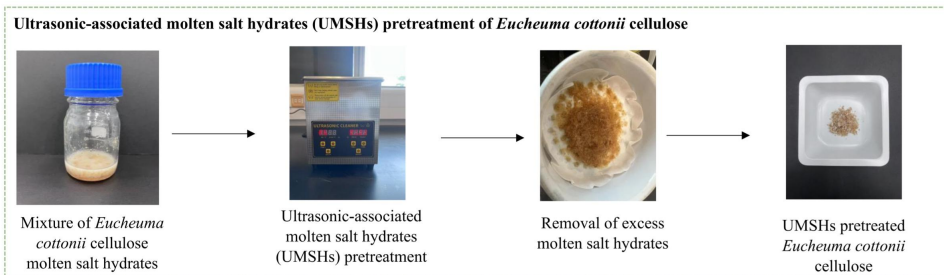
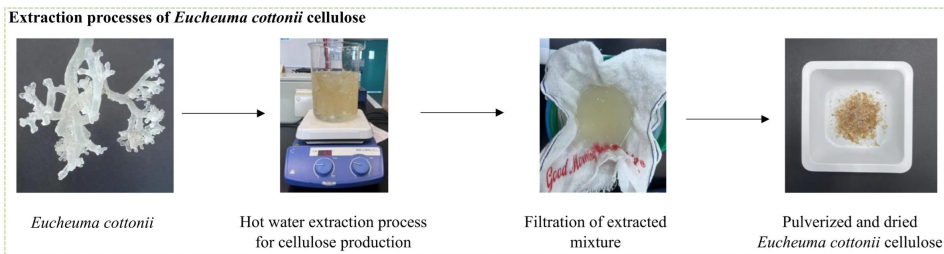


## SUSTAINABLE SOLUTIONS FROM THE SEA: TRANSFORMING MACROALGAE WASTE INTO A GREEN PRECURSOR FOR BIOPLASTICS PRODUCTION

Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
			√
	Local		International
	√		
<b>Project Member(s)</b>	Tan Inn Shi <sup>1</sup> , Henry Foo Chee Yew <sup>2</sup> , Chong Soo Ling <sup>3</sup> , Lam Man Kee <sup>4,5</sup> , Wong Mee Kee <sup>6</sup> .		
<b>Affiliation</b>	<p><sup>1,2,3</sup> Department of Chemical and Energy Engineering, Faculty of Engineering and Science, Curtin University Malaysia, CDT 250, 98009 Miri, Sarawak, Malaysia</p> <p><sup>4</sup>Chemical Engineering Department, Universiti Teknologi PETRONAS, 32610 Seri Iskandar, Perak, Malaysia</p> <p><sup>5</sup>HICoE-Centre for Biofuel and Biochemical Research, Institute of Self-Sustainable Building, Universiti Teknologi PETRONAS, 32610 Seri Iskandar, Perak, Malaysia</p> <p><sup>6</sup>PETRONAS Research Sdn Bhd, Lot 3288 &amp; 3289, Off Jalan Ayer Hitam, Kawasan Institusi Bangi, 43000, Kajang, Selangor, Malaysia</p>		
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<b>Correspondence</b>	<p style="text-align: center;">Ir. Ts. Dr. Tan Inn Shi                  Department of Chemical and Energy Engineering, Faculty of Engineering and Science, Curtin University Malaysia, CDT 250, 98009 Miri, Sarawak, Malaysia                  +60 85 630 100 Ext: 2511, Fax: +60 85 630 288</p>		
<b>Abstract</b>	This project highlights an innovative approach that converts waste biomass from macroalgae into third-generation L-lactic acid (3G L-LA), a sustainable precursor that produces polylactic acid (PLA). PLA is a widely used bioplastic known for its sustainable characteristics. Using ultrasonic-molten salt hydrates (UMSHs) pretreatment, this invention efficiently		

	<p>repurposes abundant macroalgae biomass, providing a sustainable alternative to petrochemical-based plastics. The research addresses urgent challenges related to plastic pollution and the demand for sustainable materials. The method transforms discarded macroalgae waste, specifically <i>Eucheuma cottonii</i> cellulose (ECC), into a renewable feedstock for L-LA production. The pretreatment process enhances sugar accessibility in the ECC, resulting in high glucose yields during the dilute-acid hydrolysis process. The obtained sugars are then used as a substrate for L-LA production through separate hydrolysis and fermentation (SHF). The derived L-LA serves as an environmentally friendly precursor for PLA production, reducing reliance on fossil fuels and promoting circularity in the plastics industry. The innovation offers several advantages, including utilizing renewable marine resources and promoting sustainable L-LA production. Moreover, the use of L-LA as a sustainable building block for PLA production provides a viable and eco-friendly alternative to conventional plastics. By repurposing macroalgae waste, this approach helps mitigate plastic waste and reduce dependence on petrochemicals. This groundbreaking research has significant socio-economic and environmental impacts. It facilitates the transition towards a circular economy by reducing plastic waste and promoting the sustainable use of marine resources. The commercialization prospects for this innovation are up-and-coming, considering the increasing demand for environmentally friendly alternatives to traditional plastics. In conclusion, this research presents a transformative solution by converting macroalgae waste (ECC) into L-LA, the sustainable precursor for PLA production. With its positive environmental benefits, economic potential, and the ability to replace petrochemical-based plastics, this innovation plays a crucial role in advancing sustainability within the plastics industry.</p>
<b>Keywords</b>	Macroalgae waste, L-lactic acid, renewable feedstock, green precursor, molten salt hydrates.
<b>Product description</b>	<p>The innovative product resulting from this research is a sustainable and eco-friendly precursor for L-lactic acid (L-LA), derived from macroalgae waste. With a purity of 85%, this product offers a renewable alternative for L-LA acid production, contributing to a greener future. It achieves an impressive glucose yield of 97.75% through ultrasonic-molten salt hydrates (UMSHs) pretreatment and an optimum glucose to L-lactic acid yield of 90.08% using separate hydrolysis and fermentation. By incorporating this product into their processes, industries can develop eco-friendly materials, reduce their environmental footprint, and contribute to a more sustainable and circular economy.</p>

**Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.**



**Novelty and uniqueness**

Our sustainable precursor for third-generation L-lactic acid (3G L-LA) derived from macroalgae biomass exhibits remarkable uniqueness in material development. Unlike conventional precursors, which rely on fossil fuel-derived sources, our innovative approach utilizes macroalgae waste as a renewable and abundant feedstock. This not only addresses environmental concerns but also presents a cost-effective alternative. In contrast to traditional methods that extract L-LA from food-based or lignocellulosic biomass, our process offers distinct advantages. Macroalgae biomass is free from lignin, simplifying extraction and purification while ensuring a high-purity product. Furthermore, our unique approach taps into the waste generated by the alginate industry, which discards or uses it as an

	<p>animal feed additive. With the alginate industry generating approximately 39,000 tons of waste annually worldwide, our precursor turns this waste into a valuable resource. By repurposing and transforming macroalgae waste into a sustainable precursor for L-LA, we contribute to resource efficiency and promote circularity in biomaterial production. This breakthrough innovation offers a greener solution and demonstrates the potential for transforming waste streams into valuable and eco-friendly materials, paving the way for a more sustainable future.</p>
<p><b>Benefit to mankind</b></p>	<p>Due to the extended time it takes for conventional petrochemical-based synthetic plastic products to decompose, approximately 5.25 trillion pieces of plastic waste are present in the world's oceans. The sustainable precursor for L-lactic acid (L-LA) derived from macroalgae waste offers numerous benefits to humankind. Its advantages lie in its renewable nature, providing a greener alternative to conventional L-LA acid production methods. This product finds wide-ranging applications, particularly in the synthesis of bioplastics like polylactic acid (PLA), which can replace traditional petrochemical-based plastics. By utilizing this eco-friendly precursor, industries can reduce their environmental impact, promote sustainability, and contribute to a healthier planet. Moreover, the product's versatility opens doors to innovative solutions in various sectors, such as packaging, biomedical materials, and consumer goods, ensuring a positive impact on individuals and society.</p>
<p><b>Potential commercialization</b></p>	<p>Our sustainable precursor, derived from macroalgae biomass, offers a unique and renewable solution for third-generation L-lactic acid production. With its high purity of 85%, it is poised to revolutionize the bioplastics market as a sustainable alternative to traditional precursors. The absence of lignin content simplifies extraction and purification processes, while its scalability and abundance ensure a stable supply chain. Our product has diverse applications in packaging, textiles, and biomedical materials. With intellectual property protection (IP No. LY2023Q01507), we have opportunities for licensing agreements and collaborations, positioning us for successful commercialization in the growing market for eco-friendly materials.</p>
<p><b>Acknowledgment</b></p>	<p>We want to acknowledge the financial support given by the Fundamental Research Grant Scheme (FRGS/1/2019/TK02/CURTIN/03/2) from the Ministry of Higher Education (MOHE), Malaysia.</p>

**Researchers  
Biographical Data**



Dr. Tan Inn Shi is a senior lecturer in the Department of Chemical Engineering at Curtin University Malaysia. She holds a Ph.D. in Chemical Engineering from Universiti Sains Malaysia (USM). Her research focuses on technology services related to biomass and biofuel product development, employing chemicals and enzymes for bioethanol and bio-monomer production. Her notable contributions include the development of an innovative two-step process (autohydrolysis and prehydrolysis and simultaneous saccharification and fermentation) for the efficient utilization of algae waste, resulting in the production of reducing sugar and L-lactic acid (L-LA). L-lactic acid is an affordable and sustainable single monomer to produce polylactic acid (PLA), addressing the increasing demand for renewable feedstocks in the 3D printing industry. Dr. Tan has published extensively in renowned journals such as Carbohydrate Polymer, Bioresource Technology, Energy Conversion and Management, Energy, Fuel, and Journal of Petroleum Science and Engineering.



Dr. Henry Foo Chee Yew is a senior lecturer in the Department of Chemical and Energy Engineering at Curtin University, Malaysia. He accomplished his Ph.D in Chemical Engineering from Universiti Sains Malaysia (USM) in 2015. He obtained both his Master's and Bachelor's degrees (Honours) in Chemical Engineering at the School of Chemical Engineering, Universiti Sains Malaysia. His main research interest involved multidisciplinary research between Physics, Chemistry and Engineering in the emerging area of nanotechnology. His research focuses on the development of structural nanoparticles with tunable properties through various modern processing techniques (direct write electrospinning, photolithography for miniaturized devices, electrodeposition and 3D printing). He has more than 10 years of experience in the characterization of solid-state nanomaterials (XRD, HRTEM, DLS, AFM, and fluorescent spectroscopy). His works have been published in high-impact journals such as Carbohydrate Polymer, Bioresource Technology, Fuel, and Journal of Petroleum Science and Engineering.





Chong Soo Ling is a student who is currently undertaking her PhD study program under the Department of Chemical and Energy Engineering, Faculty of Engineering and Science, Curtin University Malaysia. She was awarded a scholarship by the Ministry of Higher Education of Malaysia to pursue her study in macroalgae-based bio-refinery and fermentation & optimization study. She holds a Master of Science in Chemical Engineering from Universiti Malaysia Pahang.



Ts. Dr. Lam Man Kee is a senior lecturer in the Chemical Engineering Department at Universiti Teknologi PETRONAS (UTP) and a key core member of the HICoE-Centre for Biofuel & Biochemical Research at UTP. He received his BEng (Hons) (2008), MSc (2010), and PhD (2014) in Chemical Engineering from Universiti Sains Malaysia (USM). His research interests include microalgae cultivation, biofuel production, life cycle energy and carbon assessment, and the social-economic impact of biofuels. He has published over 130 papers in ISI-indexed journals with an H-index of 48 and cumulative citations of 7500 (SCOPUS database). Currently, he serves as the Deputy Editor-in-Chief for the International Journal of Biomass & Renewables (UTP Press) and is an Editorial Board Member for the Journal of Advanced Chemical Engineering (Omic International).

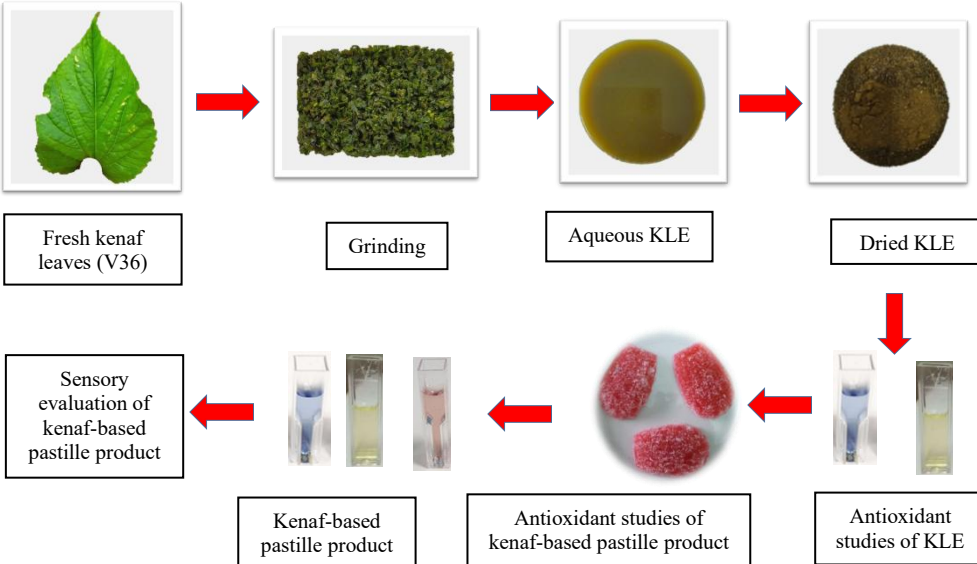


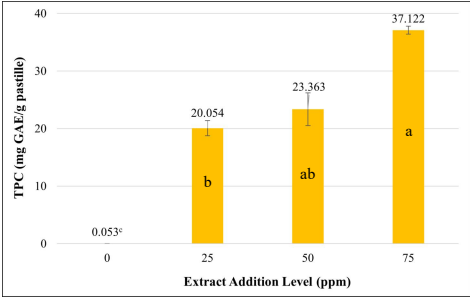
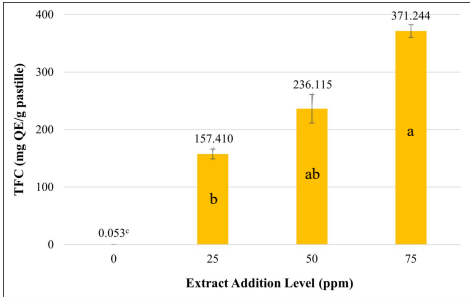
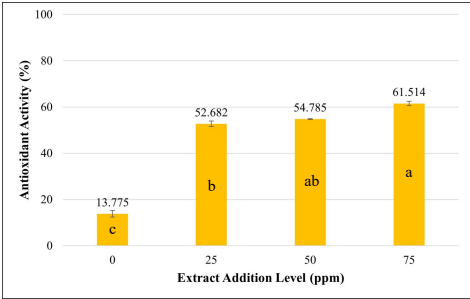

Wong Mee Kee obtained her bachelor's and Ph.D. degrees in Chemical Engineering from Universiti Teknologi PETRONAS. Her academic career began with Curtin University as a lecturer before joining PETRONAS Research in 2018. Her research interests include renewable chemicals, process intensification and CO<sub>2</sub> capture. She authored over 15 journal papers with two patents granted. Currently, she is the lead researcher in process development and technology scale-up of catalytic conversion of biomass to platform chemical in PETRONAS Research Sdn Bhd.






## THE ANTIOXIDANT STUDIES OF AQUEOUS EXTRACTION OF FRESH KENAF (*Hibiscus cannabinus* L.) LEAVES AND THE DEVELOPMENT OF KENAF-BASED PASTILLE PRODUCT

Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
			√
	Local		International
		√	
<b>Project Member(s)</b>	Loh Zhen Hao <sup>1</sup> , Roshita Ibrahim <sup>1,2</sup> , Nurul Nadzirah Mohd Yusof <sup>1,3</sup> , Mohd Asraf Mohd Zainudin <sup>1,4</sup> , Iffah Nadhira Madzuki <sup>1,5</sup>		
<b>Affiliation</b>	<sup>1</sup> Faculty of Chemical Engineering & Technology, Universiti Malaysia Perlis, Malaysia		
<b>Email</b>	<sup>1</sup> s191471726@studentmail.unimap.edu.my, <sup>2</sup> roshita@unimap.edu.my, <sup>3</sup> nadzirah@unimap.edu.my, <sup>4</sup> mohdasraf@unimap.edu.my, <sup>5</sup> iffahmadzuki@unimap.edu.my		
<b>Correspondence</b>	<p style="text-align: center;">Loh Zhen Hao Faculty of Chemical Engineering &amp; Technology, Universiti Malaysia Perlis, 02100 Padang Besar, Perlis, Malaysia. Tel: +6011-72517172</p> <p style="text-align: center;">Roshita Ibrahim Faculty of Chemical Engineering &amp; Technology, Universiti Malaysia Perlis, 02100 Padang Besar, Perlis, Malaysia. Tel: +6012-5828894</p>		
<b>Abstract</b>	Kenaf-based pastille product is a functional confectionery product through the application of kenaf leaves extract (KLE) as a functional ingredient. This product aims to meet the scarcity of functional foods in the global food market. The KLE was obtained through grinding and hot water extraction of kenaf leaves using an immersion water bath operated at 60°C for 24 hours or overnight followed by hot air drying. After that, the antioxidant studies of the KLE in terms of total phenolic content (TPC), total flavonoid content (TFC) and antioxidant activity were carried out for		

	<p>determining its antioxidant properties followed by the addition of the KLE at different levels (0, 25 ppm, 50 ppm &amp; 75 ppm) into the pastille product development and then the antioxidant studies (TPC, TFC &amp; antioxidant activity) of the kenaf-based pastille product with different respective addition level of the KLE for determining the degree of retention of the antioxidant properties of the KLE. Lastly, sensory evaluation of the kenaf-based pastille product added with different levels of the KLE in terms of aroma, colour, texture, taste and overall acceptability was conducted by 30 randomly selected panelists from different age groups for determining the kenaf-based pastille product with higher sensory acceptability. This product is enriched with numerous phytochemical or bioactive compounds such as polyphenols and flavonoids which are a great source of antioxidant properties after the addition of the KLE and would be expected to bring positive impact on the social and economic aspects, where it could attract customer purchase interest which in turn promotes rapid growth and development of the nation's food market as one of the income sources. This product would also be a substitute to other commercial pastille products on sale in the current market owing to both the health-driven and sensory-driven concepts for its development.</p>
<b>Keywords</b>	kenaf leaves extract, antioxidant studies, phytochemical compounds
<b>Product description</b>	Kenaf-based pastille product has enhanced sensory attributes, especially its aroma and colour which favour the consumer acceptability same as that of the commercial pastille products following the addition of the KLE along with some permitted food additives (rose pink colouring, vanilla flavouring & citric acid) for sensory enhancement purpose with aim to increase the competency of marketability of this product.
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<p>Methodology:</p>  <pre>                     graph TD                         A[Fresh kenaf leaves (V36)] --&gt; B[Grinding]                         B --&gt; C[Aqueous KLE]                         C --&gt; D[Dried KLE]                         D --&gt; E[Antioxidant studies of KLE]                         E --&gt; F[Antioxidant studies of kenaf-based pastille product]                         F --&gt; G[Kenaf-based pastille product]                         G --&gt; H[Sensory evaluation of kenaf-based pastille product]                 </pre> <p>The methodology flowchart illustrates the process starting with 'Fresh kenaf leaves (V36)', which are then 'Grinding' into a green powder. This is followed by the extraction of 'Aqueous KLE' (a yellowish liquid), which is then 'Dried KLE' (a dark brown powder). The 'Dried KLE' is used for 'Antioxidant studies of KLE' (shown in test tubes). The 'Kenaf-based pastille product' is then subjected to 'Antioxidant studies of kenaf-based pastille product' (shown in test tubes) and finally 'Sensory evaluation of kenaf-based pastille product' (shown in a glass). The 'Kenaf-based pastille product' is also shown as a red, textured solid.</p>

	<p>Research Data:</p> <table border="1" data-bbox="490 323 1456 436"> <thead> <tr> <th>Sample</th> <th>Extract Yield (%)</th> <th>TPC (mg GAE/g)</th> <th>TFC (mg QE/g)</th> <th>Antioxidant Activity (%)</th> </tr> </thead> <tbody> <tr> <td>Fresh Kenaf Leaves</td> <td>10.745 ± 0.798</td> <td>35.402 ± 4.360</td> <td>280.115 ± 37.256</td> <td>60.462 ± 3.764</td> </tr> </tbody> </table> <div style="display: flex; justify-content: space-around;"> <div data-bbox="490 474 956 768">  </div> <div data-bbox="989 474 1456 768">  </div> </div> <div style="display: flex; justify-content: space-around; margin-top: 10px;"> <div data-bbox="490 795 956 1092">  </div> <div data-bbox="989 795 1456 1092">  </div> </div>	Sample	Extract Yield (%)	TPC (mg GAE/g)	TFC (mg QE/g)	Antioxidant Activity (%)	Fresh Kenaf Leaves	10.745 ± 0.798	35.402 ± 4.360	280.115 ± 37.256	60.462 ± 3.764
Sample	Extract Yield (%)	TPC (mg GAE/g)	TFC (mg QE/g)	Antioxidant Activity (%)							
Fresh Kenaf Leaves	10.745 ± 0.798	35.402 ± 4.360	280.115 ± 37.256	60.462 ± 3.764							
<p><b>Novelty and uniqueness</b></p>	<p>Kenaf-based pastille product imparts distinctive leafy aroma which gives refreshing aftertaste accompanied with its bright red colour as a result of the addition of the KLE and the rose pink colouring that make it more attractive and eye-catching from outer appearance to consumers in addition to its health benefits as another advantage over the commercial pastille products.</p>										
<p><b>Benefit to mankind</b></p>	<p>Kenaf-based pastille product exhibits medicinal properties associated with the prevention of risk of certain chronic diseases such as diabetes, cardiovascular disease and cancer. Also, it is effective in the treatment of coughs and sore throats which resembles medical lozenges as a pharmaceutical product. Therefore, KLE has potential of application in many other fields apart from being applied for food product development.</p>										
<p><b>Potential commercialization</b></p>	<p>Based on the above research findings and product description, the kenaf-based pastille product has high potential of commercialization as it is intended for worldwide consumption from different age groups without threatening consumer health due to the absence of any allergens or prohibited ingredients and artificial food additives that might pose considerable risk of danger to the physiological and psychological health of</p>										

	the consumers over time.
<b>Acknowledgment</b>	The head project member acknowledges financial support from the Universiti Malaysia Perlis (UniMAP) through Short Term Grant (ITS Matching Grant 9001-00716) and all the laboratory staffs in Faculty of Chemical Engineering & Technology at UniMAP.
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; gap: 20px;"> <div style="display: flex; align-items: flex-start;">  <div style="flex: 1;"> <p>Loh Zhen Hao is a student who is currently undertaking his bachelor study program, namely Bachelor of Chemical Engineering Technology (Food Technology) under Faculty of Chemical Engineering &amp; Technology at Universiti Malaysia Perlis (UniMAP). He was awarded an offer by Universiti Sains Malaysia (USM) to pursue his master study program by research in food technology with specialization in functional food.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex: 1;"> <p>Roshita Ibrahim is currently a lecturer who specializes in food processing and preservation under Faculty of Chemical Engineering &amp; Technology at Universiti Malaysia Perlis (UniMAP). She was a holder of Master of Science in Postharvest Technology with 20 years of research experience in agriculture field.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex: 1;"> <p>Nurul Nadzirah Mohd Yusof is currently pursuing her PhD study program. She was a holder of Master of Engineering who specializes in research related to food biotechnology and had teaching experience as a lecturer under Faculty of Chemical Engineering &amp; Technology at Universiti Malaysia Perlis (UniMAP).</p> </div> </div> </div>



Mohd Asraf Mohd Zainudin is currently a lecturer who specializes in meat technology under Faculty of Chemical Engineering & Technology at Universiti Malaysia Perlis (UniMAP). He was a PhD holder with research in protein oxidation of meat and meat-based products from University of Copenhagen, Denmark. He had 5 years of research experience in antioxidant studies of plant sources.



Iffah Nadhira Madzuki is currently a lecturer who specializes in food product development under Faculty of Chemical Engineering & Technology at Universiti Malaysia Perlis (UniMAP). She was a PhD holder with research in medical biotechnology from University of Leeds, United Kingdom. She had more than 5 years of research experience in phytochemical studies of medicinal plants and herbs.

<b>RAINFALL FOREWARNING APPLICATION</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Mohd Fairuz Bachok <sup>1</sup> , Azyan Zafyrah Mohd Zahid <sup>2</sup> , Azinoor Azida Abu Bakar <sup>3</sup> , Muhammad Farid Muhammad Fathullah <sup>4</sup> , Rosehemillia Amil <sup>5</sup>		
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<b>Email</b>	<sup>1</sup> mohdfairuz@uitm.edu.my, <sup>2</sup> azyan8410@uitm.edu.my, <sup>3</sup> azinoor@uitm.edu.my, <sup>4</sup> farid4472@uitm.edu.my, <sup>5</sup> rosehemilliaamil@gmail.com		
<b>Correspondence</b>	Mohd Fairuz Bachok Civil Engineering Studies, College of Engineering, Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, Malaysia Tel: +607-3818000, Fax:+607-3818141		
<b>Abstract</b>	The Rainfall Forewarning Application is a mobile application developed to provide rainfall forecasting at any location, specifically a 1 km <sup>2</sup> x 1 km <sup>2</sup> grid in Malaysia, either in a short time period of 3 hours or in a long time period of 6 months. This is done by gathering actual information about the atmosphere's current state in a specific area and using meteorology such as radar echo imageries and rainfall data to project how the weather will be in the future. This application has two main features, including a 10-minute rainfall warning and a daily rainfall warning. On a specific day, the rainfall warning is for a 10-minute rainfall forewarning with a lead period of up to 3 hours. This tool can forecast the weather for a specified time. In contrast, the daily rainfall forewarning feature will provide a daily rainfall warning based on a predetermined date with a 6-month lead time. By using this application, users can rely on the weather forecasting provided to anticipate severe weather and plan their day appropriately. It might also provide intelligent guidance for maximizing financial benefit in specific industries		




	while guaranteeing the safety of people and property.
<b>Keywords</b>	rainfall warning, weather prediction, mobile application, grid-based forecasting, radar echo imageries
<b>Product description</b>	<p>In this project, the Rainfall Forewarning Application was created mainly to forecast weather states in order to assist users plan their days accordingly for activities, events, or vacations based on their specific place and desired day and time. This is created by compiling accurate data on the current state of the atmosphere in a particular location and using meteorology to predict how the weather will be in the future.</p> <p>There are two (2) main features in this application: a) 10-minute rainfall forewarning and b) daily rainfall forewarning. For 10-minute rainfall forewarning, the rainfall warning is recorded every 10 minutes on a particular day. This feature is able to forecast weather conditions at a specific time with a lead time of up to three hours. Meanwhile, for daily rainfall forewarning, the rainfall warning will be released based on a selected date with a lead time of 6 months. There are five (5) colour-coded rainfalls featured in this application that represent the intensity of the rainfall. The colours include green (light), blue (moderate), yellow (heavy), orange (intense), and red (torrential).</p> <p>1.     10-minute rainfall forewarning For the 10-minute rainfall forewarning feature, the forecast radar image was obtained from the Malaysian Meteorological Department (METMalaysia). The image was then overlaid on the Google Earth map to determine the exact location of the specific area. The 1 km<sup>2</sup> x 1 km<sup>2</sup> grid was used to determine the locations where heavy rainfall intensity could occur based on the colours that appeared on the map. This application will transform this colour-coded radar imagery into a table form consisting of location (grid) and rainfall intensity in 10-minute intervals.</p> <p>2.     Daily rainfall forewarning For the Daily Rainfall Forewarning feature, the forecast rainfall was determined from historical rainfall data throughout the years from the Department of Irrigation and Drainage (DID). This data will be used as an input in a machine learning programme to forecast rainfall intensity for each day in the next year. As a result, there will be a different daily intensity forecast for different years. At least the past three years' data are needed as input to forecast the rainfall intensity. As an example, in order to predict the rainfall intensity on 25 August 2023, at least the past three years of data are required to be obtained, that is, rainfall data for 25 August 2022, 25 August 2021, and 25 August 2020. The forecasted rainfall will be presented in table form, with colour-coded rainfall for that day. The colours indicate the intensity of the rainfall.</p>

3. **Grid identification**  
 In order to determine the current location, the grid for the particular location needs to be identified beforehand. The Grid Identification feature in the application demonstrates how to determine the grid for the current or desired location. The Google Earth application is required to be downloaded from the Play Store and installed on the device. After the installation is completed, the application will be allowed to access the current location. After that, users may select the current location or any desired location in Malaysia to identify the grid number.

4. **Other additional features**  
 The Daily Record feature according to location (grid), date, and warning level in this application can be manually recorded for our own reference. Meanwhile, the 10-minute Record feature allows users to record the date, location (grid), time, and warning level. The Favourite Location and Grid is an additional feature to record grid numbers that are regularly used by users. Figure below shows the overall features available in the application and the colour-coded rainfall and its classifications.

**Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.**



	
<p><b>Novelty and uniqueness</b></p>	<p>The novelty of the Rainfall Forewarning Application lies in its unique and innovative approach to rainfall forecasting. Unlike conventional weather forecasting solutions, this application offers precise and personalised forecasts for specific locations, dates, and times. Users can input their desired parameters, allowing for accurate and tailored predictions that meet their individual needs. This level of customization sets the app apart from others on the market. Additionally, the application provides comprehensive coverage across various sectors, including industrial, agricultural, aviation, and marine, recognising the diverse impact of rainfall on these industries. It goes beyond traditional weather forecasting by offering insights for maximising financial gain in specific sectors, helping businesses optimise their operations. The app's focus on safety is another distinguishing feature, with real-time alerts and safety measures to protect lives and property from the impacts of severe rainfall events. Overall, the Rainfall Forewarning Application brings a fresh and advanced approach to rainfall forecasting, delivering precise, personalised, and valuable information to its users.</p>
<p><b>Benefit to mankind</b></p>	<p>The Rainfall Forewarning Application benefits mankind by providing accurate rainfall forecasts, enabling informed decision-making, activity planning, and resource protection.</p> <ol style="list-style-type: none"> <li>1. Planning and Preparedness: Users can plan activities based on rainfall forecasts, ensuring efficient scheduling and necessary precautions.</li> <li>2. Agricultural Optimisation: Farmers can maximise crop yields, conserve water, and protect crops by planning irrigation and other activities using rainfall forecasts.</li> <li>3. Risk Mitigation for Businesses: Companies can minimise losses and</li> </ol>

	<p>enhance profitability by scheduling operations and logistics based on accurate rainfall forecasts.</p> <ol style="list-style-type: none"> <li>4. Resource Management: Water resource managers can make informed decisions on water allocation and flood management using rainfall forecasts.</li> <li>5. Safety and Loss Prevention: Early warnings and alerts help individuals and communities take necessary precautions, safeguarding lives, property, and infrastructure from severe rainfall impacts. In summary, the Rainfall Forewarning Application empowers users to optimise activities, protect resources, enhance productivity, and mitigate risks associated with rainfall weather, benefiting mankind's well-being and prosperity.</li> </ol>
<p><b>Potential commercialization</b></p>	<p>In order to reduce water-related disaster losses and increase societal advantages, rainfall weather forecasting is a crucial mechanism that should be utilized by the public. While government agencies currently disseminate warnings through various media channels, some of these warnings may not be practical for the public to effectively respond to. To address this issue, the Rainfall Forewarning Application has been developed, aiming not only to provide a better medium for disseminating warnings but also to enhance public awareness regarding severe rainfall weather conditions. This reliable response system offers high precision and timely observations, forecasts, and alerts, allowing for the reduction and mitigation of the impacts of severe rainfall events. Furthermore, the potential for commercialization of the Rainfall Forewarning Application exists. By leveraging its capabilities and advancements, the application can be offered as a valuable service to various sectors and industries. For instance, insurance companies could utilize the accurate and timely information provided by the application to assess and mitigate risks associated with severe rainfall and water-related damages. Additionally, businesses in sectors such as agriculture, construction, transportation, and outdoor events can optimise their operations and planning by leveraging the insights and forecasts generated by the application. This opens up opportunities for partnerships, licencing, and subscription models, enabling the application to generate revenue while further expanding its reach and impact beyond Malaysia to a global scale.</p>
<p><b>Acknowledgment</b></p>	<p>The Hydrology on Environment (HydEn) project team would like to express their sincere gratitude to the Universiti Teknologi MARA Johor Branch, Pasir Gudang Campus, for their support through the Special Interest Group (SIG) grant (600-UiTMJ(PJIA.5/1/4)). This financial assistance has played a crucial role in the successful execution of our project, and we are truly grateful for their continued investment in research and education.</p>

**Researchers  
Biographical Data**



Mohd Fairuz Bachok currently serving as a senior lecturer at the Centre for Civil Engineering Studies, UiTM Cawangan Johor, Kampus Pasir Gudang. He is interested in developing supporting tools for water-related disasters, especially disaster early warning. He had developed more than 10 tools, including system, mobile application, process, standard of procedure, device, index, as well as scale of water-related disasters. He is also a member of SIG Hydrology on Environment (HydEn).



Azyan Zafyrah Mohd Zahid is a dual master's degree holder in Civil Engineering (Water Resources) and Water Resources Engineering & Management from Universiti Teknologi MARA, Malaysia, and the University of Stuttgart, Germany. She is currently serving as a lecturer for Civil Engineering Studies at UiTM Cawangan Johor, Kampus Pasir Gudang. Her areas of interest include eco-, hydrological, and hydraulic system modelling and water engineering. She is actively involved in producing research publications and innovations related to her field of interest. She is also the team leader for the SIG Hydrology on Environment (HydEn).



Azinoor Azida Abu Bakar specialises in hydrology - interception loss. She is currently a senior lecturer at the School of Civil Engineering, College of Engineering at Universiti Teknologi MARA, Shah Alam. She obtained her bachelor's degree in civil engineering from Universiti Sains Malaysia and a master's degree from Universiti Putra Malaysia. Azinoor Azida has been teaching at UiTM for over 20 years and has extensive teaching experience in the areas of hydrology and water engineering. She authored over 40 journals and proceedings at the national and international levels. She is also a Professional Engineer of the Board of Engineers Malaysia, a Member of the Institution of Engineers Malaysia, an ASEAN Chartered Professional Engineer, and a Professional Technologist of the Malaysia Board of Technologists. She is also a member of SIG Hydrology on Environment (HydEn).





Muhammad Farid Muhammad Fathullah is a lecturer who is currently working at the Civil Engineering Studies, UiTM Cawangan Johor, Kampus Pasir Gudang. He has completed his master's degree in water resources engineering and management in 2015 from University of Stuttgart, Germany. His area of interest includes open channel modelling, coastal engineering, and watershed quality management. He has been awarded with research grants related to his field of interest. He is also a member of SIG Hydrology on Environment (HydEn).



Rosehemillia Amil is a student who is currently undertaking her Master in research programme under the Faculty of Civil Engineering, Universiti Teknologi MARA, Shah Alam. Her interest in water resources studies has led her to do research on quantifying precipitation estimation through convective cloud cell attributes.

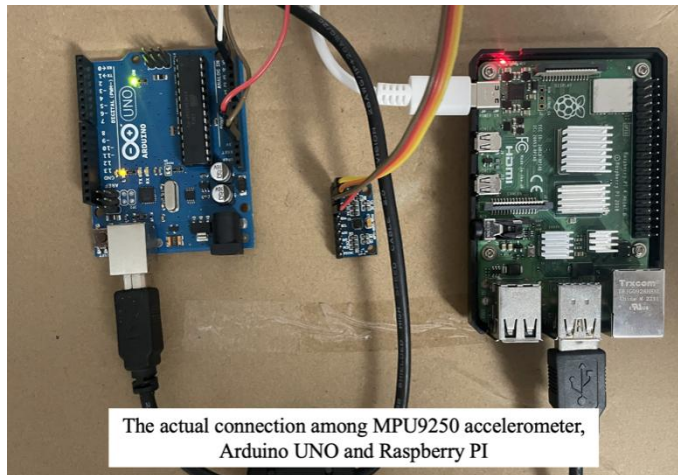
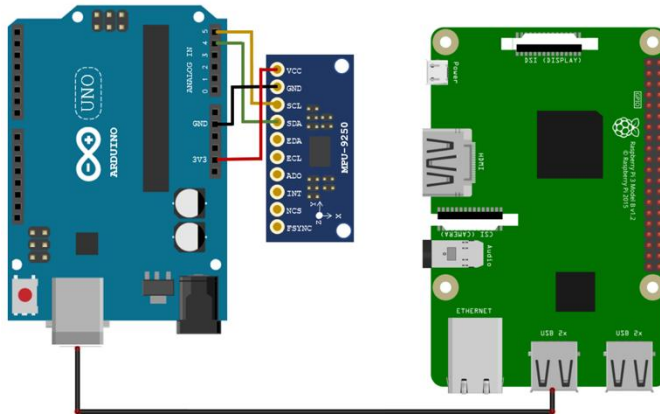


<b>DEVELOPMENT OF IOT-BASED REMOTE MONITORING VIBRATION ANALYZER (REM-VIAN)</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Amirul Azhajzul Gilok <sup>1</sup> , Mohd Affan Mohd Rosli <sup>1</sup> , Ahmad Zhafran Ahmad Mazlan <sup>1</sup> .		
<b>Affiliation</b>	<sup>1</sup> School of Mechanical Engineering, Engineering Campus, Universiti Sains Malaysia, Pulau Pinang, Malaysia		
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<b>Abstract</b>	The portable and remote monitoring vibration analyzer known as REM-VIAN is a compact and handy vibration measurement and analyzing tool that can measure up to 500 Hz of frequency. The analyzer is cheaper and more flexible compared to the common industrial based analyzer which is costly and immobile. It was constructed using the microelectromechanical system (MEMS) tri-axial accelerometer that connected to Arduino UNO microcontroller board. The acceleration data being programmed and analyzed using the Node-RED flow-based development tools and published as real-time online data using IoTFlows cloud software. It also enabled the fault detection notification for any irregular vibration data. Through a series of vibration tests and calibration, the REM-VIAN could monitor the vibration data remotely in real-time. The prototype has great potential and capability as a future handy vibration analyzer which specialized for operational mechanical machine.		
<b>Keywords</b>	MEMS accelerometer, vibration analyzer, remote monitoring		
<b>Product description</b>	REM-VIAN is constructed using MPU9250 MEMS tri-axis accelerometer		

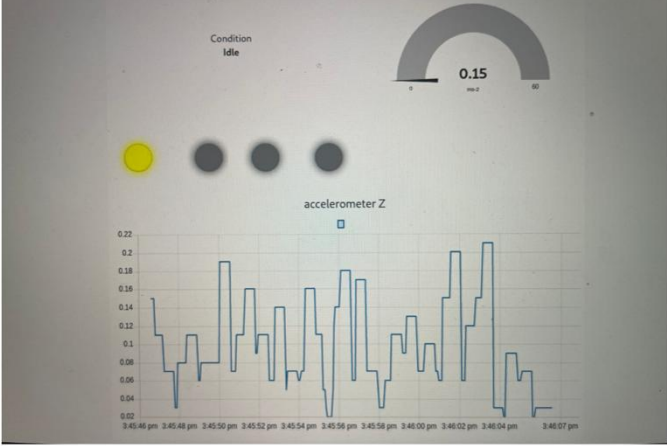
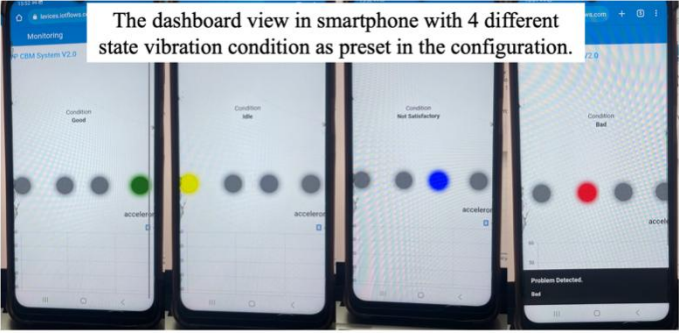
that is serially attached to Arduino UNO microcontroller board. The accelerometer was programmed using Arduino programming language to enable the measurement of acceleration data. The raw data was then computed using Node-RED software which installed in the microcomputer (Raspberry PI) to show the vibration values in graphical interface as well as the fault analysis. IoTFlows was used as cloud software to enables those data being monitored online in a real-time.




**Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.**

The diagram shows connection between the MPU9250 accelerometer and the Arduino UNO using 4 wires and the connection between the Arduino UNO and the Raspberry PI using USB cable.



The actual connection among MPU9250 accelerometer, Arduino UNO and Raspberry PI

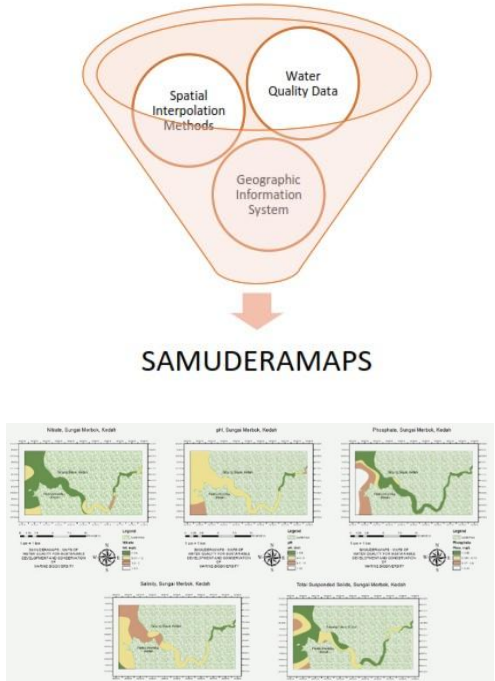
	 <p>The dashboard shows real-time live vibration measurement on the web browser</p>  <p>The dashboard view in smartphone with 4 different state vibration condition as preset in the configuration.</p>
<p><b>Novelty and uniqueness</b></p>	<p>REM-VIAN novelty and uniqueness are in terms of its portability to analyze the vibration data in real-time. Instead of using common industrial vibration analyzer, the handy REM-VIAM enables the vibration measurement process to be measured everywhere especially for the moving subject or machinery. Its palms size also makes it easy to be handled with just one operator.</p>
<p><b>Benefit to mankind</b></p>	<p>REM-VIAN applies the Internet of Things (IoT) concept. It provides an alternative and portable method in measuring and analyzing vibration data up to 500 Hz. It has huge potential in assisting the troubleshooter to detect any fault cause by abnormal vibration. It also helps the researcher to analyze the data to improve the reliability and performance of industrial machinery.</p>
<p><b>Potential commercialization</b></p>	<p>Based on physical appearance, REM-VIAN is practically used as a handy vibration measurement and analyzing tools for an individual operator. Apart from that, REM-VIAN can play an important role as fault detection method in the any related engineering industries. With suitable equipment or payloads such as integrated GPS module, REM-VIAN can be upgraded into a location enables vibration analyzer that may include other variables for optimizing the analysis.</p>

<p><b>Acknowledgment</b></p>	<p>The authors acknowledge the financial support for this project from the Ministry of Higher Education Malaysia through Fundamental Research Grant Scheme (FRGS) with project code FRGS/1/2021/TK0/USM/03/6.</p>
<p><b>Researchers Biographical Data</b></p>	<div data-bbox="505 411 737 697">  </div> <p>Amirul Azhajzul Gilok is a student who is currently undertaking his Bachelor of Mechanical Engineering study at Universiti Sains Malaysia. His interest is in sound and vibration, IoT and structural health monitoring.</p> <div data-bbox="505 810 745 1071">  </div> <p>Mohd Affan Mohd Rosli is a student who is currently undertaking his Master of Science study in Mechanical Engineering at Universiti Sains Malaysia. He has been awarded a scholarship by Ministry of Higher Education Malaysia to pursue his postgraduate study in sound and vibration field.</p> <div data-bbox="505 1171 745 1453">  </div> <p>Ahmad Zhafran Ahmad Mazlan is a Senior Lecturer at School of Mechanical Engineering, Universiti Sains Malaysia. His expertise is in sound and vibration, sensor and actuator, active vibration control, intelligent control, dynamic modelling and simulation, hand-arm vibration, and structural health monitoring.</p>

## SAMUDERAMAPS: COLLECTION OF WATER QUALITY MAPS FOR THE PROTECTION OF MARINE ENVIRONMENTS AND SUSTAINABLE SOCIO-ECONOMIC DEVELOPMENT FOR COASTAL COMMUNITIES

Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
	Local		International
	/		
<b>Project Member(s)</b>	<sup>1</sup> Sharir Aizat Kamaruddin, <sup>2</sup> Khairul Naim Abd.Aziz, <sup>3</sup> Jamil Tajam, <sup>4</sup> Zamzila Erdawati Zainol, <sup>5</sup> Aziani Ahmad		
<b>Affiliation</b>	<sup>1,2,3,4,5</sup> Marine Research Station, Faculty of Applied Sciences, Universiti Teknologi MARA, Cawangan Perlis, Kampus Arau, 02600, Arau, Perlis, Malaysia		
<b>Email</b>	<sup>1</sup> shariraizat@uitm.edu.my, <sup>2</sup> khairul87@uitm.edu.my, <sup>3</sup> jamiltajam@uitm.edu.my, <sup>4</sup> zamzila396@uitm.edu.my, <sup>5</sup> aziani@uitm.edu.my		
<b>Correspondence</b>	Gs. Sharir Aizat Kamaruddin Marine Research Station, Faculty of Applied Sciences Universiti Teknologi MARA, Cawangan Perlis, Kampus Arau 02600, Arau, Perlis, Malaysia. Tel: +604-9882157, Fax:+604-9882019		
<b>Abstract</b>	Water quality maps can be used strategically to safeguard the environment in the coastal and marine ecosystems and for sustainable marine fisheries and coastal tourism. Water quality maps are currently scarce, particularly in Malaysia's northern regions. SAMUDERAMAPS has been developed to achieve the aspiration of marine ecosystem conservation and improving economic profits for rural communities. SAMUDERAMAPS was created by integrating current water quality data and geospatial technology. SAMUDERAMAPS is a readymade product consisting of water quality maps of physicochemical water parameters, including water nutrient parameters covering the area of Sungai Kilim, Pantai Kok, Pulau Dayang Bunting, Pulau Tuba and Sungai Merbok, Kedah. SAMUDERAMAPS has a selection of maps in both paper and digital formats that will appeal to a		



	<p>wide range of purchasers, including social-economic players and local communities, at a fair price. In terms of contribution, SAMUDERAMAPS can assist environmentalists in monitoring water quality levels in inaccessible locales or areas with high biodiversity. Furthermore, SAMUDERAMAPS can be used for site-selection analysis for the sustainable development of mariculture areas, coastal tourism, and fishing hotspots. SAMUDERAMAPS is aligned with the United Nations Sustainable Development Goals, especially SDG 14 – Life below water, SDG 2 – Zero hunger, SDG 3 – Good health and well-being, and SDG 13 – Climate action.</p>
<p><b>Keywords</b></p>	<p>Coastal communities, Marine, Spatial maps, Sustainability, Water quality</p>
<p><b>Product description</b></p>	<p>SAMUDERAMAPS was created by integrating current water quality data and geospatial technology. SAMUDERAMAPS is a readymade product consisting of water quality maps of physicochemical water parameters, including water nutrient parameters covering the area of Sungai Kilim, Pantai Kok, Pulau Dayang Bunting, Pulau Tuba and Sungai Merbok, Kedah.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	 <p>The diagram illustrates the process of creating SAMUDERAMAPS. It features a funnel shape where three components are combined: 'Spatial Interpolation Methods', 'Water Quality Data', and 'Geographic Information System'. An arrow points from the funnel to the name 'SAMUDERAMAPS'. Below this, five screenshots of water quality maps are shown, each representing a different location: 'Kilim, Sungai Merbok, Kedah', 'pH, Sungai Merbok, Kedah', 'Phosphorus, Sungai Merbok, Kedah', 'Sulfate, Sungai Merbok, Kedah', and 'Total Suspended Solids, Sungai Merbok, Kedah'. Each map includes a legend, scale, and north arrow.</p>
<p><b>Novelty and uniqueness</b></p>	<p>Water quality maps are currently limited, particularly in Malaysia's northern regions. SAMUDERAMAPS has been developed to achieve the aspiration of marine ecosystem conservation and improving economic profits for rural communities. SAMUDERAMAPS has a selection of maps in both paper and digital formats that will appeal to a wide range of</p>



	<p>purchasers, including social-economic players and local communities, at a fair price.</p>
<b>Benefit to mankind</b>	<p>In terms of contribution, SAMUDERAMAPS can assist environmentalists in monitoring water quality levels in inaccessible locales or areas with high biodiversity. Furthermore, SAMUDERAMAPS can be used for site-selection analysis for the sustainable development of mariculture areas, coastal tourism, and fishing hotspots. SAMUDERAMAPS is aligned with the United Nations Sustainable Development Goals, especially SDG 14 – Life below water, SDG 2 – Zero hunger, SDG 3 – Good health and well-being, and SDG 13 – Climate action.</p>
<b>Potential commercialization</b>	<p>SAMUDERAMAPS has a selection of maps in both paper and digital formats that will appeal to a wide range of purchasers, including government sectors, social-economic players, and local communities, at a reasonable price.</p>
<b>Acknowledgment</b>	<p>The authors express their appreciation to MOHE Fundamental Research Grant Scheme (FRGS/1/2021/WAB11/UITM/03/2) for enabling this study to be conducted successfully.</p> <p>The authors also gratefully acknowledge the generous assistance and support from the academic and non-academic staff for their contribution to this research and publication. The authors also felt grateful to the Faculty of Applied Sciences, Universiti Teknologi MARA, Perlis Branch, Arau Campus, 02600, Arau, Perlis, Malaysia for the opportunity given.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; justify-content: space-between;"> <div style="width: 30%;">  </div> <div style="width: 65%;"> <p>Gs. Sharir Aizat Kamaruddin is a lecturer at the Faculty of Applied Sciences, Universiti Teknologi MARA, Cawangan Perlis, Kampus Arau, 02600, Perlis, Malaysia. He currently teaches Concepts of Biology (BIO400), Principle of Sustainability Sciences (MRS410), Marine Geographic Information Systems (MRS540) and Marine Resources Law and Policy (MRS660) for B. Sc. (Hons.) Sustainable Marine Technology. He can be reached at <a href="mailto:shariraizat@uitm.edu.my">shariraizat@uitm.edu.my</a></p> </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 30%;">  </div> <div style="width: 65%;"> <p>Mr. Khairul Naim Abd.Aziz is a lecturer at the Faculty of Applied Sciences, Universiti Teknologi MARA, Cawangan Perlis, Kampus Arau, 02600, Perlis, Malaysia. He currently teaches Hydrographic Survey (MRS500), Remote Sensing (MRS550), Introduction to Water Safety (MRS400) and Introduction to Marine Biology (MRS420) for B. Sc. (Hons.) Sustainable Marine Technology. He can be</p> </div> </div>

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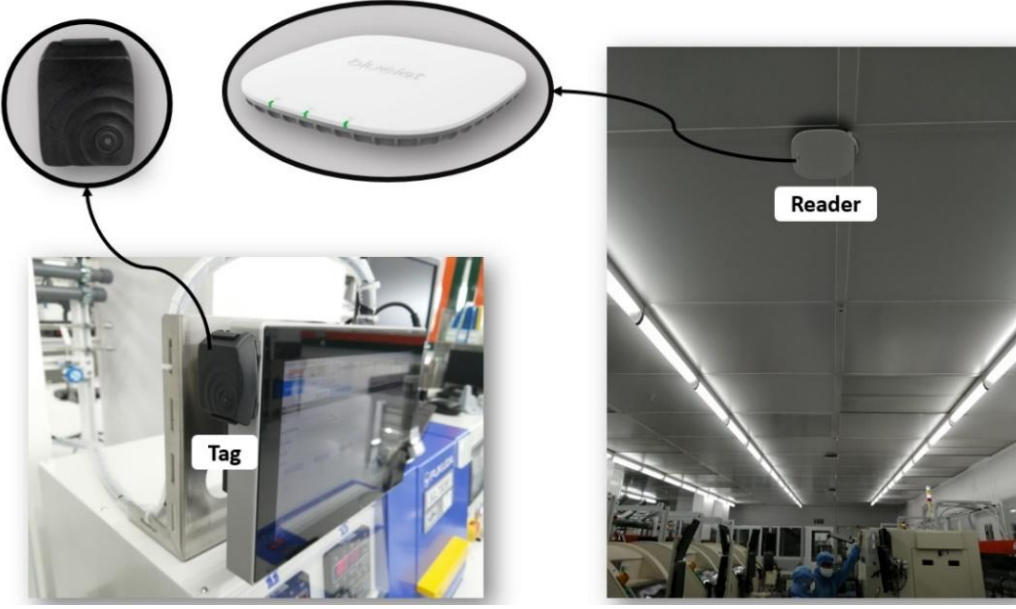
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Ms Aziani Ahmad is a lecturer at the Faculty of Applied Sciences, Universiti Teknologi MARA, Cawangan Perlis, Kampus Arau, 02600, Perlis, Malaysia. She currently teaches Marine Fisheries (MRS520), Fishing Technique and Operation (MRS610), and Processing Technology of Marine Products (MRS640) for B. Sc. (Hons.) Sustainable Marine Technology. She can be reached at [aziani@uitm.edu.my](mailto:aziani@uitm.edu.my)

<b>LOCATION ACCURACY OPTIMIZATION IN BLUETOOTH LOW ENERGY BASED INDOOR POSITIONING SYSTEM</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Dasmond Roy Philips <sup>1,2</sup> , Erfan Salami <sup>1,2</sup> , Harikrishnan Ramiah <sup>1,2</sup> and Jeevan Kanesan <sup>1,2*</sup>		
<b>Affiliation</b>	<sup>1</sup> Department of Electrical Engineering, Faculty of Engineering, University of Malaya, Kuala Lumpur 50603, Malaysia  <sup>2</sup> Center for Research in Industry 4.0, Faculty of Engineering, University of Malaya, Kuala Lumpur 50603, Malaysia		
<b>Email</b>	dasmondroy@gmail.com, erfansalami@hotmail.com, hrkhari@um.edu.my, jeevan@um.edu.my		
<b>Correspondence</b>	hrkhari@um.edu.my,  Department of Electrical Engineering, Faculty of Engineering, University of Malaya, Kuala Lumpur 50603, Malaysia		
<b>Abstract</b>	Indoor Positioning System (IPS) is a technology used to locate and track objects or people inside buildings, using sensors, wireless networks, or other means to determine their position. IPS has many applications in various fields such as healthcare, retail, logistics, and security. Achieving IPS of high location accuracy is yet to be explored further. In this experimental research, an IPS based on Bluetooth Low Energy (BLE) 5.1 protocol is implemented and two optimization techniques, parameters calibration and application of Machine Learning Algorithm (MLA) are proposed to improve location accuracy. In Layer 1 of this experiment, the measured Root Mean Square Error (RMSE) value before applying optimization techniques yielded location accuracy of 0.670m. In Layer 2, four different parameters which include elevation angle, tag height, data rate and walking pace are calibrated and tested. Also in Layer 2, three different algorithms which include Support Vector Regression (SVR), Decision Tree (DT) and K-Nearest Neighbor (KNN) are experimented. Parameters calibration decreased RMSE value down to 0.219m. Among all three MLAs tested, KNN decreased RMSE value		

	<p>down to 0.631m. In Layer 4, combining parameters calibration and MLA, lower RMSE value is achieved at 0.015m, which improved location accuracy up to 98.5%. The developed framework is applied and operational at our industry partner, ams OSRAM's wafer fabrication cleanroom facility.</p>
<b>Keywords</b>	<p>Indoor Positioning System (IPS), Bluetooth Low Energy (BLE) 5.1, Machine Learning Algorithm (MLA), Root Mean Square Error (RMSE)</p>
<b>Product description</b>	<p>Firstly, the hardware, including readers and tags, and web-based software (BlueIoT Server Management Software) to run the basic indoor positioning system is acquired from BlueIoT. Next, hardware and software are integrated to form a fully functional indoor positioning system within the allocated cleanroom facility. BLE 5.1 protocol is used as communication medium between readers and tags. Readers are signal receivers that are mounted onto ceilings of the environment whereas tags are signal transmitters that are attached to the assets that need to be tracked. In this application, tags are attached onto Panel Computers (PCs) within the cleanroom facility. BlueIoT Server Management Software is a web-based software provided by BlueIoT to operate and manage the hardware including tags and readers, and also to calculate tags' coordinates using angulation method utilizing Angle-of-Arrival (AoA) data. The coordinates calculated by this software are referred to as measured coordinates in this study, meaning these coordinates are highly prone to error and not optimized via neither parameter calibration nor machine learning approach. These measured coordinates are used as input data to MLAs since the raw AoA data is not made accessible by BlueIoT to be used as input data instead.</p>

<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs etc.</b></p>	
<p><b>Novelty and uniqueness</b></p>	<p>The novelty of this product lies in the approaches taken to improve the location accuracy by reducing the RMSE. Firstly, parameters calibration approach is taken, which involves calibration of elevation angle, tag height, data rate and walking pace. Next, for MLA, SVR, DT and KNN algorithms are tested and the MLA that delivers lowest RMSE value is determined. Finally, parameters calibration and MLA approaches are combined to reduce RMSE even more. This approach helps to achieve location accuracy up to 98.5%. This technique is novel as most of the off-the-shelf products does not come with neither parameter's calibration nor machine learning algorithm to improve location accuracy with readily available hardware and software.</p>
<p><b>Benefit to mankind</b></p>	<p>Indoor Positioning System (IPS) with improved location accuracy up to 98.5% using Bluetooth Low Energy (BLE) 5.1 can be very useful in many areas especially with its low-cost feature and wide adaptability to various indoor environments allow this product to be easily implemented and deliver exceptionally good results at almost any indoor environment. Moreover, this IPS can be replicated in any other indoor environment by adjusting the number of readers as required, which makes this product adaptable. Next, this proposed asset tracking system can be implemented to track humans as well, which can be useful to study hotspot areas of people in certain areas and mainly for contact tracing during pandemic era. Besides, this system can be helpful to study space utilization within an indoor environment which eventually may help in space optimization.</p>

<p><b>Potential commercialization</b></p>	<p>This product is already implemented and operational at our industry partner, ams OSRAM’s cleanroom facility. This system is used to track the presence and movement of panel computers within the cleanroom facility to mitigate missing assets issues. This system also provides location data and map-view visualization to the user at all times. In addition, this system provides notification to system manager when the BLE tags run out of battery power and when any asset leaves the designated cleanroom via email notification.</p>
<p><b>Acknowledgment</b></p>	<p>This work was supported in part by the Private Grant (PV) under Grant PV068-2021 and in part by the Partnership Grant under Grant MG003-2022.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 20px;"> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Dasmond Roy Philips is a master’s postgraduate student from Universiti Malaya (UM), registered under Faculty of Engineering. He is the key person in charge for the development and implementation of the proposed asset tracking system. He has been working on site with the industry partner, ams OSRAM till completion of this project. He is holding bachelor’s degree in electrical and Electronics from Universiti Teknologi Petronas (UTP).</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Dr. Erfan Salami is a post-doctoral research fellow at Universiti Malaya (UM), As a Mechatronics Engineer with 10 years of experience in both research and industrial areas, he has a strong grounding in fundamental, application, technology, and commercialization in IoT applications, Asset monitoring, Image Processing, Aircraft engineering, Smart Manufacturing, Rapid prototyping (3D printing), Biomimetic Micro Aerial Vehicles (BMAV), Unmanned Aerial Systems (UAS), Urban Air Mobility (UAM). Applying enabling technologies to different sectors for applications such as smart farming, Remote asset monitoring, drone mapping and unmanned solar panel farm maintenance which contribute to Industry Revolution 4.0 (IR4.0) initiative and society</p> </div> </div> </div>





Professor Ir. Dr. Harikrishnan Ramiah, is the Director of the Centre of Industry Research 4.0 (CRI4.0) and the Head of Analog, Digital & RF Research group at Universiti Malaya (UM). His work revolves in providing expert solutions to industry in the strength of IR4.0. With a reputable research output and solution, he has secured several international, national and industrial grants from the year 2014 till date. He serves as an Associate Editor of IEEE Access in a recognition towards his research credibility. He is a Chartered Engineer and a Fellow of the Institute of Electrical Technology (IET). His research work has resulted in several reputable technical publications in the field of Electrical & Electronics Engineering.



Associate Prof. Ir. Dr. Jeevan Kanesan, received the degree in electrical engineering from Universiti Teknologi Malaysia, in 1999, and the M.Sc. and Ph.D. degrees from Universiti Sains Malaysia, Penang, in 2002 and 2006, respectively. He was an Engineer with Carsem Semiconductor, Ipoh. He was a Research and Development Engineer at Intel, Penang, for two and a half years. He joined the Department of Electrical Engineering, Universiti Malaya, in 2008. He has published more than 70 peer-reviewed journals. His research interests include optimization and machine learning.

<b>PRODUCT OF NEW TRADITION ALTERNATIVE BATIK LUKIS COMTEMPORARY TECHNIQUES (N-TABLET)</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
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<b>Abstract</b>	The art of batik refers to the technique of designing textiles involving two main processes, namely the process of insulation or retention (resistant) and coloring which has long existed and seen from the perspective of the development of various aspects of production techniques. The new tradition in techniques based on alternative tools and materials is seen as freeing batik artists and artisans from dependence on existing conventional techniques that rely on the function of wax alone. The current dominance and trend of batik works as well as the revolution of creation in contemporary concepts, especially abstract elements, are also seen as a catalyst for more variations of new techniques to be produced. This qualitative research methodology is produced through the exploration of alternative materials from batik industry waste sources and a mixture of other materials to see the aesthetic potential if combined with wax as the		

	<p>main material in batik art. The chronology of this creative process is also recorded and the variation of the results is analyzed in aesthetic value based on the aspects of durability and coherence with wax materials and batik dyes as well as aspects. It is hoped that this study can provide inspiration, reference and encouragement to batik artists in their work as well as show the scope of contemporary batik work in a broader perspective through the uniqueness of alternative materials and media as a new tradition of creation.</p>
<p><b>Keywords</b></p>	<p>Alternative Batik, New Technique, Contemporary design</p>
<p><b>Product description</b></p>	<p>N-TABLET is the product of the design new application form of fiber in the background of plywood to create a new technique in Batik Lukis. The actual Batik Lukis prototype product was created from plywood but this take a few days before the actual result. Through a series of application form of test in batik lukis, at last N-TABLET design product has shown a successful result with high quality and at low cost.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	<div style="display: flex; flex-wrap: wrap;"> <div style="width: 50%;">  <p>Exploration 1 : mixture and layering of alternative materials batik waste wax, crayons and remazol on top of calico fabric.</p> </div> <div style="width: 50%;">  <p>Exploration 2 : a mixture and layering of alternative materials of batik waste wax, indigo dye and remazol on cotton fabric and watercolor paper</p> </div> <div style="width: 50%;">  <p>Exploration 3 : a mixture and layering of alternative materials batik waste wax, naptol dye, Coke water, salt and remazol on calico fabric.</p> </div> <div style="width: 50%;">  <p>Exploration 4 : alternative materials batik waste wax, and used sodium silicate and bleach on cotton fabric.</p> </div> </div> <p style="text-align: center;"><b>Exploration Process Alternative Form and the result product</b></p>

<b>Novelty and uniqueness</b>	N-TABLET has uniqueness especially in terms of new techniques alternative design development product. Instead of using plywood to produce batik lukis, it was better to use cheaper material such as fiber form. This material of batik lukis offer a good high quality product which is robust and agile.
<b>Benefit to mankind</b>	N-TABLET is a new product which was environmentally friendly products. It provides an alternative and robust method in developing a new techniques. It has huge potential in assisting the art of batik lukis academicians or researchers to design and develop a high quality product. It also helps the art of batik lukis students to comprehend the basic structure, system, Batik specialization and high quality design.
<b>Potential commercialization</b>	<p>The discovery of alternative techniques in batik art is very important to help give added value to existing techniques from an aesthetic and innovation point of view, this alternative technique is also capable of acting as a catalyst, opening the minds and excitement of contemporary batik art employees to produce works of paint and batik craft products in new dimensions and traditions at the same time reducing dependence on existing batik techniques that use only batik wax and remazol dyes. It will also give awareness of the importance of research culture through exploration methods, whether for waste or recycled materials or daily use materials that have their own aesthetic potential.</p> <p>After going through exploratory studies and creative processes, researchers have found new traditions in contemporary batik making techniques based on the uniqueness of aesthetic value, versatility and durability as well as the combinability of these alternative materials and media with existing conventional batik techniques. The findings of this study can later be used as a module for the next formal batik design education to support the basic aspects of the sustainability of creative arts, crafts and culture in the 4th and 8th Targets related to the importance of the product design industry and artworks in the Sustainability Development Goal (SDG) 2030 Plan by the United Nations (Chapter 2, <a href="http://un.org">http://un.org</a>) and the National Creative Industry Policy (DIKN) 2019 as well as increasing the R&amp;D treasury in the new tradition of contemporary batik crafting concepts</p>
<b>Acknowledgment</b>	The head project member acknowledges financial support from the Government of Malaysia via the sponsorship by the Ministry of Higher Education under the IPTA Academic Training Scheme. The financial support provided by the Malaysia Ministry of Higher Education's through Fundamental Research Grant Scheme (FRGS) is acknowledged.

**Researchers  
Biographical Data**

Iskandar Hasan Tan Abdullah is a senior lecturer who is currently under Faculty of Administrative Science and Policy Studies, UiTM, Cawangan Kelantan. He was awarded a scholarship by Yayasan Pelajaran MARA to pursue his study in Phd. He is holding a Phd in Policy Studies from University Malaysia Kelantan. (Correspondence).



Junaidi Awang is a senior lecturer at Department of Textile Design, College of Creative Arts @ Faculty of Art & Design, Universiti Technology MARA, Campus of Machang, Kelantan, Malaysia. His major is in Resist Textile specialisation in batik and design development. He started his career as a lecturer since 1999 at UITM Kelantan.



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Norhayati Yaacob is a Senior Lecturer at the Faculty of Administrative Science and policy Studies, UiTM Cawangan Kelantan. Starting her career as a teacher in a government school (1990 - 1996), she then continued his profession as an Assistant Program Manager cum Lecturer at a private college in Selangor (1998 - 2003), before joining UiTM since 2003 until now. With academic qualifications in the fields of Public Administration, Corporate Administration and Business Administration, her focus in teaching, writing, research and innovation is dedicated to Procedural Compliance, Human



Resource Management, Quality Management and Public Wellbeing. In addition, she is also active as a speaker and facilitator for academic, personal and community development inside and outside campus.



Nor Raihana Asmar Mohd Noor is a public administration lecturer at Universiti Teknologi MARA, Kelantan. She received her early education at Sekolah Rendah Kebangsaan Zainab 1, Kelantan. Then she continued her education at SMU (A) Mahhad Muhammadi (P), Kota Bharu, Kelantan until form five. She continued her studies at the Perlis Matriculation College, Arau before pursuing a Bachelor of Muamalat Administration specialisation in Corporate Administration at Islamic Science University of Malaysia in 2005. After completing the study in 2009, she served at Kolej Teknologi Darulnaim as a lecturer until the early of 2011 before continuing her studies at the Master level in the field of Corporate Governance at Universiti Teknologi MARA (UiTM) Shah Alam, Campus under Young Lecturer Scheme Award. In November 2020, she has been awarded her PhD at Universiti Sultan Zainal Abidin in the field of Risk Management under the supervision of Prof. Dr. Noorhayati Mansor. Her research interest is in public sector audit; corporate governance; public administration; regulation and Islamic governance.



<b>PORTABLE KEROPOK LEKOR MACHINE C/W AUTOMATION SYSTEM</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
<b>Project Member(s)</b>	Anuwar Jusoh <sup>1</sup> , Tuan Kamal <sup>2</sup> , Wan Azizurrahman <sup>3</sup> , Haizal Ahmad <sup>4</sup> , Fahmi <sup>5</sup>		
<b>Affiliation</b>	<sup>1</sup> Mechanical Department, ADTEC Batu Pahat, Johor <sup>2</sup> Jabatan Tenaga Manusia, Putrajaya, Malaysia		
<b>Email</b>	<sup>1</sup> anuwar.jusoh@gmail.com, <sup>2</sup> a.fahmi.jtm@1gov.gov.my, <sup>3</sup> wan_azizurrahman@jtm.gov.my, <sup>4</sup> kamal@jtm.gov.my & <sup>5</sup> haizal@jtm.gov.my		
<b>Correspondence</b>	Anuwar Jusoh Jabatan Mekanikal, ADTEC Batu Pahat, KM8 Jln Tnajung Labuh, 83000 Batu Pahat, Johor, Malaysia. Tel: 074287722, Fax: 074285290		

<b>Abstract</b>	<p>Small and medium industry is a very important in the national economy. The various products produced from the food production industry. Keropok Lekor is highly liked by Malaysians for breakfast, lunch or side food as well. The traditional way of producing keropok lekor manually using hand and full of energy. All the processes are complicated because its depend to our skill &amp; experiences. So its very slow and lacks of the production rate. The manual method previously using hand to pulverizing keropok lekor flour or using a machine to manually turn the handle to push the flour out of the machine. This project is named portable Keropok Lekor Machine. This is an innovation project that can facilitate the production process of keropok lekor more quickly and easily. The main problem experienced when using the manual method is that it takes a long time and uses more human energy to knead the keropok lekor flour and cut it into shapes before frying. The solution method used is to create a machine to produce keropok lekor combining with the all process. The result was a design of a tool specially designed to produce keropok lekor from scratch until complete with the cutting size. The automation machine is intended to produce raw dough of keropok material from the process of mixing the fish fillets with flour, grinding and then producing standard size of keropok lekor. Then the keropok is automatically cut according to the standard size that already programmed in the automation system. Then the goods output calculated and recorded by the IOT programmable software. The free appearances software can be installed into the Android smartphone easily.</p>
<b>Keywords</b>	<p align="center">Manual process, innovation project, keropok lekor, automation system, IOT Programmable.</p>

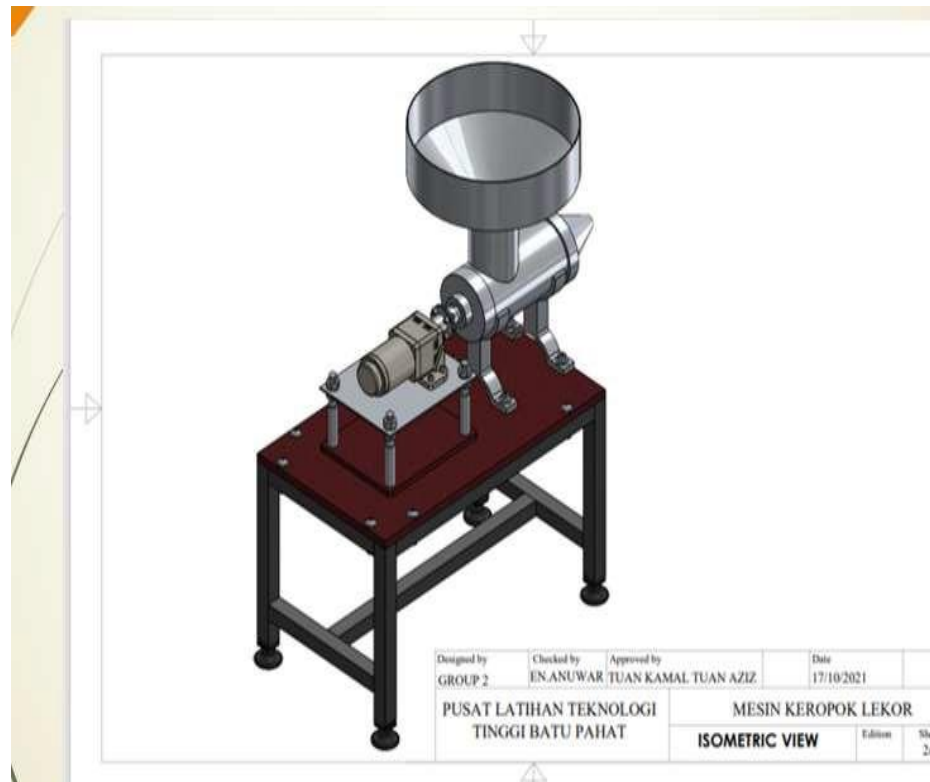
**Product description**

**Project Limitation / Scopes:**

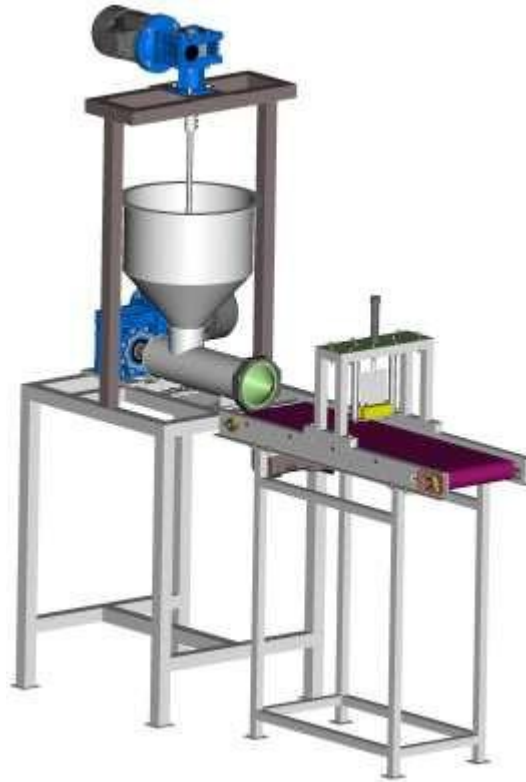
- This machine can produce the length of keropok which is 100mm to 200mm only.
- This machine has a size of lekor  $\varnothing 15$  and  $\varnothing 18$  only.

The objectives of this Portable keropok Lekor machine are as follows:-

- Designing a machine for the production of keropok lekor.
- Fabricate a portable keropok lekor machine and make modifications to the production part of keropok lekor.



**Figure 1:** keropok lekor extruded parts



**Figure 3:** keropok lekor completed drawing

### Comparison using manual and portable keropok lekor machine

The test have been done to obtain the actual result. From the tests that have been conducted, the times taken can be produced using the how many production output can be calculate and application if the automation cutting process.

TEST	TIME TAKEN (minutes)	RESULT	PRODUCTIVITY
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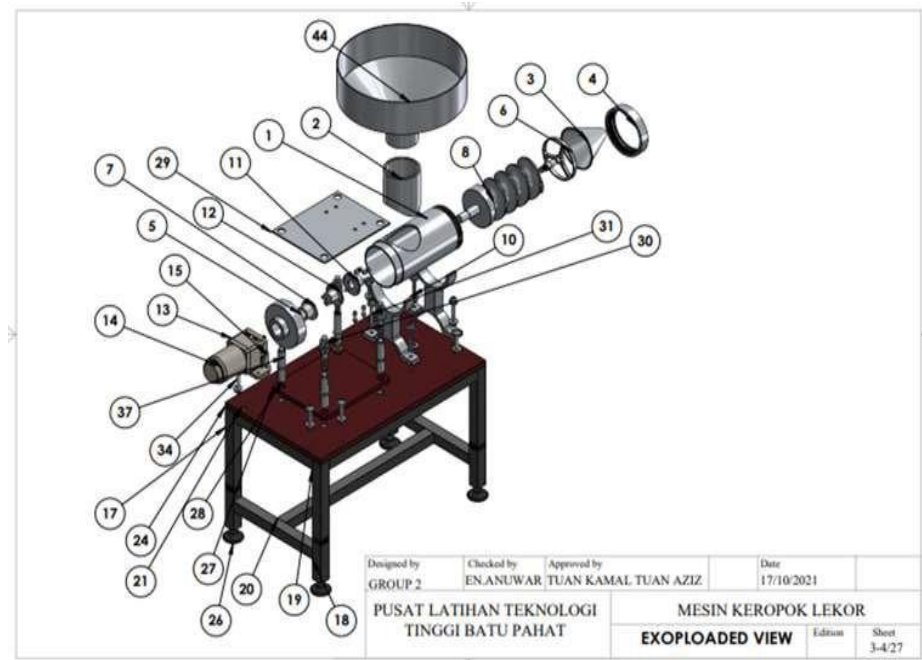
<b>1<sup>ST</sup> TEST</b>	5	1.1 KG	<ul style="list-style-type: none"> <li>• PASS &amp; NO REJECT</li> <li>• 50 PIECES</li> </ul>
<b>2<sup>ND</sup> TEST</b>	5	1.2 KG	<ul style="list-style-type: none"> <li>• PASS&amp; NO REJECT</li> <li>• 60 PIECES</li> </ul>

Table 1: result taken from the portable machine

<b>DESCRIPT ION</b>	<b>EXISTING METHOD</b>	<b>PORTABLE MACHINE</b>
<b>TIME</b>	The production takes more than 1 minute to complete 1kg of KEROPOK.	The time taken during production is 1 kg per minute
<b>QUALITY</b>	The final keropok result is poor because it requires the stable pressure.	The result of keropok lekor can be produced more better and perfectly
<b>SAFETY</b>	Easily INJURED to the delicate fish bones while kneading the flour.	reduce the risk to the user

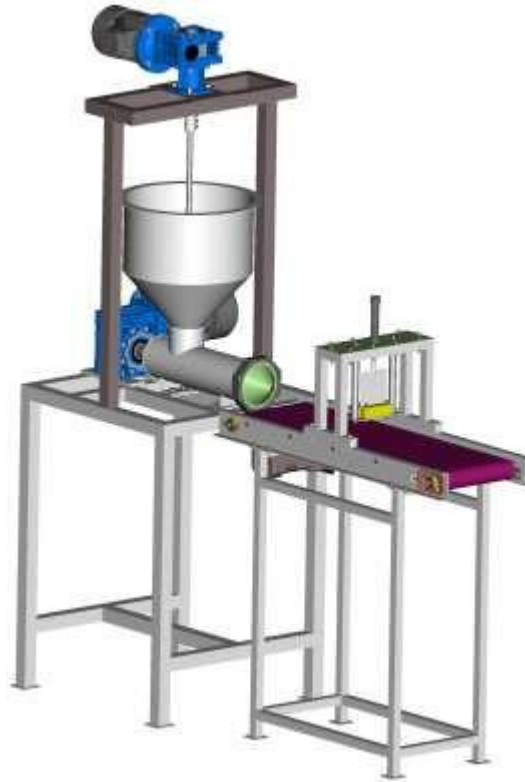
Table 2: Comparison between existing method Vs portable machine test

Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.



**Figure2:** keropok lekor exploded drawing






**Figure3:** keropok lekor machine complete with automation system

**Novelty and uniqueness**

**PATENT: Machine Design (MyIPO request ongoing)**

- The present invention relates generally to the portable keropok lekor machine design, more particularly, a 39 parts combined together as a smart combination to become be a good finishing machine for produce a huge number of keropok.
- This machine use extruder to press and produce the keropok and equipped with an automation system. .

**Benefit to mankind**

	<p>This machine is able to be classified into the 3 main categories:</p> <ol style="list-style-type: none"> <li>1) Operating cost Reduction; <ul style="list-style-type: none"> <li>• The operator can control the products over the size and the weight of keropok lekor to be included in the extruded part. In facts, the labor and material cost can be reduced automatically.</li> </ul> </li> <li>2) Time Savings; <ul style="list-style-type: none"> <li>• This machine is able to reduce the time operation while increase the production of the product.</li> </ul> </li> <li>3) High profit to the manufacturer; <ul style="list-style-type: none"> <li>• Local entrepreneur can increase the profit in term of the quantity of the output and quality of the products.</li> </ul> </li> </ol>
<p><b>Potential commercialization</b></p>	<p>This project also helps towards achieving the following goals:</p> <ol style="list-style-type: none"> <li>1. Supply to local entrepreneur &amp; SMI industrial across Malaysia.</li> <li>2. To fulfill the demand and meet customer satisfaction who buy the best products using the best innovation machine .</li> </ol>
<p><b>Acknowledgment</b></p>	<p>The head project member acknowledges financial support from the Government of Malaysia via the sponsorship by the Manpower Department under the ILKA Vocational Training Scheme. The financial support provided by the Malaysia Ministry of Human Resources through consumables training budget is acknowledged.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Anuwar Jusoh is a Vocational Officer and as a student who is currently undertaking his PhD study program under Faculty of Mechanical Engineering, UTM, Skudai, Johor. He was awarded a scholarship by JPA of Malaysia to pursue his study in vibration &amp; noise field study. He is holding a Master &amp; Degree of Mechanical Engineering from Universiti Teknologi Malaysia.</p> </div> </div>

		<p>Wan Azizurrahman is a Vocational Officer who is currently working at ADTEC Batu Pahat, Johor. He is holding a Master of Mechanical Engineering from UTHM, Johor &amp; Degree of Manufacturing from UKM.</p>
		<p>Tuan Kamal is a Vocational Officer who is currently working at ADTEC Batu Pahat, Johor. He is holding a Degree of Mechanical Engineering from University of Science Malaysia.</p>
		<p>Ahmad Fahmi is a Assistant Vocational Officer who is currently working at ADTEC Batu Pahat, Johor. He is holding a Diploma of Vocational Technology from CIAST.</p>
		<p>Haizal is a Assistant Vocational Officer who is currently working at ADTEC Batu Pahat, Johor. He is holding a Diploma of Mechanical Engineering from Polytechnic Sultan Abdul Halim Muadzam Shah.</p>

<b>IOT MOBILE GAS PIPING TEST RIG</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
<b>Project Member(s)</b>	Anuwar Jusoh <sup>1</sup> , Suzrinelly <sup>2</sup> , Rawi <sup>3</sup> , Fazri Izzuan <sup>4</sup> , Rutaha <sup>5</sup>		
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<b>Email</b>	<sup>1</sup> anuwar.jusoh@gmail.com, <sup>2</sup> suzrinnelly@jtm.gov.my, <sup>3</sup> rawi@jtm.gov.my, <sup>4</sup> fazri.izzuan@jtm.gov.my, <sup>5</sup> rutaha@jtm.gov.my		
<b>Correspondence</b>	Anuwar Jusoh Jabatan Mekanikal, ADTEC Batu Pahat, KM8 Jln Tnajung Labuh, 83000 Batu Pahat, Johor, Malaysia. Tel: 074287722, Fax: 074285290 H/P: 0126017554		

<p><b>Abstract</b></p>	<p>IOT Mobile gas piping test rig applies to pressure testing of gas piping systems for mechanical plant maintenance and fulfill the Malaysian Skill standard level two certificate of oil &amp; gas. The pressure relief devices &amp; maintenance course is core subject and the test must apply to the piping skid testing unit. The standard testing Methods of major importance for pressure and leak testing are the ASME B31 Pressure Piping Code and the ASME Boiler and Pressure Vessel Code. The conventional method most industries use in detecting pipeline leakages is called the pressure test. This method is too stressful of designing a model control system to detect leak without human intervention. In this work, a prototype test rig was designed and fabricated. Its components include pipes and piping components, safety valve, adaptor, pressure gauge, ball &amp; gate valve, non -return valve, reducer and digital pressure gauge. The rig has contactor and buzzer system and immediately it detects a pressure drop below the threshold value, it different flow line with pressure sensors and gauges mounted on each line. Thus, this study enhances quick leak detection, thus, gainfully helps to minimize losses during on the job operation in the case of spills and saves time in locating the exact point of leakage. Then the module leakage calculated and recorded by the IOT programmable software. The free appearances software can be installed into the Android smartphone easily. Then the result output calculated and recorded by the IOT programmable software. The free appearances software can be installed into the Android smartphone easily.</p>
<p><b>Keywords</b></p>	<p>IOT Mobile gas piping, leak detection, contactor and buzzer system, flow line, ASME Boiler and Pressure Vessel Code, IOT programmable.</p>

<p><b>Product description</b></p>	<p><b>Problem statement:</b></p> <ul style="list-style-type: none"> <li>• The project is made due to the existing problems by referring to cost, use mechanism and energy capacity used that student need to go to plant and learn actual symptom by referring to the old record services and maintenance.</li> <li>• It is also proactive to carry out projects that save time and maintenance as well as to analyze comparison with the output and innovation of existing in the market, thus being the mobile gas piping test rig.</li> <li>• Review of the gas piping problems as below:             <ul style="list-style-type: none"> <li>a) The use of a conventional method and daily routine checking for the leaking problem of the system.</li> <li>b) Manual &amp; Half system controller is still the most efficient, inexpensive and effective method at the plant.</li> <li>c) The lack of quick leak detection method.</li> </ul> </li> </ul> <p><b>Objectives:</b></p> <ol style="list-style-type: none"> <li>1) Mobile piping test rig would be useful for do the pressure testing and detection of leaking in piping system.</li> <li>2) To solve the teaching module problem in oil &amp; gas field of study and expensive of gas piping system to apply and teach the student or workers.</li> <li>3) The qualitative analysis for detecting the leaking of gas using naked eye only without use the complicated system and heavy instrument.</li> <li>4) Helping the University, polytechnic, technical colleague and Department Education to expose application of gas testing method using mobile and simple test rig.</li> </ol>
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**Methodology :**

The test rig operates in a manner in which a single input source supplies pressure to all the flow channels. After pressure has been built inside the rig by air compressor or oxygen tank, the air valves on the rig is used to control pressure in any section of the rig. This idea is gotten from the real life scenario whereby irrespective of the channels to be supplied different oil & gas products in an oil company, just a single pump is provided for apply the oil & gas delivery and transmission system. In addition, during the pressure flow, pressure gauges on the pipe are used to observe the amount of pressure present in the rig. Refer sensor and buzzer system used in the test rig.

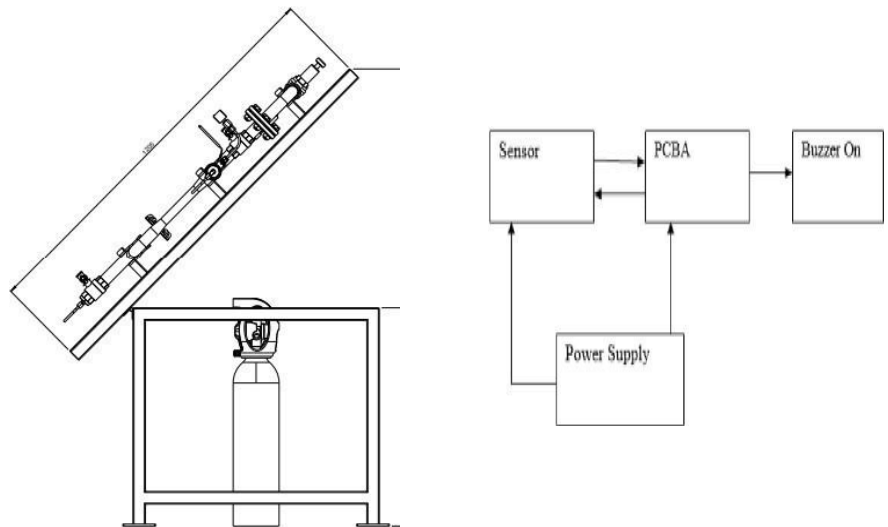
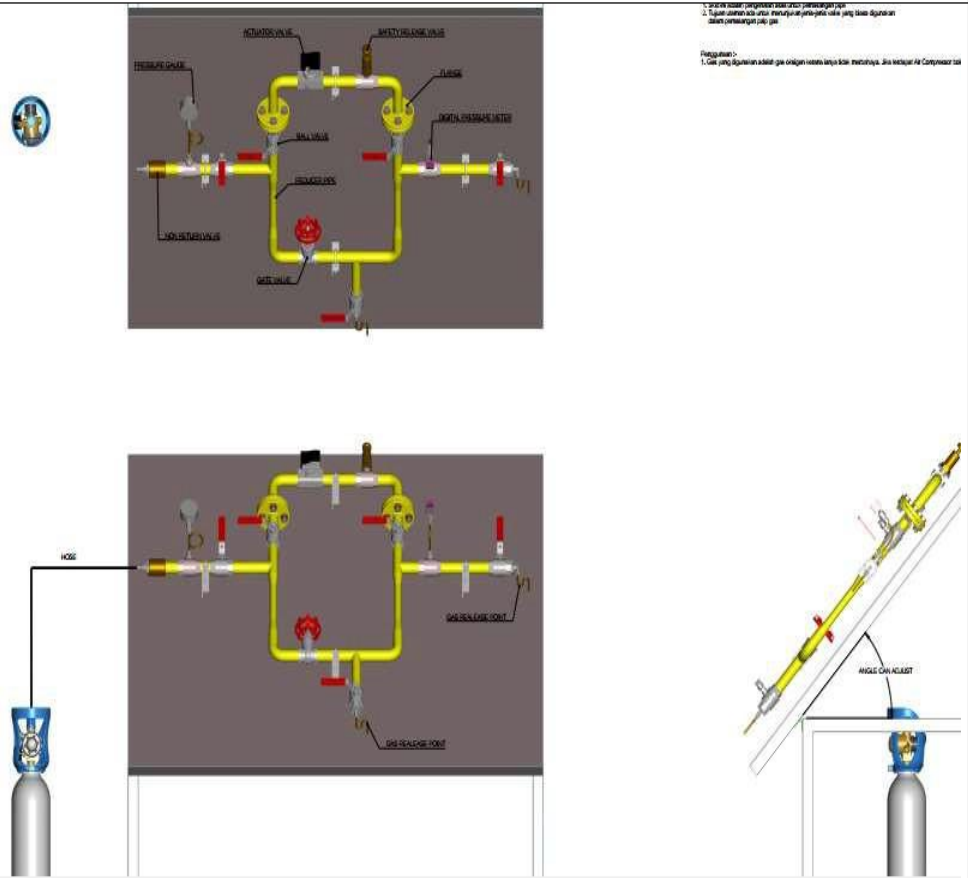


Figure 1: Gas Piping test rig using sensor & buzzer system

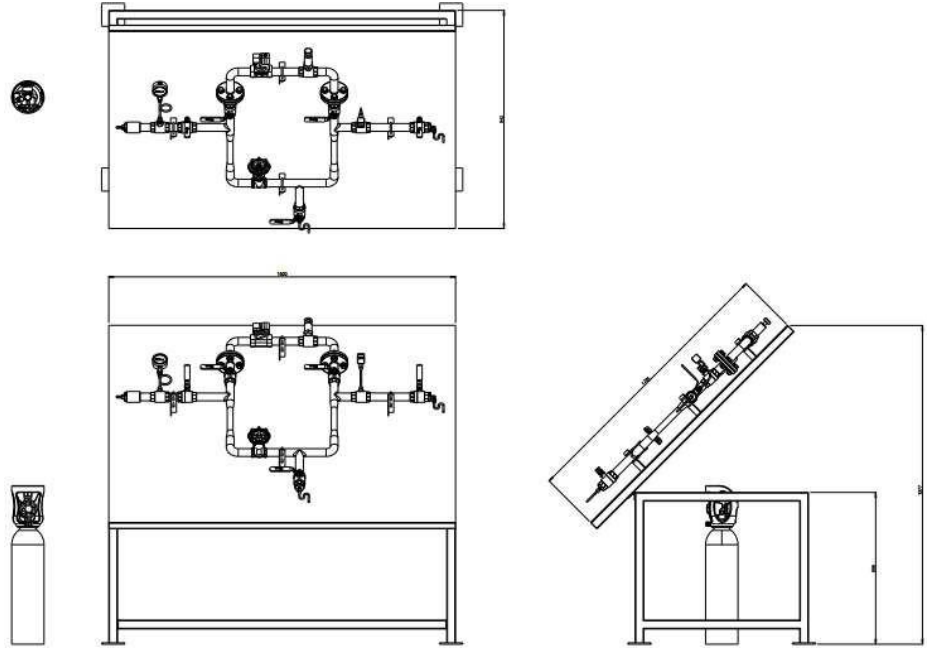


Figure 2: Price comparison with current test rig

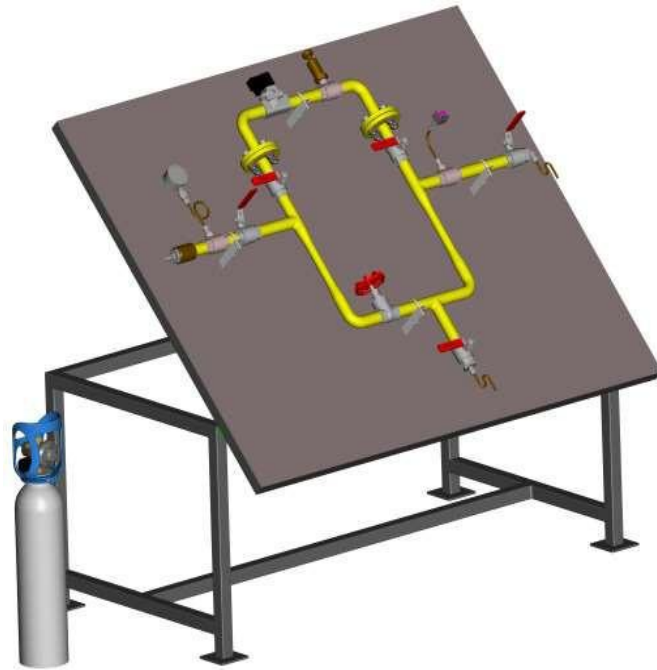
Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.



**Figure 3: Gas Piping Schematic Drawing**



**Figure 4: Gas piping orthographic view**






**Figure 5: IOT Gas piping test rig**

**Novelty and uniqueness**

**PATENT: Gas Piping leaking Design & test rig (ONGOING)**

- This design has been developed for specific piping and valve equipment to carry out the test method for apply the pressure test and piping leaking test.
- A novel technique to use mobile gas piping to the student who can apply the pressure test method after form and fitting all the ball valve, gate valve, flanges and piping connection. It's mobile and easy technique to teach and learn in mobile modules.
- Buzzer alarm triggering system applied to the gas piping module as well when the leaking detected by the instrumentation system.

	<ul style="list-style-type: none"> <li>• IOT implementation as part of IR4.0 to trigger and transfer the alarm system to the handset(software).</li> </ul>
<b>Benefit to mankind</b>	<p><b>BENEFITS: -</b></p> <ol style="list-style-type: none"> <li>1) Mobile piping test rig would be useful for do the pressure testing and detection of leaking in piping system.</li> <li>2) To solve the teaching module problem in oil &amp; gas field of study and expensive of gas piping system to apply and teach the student or workers.</li> <li>3) The Piping test rig is simple, economic and easy to use.</li> <li>4) The qualitative analysis for detecting the leaking of gas using naked eye only without use the complicated system and heavy instrument.</li> <li>5) Helping the University, polytechnic, technical colleague and Department Education to expose application of gas testing method using mobile and simple test rig.</li> </ol> <p>This project also helps industrial &amp; society:</p> <ol style="list-style-type: none"> <li>i) To help the student to carry out the non-destructive test for all the piping assembly, pressure test and leaking test test method.</li> <li>ii) As a Mobile tool to do several testing in oil &amp; gas requirement.</li> <li>iii) As a module test rig for apply pressure relief devices and pressure testing training.</li> </ol>
<b>Potential commercialization</b>	<p>This project also helps towards achieving the following goals:</p> <ol style="list-style-type: none"> <li>1) Potential market for selling this product to private and government University, polytechnic, technical institute as part of syllabus requirement in oil &amp; gas subject.</li> </ol>

	<ol style="list-style-type: none"> <li>2) Supply to the industrial as module test rig for apply pressure relief devices and pressure testing leak test training.</li> <li>3) To help the student to carry out the non-destructive test for all the piping assembly, pressure test and leaking test test method.</li> <li>4) As a Mobile tool to do several testing in oil &amp; gas requirement.</li> </ol>
<p><b>Acknowledgment</b></p>	<p>The head project member acknowledges financial support from the Government of Malaysia via the sponsorship by the Manpower Department under the ILKA Vocational Training Scheme. The financial support provided by the Malaysia Ministry of Human Resources through consumables training budget is acknowledged.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div data-bbox="508 835 768 1167">  <p>Anuwar Jusoh is a Vocational officer and at the same time as a student who is currently undertaking his PhD study program under Faculty of Mechanical Engineering, UTM, Skudai, Johor. He was awarded a scholarship by JPA of Malaysia to pursue his study in vibration &amp; noise field study. He is holding a Master &amp; Degree of Mechanical Engineering from Universiti Teknologi Malaysia.</p> </div> <div data-bbox="508 1203 768 1436">  <p>Suzrinelly is a Vocational Officer who is currently working at ADTEC Batu Pahat, Johor. He is holding a Degree of Mechanical Engineering from UTM, Johor &amp; Higher National Diploma from CIAST.</p> </div> <div data-bbox="508 1472 768 1705">  <p>Rawi is a Assistant Vocational Training officer who is currently working at ADTEC Batu Pahat, Johor. He is holding a Diploma of Mechanical Engineering from Polytechnic of Pasir Gudang.</p> </div> </div>



	 	<p>Fazri is a Assistant Vocational Training who is currently working at ADTEC Batu Pahat, Johor. He is holding a Diploma of Mechanical Engineering from Polytechnic of Pasir Gudang.</p> <p>Rutaha is a Assistant Vocational Training who is currently working at ADTEC Batu Pahat, Johor. He is holding a Diploma of Manufacturing Technology from CIAST.</p>
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<b>GaN NANOSTRUCTURE MSM PHOTODETECTOR ENHANCEMENT VIA ALTERNATING CURRENT PHOTOELECTROCHEMICAL ETCHING</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
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	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Ainorkhilah Mahmood <sup>1</sup> , Nur Iwani Nor Izaham <sup>2</sup> , Rosfariza Radzali <sup>3</sup> , Alhan Farhanah Abd Rahim <sup>4</sup> , Mahayatun Dayana Johan Ooi <sup>5</sup>		
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<b>Abstract</b>	<p>Gallium nitride (GaN) based photodetectors have been extensively studied, and this study focuses on the study of GaN nanostructure MSM (Metal-Semiconductor-Metal) photodetectors. The MSM photodetector offers various advantages, such as simplicity of fabrication, high speed operation, low device noise, and high sensitivity. A novel technique of alternating current photoelectrochemical (ACPEC) etching has been introduced in this study to enhance the optical and electrical properties of MSM photodetector compared to direct current photoelectrochemical (DCPEC) etching of porous GaN. Platinum (Pt) as a counter electrode, an UV assisted of 500 W, and KOH as electrolyte were prepared for the ACPEC and DCPEC processes. Etching duration is fixed at 45 minutes with an etching current density of <math>J = 25 \text{ mA cm}^{-2}</math>. Based on the FESEM result shown, 34.20 % is the highest porosity obtained by ACPEC compared to the DCPEC process, which is 30.6 %. The RMS values for ACPEC and DCPEC analyzed by AFM are 60.08 nm and 53.60 nm, respectively, while the XRD intensity peak positions for both are <math>17.294^\circ</math> and <math>17.006^\circ</math>, respectively. PL peak shift for ACPEC is much larger than ACPEC, which is 1.36 nm compared to 1.09 nm obtained by DCPEC. Raman spectra show a small shift of <math>E_2</math> (high) for porous samples prepared by DCPEC, which is <math>0.47 \text{ cm}^{-1}</math>, and a much larger shift for ACPEC, which is <math>2.13 \text{ cm}^{-1}</math>. The I-V characteristic has also been studied for a GaN based MSM photodetector prepared by ACPEC etching. Generally, the device shows an increase in its photocurrent (<math>I_h</math>) upon light illumination compared to its dark current (<math>I_d</math>). The current also increased to saturation when the light was turned on and decreased again when the light was switched off. The rise and decay times of the device are 377.8 ms and 393.7 ms, respectively. The nanostructure characterisation of the sample and the I-V graph of the device reveal that optimising the nanostructure of GaN by ACPEC etching with porosity and homogeneity is suitable for enhancing photodetector applications.</p>
<b>Keywords</b>	photodetector, porous GaN, photoelectrochemical etching.
<b>Product description</b>	<p>The MSM photodetector structure consists of interdigitated metal contacts sputtered on top of a porous GaN semiconductor absorbing layer, forming Schottky barriers at each metal-semiconductor interface. The fabrication process involved sputtering Platinum (Pt) using RF magnetron sputtering in a vacuum environment, with a metal mask used to define the interdigitated finger contact pattern. The porous GaN layer was prepared through ACPEC etching, utilizing Platinum wire (Pt) as a counter electrode and a potassium hydroxide (KOH) solution as the electrolyte. The device demonstrated rise and decay times of 377.8 ms and 393.7 ms, respectively, indicating its response to light stimuli.</p>

Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.


**METHODOLOGY**

**GaN NANOSTRUCTURE MSM PHOTODETECTOR ENHANCEMENT VIA ALTERNATING CURRENT PHOTOELECTROCHEMICAL ETCHING**


**1. Wafer Cleave/Clean**  
The GaN wafer is cleaved (1cm X 1 cm) and then cleaned by three chemical steps.




**2. Preparation of Porous GaN**  
Porous GaN was prepared by both ACPEC and DCPEC for comparison. .




**3. GaN Nanostructure Characterization**  
Optical and morphological characterization by FESEM, EDX, PL, Raman, and AFM



**4. Photodetector Fabrication**  
MSM photodetector fabricated using RF magnetron sputtering and finger contact



**5. Photodetector Characterization**  
The electrical characteristics of the photodetector are analyzed with an integrated Source meter.



## WAFER CLEANING AND PREPARATION FOR ACPEC AND DCPEC ETCHING

### MATERIAL USED AND CLEAVING

<b>Material</b> Wafer: Undoped GaN thin Film grown by MOCVD on two inch diameter sapphire with thickness of 3 $\mu$ m.	<b>Cleaving</b> The wafer is cleaved into 1cm x 1cm pieces.
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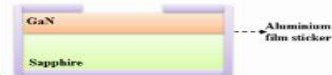
### WAFER CLEANING

Following 3 steps of cleaning:

- 1) Wafer dipped into (NH<sub>4</sub>OH: H<sub>2</sub>O) (1:20) solution for 10 minutes and rinsed with DI water.
- 2) Wafer dipped into (HF: H<sub>2</sub>O) (1:50) solution for 20 seconds, then rinsed with DI water.
- 3) Wafer dipped into boiling (80°C) aqua regia (HCl: HNO<sub>3</sub>) (3:1) solution for 10 minutes and soaked in DI water for 5 minutes.

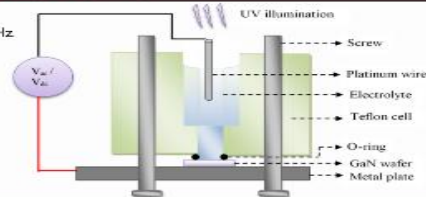
### WAFER FRONT AND BACK CONTACT

Conductive Aluminium sticker used for front and back contact. The whole area is wrapped with Al stickers except the non contact area to allow it to be exposed to electrolyte for the etching process.

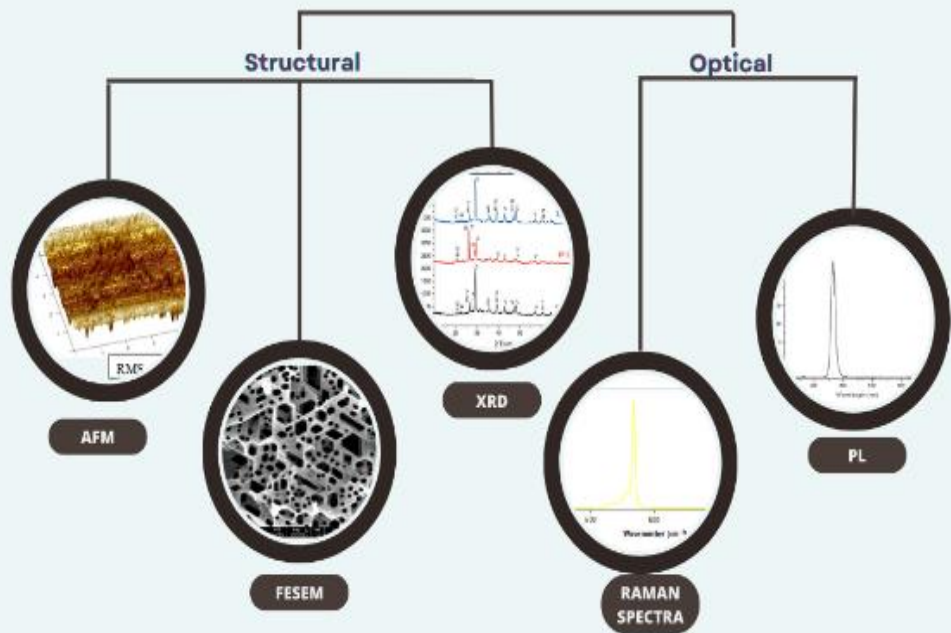


### ACPEC/DCPEC ETCHING


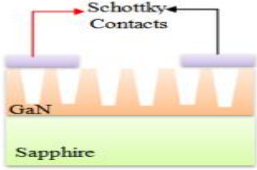
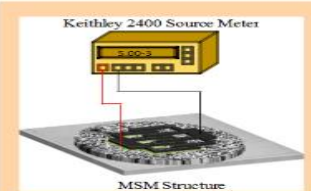
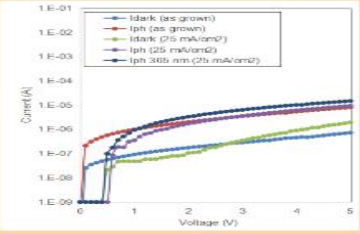
- Alternating current with a frequency of 50 Hz
- Current density  $J = 25 \text{ mA/cm}^2$ .
- KOH as an electrolyte
- Platinum wire (Pt) as a counter electrode
- Photo assisted 500W UV lamp
- 45-minute etching duration
- Room Temperature
- Aluminium sticker as contact






## GaN Nanostructure Characterization





	<p style="text-align: center;"><b>MSM PHOTODETECTOR FABRICATION AND CHARACTERIZATION</b></p> <p><b>FABRICATION</b></p> <p>The MSM photodetector is fabricated by sputtering Platinum (Pt) using RF magnetron in vacuum.</p> <p>A metal mask is used for interdigitated finger contact patterns.</p>  <p><b>DEVICE STRUCTURE</b></p> <p>The active area of the whole device is 4 x 4 mm<sup>2</sup>.</p> <p>MSM photodiodes consist of two interdigitated Schottky contacts connected back to back.</p> <p>One of the Schottky contacts is forwardly biased, and the other is reversely biased when bias is applied.</p>   <p><b>DEVICE CHARACTERIZATION</b></p> <p>The electrical characteristics of the fabricated device were analyzed with a computer-controlled integrated Sourcemeter.</p> <p>The I-V measurements of the samples were taken in a dark environment and UV illumination.</p> 
<p><b>Novelty and uniqueness</b></p>	<p>Introducing a groundbreaking GaN MSM photodetector with unparalleled fabrication methods. Utilizing alternating current photoelectrochemical etching, we achieve a highly porous GaN semiconductor, a first in this context, resulting in unprecedented efficiency and sensitivity. Our ingenious use of aluminium wrap for front and back contacts ensures continuous and uniform current distribution, setting our product apart. With a remarkable response time of 377.8 ms rise and 393.7 ms decay, it outperforms existing solutions, promising to reshape light sensing applications. Peer-reviewed and supported by quantifiable data, our photodetector heralds a new era in light detection technology.</p>
<p><b>Benefit to mankind</b></p>	<p>GaN MSM photodetector uses ACPEC to prepare it. The study of nanostructured GaN will yield valuable information for future green technology applications. Furthermore, the use of alternating current photoelectrochemical etching to prepare nanostructured GaN will assist the government in evolving towards green technology to improve the sustainability and resilience of our country's manufacturing as well as resource efficiency.</p>
<p><b>Potential commercialization</b></p>	<p>GaN based MSM photodetectors are suitable for UV detectors working in extreme conditions due to their superior radiation hardness and high temperature resistance. Furthermore, due to its tremendous response upon exposure to photons, it is also suitable for detecting hydrogen gas and acting as a hydrogen gas sensor. GaN material inherits detector</p>



	<p>characteristics including good temperature sustainability, high breakdown voltages, high carrier mobility, inertness, and hardness to chemicals and radiation, respectively. GaN MSM photodetector has made its mark in many applications, including monitoring combustion, flame detection, ozone detection, space communication, biological sensors (phototherapy, sterilization control, solar irradiance measurement), industrial monitoring, missile plume detection, and ultraviolet astronomy.</p>
<p><b>Acknowledgment</b></p>	<p>The authors thank the Ministry of Higher Education (MOHE) for awarding financial support through the Fundamental Research Grant Scheme (Grant No. FRGS/1/2022/STG07/UITM/02/1) and Universiti Teknologi MARA Cawangan Pulau Pinang.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Ainorkhilah Mahmood obtained her B.Sc Hons in Applied Physics, M.Sc in Solid State Physics and PhD in Solid State Physics from Universiti Sains Malaysia in the years 1999, 2003 and 2017, respectively. She is currently the Coordinator of the Research Management Unit at Universiti Teknologi MARA Cawangan Pulau Pinang Malaysia. Her research interests focus on nanostructure fabrication, specifically in III-nitrides and silicon materials. These nanostructures are applied in various semiconductor fields, including photonics, optoelectronics, and gas and environmental sensors.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Nur Iwani Nor Izaham holds a B.Sc. (Hons.) in Physics from Universiti Teknologi MARA, Malaysia. Presently, she serves as a graduate research assistant at the same university, working under the supervision of Dr. Ainorkhilah Mahmood on a FRGS grant project. Her current pursuit involves an MSc degree with a focus on GaN nanostructures for sensor applications.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Rosfariza Radzali received her B.Eng. in electronics and System from Takushoku University, Japan and her MSc. In Microelectronics from Universiti Kebangsaan Malaysia. She obtained her PhD in Semiconductor Fabrication from Universiti Sains Malaysia. Her research interest is in the fabrication and characterisation of III-Nitrides alloys porous structure and its application in semiconductor and sensing devices. She is a senior lecturer at Electrical Engineering Studies, College of Engineering,</p> </div> </div> </div>

Universiti Teknologi MARA, Malaysia.


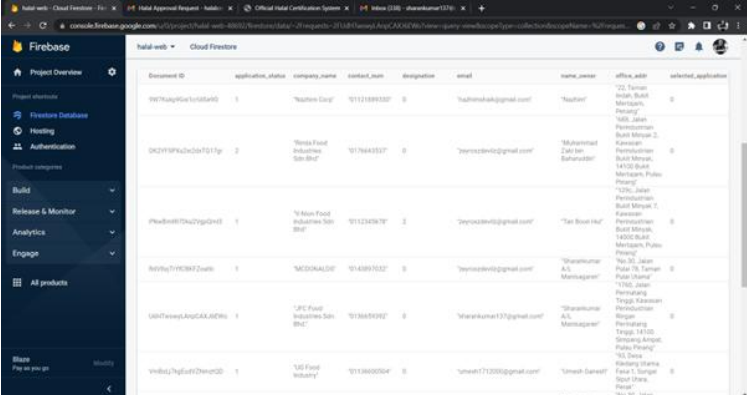




Alhan Farhanah Abd Rahim obtained her B.Eng (Hons) in Electronics Engineering from University of Southampton, United Kingdom in 1998, MSc and PhD in Solid State Physics from Universiti Sains Malaysia in 2003 and 2014 respectively. She is currently an Associate Professor at the Centre for Electrical Engineering Studies, Universiti Teknologi MARA, Cawangan Pulau Pinang, Malaysia. Her research interests include synthesis and fabrication of semiconductor materials (group IV, III-V, porous semiconductors, and metal-oxides) through electrochemical, thermal evaporation, RF Sputtering techniques for Optoelectronic and gas sensing applications. She is also keens on semiconductor modelling and simulation utilizing SILVACO TCAD for her research work



Mahayatun Dayana Johan Ooi received her B.Sc. (Hons) in Engineering Physics, MSc in Physics and holds a PhD in Semiconductor Fabrication (Thin Film, Epitaxy and Nanostructures) from Universiti Sains Malaysia. Her research interests focused on bimetallic and trimetallic alloys for fuel cell applications. She has published widely on topics such as noble catalysts and II-VI semiconductor materials. She is a senior lecturer at the School of Physics, Universiti Sains Malaysia, Pulau Pinang, Malaysia.

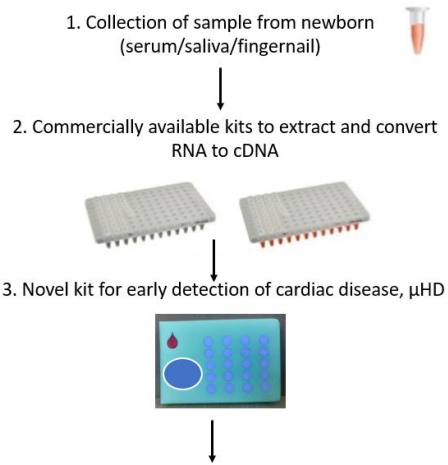
<b>DEVELOPMENT OF AN ONLINE SYSTEM FOR HALAL CERTIFICATION REGISTRATION AND MONITORING</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
		√	
<b>Project Member(s)</b>	Sharankumar Manisagaren <sup>1</sup> , Rosmiwati Mohd Mokhtar <sup>2</sup> .		
<b>Affiliation</b>	School of Electrical and Electronic Engineering, Universiti Sains Malaysia, Pulau Pinang, Malaysia		
<b>Email</b>	<sup>1</sup> sharankumar13@student.usm.my, <sup>2</sup> eerosmiwati@usm.my.		
<b>Correspondence</b>	Rosmiwati Mohd Mokhtar School of Electrical and Electronic Engineering, Universiti Sains Malaysia, Engineering Campus 14300 Nibong Tebal, Pulau Pinang, Malaysia. Tel: +604-5996003, Fax: +604-5996909		
<b>Abstract</b>	<p>An online system for Halal certification registration and monitoring process is developed using the HTML5 JavaScript coding to create a web application. The web application is hosted at Visual Studio (VS) Code with a Halal registration application form to be sent by email to the Halal Department as well as handling the libraries available in VS code and Astro extension. The deadline of Halal certification will be recorded in JavaScript Object Notation (JSON) format and transfer to the database via firebase package over the internet. The system will gather information and record for the Halal certification applications and will notify via email notification when the recurring deadline is approaching. The proposed system will overcome the existing manual Halal certification application and provide a novel approach on monitoring and alert both authorities and food industries/premises when the expiring date approaching. In addition, the system also provides with the Halal certification of the registered for consumer view. The online registering and monitoring features proposed in this project will significantly assist three parties: The Halal authority, the food/premise supplier, and the Muslim consumers. The impact of online registration process will overcome over the counter and manual registration, embark on go digital approach, increase awareness on the need</p>		

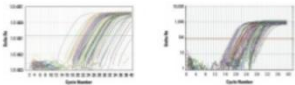
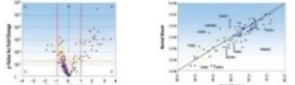

	to renew the registration certificate on time, and increase confidence among consumers.
<b>Keywords</b>	Halal certification application, online system, monitoring process.
<b>Product description</b>	An online system for Halal certification registration and monitoring process is fully software application developed using the HTML5 JavaScript coding to create a web application. The web application is hosted at Visual Studio (VS) Code with a Halal registration application form to be sent by email to the Halal Department as well as handling the libraries available in VS code and Astro extension. The application details together with the deadline of Halal certification will be recorded in JavaScript Object Notation (JSON) format and transfer to the database via firebase package over the internet.
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	 <p align="center">Welcome page of Halal Registration form</p>  <p align="center">Firebase database storage of Halal application in the query builder</p>
<b>Novelty and uniqueness</b>	<p>The novelty and uniqueness of this system can be devised as follows.</p> <ul style="list-style-type: none"> <li>• The online Halal certification registration overcomes the existing over the counter form submission.</li> <li>• The reminder alert notifying that the expiry date is approaching is a completely novel approach which is yet to be implemented in the current Halal certification application process.</li> </ul>

	<ul style="list-style-type: none"> <li>• The online one-stop information to check the validity of the Halal certification of the food industries/premises.</li> </ul>
<b>Benefit to mankind</b>	<p>The online registering and monitoring features proposed in this project will significantly assist three parties: The Halal authority, the food/premise supplier, and the Muslim consumers. The benefit of online registration process will overcome over the counter and manual registration, embark on go digital approach, increase awareness on the need to renew the registration certificate on time, and increase confidence among consumers.</p>
<b>Potential commercialization</b>	<p>The developed system can be utilized by the Halal management unit, Jabatan Kemajuan Islam Malaysia (JAKIM).</p>
<b>Acknowledgment</b>	<p>The project members acknowledge partial financial support from the Ministry of Higher Education through Fundamental Research Grant Scheme: FRGS/1/2019/TK04/USM/02/12. The Halal management unit, Jabatan Kemajuan Islam Malaysia (JAKIM) is also acknowledged.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 20px;">  <p>Sharankumar Manisagaren is a student at the School of Electrical and Electronic Engineering, Universiti Sains Malaysia.</p> </div> <div>  <p>Rosmiwati Mohd Mokhtar is a lecturer at the School of Electrical and Electronic Engineering, University Sains Malaysia.</p> </div> </div>

<b>miR-17-5p AND miR-210-3p AS A POTENTIAL BIOMARKER IN HEART DISEASE DEVELOPMENT</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
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	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Zatilfarihiah Rasdi <sup>1</sup> , Siti Hamimah Sheikh Abdul Kadir <sup>2,3</sup> , Nurhaslina Hasan <sup>1</sup> , Mohammad Azizi Azreen <sup>1</sup> , and Roziana Kamaludin <sup>4</sup>		
<b>Affiliation</b>	<sup>1</sup> Faculty of Dentistry, Universiti Teknologi MARA, Selangor Branch, 47000 Sungai Buloh, Malaysia <sup>2</sup> Faculty of Medicine, Universiti Teknologi MARA, Selangor Branch, 47000 Sungai Buloh, Malaysia <sup>3</sup> Institute for Pathology, Laboratory and Forensic Medicine (I-PPerForM), Universiti Teknologi MARA, Selangor Branch, 47000, Sungai Buloh, Selangor, Malaysia <sup>4</sup> Advanced Membrane Technology Research Centre (AMTEC), Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia		
<b>Email</b>	<sup>1</sup> zatilfarihiah@uitm.edu.my		
<b>Correspondence</b>	Zatilfarihiah Rasdi Fakulti Pergigian, Universiti Teknologi MARA, Cawangan Selangor, Kampus Sungai Buloh, 47000 Sungai Buloh, Selangor, Malaysia. Tel: +603-62166566, Fax:		
<b>Abstract</b>	<b>Introduction:</b> Exposure to endocrine disruptors such as bisphenol A (BPA) during pregnancy increases the risk of later heart disease. The offspring are exposed to changes in organ development by maternal nutrition. BPA is ubiquitous and infiltrates our environment, including drinking water. MicroRNAs (miRNAs) are important regulators in the		



	<p>development of organs and can be used as an indicator of heart disease in humans. Currently, the most well-known biomarkers for heart disease are C-reactive proteins (CRP) and cardiac troponin I/T. However, miRNAs provide greater stability, specificity, sensitivity, and flexibility in the storage of sample conditions. <b>Novelty:</b> The proposed biomarker is one of the new biosensor technologies that can be used as an early detection tool, especially in newborns. We observed significant expression of miR-17-5p and miR-210-3p modifications associated with cardiac development, muscle injury, and heart failure in foetal BPA-exposed mother, indicating a high probability of offspring developing the disease later in life. In this study, we proposed the development of a biomarker for heart disease based on the expression of miRNA in the blood as a preliminary diagnosis for newborns. <b>Usefulness/Impact towards humanity:</b> This designed technology potentially reduces early death rates by introducing early therapeutic management and educating healthy lifestyles. miR-17-5p and miR-210-3p is a kit developed from a group of miRNAs related to heart disease. The findings of this study will strengthen research capacity for the development of new potential biomarkers, improving the quality of life of people and promising commercial potential in the future.</p>
<b>Keywords</b>	Heart disease, pregnancy, bisphenol A, offspring, biomarker
<b>Product description</b>	<p>miR-17-5p and miR-210-3p are constructed by using polymerase chain reaction array known as PCR. The actual kit prototype is still in an ongoing developmental stage. Through a conducted experiment using heart tissues, the miRNAs kit design has shown to potentially provide high stability and accuracy in determining prevalence of heart disease development.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	 <p>1. Collection of sample from newborn (serum/saliva/fingernail)</p> <p>2. Commercially available kits to extract and convert RNA to cDNA</p> <p>3. Novel kit for early detection of cardiac disease, <math>\mu</math>HD</p>

	<p align="center">4. Kit prepared and run-on real-time PCR</p>  <p align="center">↓</p> <p align="center">5. Data analysis</p> 
<p><b>Novelty and uniqueness</b></p>	<p>The proposed biomarker is one of the new biosensor technologies that can be used as an early detection tool, especially in newborns. Instead of using C-reactive protein to diagnose the disease, it is recommended to use specific and sensitive markers for detecting heart disease development even in newborns. Significant modifications in miR-17-5p and miR-210-3p expression indicating a high probability of offspring developing the disease later in life.</p>
<p><b>Benefit to mankind</b></p>	<p>This designed biomarker potentially reduces early death rates by introducing early therapeutic management and educating healthy lifestyles. Both miR-17-5p and miR-210-3p are sensitive, specific, and flexible kits developed from a group of miRNAs related to heart disease.</p>
<p><b>Potential commercialization</b></p>	<p>Based on the findings, miRNAs are practically used as a biomarker for individuals even in newborns to detect any disturbance or changes in heart disease development. Apart from that, miRNAs can play an important role as an intervention for heart disease therapy. This new biosensor technology can serve as an early detection tool.</p>
<p><b>Acknowledgment</b></p>	<p>The head project member acknowledges financial support from the Universiti Teknologi MARA (UiTM) via sponsorship under the Research Management Centre UiTM. The financial support provided by the Dana UiTM Cawangan Selangor (DUCS) is acknowledged.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; align-items: center;">  <div> <p>Zatilfarihiah Rasdi is a lecturer from Faculty of Dentistry UiTM, Cawangan Selangor. She is also a researcher who is currently involved with research related to environmental disruptor compounds, focusing on animal study. She was awarded the Young Investigator Award during the MEMS convention 2019. She is holding a Doctor of Philosophy in Biochemistry in Medicine from Universiti Teknologi MARA.</p> </div> </div>



Siti Hamimah Sheikh Abdul Kadir is Associate Professor from Faculty of Medicine UiTM, Cawangan Selangor. She is also a senior fellow of Institute of Pathology, Laboratory and Forensic Medicine (I-PPerForM), UiTM. She is an expert in cell signaling focusing on the heart. She is holding a Doctor of Philosophy in Molecular Medicine from Imperial College London.



Nurhaslina Hassan is a lecturer from Faculty of Dentistry UiTM, Cawangan Selangor. She is also a researcher who is currently involved with research related to cancer, currently focusing on oral cancer and potential therapy using natural extraction. She is holding a Doctor of Philosophy in Medicine from Universiti Teknologi MARA.



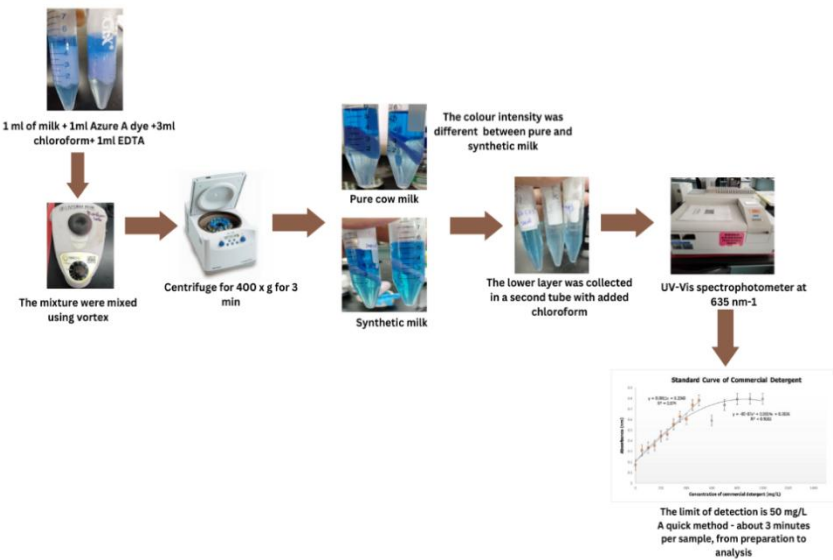
Mohammad Azizi Azreen a student who is currently undertaking his Master of Dental Science study program under Faculty of Dentistry, UiTM, Cawangan Selangor. He graduated from Faculty of Applied Science, UiTM.



Roziana Kamaludin a postdoctoral student in Advanced Membrane Technology Research Centre, Universiti Teknologi Malaysia. She is an expert in cell culture, western blot analysis and molecular engineering.

## AZURESPEC: A RAPID SPECTROPHOTOMETRIC METHOD FOR THE DETECTION OF SYNTHETIC MILK

Category	A	B	C
	School (Primary & Secondary)	Technical Institutional Students	Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
			/
	Local		International
	/		
<b>Project Member(s)</b>	Norliza Binti Julmohammad <sup>1</sup> , Emeline Tan <sup>1</sup> , Koh Wee Yin <sup>1</sup> , Siti Nur Hazwani Binti Oslan <sup>1</sup> , Nadiah bt Ameram <sup>2</sup>		
<b>Affiliation</b>	<sup>1</sup> Faculty of Food Science and Nutrition, Universiti Malaysia Sabah, Kota Kinabalu 88400, Sabah Malaysia <sup>2</sup> Faculty of Bioengineering and Technology, Universti Malaysia Kelantan, 16300 Bachok, Kelantan.		
<b>Email</b>	<sup>1</sup> norliza@ums.edu.my, <sup>1</sup> emeline_tan_mn21@iluv.ums.edu.my, <sup>1</sup> weeyin@ums.edu.my, <sup>1</sup> snhazwanioslan@ums.edu.my, <sup>2</sup> nadiah@umk.edu.my		
<b>Correspondence</b>	Norliza Binti Julmohammad <sup>1</sup> Faculty of Food Science and Nutrition, Universiti Malaysia Sabah, Kota Kinabalu 88400, Sabah Malaysia Tel: +60145520204, Fax: +6088-320259		
<b>Abstract</b>	Synthetic milk, as the name suggests, is not milk. It is a different component of adulteration to increase the volume of milk and profit. Aside from economic prejudice, this milk fraud may seriously harm the consumer's health. Anionic detergents, which are frequently used in the preparation of synthetic milk to emulsify non-milk fats to create milk-like properties, interact with cell membrane proteins, causing damage to their structure. This can result in renal failure, hemolysis, tachycardia, and coagulation problems. The main concern is that existing standard detection procedures are not always practical, making it challenging to address the various forms of milk fraud. Thus, this study aims to introduce a fast and straightforward AzureSpec method for determining synthetic milk by non-direct detection of anionic detergent. Anionic detergent in milk increased the extent of dye partitioning into the chloroform layer, thus increasing the		

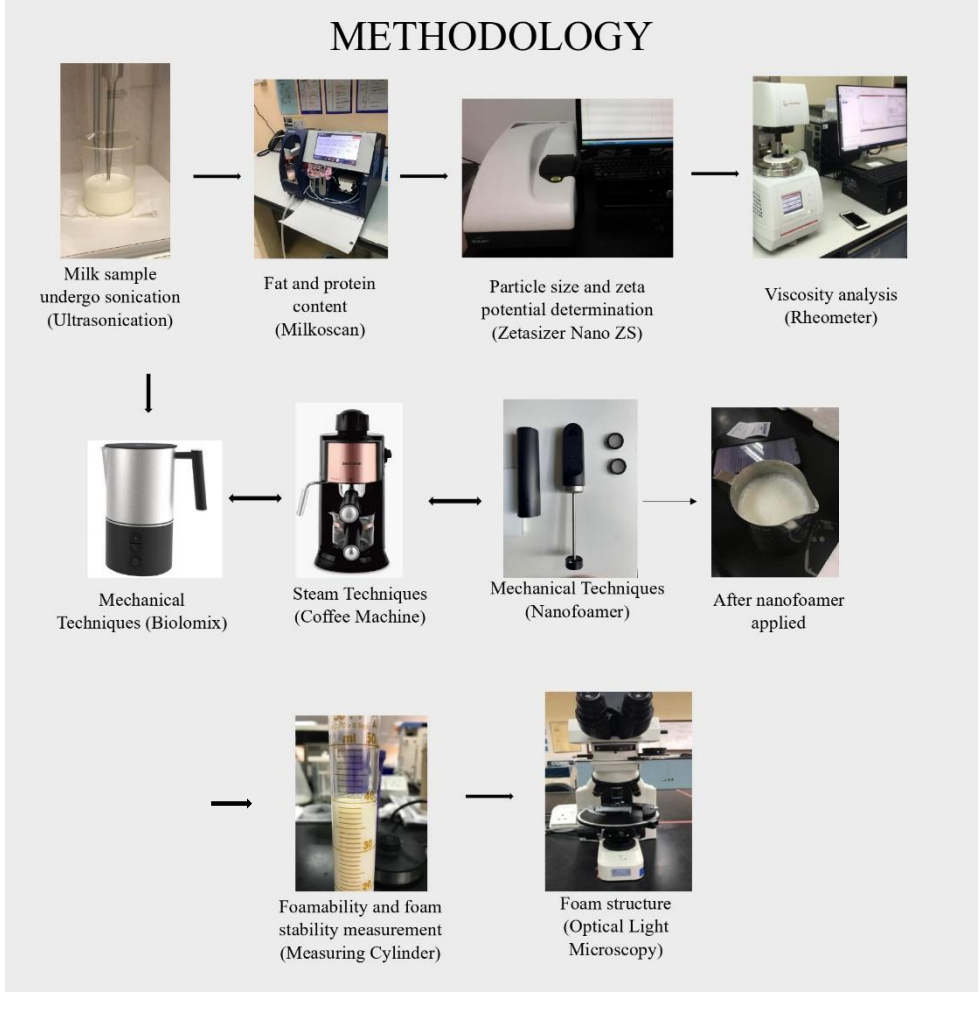
	absorbance value. The absorbance value of the control was 0.1717 nm, while the sample with anionic detergent at the lowest detection limit (50mg/L) was 0.3104 nm. This method is suitable for routine analysis because it produces quick results and good sensitivity.
<b>Keywords</b>	AzureSpec, Synthetic milk, Anionic detergent, Azure A dye, UV-Visible
<b>Product description</b>	The AzureSpec method is based on forming a colored complex between the cationic dye azure A and an anionic surfactant. The ionic complex is extractable in chloroform. The Azure A dye was partitioned into the chloroform layer at low concentrations from a mixture of chloroform, dye, and water. The chloroform-extractable layer remained translucent after being mixed with chloroform, dye, and milk, while the addition of Ethylenediaminetetraacetate acid (EDTA) made the chloroform layer transparent and inhibited dye partitioning into the chloroform layer. When anionic detergent was present in milk, colour partitioning into the chloroform layer increased, thus increasing the absorbance value when detected with UV-Visible spectrophotometry.
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots/Graphs and etc</b>	 <p>The flowchart illustrates the experimental procedure. It starts with the preparation of a mixture: 1 ml of milk, 1 ml of Azure A dye, 3 ml of chloroform, and 1 ml of EDTA. This mixture is vortexed and then centrifuged at 400 x g for 3 minutes. The process then compares pure cow milk and synthetic milk, showing that the lower layer is collected in a second tube with added chloroform. The final step is measuring the UV-Vis spectrophotometer at 635 nm-1, which leads to a standard curve of commercial detergent. The graph shows a linear relationship between absorbance and concentration, with the equation <math>y = 0.0012x + 0.0001</math> and <math>R^2 = 0.9999</math>. The limit of detection is 50 mg/L, and the method is quick, taking about 3 minutes per sample from preparation to analysis.</p>
<b>Novelty and uniqueness</b>	The most widely used method for the determination of anionic detergent in water uses methylene blue. Methylene blue, a cationic dye, forms a complex with anionic detergents. Due to ion pair formation between the dye and the detergent, the complex preferentially distributes into the chloroform phase of a two-phase water chloroform system. The measurement of dye in the chloroform phase has been the basis of the estimation method for anionic. The chloroform layer in milk samples is not transparent,

	<p>making the methylene blue method unsuitable for measuring absorbance in milk samples. Prior milk treatment with ethanol results in a transparent chloroform layer, which gives higher blank values. In contrast, Azure A dye has substantially lower blank values from pure milk samples, making it more suitable for assessing anionic detergent in milk. Azure A dye's cationic nature, specific application for detecting anionic detergents, sensitivity, availability, and unique usage distinguish it from other dyes. In addition, the uniqueness of this AzureSpec method can be used for screening by observing the difference in colour intensity between pure milk and synthetic milk—suitable for small laboratories in developing countries. The Azure A dye with spectrophotometer concept has been applied in wastewater treatment. The same idea applies to raw milk in existing studies, and this study tries to apply the method to UHT milk samples as the study on it has still not been found.</p>
<b>Benefit to mankind</b>	<p>This AzureSpec method is suitable for routine analysis because it produces quick results and has a lower detection limit. The method can be used with both raw and treated milk. In addition, the approach can test for anionic detergent adulteration in bovine and buffalo milk samples. The approach can also show residual anionic detergent in milk that has mistakenly entered the milk after washing milk tankers and dairy equipment.</p>
<b>Potential commercialization</b>	<p>This AzureSpec project was expected to provide an alternative methodology to the dairy industry for screening and detecting potentially fraudulent practices used for economic adulteration of cow's milk to save millions of lives from consuming adulterated or fake dairy products. Currently, there are several dairy milk companies in Sabah, that actively produced new UHT milk products. Therefore, product of AzureSpec has potential as a rapid method for adulteration detection. In addition, our work is planned for trademark application. In future recommendations, using multivariate data analysis in combination with a spectrophotometer proves helpful when confronted with substantial sample size. Multivariate data analysis can enhance the precision and dependability of the detection method through the mitigation of noise and variability present in the data.</p>
<b>Acknowledgment</b>	<p>The head project member acknowledges financial support from the Universiti Malaysia Sabah (<i>Skim Bidang Keutamaan</i>, SBK0503-2021 Grant) for their funding and academic support.</p>








<b>Researchers Biographical Data</b>	
	 <p>Norliza Binti Julmohammad is a project leader to this grant (SBK0503-2021) and is currently a Senior Lecturer from the Faculty of Food Science and Nutrition, Universiti Malaysia Sabah, under the Food Science and Nutrition program. She holds a Bachelor of Science (Hons) in Oleochemistry (UKM), a Master in Science (Chemistry, UKM), and Ph.D. in Food Science (Auckland)</p>
	 <p>Emeline Tan is a student currently undertaking her Master by Research program under the Faculty of Food Science and Nutrition, Universiti Malaysia Sabah. She holds a Bachelor of Science (Hons) in Chemistry (UiTM).</p>
	 <p>Koh Wee Yin is a co-researcher to this grant (SBK0503-2021) and is currently a Senior Lecturer from the Faculty of Food Science and Nutrition, Universiti Malaysia Sabah, under the Food Science and Nutrition program. She holds a Bachelor of Food Technology and Bioprocess (Hons) (UMS) and Ph.D. in Functional Foods (USM).</p>
	 <p>Siti Nur Hazwani Binti Oslan is currently a Senior Lecturer from the Faculty of Food Science and Nutrition, Universiti Malaysia Sabah, under the Food Science and Nutrition program. She holds a Bachelor of Biotechnology (Hons) (UM), a Master in Molecular Biology (UPM) and Ph.D. in Industrial Biotechnology (UPM).</p>
	 <p>Nadiah bt Ameram is currently a Senior Lecturer from Faculty of Bioengineering and Technology (FBKT) from Universti Malaysia Kelantann (UMK) under the Forest Resources Technology program. She holds a Bachelor of Science (Hons) in Chemical Science (UMT), a Master Degree in Science (Chemistry, UKM) and PhD In Chemical Science (Heterogenous Catalyst) from USM Pulau Pinang.</p>

<b>NANO-MILK: NANO-SIZED FOAM TO IMPROVE MILK FOAMABILITY</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Norliza Julmohammad <sup>1</sup> , Norazilah Maklin <sup>1</sup> , Suryani Saalah <sup>2</sup> , Norliayana Abd Rahman <sup>3</sup> , Norziana Julmohammad <sup>4</sup>		
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<b>Correspondence</b>	Norliza Binti Julmohammad <sup>1</sup> Faculty of Food Science and Nutrition, Universiti Malaysia Sabah, 88400 Kota Kinabalu, Sabah, Malaysia. Tel: +60145520204, Fax: +6088-320259		
<b>Abstract</b>	Nanofoam is a desired feature in the dairy industry, adding a smooth, light texture and stable foam to beverages like cappuccinos and lattes. It is created by incorporating air bubbles into milk through frothing or steaming, providing a creamy and enjoyable experience for consumers. However, milk fat can cause instability in foam. By reducing the size of fat globules through ultrasonication, the foamability and stability of milk can be improved. Nano-Milk (nanoemulsion), unstable dispersions made from oil, emulsifier, and water, are used to modify fat globule size. This research involves analyzing oil-in-water emulsions, studying milk qualities, and foaming properties. It is expected the foamability improved in milk samples with reduced fat globule size. The foam structure showed the stability of the foam at 0 and 10 mins. The qualities of milk foam were examined using mechanical and steam injection techniques. A recent		

	<p>breakthrough in the form of nanoemulsion dairy milk fat has emerged, promising to enhance the foam qualities. Nano-Milk product innovation discovery holds great potential for the dairy milk-based beverage industry in the future.</p>
<p><b>Keywords</b></p>	<p align="center">Nano-Milk, Nanoemulsion, Nanofoam, Milk Fat Properties, Foaming Properties.</p>
<p><b>Product description</b></p>	<p>Nano-Milk or also known as nanoemulsion are a colloidal particulate system in the submicron size range acting as carriers of drug molecules. Nanofoam, a frothy and aerated layer that forms on top of milk, has been studied extensively using mechanical and steam injection methods. Milk that been treated by ultrasonication process which led to nano-fat particle size. Then, undergo foaming techniques using mechanical and steam injections.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	<p align="center"><b>METHODOLOGY</b></p>  <pre> graph TD     A[Milk sample undergo sonication (Ultrasonication)] --&gt; B[Fat and protein content (Milkoscan)]     B --&gt; C[Particle size and zeta potential determination (Zetasizer Nano ZS)]     C --&gt; D[Viscosity analysis (Rheometer)]     D --&gt; E[Mechanical Techniques (Biolomix)]     E --&gt; F[Steam Techniques (Coffee Machine)]     F --&gt; G[Mechanical Techniques (Nanofoamer)]     G --&gt; H[After nanofoamer applied]     H --&gt; I[Foamability and foam stability measurement (Measuring Cylinder)]     I --&gt; J[Foam structure (Optical Light Microscopy)]     </pre> <p>The methodology flowchart illustrates the experimental process. It begins with the sonication of a milk sample, followed by the determination of fat and protein content using a Milkoscan. Particle size and zeta potential are then determined using a Zetasizer Nano ZS. Viscosity analysis is performed using a Rheometer. The process continues with mechanical techniques using a Biolomix, followed by steam techniques using a coffee machine, and finally mechanical techniques using a Nanofoamer. The resulting foam is analyzed for foamability and stability using a measuring cylinder, and its structure is examined using optical light microscopy.</p>
<p><b>Novelty and uniqueness</b></p>	<p>A recent groundbreaking development in the field involves the use of nanoemulsion dairy milk fat, which has the potential to significantly</p>

	<p>improve the qualities of milk foam of the Nano-Milk product. Ultrasonication is a new method for processing food without using heat. It helps create safe and clean dairy products. This technique can homogenize dairy beverages and make them safe and nutritious with natural immune-boosting properties. It can also modify the texture of dairy liquids to produce different healthy dairy products. This exciting discovery holds promising prospects for the dairy milk-based beverage business in the future.</p>
<b>Benefit to mankind</b>	<p>Nanoemulsion technology makes foam in this Nano-Milk product beverages look smoother and more appealing. It adds a touch of sophistication to foam-enhanced drinks, making them more attractive to consumers. This technology can also be used in plant-based milks and non-dairy creamers, giving more options for foam-based drinks. The study explores a new and safe method of processing food without heat, focusing on the protein component related to the body's immune response. By preserving this important aspect, it improves the quality of dairy products like milk and cheese, making them healthier with natural immune-boosting properties. These improvements benefit people of all ages and support the growth of the dairy industry.</p>
<b>Potential commercialization</b>	<p>Milk foam is a significant ingredient in many industries, especially in the food and beverage sector. It has a desirable texture and appearance that makes it popular in various products. Whether it's a frothy cappuccino or a rich milkshake, milk foam adds an elegant and indulgent touch to drinks. By leveraging tiny particles called nanomaterials, we aim to achieve longer-lasting and tastier foam of Nano-Milk product. The research explores the relationship between the average cavitation bubble size and the changes in treated milk. It aims to understand the effect of reducing the milk fat size and stability in milk after using sonication treatment, which is a new food processing technology. This valuable information will be crucial for the commercialization of this emerging technology in the food industry. Our collaboration with Desa Cattle Dairy Milk allows us to access their expertise in dairy production and their high-quality milk, which will be crucial in developing the best milk foam possible. Additionally, Veterinary, renowned experts in food safety and veterinary sciences, will be providing valuable assistance in ensuring the safety of milk used in the milk foam. We also plan to enrich the foam with essential nutrients, making it healthier for consumers. This collaborative project with Desa Cattle Dairy Milk and Veterinary, could revolutionize milk foam in beverages, creating a more delightful and enjoyable drinking experience for everyone. This project also aims to apply for trademark in the future.</p>
<b>Acknowledgment</b>	<p>The head project member acknowledges the financial support received from the SKIM DANA NIC (SDN – Grant Code DN21099) under Universiti Malaysia Sabah (UMS). The project is also conducted in collaboration with Desa Cattle Dairy Farm at Mesilau, Kundasang, Sabah</p>

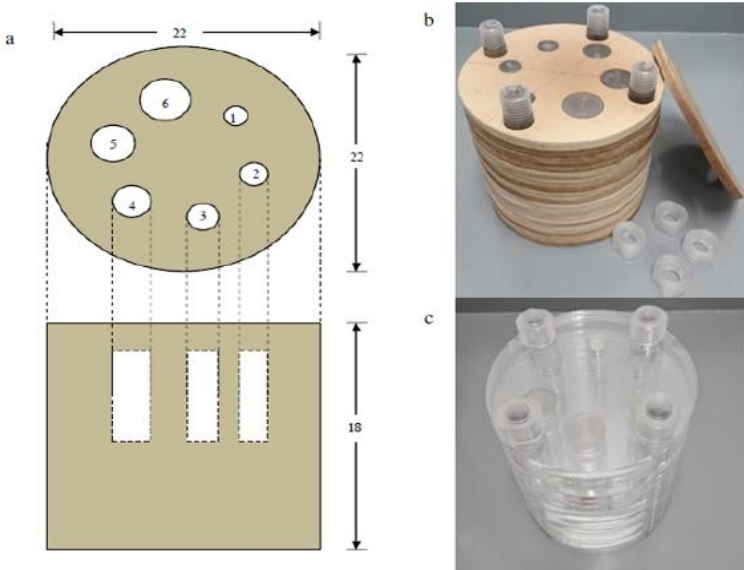
	<p>and has the support of the Sabah Department of Veterinary Services.</p>
<p><b>Researchers Biographical Data</b></p>	<div data-bbox="509 289 732 562">  <p>Norliza Binti Julmohammad is a project leader to this grant (DN21099) and is currently a Senior Lecturer from the Faculty of Food Science and Nutrition, Universiti Malaysia Sabah. She holds a Bachelor of Science (Hons) in Oleochemistry (UKM), a Master in Science (Chemistry, UKM), and Ph.D. in Food Science (Auckland).</p> </div> <div data-bbox="509 613 732 898">  <p>Norazilah Maklin is a student who is currently undertaking her Master study program under Faculty of Food Science and Nutrition, UMS. She is holding a Bachelor of Chemical Industry (Hons), UMS.</p> </div> <div data-bbox="516 953 738 1220">  <p>Suryani Saalah is currently a Senior Lecturer from the Faculty of Food Science and Nutrition, Universiti Malaysia Sabah. She holds a Bachelor of Chemical Engineering (Bioprocess) (Hons), UTM, a Master in Bioprocess Engineering, UPM and Ph.D. in Bio-Applications and Systems Engineering, TUAT, Japan.</p> </div> <div data-bbox="516 1285 738 1570">  <p>Norziana Binti Julmohammad is currently Research Officer from the Sabah Department of Veterinary Department. She holds a Bachelor of Biochemistry, UKM and a Master in Molecular Biology, UMS.</p> </div> <div data-bbox="516 1619 722 1850">  <p>Siti Norliayana Binti Abd Rahman is currently a Quality Assurance from the Desa Cattle Dairy Farm. She holds a Bachelor of Food Technology and Bioprocess, UMS.</p> </div>



## FABRICATION OF PHANTOM MATERIAL MADE OF RHIZOPHORA SPP. PARTICLEBOARDS FOR EVALUATIONS OF SPECT/CT PERFORMANCE PAREMETERS

Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
			√
	Local		International
		√	
<b>Project Member(s)</b>	Mohd Fahmi Mohd Yusof <sup>1</sup> , Puteri Nor Khatijah Abd Hamid <sup>2</sup> , Abd Aziz Tajuddin <sup>3</sup> , Rafidah Zainon <sup>4</sup> , Rokiah Hashim <sup>5</sup> .		
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<b>Abstract</b>	A phantom material was designed and fabricated by using <i>Rhizophora</i> spp. particleboards with corn starch as biological based adhesive materials. The <i>Rhizophora</i> spp. Was chosen as the material due to its close attenuation properties towards ionizing radiations to water/human soft tissue. Besides its readily available at lower cost. The phantom material was designed based on the commercially available Jaszczak phantom and to serve the purpose as the tool for the evaluation of several performance parameters on SPECT/CT imaging in the nuclear medicine. The phantom material was		



	<p>characterized on its suitability as water/tissue equivalent phantoms including the physical density, effective atomic number, CT numbers and mass attenuation coefficients. The fabricated phantom material was designed with several circular chambers with different diameters to simulate small to large volume of radionuclide. The phantom material was used to evaluate several performance parameters on SPECT/CT imaging modality including contrast, image quality and recovery coefficients of the gamma camera. A comparison with the Jaszczak and another fabricated phantom material by using Perspex® showed excellent agreement of performance by the fabricated phantom material indicating its suitability to be used as phantom material in SPECT/CT Imaging.</p>
<p><b>Keywords</b></p>	<p>Rhizophora spp., phantom materials, SPECT/CT, nuclear medicine</p>
<p><b>Product description</b></p>	<p>The phantom material was fabricated by using <i>Rhizophora</i> spp. Particleboards and loosely based on the readily available Jaszczak phantom regularly used in quality assurance works in nuclear medicine concerning on SPECT and SPECT/CT imaging. The phantom material is cylindrical shaped with diameter of 30cm to simulate the average human body. Several cylindrical chambers are crafted inside the phantom to simulate different volume and diameter of radionuclide in human body during SPECT/CT Imaging. The phantom material would serve as the tool for quality assurance work to evaluate several technical parameters on SPECT/CT modalities including contrast and recovery coefficients.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	<div style="text-align: center;">  </div> <p>Figure 1. (a) The layout design of SPECT/CT phantom made of corn starch-bonded <i>Rhizophora</i> spp. particleboards and Perspex®, (b) the constructed <i>Rhizophora</i> spp. particleboards phantom and, (c) Perspex® phantom.</p>

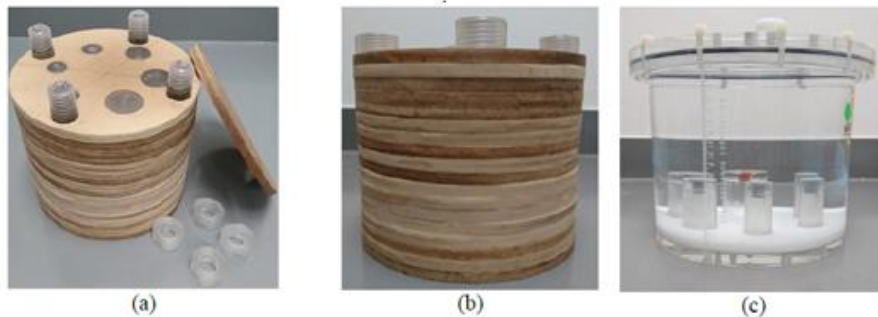


Figure 2. (a) The cylindrical vials were positioned in the inserts of the constructed corn starch-bonded *Rhizophora* spp. particleboards, (b) the 18 pieces of *Rhizophora* spp. particleboards were stacked together and (c) the Jaszczak phantom inserted with its set of radiopharmaceutical vials.

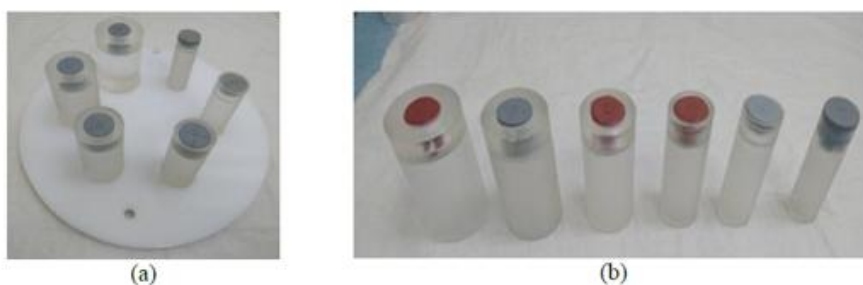


Figure 3. Two sets of constructed radionuclide vials for (a) Jaszczak phantom and (b) for corn starch-bonded *Rhizophora* spp. particleboards phantom.

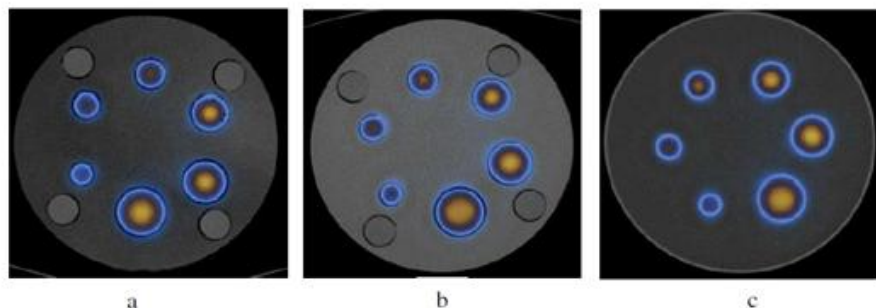



Figure 4. The SPECT/CT images of (a) *Rhizophora* spp. particleboard (b) Perspex® and (c) water (Jaszczak) phantoms.




**Novelty and uniqueness**

The fabricated phantom has the uniqueness in term of new type of material as phantom. The use of natural and biological resources of *Rhizophora* spp. has the advantages on closer attenuation properties to human soft tissues and water compared to the commonly used Perspex® and other solid type phantom materials. The design of the phantom has allowed several more technical parameters in SPECT/CT to be evaluated. The evaluations by using this phantom can be compared with the commonly used phantoms for quality assurance works.

**Benefit to mankind**

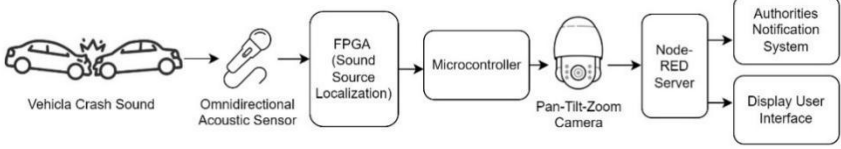
The outcome of the fabrication of this phantom material has two main

	<p>purposes. Firstly, to acknowledge and possibly develop many other types of phantom materials by using <i>Rhizophora</i> spp. and its particleboards. Secondly the fabrication of this phantom for SPECT/CT would open up the possibilities for other applications and research works in nuclear medicine such as internal dosimetry and performance parameters in other related works such as in PET and PET/CT imaging. The fabrication of this phantom is hoped to benefit the medical physics society and towards better imaging system in nuclear medicine.</p>
<p><b>Potential commercialization</b></p>	<p>The fabricated phantom had explored the possibilities of other non-industrial materials to be fabricated and constructed as phantom for the medical physics works. With further development and enrichment into the materials, The phantom would be a useful as alternative phantom material not only in nuclear medicine but also in other applications that involved ionizing radiations such as radiotherapy and diagnostic imaging. A potential commercialisation is possible due to its lower cost and non-complex production.</p>
<p><b>Acknowledgment</b></p>	<p>The head project member acknowledges financial support from the Universiti Sains Malaysia through the Bridging Grant scheme. We also acknowledges the Forestry Department of Peninsula Malaysia and Malaysian Nuclear Agency (Nuclear Malaysia) for the support on materials and equipment.</p>
	<div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: flex-start;">  <div data-bbox="761 1052 1455 1346"> <p>Mohd Fahmi Mohd Yusof is a senior lecturer in the School of Health Sciences under the Medical Radiations Programme. His field of teaching and expertise includes radiation physics, radiation dosimetry and radiation protections. He has several notable research works on the <i>Rhizophora</i> spp. phantom materials and has been an invited speaker in several conference and workshops at national level.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div data-bbox="761 1381 1455 1640"> <p>Puteri Nor Khatijah Abd Hamid is a PhD graduate under the School of Physics, Universiti Sains Malaysia. She was awarded a scholarship by the Ministry of Higher Education Malaysia and has recently completed her PhD study. She is currently becoming a research assistant in several studies in the medical physics.</p> </div> </div> </div>

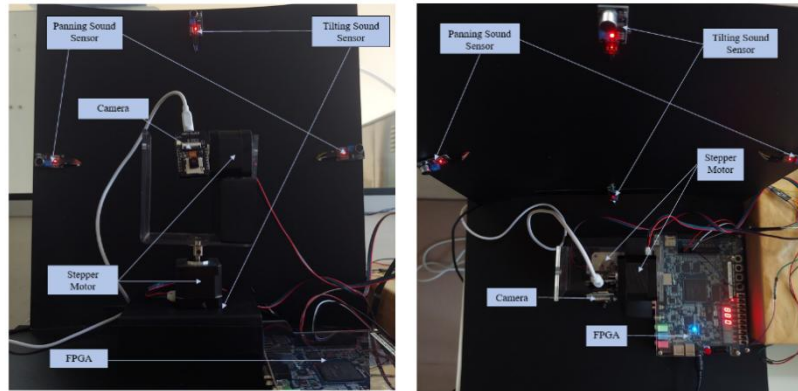
		<p>Emeritus Professor Dato' Dr. Abd Aziz Bin Tajuddin is a former professor and registrar in Universiti Sains Malaysia and currently the President and Vice Chancellor in Albukhary International University. He was awarded the Committee of Vice-Chancellors and Principals of the Universities of the United Kingdom Overseas Research Students - Fees Support Scheme Award. He was awarded Emeritus Professor by Universiti Sains Malaysia due to his contributions in research and administration to the university. He is also the fonder of the Rhizophora spp. study as phantom material</p>
		<p>Rafidah Zainon is an Associate Professor in Advanced Medical and Dental Institute, Universiti Sains Malaysia. She has been announced as one of the co-investigators of a prestigious Kingdom of Saudi Arabia International Collaboration Grant following her research works in molecular imaging. She has supervised and graduated a number of MSc and PhD students in the medical physics field.</p>
		<p>Rokiah Hashim is a Professor in the Schhol of Inductrial Technology, Universiti Sains Malaysia. She was recognized as the Top Research Scientist Malaysia (TRSM) by Akademi Sains Malaysia in 2017 due to her contributions in researches. She has supervised and graduated a number of MSc and PhD students in her field of expertise in the bioresources.</p>

<b>VEHICLE CRASH SOUND COMPASS: FPGA-BASED SOUND SOURCE LOCALIZATION</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Ili Shairah Abdul Halim <sup>1,2</sup> , Siti Lailatul Mohd Hassan <sup>1</sup> , Nur Nazifah Adlina Mohd Nazeem <sup>1</sup> , Muhammad Alif Aiman Roslam <sup>1</sup> , Norish Camelia Jamaludin <sup>1</sup>		
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<b>Abstract</b>	The ever-increasing traffic demand has led to a surge in drivers and motor vehicle owners, leading to a yearly rise in total traffic violations and accidents. Detecting car accidents in less populated areas like highways can be challenging, as authorities and first responders often take time to reach the location, unaware of the crash severity. Despite installing a camera system in some areas, its effectiveness is limited due to a fixed camera angle, resulting in authorities being unable to view the crash or encountering blind spots that hinder locating the exact crash site. A novel solution has been proposed to address this issue – an FPGA-based sound source localization (SSL) system designed to detect highway vehicle crashes by analyzing crash sounds and promptly alerting authorities using a real-time camera tracker. This innovative system employs acoustic sensors		



	<p>to capture crash sounds, which are then processed using the FPGA-based SSL algorithm, utilizing the time difference of arrival (TDOA) method. The calculated location coordinates of the crash are then relayed to a real-time camera monitoring system capable of panning and tilting to precisely focus on the crash site based on the SSL signal processing results. To ensure swift communication and notification, an IoT implementation using Node-RED is utilized to inform the authorities promptly. Furthermore, this system allows authorities to take control of the camera's movement through a user-friendly display interface. During experimental testing, the camera's pan and tilt angle accuracy was found to be 76.18% and 71.43%, respectively. The system can be improved by integrating additional analog acoustic sensors to enhance the pan tilt angle accuracy further.</p>
<b>Keywords</b>	Angle accuracy, Node-RED IoT implementation, Sound Source Localization, Time difference of arrival, Vehicle crash detection.
<b>Product description</b>	<p>The Vehicle Crash Sound Compass: FPGA-based Sound Source Localization consists of acoustic sensors, pan-and-tilt camera and monitoring and notification. The process begins with capturing the vehicle crash sound using acoustic sensors. The captured sound is then processed through the hardware implementation of SSL using the FPGA board. The SSL algorithm determines the location coordinates of the crash, which are used to make decisions regarding the motorised camera's movement (pan and tilt) toward the crash location. Simultaneously, the real-time monitoring video is connected and uploaded to a server for storage and further analysis. The Node-RED programming platform is utilized to develop a code that enables the notification and display of the crash area to the relevant authorities and notification applications.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<div style="text-align: center;">  <pre>                     graph LR                         A[Vehicle Crash Sound] --&gt; B[Omnidirectional Acoustic Sensor]                         B --&gt; C[FPGA Sound Source Localization]                         C --&gt; D[Microcontroller]                         D --&gt; E[Pan-Tilt-Zoom Camera]                         E --&gt; F[Node-RED Server]                         F --&gt; G[Authorities Notification System]                         F --&gt; H[Display User Interface]                     </pre> </div> <p>Figure 1: Vehicle crash sound source localization and notification alert system overview.</p>





(a)

(b)

Figure 2: SSL algorithm on FPGA integration with microcontroller and pan-tilt camera (a) front view and (b) top view.

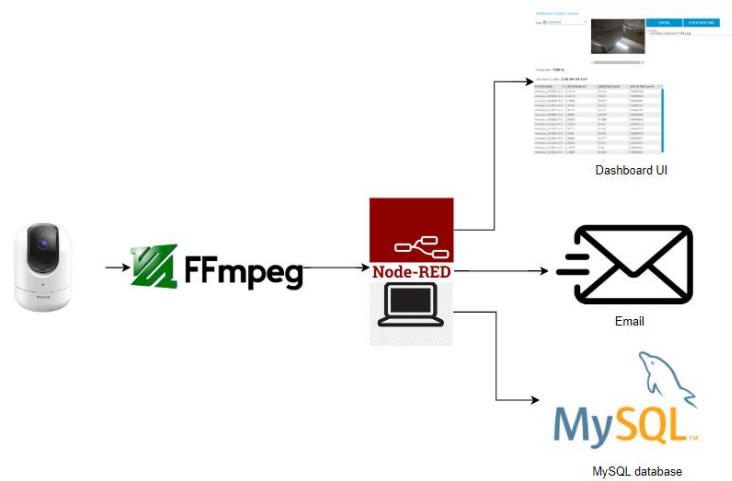




Figure 3: Monitoring and notification system (Node-RED)

**Novelty and uniqueness**

The novelty of this project lies in the introduction of a groundbreaking FPGA-based sound source localization (SSL) system designed specifically for detecting highway vehicle crashes. Unlike conventional visual-based systems, this novel solution relies on acoustic sensors to capture crash sounds. Analyzing crash sounds instead of visuals introduces a fresh approach to detecting accidents, potentially offering advantages in scenarios with limited visibility or during adverse weather conditions. The system integrates a real-time camera tracking mechanism that responds promptly to detected crashes. This integration with IoT technology facilitates seamless data transfer and communication, streamlining the emergency response process.

**Benefit to mankind**

The FPGA-based SSL system utilizes advanced algorithms like the TDOA method, which enables precise localization of crash sounds. This high accuracy helps authorities quickly and accurately identify the crash location, leading to faster emergency response times. The FPGA-based

	<p>SSL system can be deployed on smart highways as part of an intelligent transportation infrastructure. It enhances road safety by providing real-time crash detection and improving emergency response coordination. The SSL system significantly improves road safety by reducing emergency response times and facilitating timely assistance to accident victims.</p>
<p><b>Potential commercialization</b></p>	<p>The commercialization potential of this project is significant, given the increasing demand for smart transportation and road safety solutions. Some potential avenues for commercialization are government agencies and transportation authorities, private road operators, smart city initiatives, insurance companies, traffic management and safety companies, the automotive industry and emergency response service provider.</p>
<p><b>Acknowledgement</b></p>	<p>This work is supported by Geran Penyelidikan MyRA Lepas PhD (600 RMC/GPM LPHD/5/3 (093/2022) and Geran Penyelidikan Khas 600-RMC/GPK 5/3 (168/2020) from Universiti Teknologi MARA and the lab facilities in Integrated Sensors Laboratory, College of Engineering, Universiti Teknologi MARA.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 20px;">  <p>Ts. Dr. Ili Shairah Abdul Halim is a Senior Lecturer in College of Engineering, Universiti Teknologi MARA. She received her Bachelor Degree in Electrical Engineering (Hons) from Universiti Teknologi MARA, Malaysia, in 2007. She obtained her Master of Engineering Science from the University of New South Wales, Australia, in 2009. She currently received her Ph.D in 2021 from UTM in the area of embedded system and reconfigurable computing.</p> </div> <div>  <p>Dr. Siti Lailatul binti Mohd Hassan is a Senior Lecturer at College of Engineering, Universiti Teknologi MARA. She received her Bachelor Degree in Electrical Engineering (Hons) from Universiti Teknologi MARA, Malaysia, in 2007. She obtained her Master of Engineering Science from the University of New South Wales, Australia, in 2009. She had her PhD in 2019 from Universiti Putra Malaysia. Her primary area of interest are embedded systems and integrated circuit design.</p> </div> </div>



Nur Nazifah Adlina is an undergraduate student who is currently undertaking her Bachelors Degree in Electrical Engineering under School of Electrical Engineering, College of Engineering, UiTM Shah Alam. She was awarded a sholarship by the Public Service Department (JPA) Malaysia to pursue her tertiary education in Electrical Engineering.




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## INVENTION OF AEROBIC RICE CULTIVATION

Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Siti Maslizah Abdul Rahman, Siti Nur Anisah Aani.		
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<b>Abstract</b>	<p>Aerobic rice cultivation is a relatively newer approach that has the potential to address water scarcity and reduce the environmental impact as compared to the traditional rice farming methods. However, aerobic cultivation is not familiar among agriculture practices due to low in yield production. Proper practices management is essential for the success of aerobic rice cultivation. Therefore, the innovation methods by optimizing the irrigation frequency, efficiency fertilizing management and an ideal timing of harvesting significantly impact the water usage in aerobic rice fields and increase the yield production. In addition, optimizing nutrient application, managing weeds effectively, and controlling pests and diseases also contribute the performance of aerobic rice crops. This innovation methods also suitable to be implement in abundant land or the area of water scarcity. However, this aerobic rice cultivation depends on other various factors, including the specific agro-climatic conditions of the region, the availability of resources, and the willingness of farmers to adopt new practices. In future, this innovation of optimizing the cultural methods not only increased yield production but potentially promote sustainability and water-efficiency in the aerobic rice production.</p>		

<b>Keywords</b>	Aerobic rice, Water-Use Efficiency, Fertilizing, Harvesting
<b>Product description</b>	Aerobic rice cultivation produced a low yield production. Therefore, this innovative approach to aerobic rice cultivation was developed by optimizing irrigation frequency, efficiency of fertilizing management and application of ideal harvest maturity led to increased yield production of aerobic rice.
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	
<b>Novelty and uniqueness</b>	This innovative cultivation method increases yield production significantly, with grain yields surpassing estimated about 7-8 tons per hectare, compared to the typical 3-4 tons per hectare in aerobic rice cultivation. By implementing of drip irrigation by optimizing the frequency, water use-efficiency can be improved, leading to reduced water consumption. The seed quality remains high if the recommended practices from this invention are followed, ensuring the maintenance of high seed vigor.
<b>Benefit to mankind</b>	Aerobic rice cultivation, with its potential application on abandoned lands without the need for an irrigation system like flooded rice fields, presents a promising opportunity for addressing the deficit in Malaysia's rice production. This innovative method not only increases yields, with grain production exceeding 7 tons per hectare compared to the conventional 3-4 tons, but it also contributes to environmental sustainability by reducing water usage. One of the key components of this innovative method is the optimization of irrigation frequency. Rather than adhering to conventional practices, farmers may adopt a precision-based approach to water management. This implementation to aerobic rice cultivation represents a water-saving approach that promotes efficient water usage. By providing the right amount of water at critical growth stages, they have successfully ensured optimal soil moisture, allowing rice plants to thrive and reach their full potential. These methods of irrigation not only conserve water resources but also minimizes wastage and ensures that the crops receive precisely what they need for robust growth. Moreover, the adoption of this method helps alleviate soil compaction while simultaneously enhancing root development and nutrient uptake, leading to improved overall crop growth.

<p><b>Potential commercialization</b></p>	<p>The method of aerobic rice cultivation has the potential to be implemented on a large scale, leading to commercialization and marketability due to its ability to produce a high yield compared to other methods of aerobic rice production. This high yielding is a favor for rice farmers and seed producers. As rice is our Malaysian staple food, this method also can secure our national rice production as food security purposes.</p>
<p><b>Acknowledgment</b></p>	<p>This research was funded by the grant from the Minister of Higher Education (MOHE), Malaysia as Fundamental Research Grant Scheme (FRGS/1/2019/WAB01/UITM/02/4).</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column;"> <div style="display: flex; align-items: flex-start; margin-bottom: 20px;">  <div style="flex-grow: 1;"> <p>Siti Maslizah Abdul Rahman holds a PhD from University of Reading in the UK. As an agronomist and seed physiologist, she has immersed in understanding on seed and plant growth development. Currently active engaged in the research on the effect of climate change on aerobic rice cultivation. She also contributes to the seed treatment study such as seed priming and nanotechnology study as to improve seed performance, enhancing germination rates nutrient absorption and resistance to environmental stressor.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Siti Nur Anisah Aani is a PhD holder in the field of weed science from Universiti Putra Malaysia. She has expertise in weed identification and morphology as well as weed management. Currently active in several research area such as herbicides application and legume cover crop to reduce weed infestation in many types of crops.</p> </div> </div> </div>



<b>EMPOWERING URBAN AGRICULTURE: A SMART APPROACH TO CULTIVATING NUTRIENT-DENSE MICROGREENS</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Shahril Efzueni Rozali <sup>1,2</sup> , Nur Raihan Abd Rahim <sup>1</sup> , Amina Syarfina Abu Bakar <sup>1</sup> , Safrena Noreen Abd Malek <sup>1</sup> and Zulfazli Rosli <sup>1,2</sup> .		
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<b>Correspondence</b>	Shahril Efzueni Rozali Faculty of Arts and Science, International University of Malaya-Wales, City Campus, Jalan Tun Ismail 50480 Kuala Lumpur Malaysia. Tel: +60326173000		
<b>Abstract</b>	Microgreens are the seedlings of edible vegetables and herbs grown until the cotyledons have fully opened and the first true leaves have emerged. These young vegetable greens are considered superfoods due to their higher levels of health-promoting micronutrients and are increasingly used as new culinary ingredients for their intense flavors, attractive colors, and tender texture. However, the cultivation of microgreens as an alternative source of nutritious vegetables and their upscale commercialization are still limited in this country. As urbanization continues to rise, ensuring sustainable and affordable food sources for urban citizens becomes increasingly crucial. In this context, microgreens present a promising solution for urban agriculture due to their compact size and rapid growth cycle. By leveraging LED technology, we aimed to establish an energy-efficient and cost-effective		

	<p>method for growing nutrient-dense microgreens even in limited urban spaces.</p> <p>We have developed a portable multipurpose growth drawer for establishing microgreens and to investigate the effects of LED illumination on their growth and phytochemical composition. The prototype growth drawer was created by integrating a programmable timer LED with a drawer, forming a growth chamber. We used this portable growth chamber to cultivate kale microgreens (<i>Brassica oleraceae</i>) through hydroponic techniques under blue-red LED light conditions for 12 hours. The microgreens under normal white LED serving as a control.</p> <p>Over the course of two weeks, our results demonstrated that the growth rate and biomass of microgreens were significantly affected by the different light sources provided. The germination and growth rate were higher in the growth drawer compared to the control growth condition, leading to increased biomass accumulation and phytochemical composition in the microgreens within the growth drawer. Our findings highlight the potential of the developed portable growth drawer as a sustainable and affordable method for urban citizens to cultivate their own nutrient-rich microgreens at home. By harnessing the power of programmable LEDs, this method not only optimizes microgreens' growth and quality but also reduces resource consumption and promotes a greener, more sustainable urban food production system.</p>
<b>Keywords</b>	<i>Brassica oleraceae</i> , food security, growth drawer, microgreens, urban farming
<b>Product description</b>	<p>Studies have suggested that microgreens may serve as a promising alternative low-caloric source of nutrients and bioactive components, offering health-promoting effects that could prevent the development of inflammatory-related chronic diseases, such as cancers. Various physicochemical factors, including light exposure, play a critical role in influencing the growth and phytonutrient levels of microgreens. In this project, kale (<i>Brassica oleraceae</i> var. <i>acephala</i>), also known as <i>kailan</i>, was chosen as the model microgreen due to its robust nature, high nutritional value, and intense flavor, making it a valuable ingredient in many vegetable recipes.</p> <p>Recognizing the immense potential of microgreens as an alternative sustainable source for highly nutritious vegetables, the primary objective of this project is to develop an efficient growth chamber suitable for both learning and commercialization purposes, contributing to biobusiness in smart farming. To achieve this goal, we have innovated a portable growth drawer integrated with a blue-red LED system (Figure 2). The practicality of this portable growth drawer offers unprecedented advantages in urban</p>

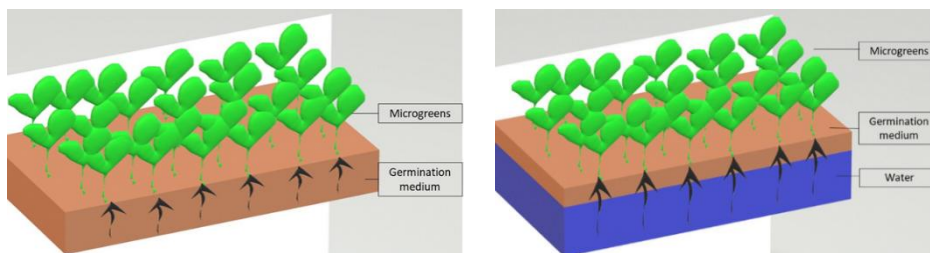
agriculture and beyond.

The portable growth drawer enables urban citizens and small-scale growers to cultivate microgreens conveniently within limited spaces, such as apartments, balconies, or even small kitchen countertops. Its compact and self-contained design allows for easy transportation, making it ideal for use in classrooms, educational workshops, and research settings. Furthermore, the incorporation of programmable LED technology enhances energy efficiency, minimizing resource consumption and promoting sustainability in microgreens cultivation.

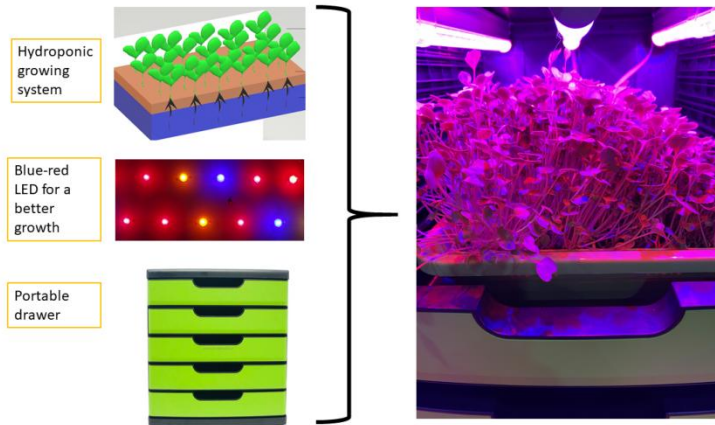
The hydroponic technique was employed in this study for its efficiency, as observed in our previous pilot study (Figures 1a and 1b), surpassing the traditional non-hydroponic germination condition. Specifically, a hydroponic sowing tray was utilized with the growth drawer, equipped with a programmable timer LED set at a 12-hours day and 12-hour dark cycle. As a control, microgreens were grown under normal white fluorescent light conditions. A mixture of cocopeat and perlite served as the germination medium, and the growth temperature was maintained at room temperature ( $25\pm 2^{\circ}\text{C}$ ).

For two weeks, we meticulously evaluated the microgreens' germination and growth rate, biomass, and phytochemical composition in both conditions.

**Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.**



**Figure 1.** Two different germination methods of microgreens. (a) Non-hydroponic method. (b) Hydroponic germination method.



**Figure 2.** The development of portable growth drawer with integration of hydroponic germination method and programmable timer blue-red LED.

Effects of different LED Illumination on Biomass and Moisture Content of Microgreens				Effects of different LED Illumination on Photosynthetic Pigment Content of Microgreens				
LED Illumination	Fresh Weight (g) (mean ± SE)	Dry Weight (g) (mean ± SE)	Percentage of Moisture content (mean ± SE)	LED Illumination	Chlorophyll a (mg/g FW)	Chlorophyll b (mg/g FW)	Chlorophyll a + b (mg/g FW)	Carotenoid (mg/g FW)
White	13.76 ± 0.68	0.59 ± 0.02	95.36 ± 0.08	White	0.13 ± 0.02	0.05 ± 0.02	0.18 ± 0.07	0.03 ± 0.01
Red + Blue	13.48 ± 0.44	0.63 ± 0.02	95.68 ± 0.09	Red + Blue	0.20 ± 0.01	0.07 ± 0.02	0.27 ± 0.06	0.03 ± 0.01


Effects of different LED Illumination on Phytochemical Contents of Microgreens		
Light Condition	Total Phenolic Content (mg Gallic Acid equivalent/ g DW)	Total Flavonoid Content (mg Quercetin equivalent/ g DW)
White	101.15 ± 0.39	3.40 ± 0.18
Red + Blue	99.10 ± 1.56	3.62 ± 0.12

**Novelty and uniqueness**

The project of developing a portable growth drawer for cultivating microgreens stands out for its novelty and uniqueness in several key aspects:

- a. **Integrated LED Technology:** Integrating programmable blue-red LED technology in the growth drawer sets this project apart from conventional cultivation methods. The specific light wavelengths have been shown to impact microgreens' growth and phytonutrient content significantly.
- b. **Compact and Portable Design:** Developing a compact and portable growth drawer allows for efficient microgreens cultivation in limited spaces, such as urban apartments, schools, or small kitchens. Unlike traditional gardening setups, this unique feature makes it a practical solution for urban citizens and small-scale growers with limited outdoor space, bringing urban farming closer to people's

	<p>everyday lives.</p> <ul style="list-style-type: none"> <li>c. Hydroponic Germination: The project explores hydroponic germination as an efficient and resource-saving method for cultivating microgreens. This novel approach enhances growth rates and nutrient absorption by employing a hydroponic sowing tray within the growth drawer, surpassing traditional non-hydroponic techniques. This innovation is particularly valuable for promoting water conservation and sustainable agricultural practices.</li> <li>d. Multi-Purpose Use: The versatility of the growth drawer allows for various applications, from educational purposes in schools and research institutions to commercial ventures in urban farming and specialty restaurants.</li> <li>e. Focus on Sustainability: With its emphasis on energy-efficient LED technology, hydroponic cultivation, and small-scale urban farming, the project aligns with the increasing global focus on sustainability and eco-friendly agricultural practices.</li> </ul> <p>This product not only stands out in the field of microgreens cultivation but also presents a promising solution to the challenges of modern agriculture, emphasizing a greener and healthier future for mankind.</p>
<p><b>Benefit to mankind</b></p>	<p>The findings from this project demonstrate the substantial impact of light conditions on the growth and biomass accumulation of kale microgreens. Moreover, it introduces an innovative approach to establishing microgreens using the hydroponic germination method, emphasizing resource efficiency and sustainability.</p> <p>The development of this portable growth drawer marks a significant leap towards maximizing the benefits of microgreens for humankind. Its practicality and versatility enable the seamless cultivation of microgreens for various purposes, including learning, research, and commercialization. Urban citizens and small-scale growers can now conveniently produce nutrient-rich microgreens within limited spaces, promoting accessibility to healthy and fresh produce.</p> <p>By incorporating cutting-edge LED technology, the growth drawer ensures optimal growth conditions, enhancing microgreens' nutritional content and quality. This breakthrough holds immense potential in fulfilling the growing interest among consumers for healthier diets, as microgreens are recognized for their superior nutritional value and health-promoting effects.</p> <p>Ultimately, this project aims to contribute to our country's sustainable commercialization of microgreens as a highly nutritious vegetable source. By harnessing the potential of innovative growth chambers and LED technology, we aspire to pave the way for a greener and healthier future, empowering individuals to cultivate their own fresh and wholesome food</p>

	<p>while positively impacting environmental conservation.</p> <p>Through this pioneering effort, we envision a society that embraces the significance of microgreens in promoting overall well-being and fostering a sustainable food ecosystem. By growing microgreens efficiently and affordably with the portable growth drawer, we take a step closer to a healthier and more resilient world for generations to come.</p>
<p><b>Potential commercialization</b></p>	<p>The portable growth drawer for cultivating microgreens has significant marketability and commercialization potential in various sectors. Its unique features and benefits make it a promising agricultural and urban farming product.</p> <p>In terms of marketability, the product addresses the growing demand for sustainable and locally-grown produce. As microgreens gain popularity as nutrient-dense superfoods and versatile culinary ingredients, consumers increasingly seek fresh and affordable sources of these health-promoting greens. The portable growth drawer offers a practical solution for individuals, urban citizens, and small-scale growers to produce their microgreens in limited spaces, such as homes, schools, or community gardens. Its compact design, energy-efficient LED technology, and hydroponic cultivation method cater to the needs of modern urban lifestyles, driving its marketability among health-conscious consumers.</p> <p>In terms of commercialization possibilities, the invention holds immense commercial potential in several key areas, such as home gardening and DIY kits, educational institutions and research, urban farming ventures, as well as specialty restaurants and hospitality.</p> <p>Overall, the portable growth drawer's marketability lies in its accessibility, adaptability, and potential to empower individuals and businesses alike in pursuing sustainable and nutritious food production. Its commercialization possibilities span diverse industries, positioning it as an innovative solution to cater to the growing demand for healthy, fresh, and environmentally conscious food options.</p>
<p><b>Acknowledgment</b></p>	<p>The head project member acknowledges financial support from the International University of Malaya-Wales (IUMW).</p>
<p><b>Researchers Biographical Data</b></p>	<div data-bbox="509 1623 732 1885" data-label="Image">  </div> <p>Shahril Efzueni Rozali is a lecturer in biotechnology at the Faculty of Arts and Science, IUMW. His focus area is plant tissue culture, postharvest technology, urban farming and plant biotechnology.</p>





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# SOCIAL SCIENCES AND EDUCATION

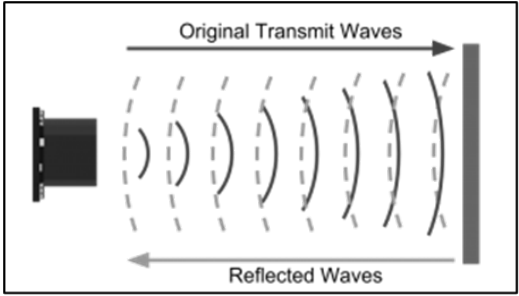
## CATEGORY B

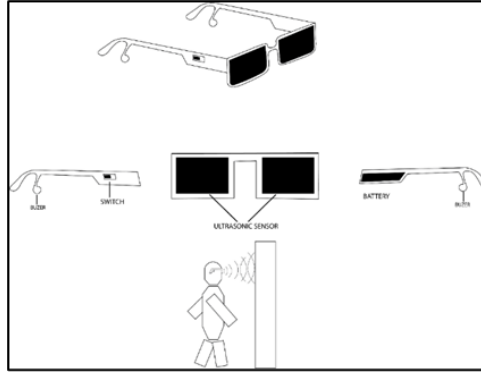
*UNIVERSITY AND TECHNICAL INSTITUTION STUDENT*

**MECHASONIC IRIS PROJECT CONSISTING OF A SMART LENS AND SMART STICK FOR VISUALLY IMPAIRED PEOPLE BY USING ARDUINO UNO AND AN ECO-FRIENDLY LITHIUM POLYMER BATTERY**

Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
	/		
	Local		International
	/		
<b>Project Member(s)</b>	<b>Muhammad Isyraq Husaini Muliadi<sup>1*</sup>, Assoc. Prof. Dr. Nik Salida Suhaila Nik Saleh<sup>2</sup>, Farhani Nabihah Mohd Yazid<sup>3</sup> and Syaza Nur Sharif<sup>4</sup></b>		
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<b>Email</b>	<a href="mailto:prof.isheghokk@gmail.com">prof.isheghokk@gmail.com</a> <a href="mailto:salida@usim.edu.my">salida@usim.edu.my</a> <a href="mailto:farhani03.my@gmail.com">farhani03.my@gmail.com</a> <a href="mailto:syzshrf@icloud.com">syzshrf@icloud.com</a>		
<b>Correspondence</b>	Muhammad Isyraq Husaini Muliadi Project leader and Undergraduate Student, Bachelor of Fiqh and Fatwa with Honours, Faculty of Syariah and Law, Universiti Sains Islam Malaysia, Bandar Baru Nilai, 71800 Nilai, Negeri Sembilan, Malaysia <a href="mailto:prof.isheghokk@gmail.com">prof.isheghokk@gmail.com</a> +60103948481 (HP)		

<b>Abstract</b>	<p>In the making of the Mechasonic Iris Project, we attempt to address matters that visually impaired people frequently struggle with. This is as such, matters which have been overlooked such as thin obstacles which could be missed by walking sticks. For instance, high signboards within a human's average height are out of the range that could be detected by walking sticks, visually impaired people had to depend heavily on their memories of every placement of things such as house appliances as those things are not easily accessible by walking sticks and most of them need to be accompanied by their relatives and friends to guide them whenever they are outside as many unforeseen obstructions may occur. Therefore, Mechasonic Iris Project aims to support the visually impaired people which complements the use of a traditional stick. This project inspires to boost the user's confidence with every step, allowing them to be more independent and to be able to provide the chance for these people to move around with ease wherever they want to go. The main features consist of an ultrasonic sensor, buzzer, Arduino UNO, and rechargeable battery which is Lithium Polymer Battery. This project mechanically works started with, the ultrasonic sensor with the ability to detect obstacles in front and upfront of consumers within 2 meters range and transfer the input to Arduino UNO for coding which is later on, transmitted to the buzzer to ring and vibrate. Hence, we are positive that the commercialization of our product is highly efficient to make sure the inclusiveness of stakeholders in society, an affordable device for all and we are proud to say that the battery used for this project is free of harmful metals such as cadmium, lead, and mercury which makes it environmental friendly which it is not only consumer-friendly but also eco-friendly.</p>
<b>Keywords</b>	<i>Mechasonic, Iris, ultrasonic sensor, inclusiveness, eco-friendly.</i>
<b>Product description</b>	<p>Mechasonic Iris Project creates opportunities for the stakeholders with visual disabilities to be able to live 70% as functional as those without any visual problems and those who do not require any assistance. Hence, the research objectives could be listed as below:</p> <p>Mechasonic Iris Project aims to reduce the impact of visual impairment disability in terms of restrictions in consumer's independence, mobility, and educational achievement, as well as risk of falls, fractures, injuries, poor mental health, cognitive deficits, and social isolation.</p> <p>Mechasonic Iris Project focuses on improving the sensitivity of other sensory systems namely hearing and touch by increasing the factor of alertness covering 180 degrees of a person's frontal area.</p>

	<p>Mechasonic Iris Project intends to level up the efficiency of visual impairments devices used to aid the consumers through a simple technology and is a low cost, easily installed programme.</p> <p>Mechasonic Iris Project aims to achieve a few of the Sustainable Development Goals designated by the United Nation namely SDG 3 (promoting good health and wellbeing), SDG 4 (quality in education) and SDG 10 (reducing inequalities) and thus conforming with the consumers' need.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	<p><b>Ultrasonic Sensors</b></p> <p>Ultrasonic sensors are instruments that measures the distance to an object using ultrasonic sound waves. Ultrasonic sensors use transducers to send and receive ultrasonic pulses that relay back information about an object's proximity. High-frequency sound waves reflect from boundaries to produce distinct echo patterns (Roderick Burnett, 2018). They serve as the main function of our product which is to determine the proximity of obstacles in front of the user.</p> <div data-bbox="732 982 1247 1276" data-label="Image">  <p>The diagram illustrates the principle of ultrasonic sensing. On the left, a black rectangular transducer emits sound waves, represented by a series of dashed semi-circular lines moving to the right. An arrow above the waves is labeled 'Original Transmit Waves'. On the right, a vertical black bar represents a boundary. The waves hit the boundary and reflect back to the left, shown as dashed semi-circular lines moving leftward. An arrow below the reflected waves is labeled 'Reflected Waves'.</p> </div> <p><b>Picture 1 - High-frequency sound waves reflect from boundaries to produce distinct echo patterns.</b></p> <p><b>Light Emitting Diode (LED)</b></p> <p>Light emitting diodes, commonly called LEDs, are real unsung heroes in the electronics world. LEDs are just tiny light bulbs that fit easily into an electrical circuit. But unlike ordinary incandescent bulbs, they do not have a filament that will burn out, and they do not get especially hot (Tom Harris and Wesley Fenlon, 2017). In our products, they serve as the indicator for the circuit, either the circuit is open or already closed.</p>



**Picture 2** - The labels for each component for Mechasonic Iris Project and the main purpose of the project.



**Picture 3** - The actual prototype for Mechasonic Iris Project.




**Novelty and uniqueness**

A standard stick commercialised in the market is not provided with a sensory system which causes the consumers to rely solely on their instinct upon the touch of the end of their stick onto the object in front of them thus creating difficulty when they encounter any unfamiliar area without anyone to physically assist them. It is unfortunate too when consumers have to go through public areas which are under construction such as the pavement and bus station. They are basically exposed to the risks of injuries upon any unfavourable accidents happening to them. Inspired by the car reversing alert system where the sound of a buzzer intensifies upon the closer distance of the object at the back of the car, the same concept is applied to our device.

The device in question today is a kit equipped with a sensory stick and glasses paired with ultrasonic sensors, buzzers and LED. The important element of the device is the ultrasonic component and a buzzer to create a smart working system to alert the consumers of the obstacles in front of them. To fully comprehend the whole system of the device, the components required are listed as below:



	No.	<b>MATERIALS FOR SMART STICKS</b>	<b>MATERIALS FOR SMART LENSES</b>
	1.	Walking stick	Glasses frame
	2.	Buzzer	Buzzer
	3.	Maker UNO	Ultrasonic Sensors
	4.	Ultrasonic Sensor	Rechargeable battery
	5.	Lipo Power Shield + Lipo Battery	Cables
	6.	Jumper Wires	Switch
	<p>The steps of assembling each component are shown through the video of the prototype. Once done, the sensors have to be set up for the limitation of the distance so as to make it fully functional. Intensity of the buzz will increase as the sensor approaches the obstacle. A specific range of distance is determined so as to show the level of alertness in the form of intensified vibration or ringing sound. The nearer the obstacle, the intensified the vibration or ringing of the buzzer. Through both items equipped with sensory components and alert system, consumers will be able to go through their daily life with maximum efficiency.</p>		
<b>Benefit to mankind</b>	<p>We guarantee that Mechasonic Iris Project could benefit the users greatly. We hope that our invention could give sightless people hope to explore this wonderful world within their unique point of view. In a few years' time, we believe Mechasonic Iris Project would become one of the basic needs for vision impaired people especially legally blind individuals. Further studies can be conducted to expand the capability of the Mechasonic Iris Project in order to improve any loopholes that might be upgraded and commercialized by the industry. Soon, Mechasonic Iris Project may come in additional features to ensure maximum capabilities to meet the user's demand.</p>		
<b>Potential commercialization</b>	<p>Based on our research, we have found several potential commercialization of this product due to its advantages. It is crucial for us to understand which material is the most suitable for our climate. The material is plastics which comes with lots of advantages, which are:</p> <p><b>Durable.</b> Plastics are truly great to resist corrosion, natural elements and are also chemically resistant.</p> <p><b>Flexibility.</b> Plastic can be shaped and molded into any desirable form, have any color, or any physical property.</p> <p><b>Sturdy.</b></p>		

	<p>Plastics are very light and easy to handle, yet strong enough to withstand physical damage compared to more organic materials.</p>
<p><b>Acknowledgment</b></p>	<p>This research is conducted with the encouragement and guidance of our dean, Assoc. Prof. Dr. Nik Salida Suhaila Nik Saleh who continuously and patiently mentoring us. We offer our humblest salutes and respects for our faculty upon the path paved for us to complete our research. Finally, a tremendous appreciation for everyone who directly and indirectly assists the research journey and inspired the whole writing to be completed.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 20px;"> <div style="display: flex; align-items: flex-start;">  <div> <p>Assoc. Prof. Dr. Nik Salida Suhaila Nik Saleh is currently a Commissioner, Human Rights Commission of Malaysia and Dean at the Faculty of Syariah and Law, Islamic Science University of Malaysia. Her academic qualification includes Doctor of Philosophy in Law (University of Keele, UK) 2013; Masters of Comparative Laws (International Islamic University Malaysia) 2001; LLB (Hons.) (International Islamic University Malaysia) 2000.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div> <p>Muhammad Isyraq Husaini Muliadi, a fourth-year student of Fiqh and Fatwa programme has an interest in international innovation competition. A debater and public speaker. At the university, holding a portfolio as President of the Invention and Innovation Club responsible for managing innovation programs including USIM Invention and Innovation National Competition 2022.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div> <p>Farhani Nabiha Mohd Yazid, a fourth-year student of Law and Syariah programme. Founder of Legal Professional Writing Club (LPWC) and had involved with various researches across studies. Love to create any creative ideas that might contribute to the society and country.</p> </div> </div> </div>

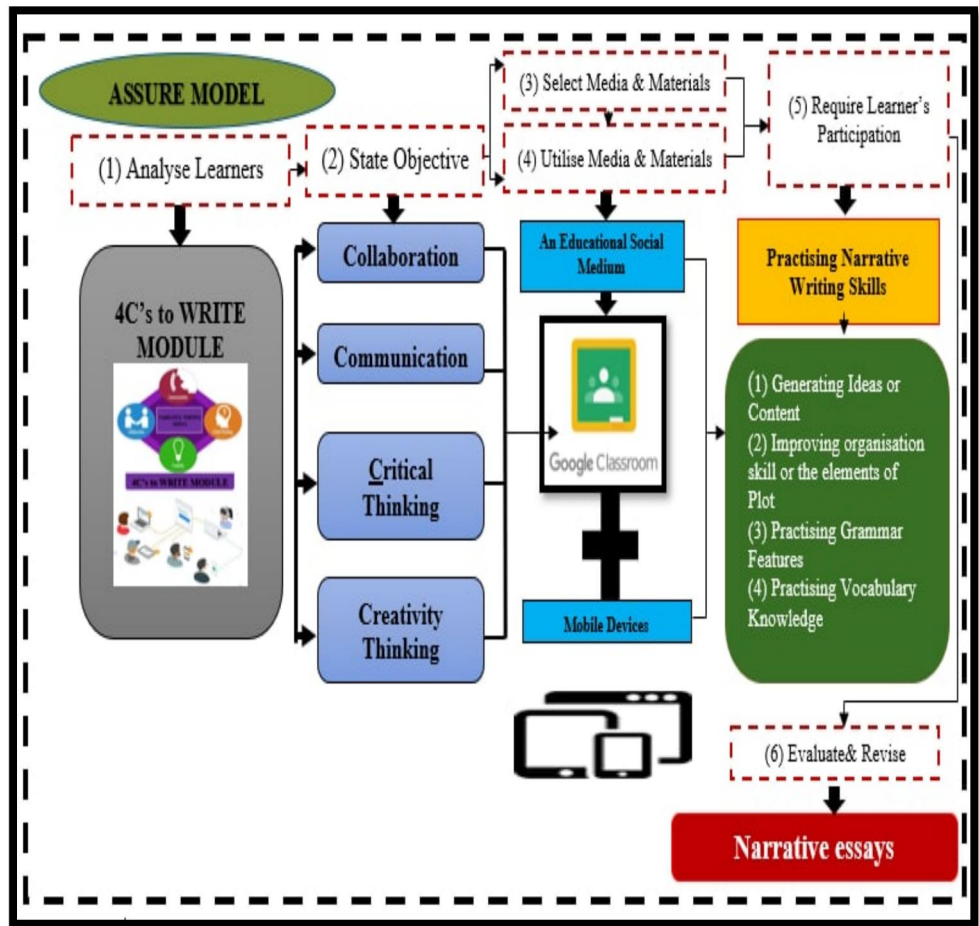
	 <p>Syaza Nur Sharif, a fourth-year student in the Law and Syariah department, enjoys researching and analyzing current invention in technology. Her enthusiasm for striking a balance between her academic and extracurricular commitments inspired her to take part in innovation competition, moot court, debate, emceeding for international programmes, innovative creation, engaged with club activities and community service, netball player for the department, and fun run.</p>
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**EFFECTIVENESS OF 4C'S TO WRITE MODULE  
IN EMERGING NARRATIVE WRITING SKILLS  
BASED ON ASSURE MODEL**

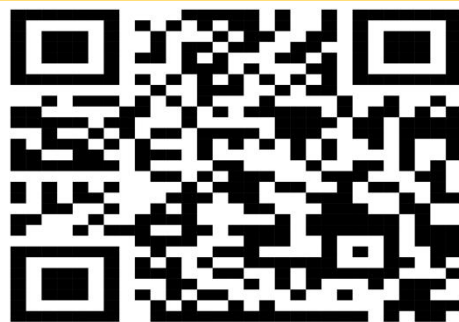
Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
		√	
	Local		International
	√		
<b>Project Member(s)</b>	Raganeswari Ramasamy <sup>1</sup> , Mariam Mohamad <sup>2</sup> , Mageswaran Sanmugam <sup>3</sup> , Hooi Chee Mei <sup>4</sup>		
<b>Affiliation</b>	<sup>1</sup> Centre for Instructional Technology and Multimedia Universiti Sains Malaysia Penang, Malaysia  <sup>2</sup> Centre for Instructional Technology and Multimedia Universiti Sains Malaysia Penang, Malaysia  <sup>3</sup> Centre for Instructional Technology and Multimedia Universiti Sains Malaysia Penang, Malaysia  <sup>4</sup> Faculty of Creative Industries Universiti Tunku Abdul Rahman Selangor, Malaysia		
<b>Email</b>	<sup>1</sup> raganes_87mr@yahoo.com; <sup>2</sup> mmohamad@usm.my, <sup>3</sup> mageswaran@usm.my, <sup>4</sup> <a href="mailto:hooicm@utar.edu.my">hooicm@utar.edu.my</a>		
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<b>Abstract</b>	<p>The importance of English language can be seen in almost every part of our lives. Nevertheless, students in Malaysia are facing huge deficiencies in writing skills compared to other three language skills. On this 21<sup>st</sup> century era, various teaching approaches could be implemented to overcome writing difficulties among students. One of the ways is creating a writing module by incorporating the usage of mobile devices which would enable students to practise their writing skills anywhere and anytime. The 4C's to WRITE Module is a new transformation based on ASSURE Model to be incorporated among upper secondary students in Malaysia to develop their narrative skills. The objective of this module is to employ the main 4C's of 21<sup>st</sup> century learning skills which are communication, collaboration, critical thinking, and creativity thinking using an online learning platform to develop the elements of narrative writing skills in terms of improving main ideas, organising the elements of plot, developing the grammar and vocabulary features among upper secondary students in Malaysia. The outcome from this study could enable future researchers, policy makers, and educators to consider the importance of using a step-by-step guideline for preparing modules which could be utilised in future to improve students' narrative writing skills and other types of writing skills among secondary students.</p>
<b>Keywords</b>	<p align="center">4C's of the 21<sup>st</sup> Century Learning Skills, 4C's to WRITE Module, Narrative Writing Skills, ASSURE Model</p>
<b>Product description</b>	<p>The purpose of creating the 4C's to WRITE Module is to enable the upper secondary students in Malaysian National schools have an opportunity to practise their narrative writing elements using an online learning platform via mobile devices after their school hours. The module (4C's to WRITE) serves as a guideline to enable students to take part in a series of narrative writing activities.</p>

Pictures/  
Schematic  
diagrams/ Flow  
Charts/Screenshot  
s/Graphs and etc.



(4C's to WRITE Module)  
(SCAN HERE)



**Novelty and uniqueness**

The 4C's to WRITE module is the first attempt of implementing among Malaysian National upper secondary students to enhance their narrative writing skills by referring to the module while it is being used through an online learning platform via mobile devices. It creates an opportunity for students to train themselves to practise narrative writing skills using technology in Malaysian National Secondary schools. The researcher created the module (4C's to WRITE)



	<p>as it would help educators to easily follow the given guidelines to upload the activities on online learning platform and students could view the activities and complete the activities using their mobile devices after school hours.</p>
<p><b>Benefit to mankind</b></p>	<p>In Malaysia, students are facing a huge problem in writing skills compared to other three skills. On the same spectrum, students need to master their writing skills so that they can do well in their public examinations. Nevertheless, educators in classroom, they do not have ample of time to make students to fully master in each type of writing skill due to time constraint and the conventional approaches that being applied. In this 21<sup>st</sup> century era, technology is playing a fundamental role in everyone life and implementing it to train writing skills among students would be beneficial. Students need continuous writing practices to master their writing skills. Therefore, the (4C's to WRITE) module, integrating online learning platform and mobile devices would make students to practise writing skills after their school hours.</p> <p><b><i>***This module (4C's to WRITE Module) has received the copyright in year 2022.</i></b></p>
<p><b>Potential commercialization</b></p>	<p>This module would be beneficial among students to improve their narrative writing skills. Apart from that, the new format of English Paper of SPM requires students to share their opinions, thoughts, and experiences. Therefore, this module would create a room for students not only to improve their narrative writing skills but they would learn how to construct their main ideas, organising the ideas into a few paragraphs, improving their grammar and vocabulary features. This is because the SPM assessors would evaluate student's writing based on the four criteria which are content, organisation, communicative achievement, and language.</p>
<p><b>Acknowledgment</b></p>	<p>I am heartily grateful to my main supervisor (Dr. Mariam Mohamad) who given me an idea to create a narrative writing module for Malaysian Upper Secondary students to improve their narrative writing abilities in future. The module was given a name as (4C's to WRITE). Besides that, I would like to express my thankfulness to my co-supervisor Dr. Mageswaran Shanmugam and my friend, Asst.Prof.Dr. Hooi Chee Mei to their continuous supports, productive responses and ideas to create this module to bring some changes in Malaysian Education system to enable the young generation to progress immensely in their writing skills.</p>

**Researchers  
Biographical Data**



Raganeswari Ramasamy, a PhD student at Centre of Instructional Technology and Multimedia, Universiti Sains Malaysia, Penang, Malaysia.

Area of study: Mobile Learning, Language Learning



Dr. Mariam Mohomad, a senior lecturer of Centre of Instructional Technology and Multimedia, Universiti Sains Malaysia, Penang, Malaysia

Skills or Specialisation: Mobile learning, Mobile Assistive Technology, Mobile Assisted Language Learning



Ts. Dr. Mageswaran Sanmugam, a senior lecturer of Centre of Instructional Technology and Multimedia, Universiti Sains Malaysia, Penang, Malaysia


Skills or Specialisation: Game Based Learning or Ludology, Educational Technology, Educational Management, Sports Science, Game Theory, Human Computer Interaction

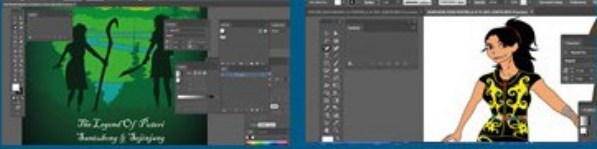




Dr. Hooi Chee Mei is an Assistant Professor at the Faculty of Creative Industries, Universiti Tunku Abdul Rahman, Selangor, Malaysia.



Skills/Specialisation: English Language, Applied Linguistics, Syntax, English for Specific Purposes (ESP), and Teaching Methodology

<b>LEGEND BORNEO: PUTERI SANTUBONG &amp; SEJINJANG GAME APP</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
	<b>Local</b>		<b>International</b>
<b>Project Member(s)</b>	Harryiato Vequase Anak Atong <sup>1</sup> , Lilian Lee Shiau Gee <sup>2</sup>		
<b>Affiliation</b>	<sup>1</sup> Academy of Arts and Creative Technology, Universiti Malaysia Sabah, Kota Kinabalu, Malaysia  <sup>2</sup> Academy of Arts and Creative Technology, Universiti Malaysia Sabah, Kota Kinabalu, Malaysia		
<b>Email</b>	<sup>1</sup> harryiato123@gmail.com, <sup>2</sup> lilian@ums.edu.my		
<b>Correspondence</b>	Lilian Lee Shiau Gee Akademi Seni dan Teknologi Kreatif, Universiti Malaysia Sabah, Jalan UMS 88450 Kota Kinabalu, Sabah, Malaysia. Tel: +6088 320000 Ext: 104006		
<b>Abstract</b>	Folklore is a crucial component of cultural inheritance and needs to be preserved for future generations. The appeal of folklore is that it is a component of an oral cultural history that has been handed down orally over ages that reflects the indigenous people's unique cultural identity. But the younger generation is forgetting this legacy more and more. The objective of the interactive games is to preserve lost cultural heritage. Consequently, a concerted effort is made to introduce and market them to young people together with the interactive gaming environment. 'Legend Borneo' was created to popularise local folklore (The legend of Puteri Santubong and Sejinjang) in an effort to broaden exposure to historical aspects. The 'Legend Borneo' concept started with the transcription of the story from an oral tradition into a gaming mechanic and game character, while the environment and objects used computer graphics to mimic the local dress and culture. Based on the iterative game framework, the game was created using four key processes: design, implementation, playtesting, and evaluation. Through a number of game tests, the "Legend Borneo" prototype with fixed bugs and high interactions was observed. The game's prototype offers a lot of potential for connecting concepts and inspiring players to learn about Borneo stories.		

	<p>In the context of learning to raise the cultural awareness of folktales among younger generations, "Legend Borneo" offers incredible experience, recognition, and artistic production of a new perspective towards Borneo Folktales.</p>
<b>Keywords</b>	<p>folktales, borneo art, edugames, learning culture, local game</p>
<b>Product description</b>	<p>The 'Borneo Legend' is an attempt to utilise gamification to popularise local stories through the platform of an RPG (Role-Playing Game) based on 2D games. The concept and design of 'Borneo Legend' are minimalistic flat arts, with a retro appeal and a 2-D visual form. The player advances through the game's missions by speaking with non-playable characters whose backstories are drawn from the legends of Puteri Santubong and Puteri Sejinjang. Gamification aspects, such as points, levels, lives, villains, and achievement boards, have been incorporated into the storyline of the game.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	

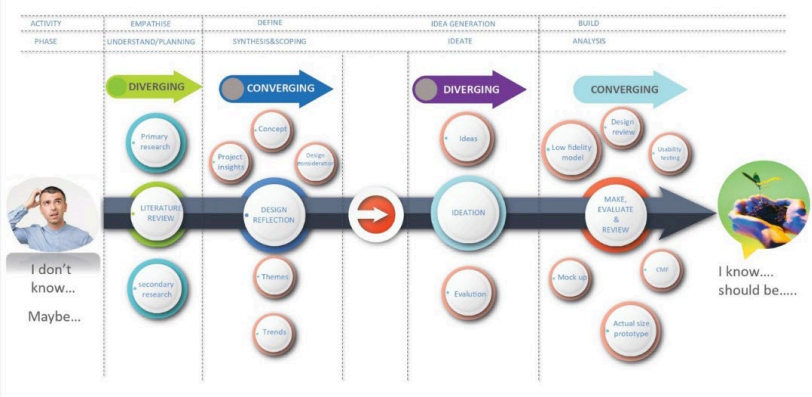
	<div style="text-align: center;"> <h2>ITERATIVE GAME FRAMEWORK</h2> </div> <div style="text-align: center;"> <h3>DESIGN</h3> <p>Taking inspiration from 2D gaming art. All the in-game graphics were produced in 2D computer programmes.</p>  </div> <div style="text-align: center;"> <h3>IMPLEMENTING</h3> <p>Additional animation added, consisting of very few movements, and coded into the game.</p>  </div> <div style="text-align: center;"> <h3>PLAYTEST</h3> <p>Playtests were conducted, and the code system underwent testing.</p>  </div> <div style="text-align: center;"> <h3>EVALUATE</h3> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>PERALATAN</p> <ul style="list-style-type: none"> <li>• KOMPUTER ATAU LAPTOP</li> <li>• SOFTWARE</li> </ul> </div> <div style="text-align: center;"> <p>PROSES</p> <ul style="list-style-type: none"> <li>• LAKARAN WATAK</li> <li>• LAKARAN PETA</li> <li>• PEMBANGUNAN KARAKTER</li> <li>• PENGUJIAN AUDIO</li> </ul> </div> <div style="text-align: center;"> <p>HASIL</p> <ul style="list-style-type: none"> <li>• PERMAINAN VIDEO LEGENDA PUTERI SARABAK</li> </ul> </div> </div> <p>This game's functioning was evaluated, and as a result, this game can work smoothly and without online support to facilitate the use of users in the rural area.</p> </div>
<p><b>Novelty and uniqueness</b></p>	<p>The 'Legend Borneo' is distinctive, particularly in regard to the current trend of using the digital era to display and popularise the regional cultural history. It helps preserve cultural traditions by providing players with immersive experiences that are not restricted by the passage of time or location. The inclusion of a broad range of multimedia content in gaming provides an accurate picture of events from the past, as well as educational and documentary material relevant to our local tradition and globalisation.</p>

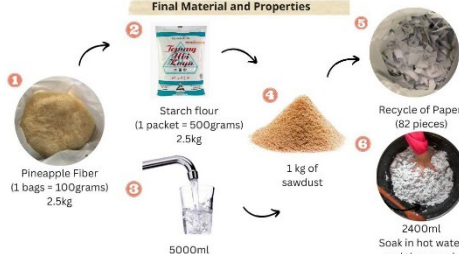


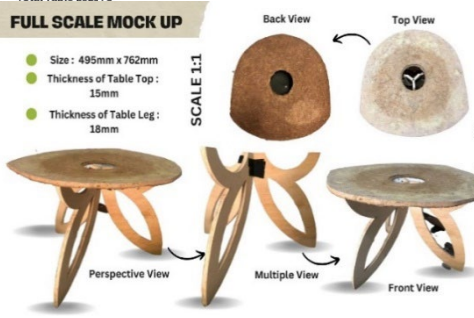



<b>Benefit to mankind</b>	<p>It would appear that ‘Legend Borneo’ is an alternate and powerful method for incorporating Malaysian local heritage. The development of “Legend Borneo’ has the potential to be of considerable assistance to academics, researchers, and designers in the process of interactively planning and developing cultural resources. Students have a deeper comprehension of the diverse cultures and historical traditions of the world as a result of their education. In addition, the benefits of gameplay promote the development of cognitive abilities, physical skills, strategic thinking, emotional feelings, and communicative abilities, and the acceptance of interactive games in modern education.</p>
<b>Potential commercialization</b>	<p>In addition, ‘Legend Borneo’ has significant potential as a tool for educational purposes, particularly in regards to local and regional history, culture, literature, and folklore. This will have the effect of enriching the local culture. 'Legend Borneo' could be improved over time by introducing gamification aspects like as additional players, leaderboards, objectives, narrators, and user interface aids. It has the potential to be developed into a gaming app, which would attract a wider audience around the world.</p>
<b>Acknowledgment</b>	<p>Many thanks to all respondents for their participation and insightful comments. This study was the third-year students' final project assignment. In addition, special appreciation is extended to all organisations for their useful assistance and to the reviewer for his or her insightful remarks.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 20px;">  <p>Harryiato Vequase Anak Atong is a student who is currently undertaking his Degree study program under Academy of Arts and Creative Technology, Universiti Malaysia Sabah, Malaysia. As a result of his passion for gamification design and interactive creativity, he dedicated his final year project to gaming design.</p> </div> <div>  <p>Lilian Lee Shiau Gee is a lecturer and currently attached to Visual Arts Technology Programme at Universiti Malaysia Sabah. Her research interest includes graphic design, multimedia design, game art, educational games, gaming experiences and interaction design. She practiced cross disciplines and collaborative, enriching visual design as a platform, fostered by advanced technologies.</p> </div> </div>



<b>ALTERNATIVE PINEAPPLE FIBRE ADVANCEMENT IN FURNITURE DESIGN</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
		/	
	<b>Local</b>		<b>International</b>
		/	
<b>Project Member(s)</b>	Noor Siti Fitrah Azman <sup>1</sup> , Zulkifli Romli <sup>2</sup>		
<b>Affiliation</b>	<sup>1</sup> College of Creative Arts, Universiti Teknologi MARA, Shah Alam, Malaysia <sup>2</sup> College of Creative Arts, Teknologi MARA, Shah Alam, Malaysia		
<b>Email</b>	<sup>1</sup> noorsitifitrahazman@gmail.com / 2022363379@uitm.edu.my <sup>2</sup> zul308@uitm.edu.my		
<b>Correspondence</b>	Noor Siti Fitrah Binti Azman No 57, Jalan TTP1, Taman Tambak Paya Permai, 75460, Air Molek Melaka, Malaysia Tel: +6017-6367523		
<b>Abstract</b>	The pineapple fruit plant is widely used in Malaysian agriculture, and Malaysia is one of the top three countries for pineapple production. One of the issues with pineapple trees is leaf waste. Pineapple leaf waste takes a long time to decompose. The impact of pineapple leaf waste will be put into the sewer, allowed to rot, and then burned to eradicate it after harvest. Apart from being a nuisance to farmers and the environment, the waste can be repurposed into useful products, which is beneficial to both society and the economy. Pineapple leaves have long fibers that can be extracted and used to create textiles, paper, and composites materials. Pineapple fiber, also known as Pina, is a valuable material in the fashion industry and has been		

	<p>used in traditional Filipino garments for centuries. It is also used to create high-quality paper products. In recent years, designers and manufacturers have started using pineapple leaf fibers in furniture production. The fibers can be combined with other materials like resin to create durable, lightweight, and eco-friendly furniture. This innovative approach to furniture design is not only environmentally friendly but also addresses the growing demand for sustainable materials in the industry. Furthermore, the use of pineapple leaf waste as a material in industrial design can be a game-changer in terms of sustainable material innovation. Not only can it reduce the amount of waste produced by pineapple farming, but also creates economic opportunities for farmers and manufacturers. In conclusion, the use of pineapple leaf waste as a material in industrial design is an excellent example of how waste can be turned into a valuable resource. With further research and development, the potential uses of pineapple leaf fibers in furniture production can be explored to create a more sustainable and environmentally friendly future.</p>
<b>Keywords</b>	Pineapple leaves waste, sustainability, material, furniture design, manufacturing
<b>Product description</b>	<p>The main focus of this alternative furniture material, made from degradable pineapple fiber, is on the top of a coffee table. Instead of a standard coffee table in the living room, this new material will be used to create a one-of-a-kind piece of furniture inspired by star anise. The resulting coffee table design is truly unique.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<p>Structure of the Design Research and Methods</p>  <p>Procedure of Experimental:</p>

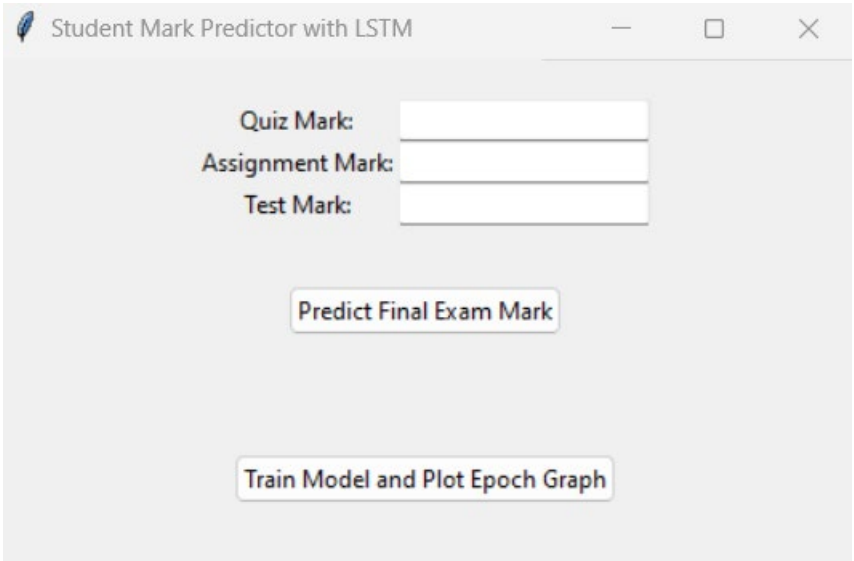
	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p><b>Final Material and Properties</b></p>  <p><b>Procedure</b></p> <p>After the three ingredients have been combined, the mould container has been prepared and lined with plastic to ensure that the drying process does not stick and that the drying process goes as smoothly as possible.</p>  </div> <div style="width: 45%;"> <p><b>Procedure</b></p> <p>1. There are 25 bags of pineapple fibre used. To facilitate mixing, pineapple fibre is separated and cut.</p> <p>2. To facilitate mixing activities, 52 sheets of A4 size recycled paper are used and torn.</p> <p>3. The ripped paper is mixed with 2400ml of hot water and crushed by hand for 2 hours.</p> <p>4. The researchers used starch to make the glue mixture. In this process, 2.5kg of mixture is required, and 5000ml of water is required. It is heated and on the stove with medium heat for 2 hours and 30 minutes to complete the mixture.</p> <p>5. After the starch glue mixture is prepared, 25kg pineapple fibre was gradually mixed with glue, and blended until smooth. The procedure is carried out by hand.</p> <p>6. Next, combining the pineapple fibre and starch glue, 1kg of sawdust is measured in. The connection process is carried out manually.</p> <p>7. The final step is to thoroughly combine the crushed and mixed 82 pieces of paper. The procedure is carried out manually and takes 2 hours and 30 minutes to complete.</p> <p>8. The upper part that was exposed to the sun after dried. The colour is dark.</p> <p>9. The drying process takes 14 days under the sun.</p> <p>10. A cracking process occurs at the mould container's edge, indicating that it dried successfully.</p> <p><b>The Outcome</b></p> <p>11. The upper part that was exposed to the sun after dried. The colour is dark.</p> <p>12. The bottom part that was exposed to the sun after dried. The colour is light.</p> </div> </div> <div style="text-align: center; margin-top: 20px;"> <p><b>FULL SCALE MOCK UP Process</b></p>  <p>Material Plywood</p> <p>Size for Table legs: 469mm x 330mm Thickness: 18mm Total Table Legs: 3</p> </div> <div style="text-align: center; margin-top: 20px;"> <p><b>FULL SCALE MOCK UP</b></p> <p>Size: 495mm x 762mm Thickness of Table Top: 15mm Thickness of Table Leg: 18mm</p>  <p>SCALE 1:1</p> </div>
<p><b>Novelty and uniqueness</b></p>	<p>The results of this study contribute to the understanding that utilizing alternative materials derived from recycled pineapple fibre can help mitigate environmental pollution. This approach reduces costs and offers an additional source for furniture manufacturing in Malaysia, diversifying options beyond traditional wood materials. The widespread adoption of pineapple fibre in industrial design, particularly in consumer products, can significantly promote sustainable practices.</p>
<p><b>Benefit to mankind</b></p>	<p>The coffee table's design considers the user's comfort, ensuring that it provides a pleasant and convenient experience. Its sustainable materials contribute to its decorative purpose, making it an eye-catching element in the center of the living room. The presence of the coffee table creates an inviting</p>

	<p>and cost atmosphere for guests, encouraging them to gather around and engage in conversations.</p> <p>Overall, the combination of comfort, usability, and sustainable materials in the design of the coffee table results in a decorative piece that serves as a focal point in the living room, attracting guests' attention and creating a welcoming environment.</p>
<b>Potential commercialization</b>	<p>Furniture design with alternative pineapple fiber offers commercialization opportunities for sustainable, eco-friendly materials like table tops. This material's unique aesthetic appeal and natural texture attract consumers seeking distinctive pieces. However, challenges in large-scale production, supply chain management, and initial costs must be addressed. Collaborative efforts between researchers, manufacturers, and consumers are crucial for unlocking its full potential.</p>
<b>Acknowledgment</b>	<p>The author would like to thank Universiti Teknologi MARA for supporting this research, the organizer for the opportunity, and several people for their help and support during my journey in this research. Thank you to my supervisor, Mr Zulkifli Romli. I am grateful for his time, patient guidance, intellectual input, advice, and support. Thank you for being part of this learning process and always encouraging me to improve.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; align-items: center;">  <div> <p>Noor Siti Fitrah Binti Azman completed her Bachelor's in Art and Design from Universiti Teknologi Mara, Shah Alam, in 2022. Her thesis project investigated pineapple fibre as an alternative material for furniture manufacturing. During her Master's degree, she advanced her research by developing a unique experimental procedure tailored to utilise large-sized compostable pineapple fibre. Notably, she has made significant contributions to the field by introducing sustainable materials and innovative approaches to enhance the material's properties. Her work includes the design of a tabletop using the material mentioned above.</p> </div> </div>

	 <p>Zulkifli Romli is a senior lecturer in the College of Creative Arts, UITM, Kampus Shah Alam. He is my supervisor for this research study.</p>
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<b>AI-DUCATE: AI DRIVEN PREDICTIVE ANALYTICS FOR STUDENT PERFORMANCE ANALYSIS</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
		√	
	<b>Local</b>		<b>International</b>
		√	
<b>Project Members</b>	Mohd Rizman Sultan Mohd <sup>1</sup> , Fazlina Ahmat Ruslan <sup>2</sup> , Juliana Johari <sup>3</sup>		
<b>Affiliation</b>	School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA, Shah Alam, Malaysia		
<b>Email</b>	<sup>1</sup> engr_rizman@outlook.com, <sup>2</sup> fazlina419@uitm.edu.my, <sup>3</sup> julia893@uitm.edu.my		
<b>Correspondence</b>	Mohd Rizman Sultan Mohd School of Electrical Engineering, College of Engineering, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia. Tel: +6012-5344649		
<b>Abstract</b>	<p>AI-DUCATE is an innovative AI-driven Python application for student performance analysis, leveraging an enhanced LSTM model with a corrective filter. This advanced approach predicts final exam marks based on quiz, assignment, and test scores, providing valuable insights for timely interventions. The software optimizes teaching strategies and engages students proactively, utilizing the power of Python libraries for deep learning. Its advantages include automation, real-time feedback, and data-driven insights, fostering improved academic outcomes and student retention. AI-DUCATE's socio-economic impact is significant, promoting a skilled workforce and equitable access to quality education. Based on results, the enhanced LSTM achieved an impressive R-squared value of 70.31%. Commercially, it holds promising prospects in the growing data-driven educational technology market. In conclusion, AI-DUCATE revolutionizes education with Python-based AI, incorporating enhanced LSTM and a corrective filter for accurate predictive analytics, empowering educators and students to thrive in a data-enhanced learning environment.</p>		



<b>Keywords</b>	AI-driven, Predictive Analytics, Student Performance, Enhanced LSTM Model
<b>Product description</b>	AI-DUCATE is an innovative Python software featuring a user-friendly GUI developed with PyCharm. It utilizes enhanced LSTM with a corrective filter to predict final exam marks based on quiz, assignment, and test scores. The visually appealing interface offers real-time feedback and a training epoch graph. With potential in optimizing teaching strategies and enhancing student outcomes, AI-DUCATE positively impacts the education sector. Empowering educators with data-driven insights, it paves the way for a brighter future in education. This powerful tool facilitates informed decision-making and fosters academic excellence.
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs etc.</b>	 <p style="text-align: center;">Figure 1 – First page of the software.</p>

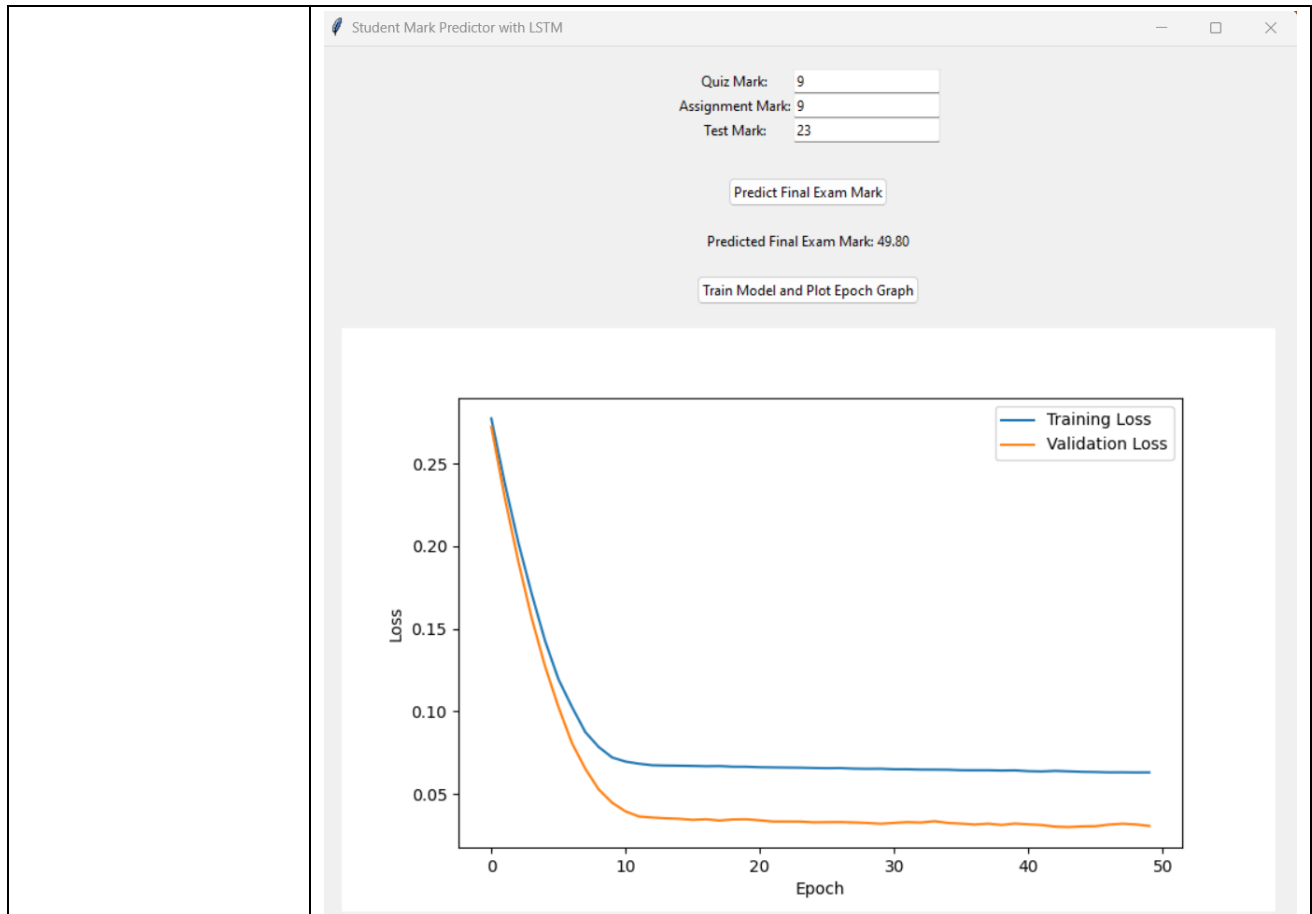



Figure 2 – The results page.

**Novelty and uniqueness**

AI-DUCATE's novelty lies in its cutting-edge AI technology, user-friendly GUI developed with PyCharm, and enhanced LSTM model with a corrective filter achieving an impressive R-squared value of 70.31%. Unlike others, it proactively predicts final exam marks, enabling early interventions and optimized teaching strategies. The real-time feedback and training epoch graph enhance transparency. Personalized learning capabilities promote equitable access to quality education. Its automation sets it apart, streamlining predictive analysis. Commercially promising, AI-DUCATE revolutionizes education, empowering educators and fostering student success. This innovative tool has the potential to transform student performance analysis and elevate education standards globally.

**Benefit to mankind**

AI-DUCATE benefits mankind through accurate predictions of final exam marks, empowering educators with insights for timely interventions and optimizing teaching strategies. Its user-friendly GUI ensures accessibility for students, educators, and institutions, fostering data-driven decision-making.

	<p>The application spans various educational settings, promoting personalized learning experiences and equitable access to quality education. AI-DUCATE's impact on education contributes to a skilled workforce, socio-economic growth, and societal advancement. By addressing disparities and driving academic excellence, it creates a brighter future for individuals and society, enhancing overall progress and prosperity.</p>
<p><b>Potential commercialization</b></p>	<p>AI-DUCATE has strong commercialization potential in the education technology sector. Its AI-driven technology, user-friendly GUI, and unique features, including an enhanced LSTM model with a corrective filter achieving an impressive R-squared value of 70.31%, make it a compelling solution. Educational institutions, schools, and online learning platforms can optimize teaching strategies and improve student outcomes, enhancing their academic reputation. With automated predictive analysis, real-time feedback, and data-driven insights, AI-DUCATE stands out in the market. Its global applicability and positive socio-economic impact position it as a leading product, attracting investors and businesses looking to revolutionize education with cutting-edge AI solutions.</p>
<p><b>Acknowledgment</b></p>	<p>The head project member acknowledges the School of Electrical Engineering, College of Engineering, UiTM Shah Alam for their support. The appreciation also goes to the members of the Innovative Electromobility Research Laboratory (ITEM) at Universiti Teknologi MARA (UiTM) Shah Alam.</p>
<p><b>Researchers Biographical Data</b></p>	<div style="display: flex; flex-direction: column; gap: 10px;"> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>Mohd Rizman Sultan Mohd is a PhD student currently pursuing his studies under the School of Electrical Engineering, College of Engineering at UiTM Shah Alam. He holds a Master of Science in Electrical Engineering from the same institution. Additionally, he is a certified Professional Engineer in Electronics Engineering and a Professional Technologist in Telecommunication and Broadcasting Technology.</p> </div> </div> <div style="display: flex; align-items: flex-start;">  <div style="flex-grow: 1;"> <p>F.A. Ruslan holds a PhD in Electrical Engineering from UiTM, a Master's degree in Microelectronics from Universiti Kebangsaan Malaysia. Currently, she serves as a Senior Lecturer in the Center of System Engineering Studies at the Faculty of Electrical Engineering, Universiti Teknologi MARA Malaysia. Her areas of specialization include prediction systems and Artificial Intelligence.</p> </div> </div> </div>



Juliana Johari holds a PhD in Micro-Engineering and Nano-Electronics from Universiti Kebangsaan Malaysia, a Master's degree in Biomedical Engineering from the University of Surrey, United Kingdom, and a Bachelor's degree in Electrical and Electronics Engineering from the University of Strathclyde, United Kingdom. Currently, she is an Associate Professor in Control System and Instrumentation Engineering at the Faculty of Electrical Engineering, Universiti Teknologi MARA Malaysia, and an Affiliate Professor in Electronics and Instrumentation Engineering at the B.S. Abdur Rahman Crescent Institute of Science and Technology, Chennai, India. Her areas of specialization include robotics, automation, MEMS, and Artificial Intelligence.

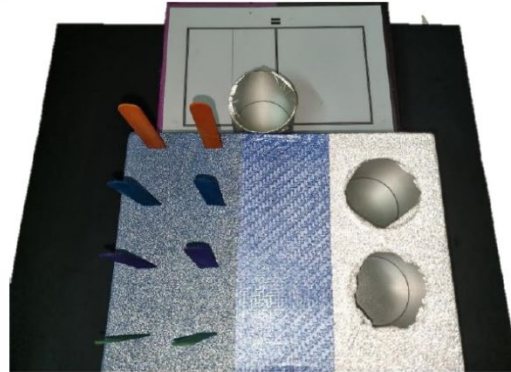
## DEVELOPMENT OF THE L-EQ KIT INTEGRATING GAME-BASED LEARNING FOR THE TOPIC OF LINEAR EQUATIONS FORM 1

Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
	/		
	Local		International
<b>Project Member(s)</b>	Muhammad Hilmi Zulhakim Nazlan <sup>1</sup> , Fainida Rahmat <sup>2</sup>		
<b>Affiliation</b>	<sup>1,2</sup> Department of Mathematics, Faculty of Science and Mathematics, Universiti Pendidikan Sultan Idris, Tanjung Malim, Perak, Malaysia		
<b>Email</b>	<sup>1</sup> <a href="mailto:d088528@siswa.upsi.edu.my">d088528@siswa.upsi.edu.my</a> , <sup>2</sup> <a href="mailto:fainida@fsmt.upsi.edu.my">fainida@fsmt.upsi.edu.my</a>		
<b>Correspondence</b>	Muhammad Hilmi Zulhakim Nazlan Department of Mathematics, Faculty of Science and Mathematics, Universiti Pendidikan Sultan Idris, Tanjung Malim, Perak, Malaysia Tel: +6011-10098069		
<b>Abstract</b>	<p>Linear equation is one of the important topics in Algebra and widely used in other areas of Mathematics. However, students have difficulties in understanding and solving linear equations. By employing suitable method such as Game-based learning (GBL) may provide students with better explanation and aid in their learning. Therefore, this study developed L-Eq Kit (LEK) which is a teaching aid integrating a GBL method that aims to develop and improve students' understanding of the concept of Linear Equations in Mathematics Form 1 through fun and engaging activities. LEK is developed based on Developmental Research Design (DRD), ADDIE model and constructivism theory. Several components in LEK are developed from reusable and recyclable material. The activities in LEK integrate all learning domain, namely cognitive, psychomotor and affective and inspired by traditional games such as rubber band throwing and disk flicking. The validity assessment of LEK is carried out by three experts, namely two UPSI Mathematics lecturers and an experienced Mathematics teacher. The usability of the LEK is determined by sixty Form 1 students at one of the schools in Gombak district who were selected through convenience sampling</p>		

	<p>technique. The findings of the study show that LEK has a satisfactory validity with an average value of content validity index (CVI), 1.00, and a high level of usability with an overall mean score value of 3.12. In conclusion, the LEK complies with the Mathematics Curriculum and meets the criteria of a suitable kit for Linear Equations topic and receives a positive response among students. This L-Eq Kit can be used by teachers as an additional teaching aid that has good potential in improving students' understanding and enhancing their interest in learning Linear Equations.</p>
<b>Keywords</b>	<p>Teaching Aids, Game-Based Learning, Linear Equations</p>
<b>Product description</b>	<p>L-EQ KIT (LEK) is a <b>Teaching Aid</b> integrating a Game-based learning (GBL) method that aims to develop and improve students' understanding of the concept of Linear Equations in Mathematics Form 1. LEK is developed based on Developmental Research Design (DRD), ADDIE model and constructivism theory. Several components in LEK are developed from reusable and recyclable material that we use in our daily life such as boxes, cans, bottle caps, etc. The validity assessment of LEK is carried out by three experts, namely two UPSI Mathematics lecturers and an experienced Mathematics teacher. The usability of the LEK is determined by sixty Form 1 students at one of the schools in Gombak district who were selected through convenience sampling technique. The findings of the study show that LEK has a satisfactory validity with an average value of content validity index (CVI), 1.00, and a high level of usability with an overall mean score value of 3.12. In conclusion, the LEK complies with the Mathematics Curriculum and meets the criteria of a suitable kit for Linear Equations topic and receives a positive response among students.</p>



Set the game like this:



The first game is "**Permainan Lempar Gelang**" and this game for play to get the number of variables  $x$  by throw some rubber band to the stick.



The second game is "**Permainan Putar Syiling**" and this game to help play to get the symbol of plus and minus in equation by using real coin.



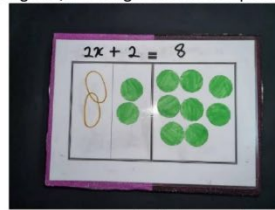
**Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.**

the third game is "Permainan Jentik Token" and this game is same as carem and it also use to get number of equation before symbol "=".

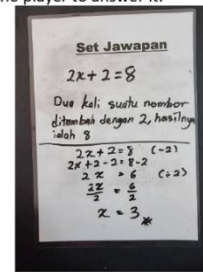


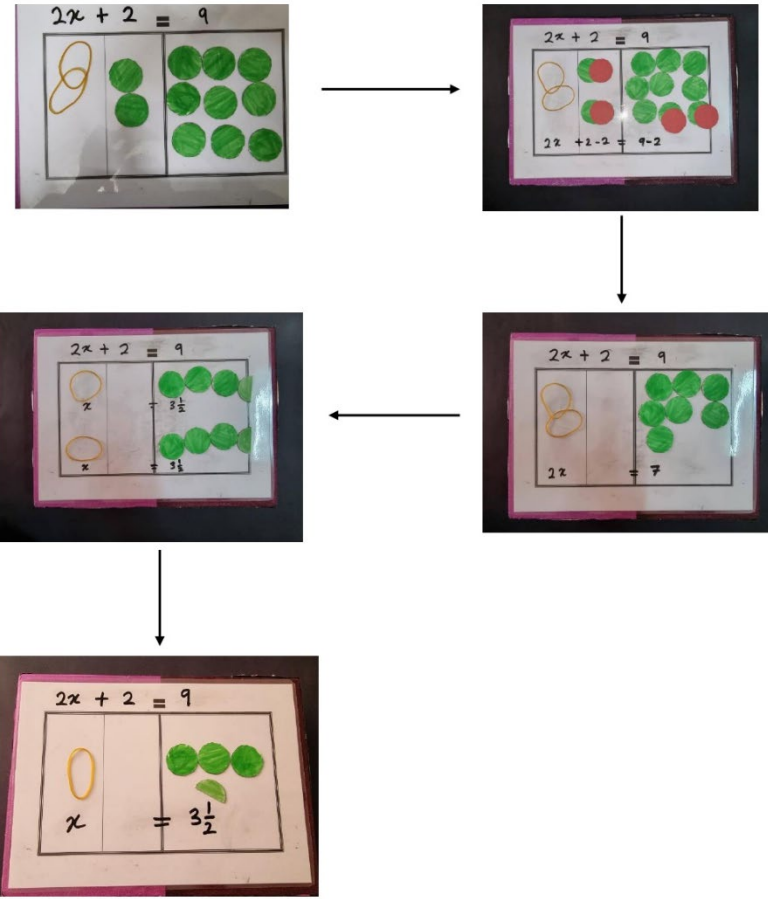
The forth game is "Permainan Baling Token" and this game is about player throw some token to the hole in time given. The number of token in the game is set as number of equation after the symbol "="



When we finish the game, we will get the linear equation as picture below:



From the equation, question card will given to the player to answer it.



	<p style="text-align: center;">We can use the table given to answer to equation given</p> 
<p><b>Novelty and uniqueness</b></p>	<p>The activities in LEK integrate all learning domain, namely cognitive, psychomotor and affective. In addition, students can construct their own linear equations by playing games that were inspired by traditional games such as rubber band throwing and disk flicking. Students can solve the equations by using rubber band and the token obtained from the game. Accordingly, LEK comprises of element across the curriculum as well sustaining the Malaysian Cultural Heritage.</p>
<p><b>Benefit to mankind</b></p>	<p>LEK complies with the Mathematics Curriculum and meets the criteria of a suitable kit for Linear Equations topic and receives a positive response among students. This L-Eq Kit can be used by teachers as an additional teaching aid that has good potential in improving students' understanding, enhancing their interest in learning Linear Equations in a fun and engaging activities as well as encourages the teamwork and collaboration among students.</p>

<b>Potential commercialization</b>	<p>L-EQ KIT is practically used as a game based teaching aid for linear equations topic that can be used for individual or team. With some suitable material, this teaching aid can be improved in the future.</p>
<b>Acknowledgment</b>	<p>The project members acknowledge those who contributed in this project directly and indirectly, particularly the panel of experts and the respondents.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="display: flex; align-items: center; margin-bottom: 20px;">  <div style="flex-grow: 1;"> <p>Muhammad Hilmi Zulhakim Nazlan is a student who is currently undertaking his Degree study program under Faculty of Science and Mathematics, UPSI, Tanjung Malim, Perak.</p> </div> </div> <div style="display: flex; align-items: center;">  <div style="flex-grow: 1;"> <p>Fainida Rahmat is currently a senior lecturer at Faculty of Science and Mathematics, UPSI, Tanjung Malim, Perak. She is the Final Year Project Supervisor for Muhammad Hilmi.</p> </div> </div> </div>



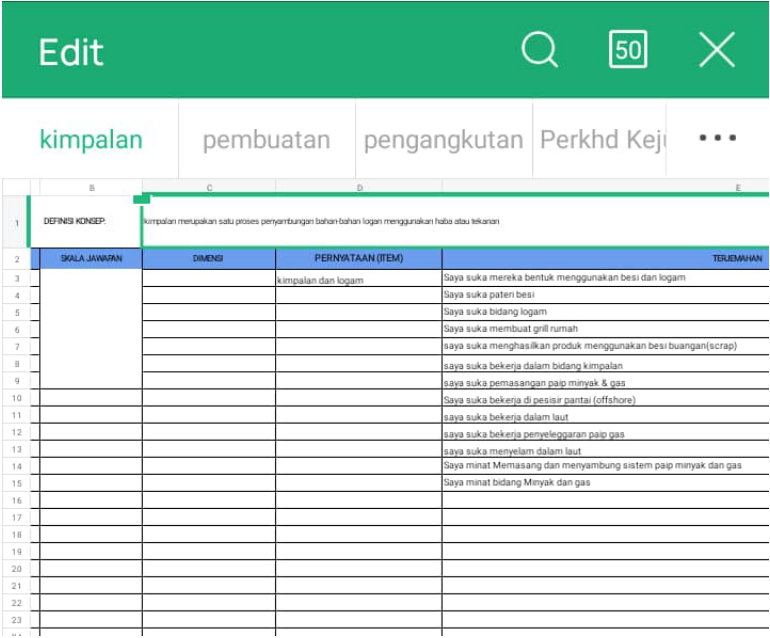
# SOCIAL SCIENCES AND EDUCATION


## CATEGORY C

*CADEMICIAN, INDUSTRY AND PROFESSIONAL*

<b>KESAHAN DAN KEBOLEHPERCAYAAN INSTRUMEN CAREER MATCHING INVENTORY (CMI)</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Parmeswari <sup>1</sup> , Sarah Falwani <sup>2</sup> , Fatin Nordin <sup>3</sup> , Fatimah Akmal <sup>4</sup> , Jihan Ramli <sup>5</sup> .		
<b>Affiliation</b>	<sup>1</sup> Unit Pengurusan Psikologi, Kementerian Sumber Manusia		
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<b>Correspondence</b>	Ibrahim Maclean Chong Unit Pengurusan Psikologi, Bahagian Pembangunan, Kewangan & Sumber Manusia Kementerian Sumber Manusia. Tel: +03-8886 2369 Email: <a href="mailto:ibrahim.mc@mohr.gov.my">ibrahim.mc@mohr.gov.my</a>		
<b>Abstract</b>	<p>Sebuah inventori kajian telah dibina bertujuan mengukur minat dan kecenderungan bakal pelajar dalam bidang kemahiran. Inventori ini (<i>Career Matching Inventory</i>, CMI) diwujudkan bagi membantu bakal pelajar untuk mengenali kelebihan dan kecenderungan diri mereka kearah kursus-kursus yang ada dalam bidang kemahiran. Usaha ini adalah untuk mengurangkan kadar <i>mismatch</i> yang sering berlaku dalam kalangan pelajar kemahiran. Pembinaan instrument ini merupakan percambahan idea daripada Self Directed Search (SDS) oleh John L. Holland. (1994) yang mengukur jenis personaliti dan minat kerjaya. Sehingga kini, SDS menjadi inventori utama bagi mengukur hala tuju kerjaya pelajar kemahiran. Namun, SDS hanya mengukur personaliti dan minat kerjaya sahaja secara keseluruhan.</p> <p>Oleh itu, CMI dibina adalah untuk menentukan minat individu dalam bidang kemahiran sebelum mereka memasuki pengajian di mana-mana bidang kemahiran. Kaedah ini adalah untuk membantu bakal pelajar agar memilih kursus yang lebih tepat dengan minat, personaliti dan kemampuan diri mereka. Selain itu, CMI dibina bagi menggantikan peranan SDS berkaitan</p>		



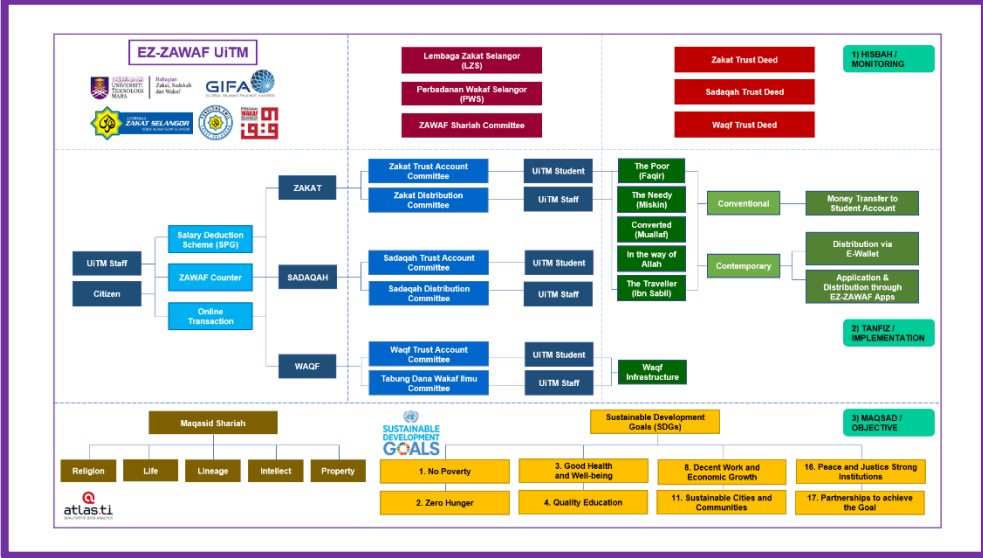
	<p>pelajar TVET kerana SDS tidak begitu memberi impak yang signifikan terhadap bidang TVET.</p>
<b>Keywords</b>	<p>Career, career matching</p>
<b>Product description</b>	<p>CMI merupakan olahan dan percambahan idea daripada Self Directed Search (SDS) oleh John L. Holland. (1994). CMI membantu bakal pelajar untuk memilih kursus yang bersesuaian dengan diri mereka sebelum memilih kursus untuk dipelajari dalam bidang kemahiran.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	 <p>The screenshot shows a mobile application interface for 'kimpalan' (welding). The screen displays a table with the following columns: SKALA JAWAPAN, DIMENS, PERNYATAAN (ITEM), and TERUJEMAHAN. The table contains 23 rows of statements related to welding, such as 'Saya suka mereka bentuk menggunakan besi dan logam' and 'Saya suka bekerja dalam bidang kimpalan'.</p>


	<p style="text-align: center;"><b>DOMAIN UJIAN PSIKOMETRIK CMI</b></p> <div style="text-align: center;">  </div> <p style="text-align: center;">Rajah 3: Domain ujian psikometrik CMI</p>
<p><b>Novelty and uniqueness</b></p>	<p>CMI merupakan inventory pertama yang dibina bagi mengukur kesesuaian kursus berdasarkan kemampuan bakal pelajar dalam bidang kemahiran. Pembinaan inventory ini melibatkan pelbagai pihak termasuklah pakar-pakar yang memantau dan memastikan item yang digunakan dalam skala mempunyai tahap kebolehpercayaan yang tinggi dan dapat mengukur dimensi yang hendak diukur dengan maksima.</p>
<p><b>Benefit to mankind</b></p>	<p>Pembentukan CMI memberi kemudahan kepada bakal pelajar kemahiran untuk mendapatkan cadangan bidang yang sesuai dengan kemampuan diri mereka. Kaedah ini dapat mengurangkan kadar “mismatched” yang sering berlaku dalam kalangan pelajar. Isu salah pilih bidang (mismatched) ini amatlah merugikan pelajar dari segi tempoh masa, kewangan dan motivasi diri. Oleh itu, CMI dibina bagi membantu bakal pelajar untuk memilih bidang kemahiran yang sesuai dengan diri mereka.</p>

<b>Potential commercialization</b>	<p>CMI berpotensi untuk digunapakai oleh semua institusi TVET kerana item yang digunakan dalam inventory ini hanya memfokuskan kepada bidang TVET. Ini boleh menjadi batu loncatan dan penanda aras kepada jabatan-jabatan lain.</p>
<b>Acknowledgment</b>	<p>Buat masa sekarang, para panel yang terlibat tidak menggunakan sebarang geran atau pembiayaan daripada mana-mana pihak.</p>
<b>Researchers Biographical Data</b>	<ol style="list-style-type: none"> <li>1. Parmeswari merupakan seorang Pegawai Psikologi di Institut Latihan Perindustrian Kuala Lumpur.</li> <li>2. Siti Sarah Falwani Ismail merupakan seorang Pegawai Psikologi di Institut Latihan Perindustrian Kuantan.</li> <li>3. Nur Jihan Ramli merupakan seorang Pegawai Psikologi di Institut Latihan Perindustrian Jitra.</li> <li>4. Fatin Nurain Nordin merupakan seorang Pegawai Psikologi di Institut Latihan Perindustrian Marang.</li> <li>5. Fatimah Akmal Mohd Rashid merupakan seorang Pegawai Psikologi di ADTEC Kemaman.</li> </ol>



<b>EZ-ZAWAF UiTM: A Digital Transformation of Zakat, Sadaqah And Waqf Management In Universiti Teknologi MARA</b>			
<b>Category</b>	<b>A</b> School (Primary & Secondary)	<b>B</b> Technical Institutional Students	<b>C</b> Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Mohd Ashrof Zaki Yaakob <sup>1</sup> , Nurulaina Saidin <sup>2</sup> , Azri Bhari <sup>3</sup> , Mohd Faiz Mohd Yusof <sup>4</sup> , Mohammad Mahyuddin Khalid <sup>5</sup>		
<b>Affiliation</b>	<sup>1</sup> Bahagian Zakat, Sedekah dan Wakaf (ZAWAF), Universiti Teknologi MARA, Shah Alam Selangor, MALAYSIA <sup>1, 2, 3, 4, 5</sup> Academy of Contemporary Islamic Studies, Universiti Teknologi MARA, Shah Alam, Selangor, MALAYSIA		
<b>Email</b>	<sup>1</sup> ashrof@uitm.edu.my, <sup>2</sup> nurulainasaidin@uitm.edu.my, <sup>3</sup> azrib178@uitm.edu.my, <sup>4</sup> faizyusof@uitm.edu.my, <sup>5</sup> emkay@uitm.edu.my.		
<b>Correspondence</b>	Prof. Madya Dr. Mohd Ashrof Zaki Bin Yaakob Bahagian Zakat, Sedekah dan Wakaf (ZAWAF) Aras Bawah Masjid Al-Wathiqu Billah Tuanku Mizan Zainal Abidin Universiti Teknologi MARA, 40450, Shah Alam Selangor, MALAYSIA  <b>Tel:</b> 03-5544 3115 / 2381 <b>Email:</b> ashrof@uitm.edu.my		
<b>Abstract</b>	EZ-ZAWAF UiTM is a digital transformation in the management of zakat, sadaqah and waqf at Universiti Teknologi MARA (UiTM) since the COVID-19 pandemic hit the world. This digitization innovation is implemented through two phases, the first, the phase of adapting changes towards a hybrid digital system, while the second phase focuses on the full implementation of digital systems and the strengthening of new systems implemented. Focus is given to the aspects of zakat, sadaqah and waqf collection that are implemented online, and then the aspects of implementation that are controlled and implemented in synergy and integrity. Next, the evaluation by outcome is made based on the framework of Maqasid Shariah and		

	<p>Sustainable Development Goals (SDGs) in line with the instruments of zakat, sadaqah and waqf implemented at UiTM. Through this management transformation innovation, the management of zakat, sadaqah and waqf in UiTM becomes more efficient, user-friendly and meets the purpose of implementation through the evaluation based on Maqasid Shariah and SDGs. The implementation of EZ-ZAWAF can be the best guide to the management of zakat, sadaqah and waqf in universities throughout Malaysia, and can be a guide in the implementation at the State Islamic Religious Council (SIRC) throughout Malaysia.</p>
<b>Keywords</b>	<p>EZ-ZAWAF, Digitalize Innovation, Zakat, Sadaqah, Waqf.</p>
<b>Product Description</b>	<p>EZ-ZAWAF, the digital transformation in the management of zakat, sadaqah, and waqf at Universiti Teknologi MARA (UiTM) was implemented since the COVID-19 pandemic. This digitization innovation is implemented through two phases; i) the phase of adapting changes towards a hybrid digital system, ii) the phase focuses on the full implementation of digital systems and the strengthening of new systems implemented. This online and digitalized innovation for zakat, sadaqah and waqf collection is controlled and implemented in synergy and integrity in UiTM and had significantly contributed to the effective collection and distribution of zakat, sadaqah, and waqf in UiTM.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	

	<p style="text-align: center;"><b>Commercial Values EZ-ZAWAF</b> States Islamic Religious Councils (SIRC) throughout Malaysia</p> 
<b>Novelty and uniqueness</b>	<p>EZ-ZAWAF has uniqueness, especially in terms of its effectiveness in the management of Zakat, Sadaqah and Waqf in UiTM. This system is the first of its kind and has facilitated the implementation process of collection and distribution of Zakat, Sadaqah and Waqf more efficiently, easily, and quickly, and at the same time user-friendly and suitable to be implemented in pandemic situations that hit the world.</p>
<b>Benefit to mankind</b>	<ol style="list-style-type: none"> <li>1. Digital transformation in the management of zakat, sadaqah and waqf at Universiti Teknologi MARA.</li> <li>2. Management of zakat, sadaqah and waqf at UiTM more efficient, easy and user friendly.</li> <li>3. Fully digital implementation in zakat, sadaqah and waqf collection at UiTM.</li> <li>4. Distribution of zakat and sadaqah through E-Wallet in 1<sup>st</sup> phase of implementation. Application process and distribution of zakat and sadaqah is fully implemented through the EZ-ZAWAF Apps in the 2<sup>nd</sup> phase of implementation.</li> </ol>
<b>Potential commercialization</b>	<ol style="list-style-type: none"> <li>1. The first implementation of zakat distribution via E-Wallet that suits the pandemic environment, systematic, controlled (restrictions on alcohol, cigarettes etc.), payment of tuition fees and college through one system, and also cash withdrawal.</li> <li>2. EZ-ZAWAF E-Wallet also connected to off-campus merchants for the purchase of student necessities such as Tesco, Mydin, Segi Fresh, Econsave, Domino, 99 Speedmart, KKMart, MrDIY and C-Zone.</li> <li>3. This EZ-ZAWAF model could be made as a reference for other zakat, sadaqah and waqf institutions at the national and international level.</li> </ol>
<b>Acknowledgment</b>	<p>This research was financially supported by Amil Fund from Zakat, Sadaqah and Waqf Division (ZAWAF) UiTM.</p>



**Researchers  
Biographical Data**


Assoc. Prof. Dr. Mohd Ashrof Zaki Yaakob is a Director of Zakat, Sadaqah and Waqf Division (ZAWAF) UiTM cum Senior Lecturer at Academy of Contemporary Islamic Studies (ACIS), UiTM, Malaysia. He completed his MA in Hadith Muamalat at University of Malaya and obtained his PhD from Universiti of Malaya in Hadith. His areas of expertise are in the Al-Quran and Al-Hadith, Waqf and Zakat Management and Islamic Social Finance. He has presented in many international conferences and produced articles in indexed journals.



Nurulaina Saidin is a Senior Lecturer at Academy of Contemporary Islamic Studies (ACIS), UiTM, Malaysia. She completed her MSc in Microbial biotechnology in 2011 at University of Malaya and obtained her PhD from Universiti Teknologi MARA in Halal Supply Chain Management. Her areas of expertise are in the fields Halal Policy studies, Halal animal feed and Halal supply Chain management. She has presented in many international conferences and produced various articles in indexed journals.



Assoc. Prof. Dr. Azri Bhari is a Deputy Dean (Student Affairs) at Academy of Contemporary Islamic Studies (ACIS), UiTM, Malaysia. He completed his MA in Shariah at University of Malaya and obtained his PhD from Universiti of Malaya also in Shariah. His areas of expertise are in the Zakat, Fatwa and Islamic Philanthropy. He has presented in many international conferences and produced articles in indexed journals.



Dr. Mohd Faiz Mohamed Yusof is a Senior Lecturer at Academy of Contemporary Islamic Studies (ACIS), UiTM, Malaysia. He completed his MA in Shariah at University of Malaya and obtained his PhD from Universiti of Malaya in Shariah. His areas of expertise are in the Takaful and Islamic Philanthropy. He has presented at many international conferences and produced articles in indexed journals.

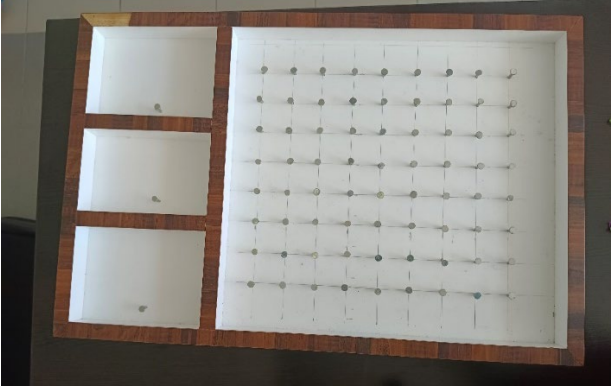


Mr. Mohammad Mahyuddin Khalid is a Senior Lecturer at Academy of Contemporary Islamic Studies (ACIS), UiTM, Malaysia. He completed his MA in Shariah at University Kebangsaan Malaysia. His areas of expertise are in Risk Management and Islamic Philanthropy. He has presented at many international conferences and produced articles in indexed journals.



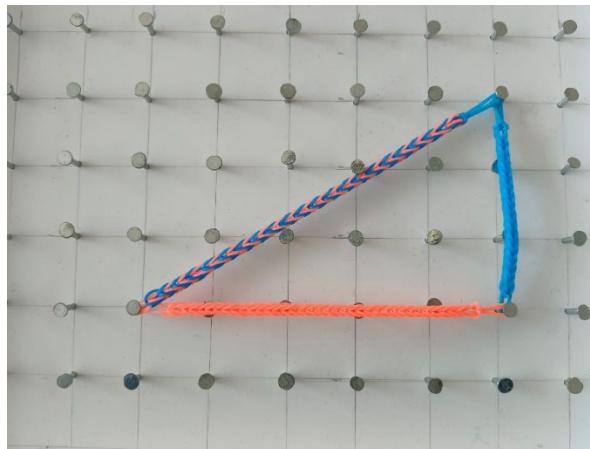
<b>FUN VECTOR LEARNING KIT</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	<b>*Nur Asyikin Ahmad Nazri <sup>1</sup>, Fadiatul Hasinah Muhammad <sup>2</sup>, Hasnorhafiza Husni <sup>3</sup></b>		
<b>Affiliation</b>	<sup>1</sup> Centre of Foundation Studies, Universiti Teknologi MARA, Cawangan Selangor, Kampus Dengkil, 43800 Dengkil, Selangor, Malaysia		
<b>Email</b>	<sup>1</sup> asyikin2750@uitm.edu.my, <sup>1</sup> fadiatul@uitm.edu.my, <sup>1</sup> hasnor731@uitm.edu.my		
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<b>Abstract</b>	Fundamental concepts of physics such as forces, motion and kinematic qualities, understanding the basic concept of vectors play an extremely important role, particularly when solving physics problems. This innovation used to enhance the understanding of the vector concept among secondary school to pre-university students. This innovation is a simple, low-cost and mind-training game to get students to be more invested in learning physics. This game prioritises guiding the players to solve the questions, so the players will not be ranked. The used of fishtail rubber band to represent the vector and total of two vector would use fishtail rubber band with 2 colours which the combination of the colour of each vectors. This game had been played by 100 foundation students. Pre and post test were carried out in order to confirmed that this vector board game enhanced understanding on vector concepts. Instrument consisted of 7 questions was used in pre and post-test. As a results, higher score was obtained after playing this vector board game.		
<b>Keywords</b>	Physics, Vector 2-D, vector board, innovation, fundamental physics		



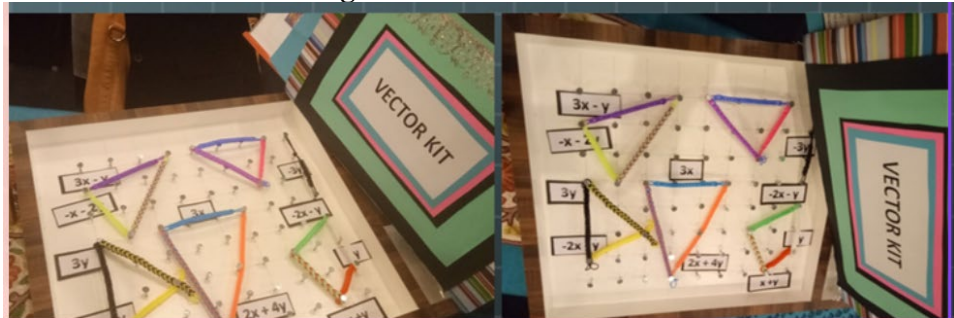
<p><b>Product description</b></p>	<p>This innovation involved a board consisting of nails arranged in grid form as shown in Figure 1. The use of the nails placed on the board is to attach the fishtail rubber band depending on the magnitude of the vector. Vector consists of head and tail. This inspired the project to have something that having direction with a magnitude. Therefore, fishtail rubber band used to represent a vector as shown in Figure 2. A resultant vector would combine the colors of the 2 vectors.</p> <p>When placed on the board, they looks like as shown in Figure 3. The total vector is <math>5x + 3y</math>. The fishtail rubberband helps students in remembering the direction of the resultant vector.</p> <p>Figure 4 shows the samples of several vectors placed on the vector board. To make it more fun, this learning kit can be played in team of 4 students. Teacher can prepare questions, and students will answer the questions on the board by using the vectors (fishtail rubberband).</p> <p>Besides that, this vector kit has a set of cards to be used for the minigame of the kit. The cards come in three colours, which are green, yellow and red. The colours represent the difficulty of the questions given for the students to solve. The higher the difficulty of the question, the higher the marks given to the students. Running a game with questions at different difficulty help students to practice their minds to get used to answer mind-boggling questions similar with examination. The cards also have two features namely 'CHANCE' and 'FATE'. Some question cards are randomly labeled with 'CHANCE' with an envelope image or 'FATE' with a bird image. It is up to the players to pick one of these cards and answer the questions afterward.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	 <p>Figure 1: Vector board</p>



**Figure 2.** Fishtail rubberband.



**Figure 3.** Resultant vector.



**Figure 4:** Sample of vectors on the board.

**Novelty and uniqueness**

Fun Vector Learning Kit has uniqueness especially in terms of new material development. Instead of using white board to show the vectors, it used different approached on representing the vectors. This learning kit was received several award such Gold, Diamond Award, and Silver Award. The usage of fishtail rubberband with colours are very attractive and students able to understand and remember the basic of 2-D vectors.


**Benefit to mankind**

This Fun Vector Learning Kit is as enjoyable as it is educational, especially to the target audience that are school students and pre-university of matriculation students as they can be exposed to problems involving



	<p>physics. The benefits that students can reap from this learning kit include problem-solving abilities that will make the students quicken their thinking pace to complete the question answering tasks involving calculation. The questions are composed of three difficulty tiers, namely easy, medium and hard. Our target audience are precisely students that pursue science courses that include Physics, as it is a highly compulsory subject to pass. It will be a great honour for us had the Physics Department to purchase this innovation and utilise it as a form of educating to attract more students to be inclined in bettering their understanding the basic concept of vectors. For other potential markets, we also have Petrosience as our next-level target market, considering it is a discovery centre that harbors a lot of science workshops. This vector learning kit is suitable for people aged 16 and above.</p> <p>Due to the fact that most students find physics to be too difficult and find it difficult to understand the lecturer's or teacher's lessons, students are frequently bored during class. As a result, they may give up since they are unable to grasp the lecturer's or teacher's main points. As a result, they will suffer if they lose interest in studying. In order for the students to pay attention and maintain their focus on the material, they need to play something enjoyable but tough with their peers. Experts have also found evidence to support their claims that the game helps pupils maintain their attention long enough to learn more effectively and get higher results (Lepper and Cordova, 1992).</p>
<p><b>Potential commercialization</b></p>	<p>There is only one game board, and the questions on the game cards vary in difficulty. Based on the board's quality, the quantity of nails used, the type of wood used, the rubber band used, and the type of paper used, the total cost of the game is RM45. Four players can play on one board. It relies on the proportion of the discount to determine whether the promotion can be made during the Science Carnival. Some individuals may be eligible for special discounts, such as Physics lecturers and employees who use this game as a learning tool and who will utilise it in class. Facebook, Instagram, Twitter, Shopee, and Lazada are just a few of the sites we may use to advertise our goods. Because most of the audience is made up of students who are studying science subjects and specific lecturers who teach physics, bookstores, universities, and secondary schools are the best places to conduct marketing campaigns.</p>



	<p>Budgets and Costings</p> <table border="1" data-bbox="506 262 1338 816"> <thead> <tr> <th>Material</th> <th>RM per unit</th> <th>Quantity</th> <th>Cost (RM)</th> </tr> </thead> <tbody> <tr> <td>Box nails</td> <td>0.10</td> <td>72</td> <td>7.20</td> </tr> <tr> <td>Art rubber bands</td> <td>0.028</td> <td>875</td> <td>24.50</td> </tr> <tr> <td>Wooden board</td> <td>6.80</td> <td>1</td> <td>6.80</td> </tr> <tr> <td>Papers</td> <td>0.05</td> <td>30</td> <td>1.50</td> </tr> <tr> <td colspan="3" style="text-align: center;">Total</td> <td>40</td> </tr> </tbody> </table> <p>Profit Margin</p> <p>Sale price = RM 60</p> <p>Cost price = RM 54</p> $\text{Profit percentage} = \frac{45-40}{40} \times 100\%$ $= 12.5\%$	Material	RM per unit	Quantity	Cost (RM)	Box nails	0.10	72	7.20	Art rubber bands	0.028	875	24.50	Wooden board	6.80	1	6.80	Papers	0.05	30	1.50	Total			40
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<b>Acknowledgment</b>	<p>The head project member acknowledges financial support from the Grant Sustainable Research Collaboration IIUM-UiTM-UMP. The financial support provided by the Universiti Islam Antarabangsa is acknowledged.</p>																								
<b>Researchers Biographical Data</b>	<div style="display: flex; align-items: center;">  <div> <p>Nur Asyikin Ahmad Nazri is a lecturer who is currently teaching Centre of foundation program under UiTM Kampus Dengkil, Cawangan Selangor. She was awarded a scholarship by Ministry of Higher Education of Malaysia to pursue his study in Medical Physics study in year 2005 to 2008. She is holding a Doctorate of Nanotechnology from Universiti Putra Malaysia. Even though, she really passionate to do innovations in teaching and learning.</p> </div> </div>																								



Fadiatul Hasinah is a lecturer who is currently teaching Centre of foundation program under UiTM Kampus Dengkil, Cawangan Selangor. She is holding a PhD of Advance Materials in battery application from Universiti Teknologi MARA.



Hasnorhafiza Husni is a lecturer who is currently teaching Centre of foundation program under UiTM Kampus Dengkil, Cawangan Selangor. She is holding a Master of Engineering in Electrical Engineering from Universiti Teknologi MARA.



# HaBuckMy

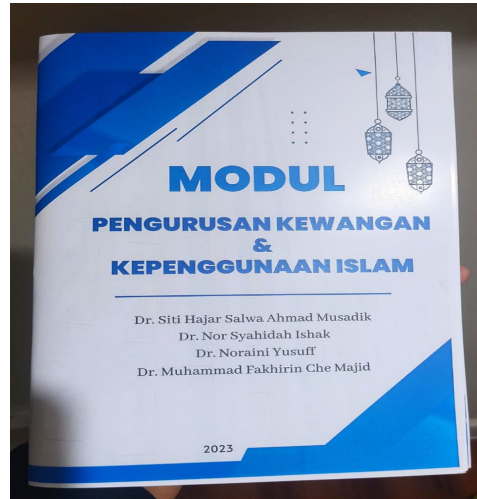
Category	A	B	C
	School (Primary & Secondary)	Technical Institutional Students	Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
			/
	Local		International
<b>Project Member(s)</b>	<sup>1</sup> Siti Hajar Salwa Ahmad Musadik, <sup>2</sup> Nor Syahidah Ishak, <sup>3</sup> Noraini Yusuff <sup>4</sup> Muhammad Fakhirin Che Majid		
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<b>Correspondence</b>	Siti Hajar Salwa Ahmad Musadik Pusat Pengajian Perniagaan Islam Kolej Perniagaan, Universiti Utara Malaysia 06010 Sintok Kedah Tel: +60135033923		
<b>Abstract</b>	<p>HaBuckMy merupakan satu inovasi daripada Literasi Pengurusan Kewangan dan Kepenggunaan Islam melalui Pembelajaran Berasaskan Permainan (GBL). Permainan ini mempunyai dua item utama iaitu; satu papan permainan yang tercetak empat kotak kosong yang dibahagi mengikut empat aspek iaitu penggunaan dan perbelanjaan Islam, simpanan, pendapatan dan pelaburan Islam, serta pemberian. Manakala item kedua pula merupakan 46 keping kad permainan yang juga meliputi empat aspek seperti yang dinyatakan di atas.</p> <p>Permainan ini bertujuan untuk memberikan pendedahan awal kepada para pelajar di sekolah dan juga universiti untuk memahami berkenaan Pengurusan Kewangan dan Kepenggunaan Islam. Melalui permainan ini mereka akan dapat memahami bagaimana cara untuk melakukan aktiviti pengurusan kewangan dan kepenggunaan mengikut perspektif Islam, cara berbelanja dengan betul, kaedah simpanan dan pelaburan secara Islam dan juga kaedah-kaedah pemberian dalam Islam seperti bersedekah, berwakaf dan berzakat.</p>		



	<p>HaBuckMy ini tercetus dari isu semasa yang telah lama berlaku dalam kalangan masyarakat kita iaitu masalah kewangan dan hutang akibat berbelanja secara tidak bijak. Untuk membasmi sikap suka berhutang dan berbelanja secara berlebihan ini, maka HaBuckMy dilahirkan untuk memberi kefahaman asas berkaitan pengurusan kewangan dan kepenggunaan Islam kepada masyarakat terutamanya dalam kalangan muda. Permainan ini dilihat mempunyai potensi yang sangat baik untuk memupuk minat anak-anak muda untuk memahami berkenaan kewangan Islam dari usia yang muda dan melatih mereka untuk berbelanja secara berhemah dan bijak. Permainan ni amat sesuai digunakan di sekolah rendah (tahun 4, 5 dan 6) menengah, pengajian tinggi, serta orang awam yang tidak mempunyai pengetahuan berkaitan dengan kewangan dan kepenggunaan Islam.</p>
<b>Keywords</b>	Pengurusan Kewangan Islam, Kepenggunaan Islam, Perbelanjaan Simpanan, Pelaburan Islam, Pemberian, Literasi Kewangan.
<b>Product description</b>	<p>HaBuckMy merupakan satu permainan yang mengandungi satu papan yang bersize 5x6 inci dan 46 keping kad permainan (Penggunaan dan Perbelanjaan Islam, Simpanan, Pelaburan Islam, dan Pemberian) size 9.3x5.7 cm.</p> <div data-bbox="761 852 1227 1268" data-label="Image"></div> <p>Setiap kad dibezakan melalui warna iaitu Warna Krim untuk aspek penggunaan dan perbelanjaan Islam, Warna Biru gelap untuk aspek pendapatan dan pelaburan Islam, Warna Purple untuk aspek simpanan, dan Warna Hijau untuk aspek pemberian.</p> <div data-bbox="748 1446 1252 1835" data-label="Image"></div>



Satu Modul Ringkas berkenaan Pengurusan Kewangan dan Kepenggunaan Islam untuk panduan dan sesi perkongsian guru dan pelajar sebelum permainan bermula juga disediakan.



**Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.**

**SEBELUM Aktiviti HaBuckMy  
Fasa Pertama: *Knowledge Transfer***

Fasilitator/guru akan berkongsi informasi berkaitan Pengurusan Kewangan & Kepenggunaan Islam bersama pelajar.



**SEMASA AKTIVITI HaBuckMy:****Fasa Kedua: Pembelajaran Berasaskan Permainan (HaBuckMy)**

**Langkah (1):** Setelah selesai sesi perkongsian maklumat bersama pelajar, pelajar di agihkan kepada beberapa kumpulan

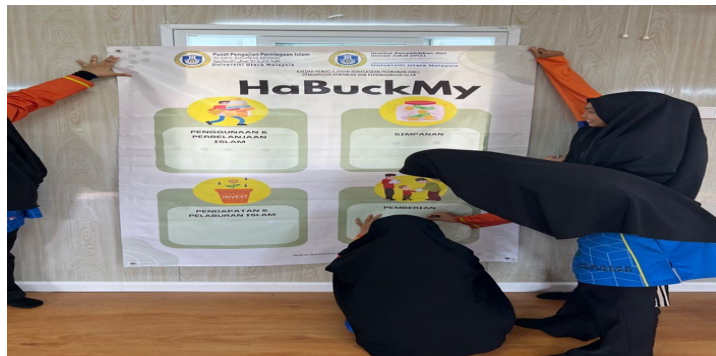


**Langkah (2):** Permainan bermula dengan arahan diberikan kepada pelajar iaitu, pelajar diminta untuk membuat keputusan berkaitan dengan pengurusan kewangan dan kepenggunaan. Fasilitator akan memberikan satu situasi berkaitan dengan kewangan dan kepenggunaan dan pelajar perlu berbincang dengan ahli kumpulan bagaimana untuk menyelesaikan situasi yang dihadapi. Permainan ini tidak menyediakan situasi yang tertentu. Setiap fasilitator berhak untuk memberi situasi mengikut pilihan mereka sendiri. Terdapat empat (4) tema kad yang berdasarkan tema permainan iaitu Penggunaan dan Perbelanjaan Islam, Simpanan, Pelaburan Islam, dan Pemberian. Pelajar dikehendaki memilih empat sahaja dari setiap tema kad.





**Langkah (3):** Setelah memilih kad yang tersebut, pelajar melekatkan kad di kotak HaBuckMy mengikut tema yang telah disediakan.



**Langkah (4):** Pelajar akan membentangkan kad pilihan mereka dengan menerangkan maksud kad tersebut dan kenapa mereka memilih kad yang berkenaan.



#### SELEPAS AKTIVITI HaBuckMy:

**Langkah (5):** Fasilitator/guru akan mengakhiri permainan dengan membuat kesimpulan ringkas dan cuba bertanyakan kefahaman pelajar berdasarkan permainan HaBuckMy



	
<p><b>Novelty and uniqueness</b></p>	<p>HaBuckMy mempunyai keunikan yang tersendiri:</p> <ul style="list-style-type: none"> <li>• Dicipta oleh empat pensyarah muda tanpa tiruvasi dari mana-mana sumber yang telah ada.</li> <li>• Alat bantuan pengajaran yang melibatkan “two way communication” diantara pelajar dan pengajar/fasilitator.</li> <li>• Berkeupayaan menarik minat pelajar/pengguna untuk menguasai dan mempelajari ilmu pengurusan kewangan dan kepenggunaan Islam kerana sifatnya yang sangat ringkas dan mudah untuk diurus.</li> <li>• HaBuckMy juga secara tidak langsung dapat memupuk dan membina skil pengucapan awam dimana pelajar perlu menerangkan dengan jelas dan yakin berkenaan kad-kad yang telah dipilih di hadapan pelajar-pelajar yang lain.</li> </ul>
<p><b>Benefit to mankind</b></p>	<p>Salah satu punca kerosakan hubungan sesama manusia dan masalah masyarakat pada hari ini ialah hidup tidak bahagia disebabkan hutang dan kehendak melampaui kemampuan. Jadi, HaBuckMy hadir untuk mencegah masalah dari akar umbinya iaitu berfungsi untuk memberi kefahaman asas pengurusan kewangan dan kepenggunaan dari sudut ajaran Islam yang sebenar. Literasi kewangan menerusi permainan HaBuckMy terutama berkaitan pengurusan kewangan dan kepenggunaan Islam perlu diperkukuhkan dalam kalangan masyarakat bermula daripada akar umbi bagi melahirkan generasi yang berasaskan nilai murni serta memenuhi keperluan ekonomi dan dan sosial masa ini.</p>
<p><b>Potential commercialization</b></p>	<p>HaBuckMy mempunyai potensi untuk dikomersialkan sebagai alat bantuan pengajaran untuk pelajar sekolah rendah, menengah dan pengajian tinggi terutamanya bagi skop pembelajaran secara tidak formal. Malahan, berdasarkan pencarian dan pengetahuan penyelidik, belum ada permainan seperti HabuckMy ini di pasaran dan ia mempunyai peluang yang cerah untuk dikomersialkan terutama di sekolah-sekolah menengah dan Jabatan Pendidikan Negeri.</p>
<p><b>Acknowledgment</b></p>	<p>HaBuckMy merupakan hasil dari geran perundingan yang ditaja sepenuhnya oleh Lembaga Zakat Negeri Kedah (LZNK) dan Institut Penyelidikan dan Inovasi Zakat (IPIZ), Universiti Utara Malaysia (UUM).</p>



**Researchers  
Biographical Data**



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Nor Syahidah Ishak is now a Senior Lecturer at Islamic Business School, Universiti Utara Malaysia (Islamic Finance and Banking Department) with a research interest related to Takaful, Microtakaful, Waqf, Zakat and Islamic Banking.



Noraini Yusuff currently works as a Senior Lecturer at Islamic Business School, Universiti Utara Malaysia in Islamic Finance and Banking Department. Her primary research interest is in behavioral finance, takaful, waqf, zakat and Islamic finance and banking.

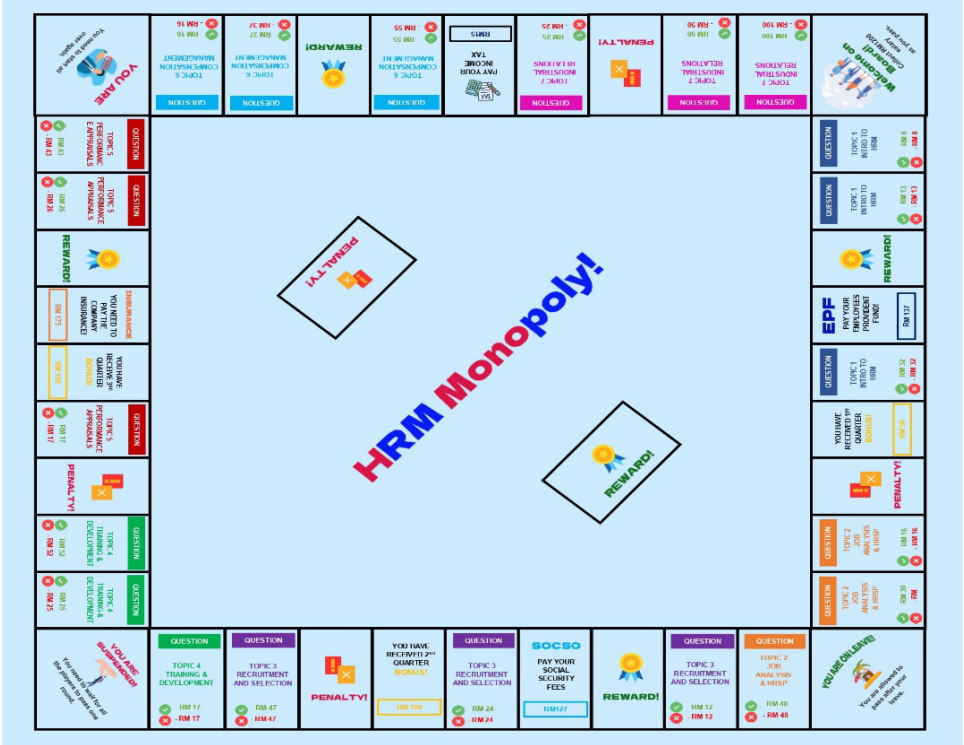


Muhammad Fakhirin Che Majid currently works as a senior lecturer at Department of Muamalat Administration and Halal Management, Islamic Business School (IBS), College of Business, Universiti Utara Malaysia. His research interest related to Islamic finance and banking specifically in disclosure information, Islamic accounting, and Islamic wealth management.

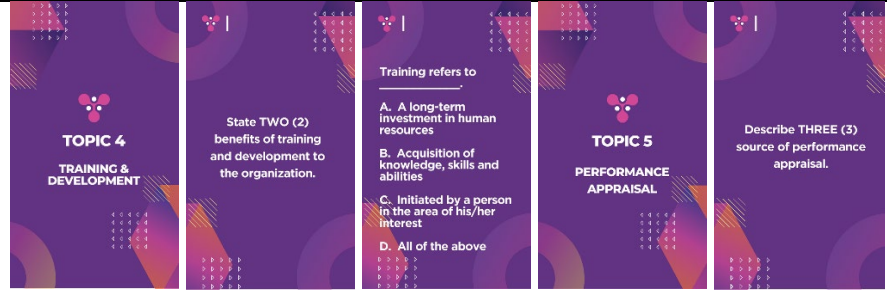


<b>DEVELOPMENT OF GAME-BASED LEARNING: HRM MONOPOLY</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Hanizah Farhani binti Jaafar <sup>1</sup> , Iman binti Mohamad Fawzi <sup>2</sup> , Siti Yummy Faridatul Akmar binti Mohamad <sup>3</sup> .		
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<b>Abstract</b>	<p>The education industry in this 21<sup>st</sup> century era has changed significantly, whereby creativity and entertainment are used in aiding teaching and learning. Thus, it is vital to innovate a creative tool especially the subject which involve theories and practices. Despite doing a lot of reading and memorizing, innovating an effective tool which promote fun and natural learning is undeniably crucial, so the learning is more fascinating. Students' understanding of their subject has an impact on the achievement of their continuous and final semester assessments. Taking into consideration, HRM Monopoly was developed to encourage students to learn in an attractive way of learning and fun environment. Games are beneficial in many ways such as motivating, interesting, enhance soft skills of learners and most importantly, it improves learning. When learners are in a relaxed setting, their attention span will be longer, which allows them to absorb more input and improve their learning. HRM Monopoly is a game-based learning which focuses on the understanding of human resource management theory and practices. This game was designed for fewer than 8 players who need to</p>		

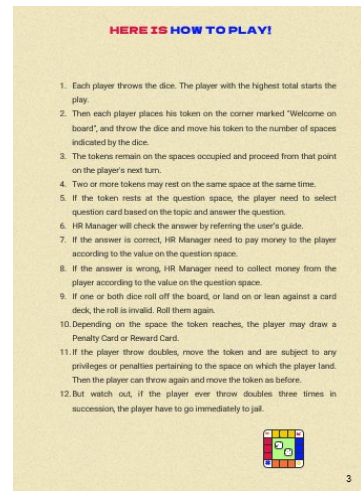
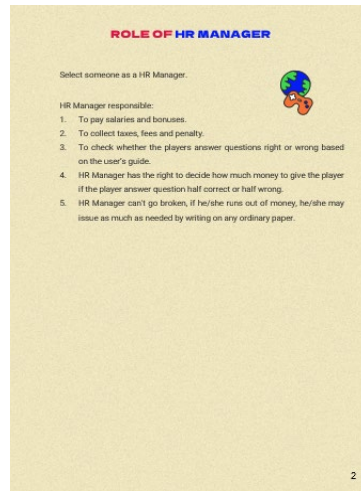
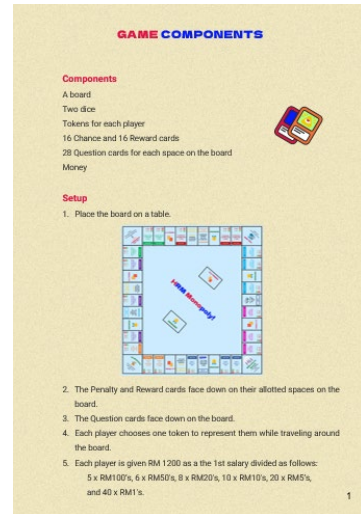
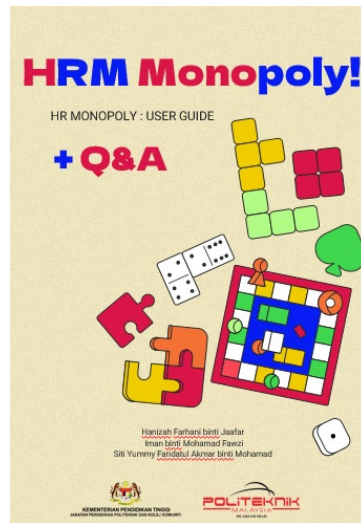


	<p>answer correctly then they will receive point and sample of money according to the questions. As game-based learning is able to provide a fun and natural learning context, it is much preferred by learners nowadays. It is hoped that teachers could incorporate entertainment in education as it will be fruitful for learners. In the future, lecturers can explore different game to cater to different proficiency learners. Hence, game-based learning can be one of the panaceas to solve memorizing and understanding issues of theory.</p>
<p><b>Keywords</b></p>	<p>game-based learning, creative tools, education</p>
<p><b>Product description</b></p>	<p>The component of HRM Monopoly actual prototype consist of a game board, two dice, tokens for each player, user guide, sixteen chance and reward cards and twenty eight question cards that need to be answered by the player. Each correct answer will be given some money and penalty for wrong answer which depending on the questions.</p>
<p><b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b></p>	 <p style="text-align: center;">Game board</p>



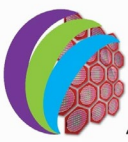



### Question cards



### User guide





	 <p style="text-align: center;">Sample of money and dice</p>
<p><b>Novelty and uniqueness</b></p>	<p>HRM Monopoly is the first gaming board created and associated with human resource management. HRM Monopoly was developed to improve students' achievement and nurture their engagement as game-based learning proved that students who were actively involved in the classroom showed significant progress in academic performance. Hence, using HRM Monopoly could portray students' true capability in real-time context.</p>
<p><b>Benefit to mankind</b></p>	<p>HRM Monopoly provides an alternative and interactive method in enhancing the understanding of students towards the theory and practice of human resource management subject. Apart from that, HRM Monopoly has fulfilled the education purpose which consist of cognitive, affective and psychomotor domain as learning occurs by active social interaction rather than passively. Therefore, HRM Monopoly attempted to encourage player to actively think about the strategy and answering the question as they are given rewards and penalty during the game.</p>
<p><b>Potential commercialization</b></p>	<p>Based on its physical and uniqueness, HRM Monopoly is practically used as teaching and learning equipment and tools for those who are taking human resources management subject, no matter for students at college or university. HRM Monopoly has introduced a more meaningful and exciting learning session with its interactive design. In the future, HRM Monopoly will likely create a motivating and engaging experience, thus increasing students' comprehension in learning theories and practices. More significantly, HRM Monopoly not only enhanced students' interest but also kept them motivated to learn especially in the 21<sup>st</sup> century classroom. Eventually, the researchers hope to commercialize this creative tools for the benefit of others. Currently, HRM Monopoly is in the process of MyIPO registration. In addition, HRM Monopoly user guide also in the process of e-ISBN registration and to be widely distributed in several institutions.</p>
<p><b>Acknowledgment</b></p>	<p>The researchers would like to express the gratitude and appreciation to those parties who have provided encouragement and helpful comments towards the development of this HRM Monopoly.</p>



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<b>‘WHAT A DAY!’ – INTERACTIVE LANGUAGE GAME FOR SPEAKING DEVELOPMENT AMONG LANGUAGE LEARNERS</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Nur Syafiqah Binti Abdul Kadar <sup>1</sup> , Nur Hani Laily Binti Ramli <sup>2</sup> , Wan Syariza Binti Wan Yadri <sup>3</sup> .		
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<b>Abstract</b>	<p>In the teaching of English for language learners, it is expected for language educators to assist learners to develop and improve the learners’ four English skills which are listening, speaking, reading and writing. Since English is a foreign language to most second language learners or foreign learners, speaking is considered the most difficult skill faced by most learners to acquire (M. Arief Syakur, 2020). Hence, most learners are not motivated during speaking class and English instructors have the most important role to motivate their learners in practicing their speaking. Considering the importance of speaking skills and difficulties faced by learners, hence, ‘What a Day!’ interactive game is designed to develop and improve learners’ motivation to speak in English through creative teaching and learning activities in the classroom. In the designed of ‘What a Day!’ game, learners’ proficiency level in English is the main consideration and hence, this game offers three levels of difficulties that can cater to and challenge learners’ ability to speak using English. In order to enjoy the game, it also encourages collaborative effort among learners and creative thinking skills to be able to solve the game. Ergo, ‘What a Day!’ can assist in improving the socio environment since learners are motivated to interact with each other using</p>		

	<p>English and indirectly increase their confidence level to speak in English. ‘What a Day!’ is perfect for commercialization prospects especially to be use for education purposes or also simply for leisure.</p>
<b>Keywords</b>	<p>Card game, speaking skills, teaching and learning, ESL classrooms and communicative ability, interactive game.</p>
<b>Product description</b>	<p>The physical projection of ‘What a Day!’ includes the following features:</p> <p>Dimensions: The cards are typically designed in a standard playing card size, measuring approximately 2.5 inches by 3.5 inches (6.35 cm by 8.89 cm). This size ensures ease of handling and portability.</p> <p>Components: The game consists three decks of cards that feature various elements related to storytelling, such as characters, objects, locations, and events. Each card contains a sentence of appropriate level (Beginner, Intermediate, Advanced) and visual cues level to prompt storytelling and memory-building.</p> <p>Artwork and Design: The cards are simple yet visually appealing with colorful illustrations or images that capture the imagination and enhance the storytelling experience. Each set of cards is coloured according to level of difficulty (Beginner - , Intermediate - , Advanced - ). The packaging (box) is visually appealing and enticing, it invites players into a world of imagination and adventure.</p> <p>Procedure Card: The game includes a ‘How to Play?’ card which includes the procedure or guide that provides rules, gameplay suggestions, and variations. This manual helps players understand the objectives, gameplay mechanics, and different ways to utilize the cards for language learning and storytelling activities...</p>



Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.



Box Packaging for Cards



Procedure for Players



Beginner Level



Intermediate Level






Advanced Level



<p><b>Novelty and uniqueness</b></p>	<p>‘What a Day!’ is an innovative learning tool created by educators to improve students' communication skills in English. The novelty and uniqueness of ‘What a Day!’ lies in the fact that it is unlike other language learning products as it combines the art of storytelling with memory-building exercises. Players are tasked with memorizing the events on their cards and collaboratively retelling the story to rearrange the sequence of events. This integration fosters cognitive development and deepens language comprehension by allowing students to practice and refine their oral language abilities in a creative and fun way. ‘What a Day!’ also promotes interactive and collaborative gameplay, encouraging active engagement, teamwork, and social connections.</p> <p>It is different from other available products because the adaptability and versatility of ‘What a Day!’ makes it a one size fits all as it is suitable for various learning environments, ages, and proficiency levels. It can be adapted for classroom use or self-study, allowing educators and students to tailor the gameplay to their specific needs. Additionally, the game accommodates different language competencies, providing challenges suitable for beginners as well as advanced learners. Overall, ‘What a Day!’ provides an enjoyable and effective way for students to enhance their communication skills and develop a holistic set of language and cognitive abilities.</p>
<p><b>Benefit to mankind</b></p>	<p>‘What a Day!’ card game is a valuable and effective tool for language educators in Malaysia as it motivates language learners of different proficiency levels to speak English and develop their speaking skills. English not being the primary language in Malaysia poses challenges for learners, making this game a helpful solution. By transforming language learning into an engaging and enjoyable experience, the game captures students' attention and improves their communication skills through active participation, collaborative discussions, and story retelling. It also enhances cognitive development by integrating storytelling and memory-building exercises, fostering critical thinking and problem-solving abilities.</p> <p>The game's versatility allows for various applications. It can be implemented in classroom settings, language courses, and ESL programs as a part of lesson plans or review activities. Language clubs and extracurricular programs can utilize it to create interactive language practice environments, promoting social interaction and cultural exchange. Furthermore, ‘What a Day!’ can be adapted for self-study and even integrated into language learning apps or online platforms, providing students with a gamified learning experience and the ability to track their progress independently.</p> <p>The benefits of the ‘What a Day!’ extend to students and society as a whole. Students improve their communication skills, gaining confidence and proficiency in expressing themselves in English, which is essential for</p>





	<p>success in a globalized world. The game also fosters cultural exchange, empathy, and global awareness as students engage with diverse storylines and perspectives. Furthermore, it contributes to improved academic performance across various subjects that require strong communication skills. Finally, the game equips students with future professional skills, preparing them for careers in a globalized workforce where effective communication, collaboration, and critical thinking are highly valued.</p>
<p><b>Potential commercialization</b></p>	<p>‘What a Day!’ holds significant marketability and commercialization potential due to its distinct approach to enhancing English communication skills. The global demand for language learning solutions continues to rise as people recognize the importance of English proficiency in a globalized world. With its engaging and interactive nature, the storytelling card game caters to this demand, offering an effective tool for language practice. It can be adapted to various educational settings, proficiency levels, and age groups, making it appealing to schools, language centers, after-school programs, and individuals pursuing self-study.</p> <p>Furthermore, the game's scalability and reproducibility contribute to its commercial viability. Once developed, ‘What a Day!’ can be easily reproduced and distributed at a relatively low cost. Its card-based format allows for straightforward replication, enabling scalability and the potential to reach a large customer base. Additionally, the game has the potential for digital integration, opening up opportunities for wider distribution and accessibility through language learning apps or online platforms. This digital integration also presents avenues for additional revenue streams, such as in-app purchases or subscriptions.</p> <p>Strategic partnerships with educational institutions, language schools, and language learning organizations can further enhance the market potential of ‘What a Day!’. By positioning the game as an innovative educational tool, these partnerships can provide credibility and leverage established networks for marketing and distribution. Collaborative efforts can expand the game's reach and attract a larger audience.</p> <p>In conclusion, the storytelling card game's unique approach, versatility, scalability, potential for digital integration, niche positioning, and opportunities for expansion contribute to its marketability and commercialization potential. It addresses the growing demand for language learning solutions, offers adaptability across various settings, and can be distributed through both traditional and digital channels. With the right partnerships and strategic marketing efforts, the storytelling card game has the potential to make a significant impact in the language learning market.</p>
<p><b>Acknowledgment</b></p>	<p>The head project member acknowledges financial support from the Centre of Foundation Studies, UiTM Cawangan Selangor, Kampus Dengkil. The</p>

	<p>group also acknowledges all the support received directly and indirectly in the making of the ‘What a Day!’ game.</p>
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## Blueprint Orbits of the Past: DEVELOPMENT OF ARCHITECTURAL HISTORICAL BOARD GAME

Category	A School (Primary & Secondary)	B Technical Institutional Students	C Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector
			√
	Local		International
	√		
<b>Project Member(s)</b>	Afiqah Ahmad <sup>1</sup> , Nur Atiqah Husaini <sup>2</sup> , Constantine Caludius Embagos <sup>3</sup> , Haritz Aiman Arman <sup>4</sup> , Megat Faridrullah Zolkefli <sup>5</sup> .		
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<b>Abstract</b>	<p>This innovation of a custom-built board game as and educational tool in acquiring knowledge of architectural history. It is a custom-built board game aims to teach architectural history, improve class participation and improve students understanding. Board games have long been recognized as an effective education tool, and their value remains significant even in the digital era. The custom-built board game was designed to engage the students in testing their architectural knowledge on Asian and Islamic Architecture. It provides a tangible and social interaction as it provides a tactile experience while moving pieces and interaction with face-to-face which foster communication. This Blueprint Orbits of the Past will require the participants to test their architectural knowledge as well as critical thinking and problem-solving skills. Participation in the board game will enhance students' cognitive development, deepen their understanding of historical architecture and provide and enjoyable educational experience.</p>
<b>Keywords</b>	<p>board games, educational tool, architecture history, digital era, cognitive development, social interaction</p>
<b>Product description</b>	<p>Blueprint Orbit of the Past is a circular board game constructed with 5 rotating rings sections moving inwards towards the circular centre which contains the Tree of Life and 16 triangular section which results in 80 section or steps in the board game. There are circular lines at each ring as well as a lines at each triangular section. These lines have gates at each of the line to limit the players movements. Each gate signifies a portion of the Asian and Islamic Architecture. The outermost gate towards the innermost gate are as follows, Torana (Indian Architecture), Pai Lou (Chinese Architecture) Torii (Japanese Architecture) and the inner most circular line is the Islamic Arch (Islam Architecture). Each player is given 6 circular question cards and 5 barricades to be used during the game. The aim of the game is to reach the centre Tree of Life of the game.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	

	
<b>Novelty and uniqueness</b>	<p>In this digital age, Blueprint Orbit of the Past is an educational tool that offers a unique and engaging way to explore and learn about architectural style, component, period and the evolution of buildings. It offers a hands on interactive way to appreciate and learn the rich tapestry of architectural history.</p>
<b>Benefit to mankind</b>	<p>Blueprint Orbit of the Past provides a unique blend of entertainment, education and cognitive development. It provides a distinctive combination of education, visual representation, strategic-decision making and cultural exploration. It helps student to test their architectural knowledge in an engaging way.</p>
<b>Potential commercialization</b>	<p>Blueprint Orbit of the Past is an educational tool suitable for any individuals of any age as long as they that are interested in the history of architecture. It provides a relief from the increasingly digital approach of the architectural landscape.</p>
<b>Acknowledgment</b>	<p>The team would like to acknowledge the College of Built Environment and the Architecture Program in UiTM Cawangan Sarawak, Kota Samarahan, Sarawak.</p>

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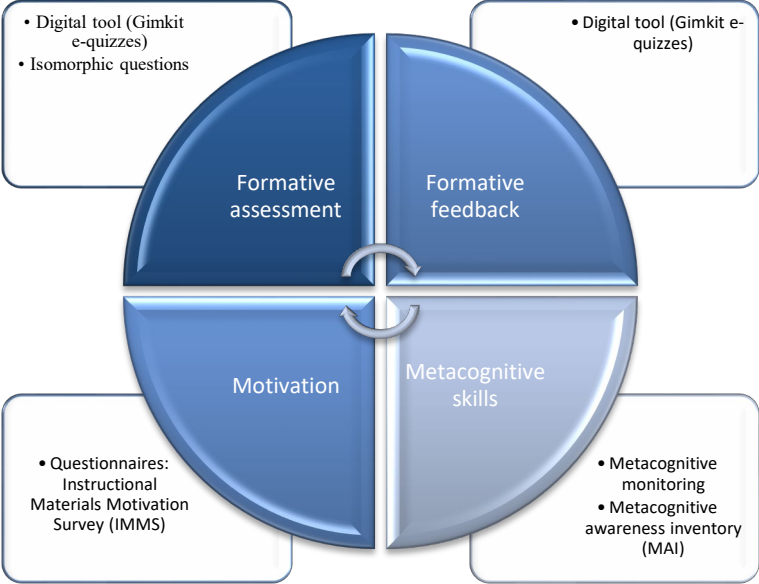
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<b>Enhancing Students' Metacognitive Skills, Motivation, and Learning Experience in Fluid Mechanics at Curtin University Malaysia through Digital Formative Assessments with GimKit</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
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<b>Abstract</b>	<p>This study conducted at Curtin University Malaysia presents a novel approach to teaching Fluid Mechanics in undergraduate engineering courses by implementing a digital formative assessment (DFA) framework using Gimkit, an interactive learning tool. The DFA framework aims to address the challenges faced by students at Curtin University Malaysia in understanding complex engineering concepts and enhancing their metacognitive skills and motivation. By integrating Gimkit into the classroom environment, students at Curtin University Malaysia can actively engage in quizzes and receive immediate formative feedback, promoting self-directed learning and deeper understanding. The uniqueness of this approach lies in its ability to personalize learning experiences, provide real-time data insights for instructors, and foster a student-centered approach at Curtin University Malaysia. The impact of this teaching method extends to socio-economic aspects, as it can improve students' academic performance, metacognitive skills, and overall learning experiences, contributing to their future success in engineering fields. Furthermore, the commercialization prospect of the DFA framework and associated digital tools opens opportunities for licensing and implementation at Curtin University</p>		



	Malaysia and other educational institutions, promoting widespread adoption and potential revenue generation.
<b>Keywords</b>	Digital formative assessments, Gimkit, Fluid Mechanics, metacognitive skills.
<b>Product description</b>	The physical projections of the teaching method using digital formative assessment (DFA) with Gimkit in Fluid Mechanics involve integrating interactive technology and learning tools into the classroom environment. This includes using electronic devices such as laptops or mobile devices for students to access and participate in Gimkit quizzes. The lecturer or instructor prepares the quizzes and delivers them through the Gimkit platform, which enables students to answer multiple-choice questions and receive immediate formative feedback. The physical projection also includes real-time data reports showing overall class and individual student responses, allowing for instant analysis and adjustment of instruction. Self-reflection surveys, such as the Metacognitive Awareness Inventory and Instructional Materials Motivation Survey, are administered to gather qualitative data and further inform instructional modifications. Overall, the physical projection of the teaching method involves using technology, interactive tools, and data-driven feedback to create an engaging and dynamic learning environment in fluid mechanics.
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	 <p>Fig. 1 Model of relations for digital formative assessment (DFA) framework (<i>Pending for applying copyright</i>).</p>
<b>Novelty and uniqueness</b>	The teaching method of digital formative assessment (DFA) with Gimkit in Fluid Mechanics originates from recognizing the challenges students face in understanding complex engineering concepts and the limitations of traditional teaching approaches. DFA is unique in combining interactive digital tools, immediate formative feedback, and metacognitive prompts to enhance students' learning experiences. Unlike traditional methods, DFA



	<p>with Gimkit offers a dynamic and customizable learning environment, allowing students to actively engage with the content through various question types and receive instant feedback. This method differentiates itself by promoting metacognitive skills, self-regulated learning, and motivation through its focus on continuous assessment and individualized feedback. Compared to other teaching methods, DFA with Gimkit offers a more interactive, student-centered approach that fosters a more profound understanding and improves academic performance in the challenging field of Fluid Mechanics.</p>
<b>Benefit to mankind</b>	<p>Implementing the digital formative assessment (DFA) framework using Gimkit in teaching Fluid Mechanics at Curtin University Malaysia offers significant benefits to humanity. The advantages of this teaching method include improved learning outcomes, enhanced metacognitive skills, and increased motivation among engineering students. By providing personalized and interactive learning experiences, the DFA framework can improve student engagement and understanding of complex concepts. This approach can be applied in various educational settings and disciplines, benefiting engineering students, educators, and institutions. By fostering a culture of self-directed learning and continuous improvement, this study contributes to the overall enhancement of engineering education and prepares students to tackle real-world challenges effectively. Ultimately, the benefits of this teaching method extend to society as a whole, as it nurtures a skilled and competent workforce capable of driving technological advancements and addressing pressing societal needs.</p>
<b>Potential commercialization</b>	<p>The digital formative assessment (DFA) teaching method with Gimkit in fluid mechanics offers significant marketability and commercialization possibilities. DFA provides a solution that enhances student engagement and understanding by addressing the challenges of traditional academic environments, such as limited feedback and personalized learning experiences. Its ability to provide instant feedback, personalized learning activities, and data-driven insights makes it attractive for educational institutions seeking to improve teaching methods and student outcomes. The DFA framework and associated digital tools can be developed and licensed to educational institutions, allowing them to integrate this innovative approach into their curriculum. Furthermore, the adaptability of the DFA framework makes it viable for expansion and application in various disciplines, broadening its market reach and commercial potential.</p>
<b>Acknowledgment</b>	<p>We are grateful for the financial support from the CEIT Teaching Excellence Award Fund (Research Fund TAN0006) from Curtin University, Australia. Financial support from Curtin University Malaysia through the Curtin Malaysia Teaching Innovation Project (CMTIP) Scheme (OLT/CMTIP/2023-013) is duly acknowledged. Curtin University Human Research Ethics Committee (HREC) has approved this study (HREC number HRE2023-0096).</p>

**Researchers  
Biographical Data**

Dr. Tan Inn Shi is a senior lecturer in the Department of Chemical and Energy Engineering at Curtin University Malaysia. She holds a Ph.D. in Chemical Engineering from Universiti Sains Malaysia (USM) and is a Fellow of the Higher Education Academy (FHEA). Dr. Tan is highly esteemed for her Fluid Mechanics expertise and outstanding contributions to teaching and research. She has been recognized with prestigious awards, including the Curtin Excellence and Innovation in Teaching Award for University Associates and the Curtin Malaysia Most Productive Researcher Award. In addition, Dr. Tan serves as the Chair of the Board of Studies in the Department of Chemical and Energy Engineering, further showcasing her leadership and dedication to academic excellence at Curtin University Malaysia.



Dr. Henry Foo Chee Yew is a senior lecturer in the Department of Chemical and Energy Engineering at Curtin University Malaysia. He completed his Ph.D. in Chemical Engineering from Universiti Sains Malaysia (USM) in 2015 and holds both a Master's and Bachelor's degrees (Honours) in Chemical Engineering from the School of Chemical Engineering, Universiti Sains Malaysia. Dr. Henry has diverse responsibilities, serving as the Unit Leader for the Engineering Industry Research Project and supervising undergraduate and postgraduate students. He received a Curtin Malaysia Teaching Innovation Project (CMTIP) and collaborates with industry partners. In addition, Dr. Henry is involved in team teaching in the field of Fluid Mechanics. His main research interest involved multidisciplinary research between Physics, Chemistry and Engineering in the emerging area of nanotechnology. His research focuses on developing structural nanoparticles with tuneable properties through various modern processing techniques (direct write electrospinning, photolithography for miniaturized devices, electrodeposition and 3D printing).



Dr. Wong Mee Kee obtained her bachelor's and Ph.D. degrees in Chemical Engineering from Universiti Teknologi PETRONAS. Her academic career began with Curtin University as a lecturer before joining PETRONAS Research in 2018. She is also serving as an industrial-academic advisor for Curtin University Malaysia. Her research interests include renewable chemicals, process intensification and CO<sub>2</sub> capture. She authored over 15 journal papers with two patents granted. Currently, she is the lead researcher in process development and technology scale-up of catalytic conversion of biomass to platform chemical in PETRONAS Research Sdn Bhd.

<b>X-ACT GAME: An Interactive Teaching Aid to Combat Sexual Child Abuse</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Nor Fadzilah Zainal <sup>1</sup> , Nor Hidayah Harun <sup>1</sup> , Siti Nur Fathini Muhsain <sup>1</sup> , Haslinda Abdul Hamid <sup>2</sup> , Maizatul Akmal Mohd Mohzan <sup>3</sup>		
<b>Affiliation</b>	<sup>1</sup> Department of Business and Management, Universiti Teknologi MARA, Cawangan Pulau Pinang, Malaysia <sup>2</sup> Department of Applied Sciences, Universiti Teknologi MARA, Cawangan Pulau Pinang, Malaysia <sup>3</sup> Academy of Language Studies, Universiti Teknologi MARA, Cawangan Pulau Pinang, Malaysia		
<b>Email</b>	<a href="mailto:iela@uitm.edu.my">iela@uitm.edu.my</a> , <a href="mailto:norhidayah510@uitm.edu.my">norhidayah510@uitm.edu.my</a> , <a href="mailto:fathini@uitm.edu.my">fathini@uitm.edu.my</a> , <a href="mailto:hasli8366@uitm.edu.my">hasli8366@uitm.edu.my</a> , <a href="mailto:maizatul.akmal@uitm.edu.my">maizatul.akmal@uitm.edu.my</a>		
<b>Correspondence</b>	Nor Fadzilah Zainal Department of Business and Management, Universiti Teknologi MARA, Cawangan Pulau Pinang, 13500 Permatang Pauh, Pulau Pinang, Malaysia. Tel: +604-3822572		
<b>Abstract</b>	X-ACT GAME is an upgraded version of a previous innovation project (KIT HERO) that simply displays information in linear written form. This innovation was developed in response to the alarming prevalence of child abuse in Malaysia, with sexual abuse accounting for the highest number of reported cases in 2022 (1,168 cases). The game's design process involved extensive research to ensure accuracy, age-appropriateness, and captivating gameplay that resonates with children. The interactive game combines educational content with engaging gameplay, using colorful graphics, relatable characters, and decision-making scenarios to impart critical life skills. It offers two methods of play that cater to cognitive, affective, and		



	<p>psychomotor development while fostering positive emotions and physical skills. Empowering children through this game contributes to creating a safer environment for them and aims to reduce the long-term socio-economic costs associated with child abuse through early intervention and prevention. The game can be made accessible through online platforms and partnerships with educational institutions, presenting commercialization potential. Overall, X-ACT GAME plays a crucial role in guiding children about sexual child abuse early on, allowing for timely action to prevent further harm. As awareness of child abuse prevention increases and the educational technology market grows, the game serves as a valuable teaching aid in safeguarding children and promoting their overall well-being.</p>
<b>Keywords</b>	<p>sexual child abuse, children, interactive game, teaching aid.</p>
<b>Product description</b>	<p>X-ACT GAME is an interactive game set aimed at educating children about the prevention and awareness of child abuse, especially sexual child abuse. It consists of two methods of playing the interactive game that incorporates cognitive, affective, and psychomotor domains. The combination of these three domains makes X-ACT GAME not only educates children about sexual child abuse prevention, but also to improve childrens' development. Through engaging and interactive gameplay, children learn to identify signs of abuse, understand their rights, and seek help from trusted adults. The game serves as one of the teaching aids to empower children and foster a safer environment for the younger generation.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	<div style="text-align: center;"> <p><b>GAME 1: SHOW YOUR EMOTIONS</b></p> <div style="display: flex; justify-content: space-around; align-items: center;"> <div style="border: 1px solid black; border-radius: 15px; padding: 10px; background-color: #ffff00; width: 25%;"> <p style="text-align: center; margin: 0;"><b>Objectives</b></p> <p style="font-size: 0.8em; margin: 5px 0;">This game can help children to understand a situation whether it is a safe or unsafe touch situation by expressing their feelings or emotions.</p> </div> <div style="border: 1px solid black; border-radius: 15px; padding: 10px; background-color: #add8e6; width: 25%;"> <p style="text-align: center; margin: 0;"><b>Instructions</b></p> <p style="font-size: 0.8em; margin: 5px 0;">Choose the correct emoji icon based on the situation of the picture shown.</p> <p style="text-align: center; margin: 5px 0;"><b>How to answer</b></p> <p style="font-size: 0.8em; margin: 5px 0;">To answer the question, the child has to show the correct picture of the emoji.</p> </div> <div style="border: 1px solid black; border-radius: 15px; padding: 10px; background-color: #333; color: white; width: 25%; text-align: center;"> <p style="font-size: 0.7em; margin: 0;">Trust or Betray</p> <p style="margin: 5px 0;"><b>SHOW YOUR EMOTIONS</b></p> <div style="display: flex; justify-content: center; align-items: center; margin: 5px 0;"> <div style="width: 20px; height: 20px; background-color: #007bff; border-radius: 50%; display: flex; align-items: center; justify-content: center; margin: 0 5px;"> <span style="color: white; font-size: 0.8em;">▶</span> </div> <div style="font-size: 0.7em; margin: 0 5px;"><b>START</b></div> </div> <p style="font-size: 0.6em; margin: 5px 0;">Play Again   Back   Home   Settings   Help</p> <p style="font-size: 0.6em; margin: 0;">© 2023</p> </div> </div> </div>

**Example 1**

**Situation:**

*Diperiksa doktor*

**Answer:**

Happy emoji

-Kids show happy emoji pictures.



**Example 2**

**Situation:**







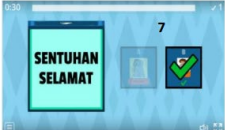
*Menepuk punggung*

**Answer:**

Angry emoji

-Kids show angry emoji pictures.



	<p style="text-align: center;"><b>GAME 2: THIS OR THAT</b></p> <div style="text-align: center; border: 1px solid black; background-color: yellow; padding: 5px; margin: 10px auto; width: fit-content;"> <p><b>Objectives</b></p> <p>This game can help children to understand and be more sensitive in making choices whether it is a safe or unsafe touch situation to do to themselves.</p> </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 45%; border: 1px solid black; border-radius: 15px; background-color: #ADD8E6; padding: 10px;"> <p style="text-align: center;"><b>Instructions</b></p> <p>This game has 10 question boxes. To open the question box, children need to pick up a numbered ball in a mystery box. If the selected ball is number 6, then the question box that will open is number 6.</p> <p style="text-align: center;"><b>How to answer</b></p> <p>To answer the question, the child has to choose the correct picture based on the statement (safe touch or unsafe touch) given.</p> </div> <div style="width: 45%;">    </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 45%; border: 1px solid black; border-radius: 15px; background-color: #ADD8E6; padding: 10px;"> <p style="text-align: center;"><b>Example 1</b></p> <p><b>Question:</b> Box number 10 (Pick up ball number 10)</p> <p><b>Statement:</b> <i>SENTUHAN TIDAK SELAMAT</i></p> <p><b>Answer:</b> Picture A</p> </div> <div style="width: 45%;">   </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 45%; border: 1px solid black; border-radius: 15px; background-color: #ADD8E6; padding: 10px;"> <p style="text-align: center;"><b>Example 2</b></p> <p><b>Question:</b> Box number 7 (Pick up ball number 7)</p> <p><b>Statement:</b> <i>SENTUHAN SELAMAT</i></p> <p><b>Answer:</b> Picture B</p> </div> <div style="width: 45%;">   </div> </div>
<p><b>Novelty and uniqueness</b></p>	<p>X-ACT GAME is a gamification process in teaching and learning that incorporates cognitive, affective, and psychomotor domains. The combination of these three domains serves not only to educate children about sexual child abuse prevention but it also fosters positive emotions and enhances children's physical development while playing. Additionally, the colorful graphic images can help children remember what they have learned more effectively and quickly.</p>
<p><b>Benefit to mankind</b></p>	<p>The socio-economic impact of X-ACT GAME is significant as it equips children with knowledge and tools to protect themselves from sexual child abuse. By empowering children, the game contributes to creating a safer environment for them. It also aims to reduce the long-term socio-economic</p>

	costs associated with child abuse by promoting early intervention and prevention.
<b>Potential commercialization</b>	The commercialization potential of X-ACT GAME is promising. With increasing awareness of child protection and a growing market for educational technology, the game can be made available through various channels, such as online platforms, and partnerships with educational institutions particularly for nurseries and kindergartens. Revenue generated from the game's commercialization can be reinvested to further improve and expand the initiative's impact on children welfare.
<b>Acknowledgment</b>	The head project member acknowledges financial support and assistance from UiTM Cawangan Pulau Pinang. Besides, appreciation goes to Social Welfare Department, Malaysia for their reliable sources.
<b>Researchers Biographical Data</b>	<div data-bbox="516 821 751 1066">  </div> <p data-bbox="776 821 1474 1220">Nor Fadzilah Zainal is an academic staff at the Department of Business and Management, Universiti Teknologi MARA, Cawangan Pulau Pinang. She obtained Master of Economics majoring in Islamic Economics from Universiti Kebangsaan Malaysia. Besides having more than 12 years of experience lecturing and researching, she has published many articles in journals and magazines. In addition, her consuming passion for products innovation bore fruit when she received several gold awards from international and local innovation competitions.</p> <div data-bbox="516 1262 751 1507">  </div> <p data-bbox="776 1262 1474 1661">Nor Hidayah Harun works as a senior lecturer at the Department of Business and Management, Universiti Teknologi MARA, Cawangan Pulau Pinang. She earned her PhD in economics from Universiti Malaysia Perlis in 2022. With more than 12 years of experience lecturing and researching in her field, she has published many articles in journals and magazines. Her consuming passion for products innovation bore fruit when she received several gold awards from international and local innovation competitions.</p>



Siti Nur Fathini is an academic staff at the Department of Business and Management, Universiti Teknologi MARA, Cawangan Pulau Pinang. She obtained Master in Business Administration majoring in Entrepreneurship and BBA (Hons) Business Economics from Universiti Teknologi MARA. Besides having more than 12 years of teaching experience in Economics, Entrepreneurship and Business courses, she has also been involved in many programme development and curriculum reviews. In addition, she has published articles in journals and magazines and has also won several awards from international and local innovation competitions.



Ts. Dr. Haslinda Abdul Hamid is a lecturer of Faculty of Applied Sciences, Universiti Teknologi MARA (UiTM). She received her PhD in 2020 from Universiti Sains Malaysia (USM) as well as majoring in Advanced Materials. Her research interests mainly focus on semiconductor fabrication technology, advanced materials, and electrochemical sensing for environmental monitoring. She has been recognized as a professional technologist by Malaysia Board of Technologists (MBOT). She has published many articles in journals, proceedings, chapter in book, technical report and magazines besides presenting her works in international and national conferences. She is also a reviewer for international and national conference papers and involves in community services with UiTM. She has joined several activities with local at all levels.



Maizatul Akmal Mohd Mohzan is a senior lecturer currently attached to the Academy of Language Studies at Universiti Teknologi MARA, Cawangan Pulau Pinang. She obtained her Bachelor of Education (Hons.) in Teaching English as a Second Language (TESL) and Master of Education in Teaching English as a Second Language (TESL) from Universiti Teknologi MARA. Her research interests include second language acquisition, emotional intelligence and educational psychology.

<b>NEO-SMEFRI INDEX AS AN INDICATOR FOR THE SUSTAINABILITY OF SINGLE MOTHERPRENEURS BUSINESS</b>			
<b>Category</b>	<b>A</b>	<b>B</b>	<b>C</b>
	<b>School (Primary &amp; Secondary)</b>	<b>Technical Institutional Students</b>	<b>Academician/ Government Sector/ Entrepreneur/ Industry/ Private Sector</b>
			√
	<b>Local</b>		<b>International</b>
	√		
<b>Project Member(s)</b>	Memiyanty Abdul Rahim <sup>1</sup> , Rozainun Abdul Aziz <sup>2</sup> , Norraidah Abu Hasan <sup>3</sup> Mohd Sirajuddin Siswadi Putera Mohamed Shith <sup>4</sup> , Saidah Hamizah Ahmad <sup>5</sup> .		
<b>Affiliation</b>	<sup>1</sup> Faculty of Administrative Science and Policy Studies, <sup>1</sup> Socio-Economic Policy Research Group, <sup>1</sup> The Big Data Analytic and Artificial Intelligence (IBDAAI) Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia <sup>2</sup> Faculty of Business,UNITAR International University, Kelana Jaya, Petaling Jaya, Selangor <sup>3,5</sup> Faculty of Administrative Science and Policy Studies, Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia <sup>4</sup> Academy of Contemporary Islamic Studies (ACIS), Universiti Teknologi MARA, Shah Alam, Selangor, Malaysia <sup>5</sup> Skinelle Sdn Bhd, Shah Alam, Selangor, Malaysia		
<b>Email</b>	<sup>1</sup> memiyanty@uitm.edu.my, <sup>2</sup> rozainun@unitar.my, <sup>3</sup> norraidah@uitm.edu.my, <sup>4</sup> sirajuddin@uitm.edu.my, <sup>5</sup> saidah2515@uitm.edu.my		
<b>Correspondence</b>	Memiyanty Abdul Rahim, FCIS PhD Faculty of Administrative Science and Policy Studies Universiti Teknologi MARA 40450 Shah Alam Selangor		
<b>Abstract</b>	Neo-SMEFRI is an abbreviation for Neo- Single Motherpreneurs Financial Management and Resources Resilience Index. It is designed to assess the pandemic resilience of various Malaysian states, with a particular emphasis on the experiences of single mother entrepreneurs. The Neo-Single Motherpreneurs Financial Management and Resources Resilience Index (Neo-SMFRI) assesses a country's pandemic financial risk reduction potential. The Neo-SMFRI is aggregated by category and then by weighted category average. The Neo-SMEFRI utilises indicators from four areas —		



	<p>entrepreneurial financial literacy, financial knowledge, self-efficacy, and resilience — to assess single mothers' ability to adapt to and recover from unexpected environmental changes. Developed with input from single motherpreneurs, strategic experts, academia, practitioners/government agencies, and non-governmental organisations, and using 22 indicators to identify the pandemic preparedness, mitigation, and recovery needs of SMPs. The indicator demonstrates that the performance of poorer nations is inferior.</p>
<b>Keywords</b>	<p>Neo-SMFRI Index, states, entrepreneur, financial knowledge, financial Information, Self-Efficacy and resilience.</p>
<b>Product description</b>	<p>Neo-SMEFRI is designed to assess the pandemic resilience of various Malaysian states, with a particular emphasis on the experiences of single mother entrepreneurs. It evaluates the ability of each Malaysian state to endure and recover from a pandemic, as well as the extent of women's engagement in their business resilience-building activities. The Neo-SMFRI is an aggregation of the underlying indicators. The Neo-SMFRI is first aggregated by category—creating a score for each underlying indicator (grey), such as the degree of financial information updating—then for each major category (dark blue), such as Entrepreneurial Financial Literacy—and lastly, based on the composite of the scores for the underlying categories. For the purpose of generating category scores, each underlying indicator (grey) was weighted and then averaged. The category ratings were then rescaled from 0 to 100.</p>
<b>Pictures/ Schematic diagrams/ Flow Charts/Screenshots /Graphs and etc.</b>	

INDICATOR	UNIT	SOURCE	WEIGHT
<b>ENTREPRENEURIAL FINANCIAL LITERACY (EFL)</b>	Rating 0-100 where 100=best		25.0%
Financial information updating	Scoring (1-5), 5=Best		20.0%
Maintain business financial management	Scoring (1-5), 5=Best		20.0%
Aware of business finance alternatives.	Scoring (1-5), 5=Best		20.0%
Working capital management	Scoring (1-5), 5=Best		20.0%
Use of economic and financial data in decision making	Scoring (1-5), 5=Best		20.0%
<b>ENTREPRENEURIAL FINANCIAL KNOWLEDGE (EFK)</b>	Rating 0-100 where 100=best		25.0%
Record daily cash in-out summary	Scoring (1-5), 5=Best		20.0%
collect debt from debtors as agreed	Scoring (1-5), 5=Best		20.0%
pay suppliers on time per agreement	Scoring (1-5), 5=Best		20.0%
I conserve revenue for the company's survival.	Scoring (1-5), 5=Best		20.0%
develop a plan for business risks and threats	Scoring (1-5), 5=Best		20.0%

	<table border="1"> <thead> <tr> <th><b>ENTREPRENEURIAL SELF-EFFICACY (ESE)</b></th> <th>Rating 0-100 where 100=best</th> <th></th> <th>25.0%</th> </tr> </thead> <tbody> <tr> <td>confidence in business expansion challenges</td> <td>Scoring (1-5), 5=Best</td> <td></td> <td>20.0%</td> </tr> <tr> <td>resilience amid declining demand</td> <td>Scoring (1-5), 5=Best</td> <td></td> <td>20.0%</td> </tr> <tr> <td>improve business management skills via various courses</td> <td>Scoring (1-5), 5=Best</td> <td></td> <td>20.0%</td> </tr> <tr> <td>enthusiastic in facing challenges in business</td> <td>Scoring (1-5), 5=Best</td> <td></td> <td>20.0%</td> </tr> <tr> <td>inspired by friends' entrepreneurial success</td> <td>Scoring (1-5), 5=Best</td> <td></td> <td>20.0%</td> </tr> </tbody> </table>	<b>ENTREPRENEURIAL SELF-EFFICACY (ESE)</b>	Rating 0-100 where 100=best		25.0%	confidence in business expansion challenges	Scoring (1-5), 5=Best		20.0%	resilience amid declining demand	Scoring (1-5), 5=Best		20.0%	improve business management skills via various courses	Scoring (1-5), 5=Best		20.0%	enthusiastic in facing challenges in business	Scoring (1-5), 5=Best		20.0%	inspired by friends' entrepreneurial success	Scoring (1-5), 5=Best		20.0%
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<b>Novelty and uniqueness</b>	<p>Neo-SMEFRI is unique due to its functions as an index. It is an absolute measure for any institution in giving training. Knowing their participants beforehand, providing an alarm for the government and states for making sure the state of the human being (Socially Responsibly- Economic well-being).</p>																								

<b>Benefit to mankind</b>	<p>Neo-SMEFRI was conceived to compile evidence and shine a light on the extent to which pandemic strategies and policies in Malaysia can be considered gender-sensitive, thereby engaging governments, development agencies, civil society representatives, and interested private-sector stakeholders in a dialogue on these issues. Future iterations and expansions of the index will enable nations to monitor their growth over time and compare their performance against a broader range of regions.</p>
<b>Potential commercialization</b>	<p>Neo-SMEFRI can be used by the government and states in evaluating any programs that intend to be delivered to the participants, especially Single Mother. The index will be able to give an initial indicator or alarm to the government or anybody in delivering the training.</p>
<b>Acknowledgment</b>	<p>The research has been funded by the Higher Ministry of Education under Fundamental of Research Grant Scheme (FRGS) (Ref: FRGS/1/2021/SS01/UITM/02/22). Many thanks to the Ministry and Universiti Teknologi MARA for this great opportunity in conducting this type of study to support Single Motherpreneurs. Special thanks to Graduate Research Assistant (GRA), Mohd Imran Tamrin for assisting with the research work.</p>
<b>Researchers Biographical Data</b>	<div style="display: flex; flex-direction: column; align-items: flex-start;"> <div style="margin-bottom: 20px;">  <p>DR MEMIYANTY ABDUL RAHIM is a lecturer from the Faculty of Administrative Science &amp; Policy Studies. Formerly in the position as a Deputy Dean of Research, Industrial Linkages, Community, Alumni, Entrepreneurial Network. She is also a fellow of the Chartered Secretary and Governance Professional (FCIS). Her area of expertise are Corporate Finance, Administration, Islamic Finance, Corporate and Shariah Governance, Ethical Leadership and Entrepreneurship. She has been working 7 years in industry and 15 years in UiTM.</p> </div> <div>  <p>PROF DR ROZAINUN HJ AB AZIZ is a professor in management accounting and is currently the Dean of Faculty of Business, UNITAR International University, President of ASEAN Accounting Educators' Workgroup (AAEW) and Vice-President of Aberystwyth University Alumni Club in Malaysia. She is a Chartered Accountant in Malaysia. She co-leads a joint research project under AAEW and ASEAN Federation of Accountants (AFA), sponsored by</p> </div> </div>

AFA, on “Adoption of Emerging Technologies by the Accounting Profession and Accounting Education” (2022-2023).



DR NORRAIDAH ABU HASAN is a senior lecturer in the Faculty of Administrative Science & Policy Studies, UiTM. She obtained Ph.D. (Corporate Finance) from Universiti Kebangsaan Malaysia and currently teaches Corporate Finance, Corporate Governance, Quality Management, and Corporate Ethics. She has published her work in the Journal of Economics, International Journal of Public Sector Management, Environment-Behaviour Proceedings Journal, and Journal of Administrative Science

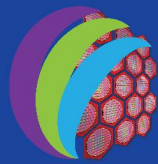


USTAZ MOHD SIRAJUDDIN SISWADI Putera is a senior lecturer at Academy of Contemporary Islamic Studies (ACIS) UiTM and is currently the Coordinator of Industry, Community and Alumni Network (ICAN). He is also the Hajj & Umrah Trainer for Tabung Haji Malaysia and Tabung Haji Travel & Services since 1998. His area of expertise are Shariah Law and Governance (Islamic Inheritance & Entrustment), Islamic Law and Jurisprudence, and Fiqh al-Ibadat. He has been working 11 years in various higher learning institutions before joining UiTM in 2008 until now.



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