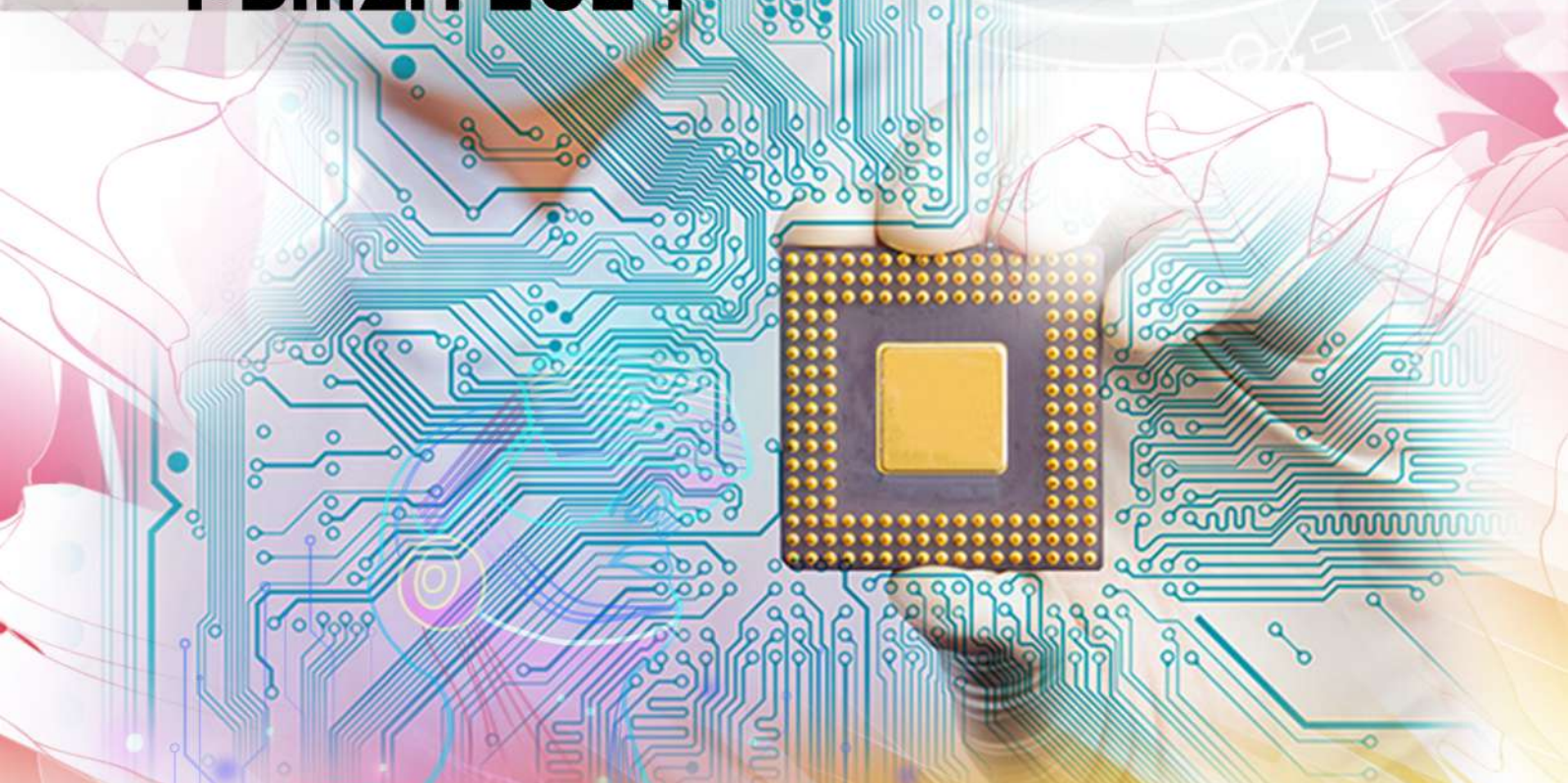
KEMENTERIAN PENDIDIKAN TINGGI
JABATAN PENDIDIKAN POLITEKNIK DAN KOLEJ KOMUNITI

POLITEKNIK MALAYSIA
SULTAN MIZAN ZAINAL ABIDIN

JILID 4

DIGES

PROJEK PELAJAR PROGRAM DIPLOMA PSMZA 2024



UNIT PENYELIDIKAN, INOVASI DAN KOMERSIAL
POLITEKNIK SULTAN MIZAN ZAINAL ABIDIN

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Terbitan ini dikeluarkan secara tahunan.

KATA ALUAN

HAJAH ZAMRA BINTI DERAHMAN
PENGARAH
POLITEKNIK SULTAN MIZAN ZAINAL ABIDIN

Assalamualaikum wbt, Salam Sejahtera & Salam Malaysia MADANI.

Syukur ke hadrat Allah SWT kerana dengan izinNYA, Diges Projek Pelajar Program Diploma PSMZA 2024 dapat diterbitkan dengan jayanya. Saya merakamkan setinggi-tinggi penghargaan dan tahniah kepada seluruh warga pensyarah serta pelajar Politeknik Sultan Mizan Zainal Abidin (PSMZA) atas penganjuran *Student's Project Competition Innovation and Invention Design* (SPEED 2024) yang memungkinkan penerbitan Diges Projek Pelajar Program 2024 ini. Langkah demi langkah yang diambil oleh para pelajar kita akhirnya membuahkan kejayaan yang membanggakan.

Saya amat berbangga menyaksikan bagaimana pelajar kita berjaya menyatukan ilmu, daya cipta dan semangat berani mencuba dalam melahirkan projek-projek inovatif yang memberi impak positif kepada komuniti dan sektor industri.

Penerbitan ini bukan sekadar dokumentasi projek, tetapi merupakan manifestasi komitmen berterusan PSMZA dalam memperkasa pendidikan teknikal dan vokasional (TVET) melalui pendekatan berasaskan *outcome-based learning* (OBE), sekali gus memberi peluang kepada para pelajar untuk mempersembahkan hasil inovasi dan ciptaan mereka dalam bentuk projek yang praktikal dan berimpak tinggi.

Penerbitan ini sangat signifikan dalam mendokong aspirasi negara ke arah Revolusi Industri 4.0, Internet of Things (IoT), kecerdasan buatan (AI), automasi, serta pembangunan mampan (SDG). Kita semua berbangga kerana para pelajar kita kini bukan sahaja celik teknologi, malah sudah bersedia untuk menjadi pencipta masa depan dan berdaya saing di peringkat global.

Akhir kata, saya berharap DIGES SPEED 2024 ini dapat menjadi inspirasi bukan sahaja kepada pelajar kita, tetapi juga kepada pembaca lain untuk terus mengejar ilmu, mencipta solusi dan menyumbang kepada masyarakat, industri dan negara. Pembudayaan *design thinking*, keberanian mencuba dan membina impian berimpak besar adalah asas kepada kejayaan dan kecemerlangan generasi masa hadapan.

Bukan sekadar wayar bersilang,
Tapi idea yang mengubah zaman,
Dari politeknik lahir gemilang,
Menjadi pencetus generasi hadapan.

#PSMZAMelangkahKeEraBaharu

Sekian, terima kasih.

KATA ALUAN

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Assalamua'laikum wbt, Salam Sejahtera & Salam Malaysia MADANI.

Alhamdulillah, syukur dengan limpah kurnia Allah SWT, Diges Projek Pelajar Program Diploma PSMZA 2024 dapat diterbitkan dengan jayanya. Saya ingin mengambil kesempatan ini untuk mengucapkan tahniah dan syabas kepada barisan jawatankuasa pelaksana, pensyarah-pensyarah, dan semua pelajar yang terlibat dalam penghasilan diges ini.

Usaha yang ditunjukkan bagi penghasilan diges sebegini bukan sahaja dapat memberi ruang kepada pelajar untuk mengasah kemahiran teknikal, tetapi juga mencungkil potensi pelajar daripada sudut kepimpinan, kerja berpasukan, pembudayaan inovasi, dan pemikiran kritis.

Saya percaya projek-projek di dalam SPEED 2024 telah dipilih antara yang terbaik dan dibukukan sebagai DIGES SPEED 2024. SPEED 2024 merupakan platform strategik yang mampu mempamerkan keupayaan dan hasil kerja para pelajar. Ini selari dengan aspirasi PSMZA untuk melahirkan graduan yang holistik, berdaya saing serta bersedia menghadapi cabaran Revolusi Industri 4.0 dan seterusnya.

Akhir kata, saya mengucapkan selamat maju jaya kepada semua pelajar yang terlibat di dalam penghasilan DIGES SPEED 2024 ini. Diharapkan pengalaman yang diperoleh dapat menjadi bekalan yang bermakna dalam perjalanan akademik dan kerjaya para pelajar kelak.

Terang bulan di malam sepi,
Disinari bintang berkerdipan,
Ilmu dikutip sepanjang hari,
Menjadi bekal masa hadapan.

#PSMZAMelangkahKeEraBaharu

Sekian, terima kasih.

KATA ALUAN

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Assalamua'laikum wbt, Salam Sejahtera & Salam Malaysia MADANI.

Saya mewakili Unit Penyelidikan, Inovasi dan Komersial (UPIK) PSMZA merakamkan setinggi-tinggi tahniah dan penghargaan kepada barisan editor di atas penerbitan DIGES SPEED 2024 ini. Naskhah ini merupakan dokumentasi pencapaian pelajar sempena program *Student's Project Competition Innovation and Invention Design* (SPEED 2024) yang menjadi nadi kepada pembangunan budaya inovasi PSMZA.

SPEED bukan sekadar pertandingan, ia adalah medan bukti bahawa pelajar politeknik bukan hanya belajar, tapi juga mampu mencipta. Di sinilah lahirnya projek-projek bercirikan penyelesaian sebenar kepada cabaran masyarakat, industri dan alam sekitar.

Program ini sangat bertepatan dalam memperkasa ekosistem penyelidikan dan inovasi akar umbi yang praktikal, relevan dan berpotensi dikomersialkan. Kami percaya, dari pertandingan seperti ini jugalah muncul projek-projek yang berupaya menjadi produk inovasi berdaftar, dipatenkan, malah dipasarkan di luar kampus.

Lebih penting lagi, SPEED 2024 mendidik pelajar untuk berfikir secara sistematik, membina prototaip yang berfungsi, dan menyampaikan idea dengan jelas kepada komuniti dan industri. Inilah nilai tambah sebenar yang kita bentuk.

Alat direka bukan sekadar gaya,
Tetapi menyelesaikan isu yang nyata,
Dari SPEED lahir iltizam yang membara,
Mengangkat TVET ke tahap utama.

Akhir kata, saya mengucapkan syabas kepada semua yang terlibat sehingga terhasilnya DIGES SPEED 2024 ini. Teruskan menyemai budaya cipta dan reka, bukan sahaja untuk menang hari ini, tetapi untuk mencipta masa depan yang lebih lestari dan berdaya saing.

#PSMZAMelangkahKeEraBaharu

Sekian terima kasih.

SIDANG EDITOR

Aplikasi Penunjuk Aras pada Tangki Simpanan Minyak Masak Terpakai di Singki bagi Memudahkan Pengurusan Minyak Masak Terpakai

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Abstrak

Satu pendekatan inovatif telah dibangunkan melalui mereka bentuk integrasi sistem penunjuk aras pada tangki simpanan minyak masak terpakai di singki dapur, bagi memudahkan pengurusan dan pelupusan minyak secara lebih teratur, cekap dan lestari. Produk ini direka bentuk untuk membantu pengguna mengenal pasti paras minyak yang disimpan serta menentukan waktu pelupusan yang sesuai melalui sistem penderia aras, bunyi amaran buzzer, dan nyalaan lampu LED apabila tangki mencapai kapasiti maksimum. Sistem ini bukan sahaja mengelakkan limpahan dan pencemaran, malah memudahkan proses pengurusan minyak masak terpakai secara sistematik dan mesra alam. Kajian melibatkan 86 responden dari Kampung Batu 7, Dungun dan data diperoleh melalui pengedaran borang soal selidik secara rawak. Hasil dapatan menunjukkan penerimaan yang sangat tinggi terhadap sistem ini; 90.7% responden bersetuju indikator berfungsi dengan baik dan mudah difahami, 94.2% bersetuju ia mendorong amalan pengurusan sisa yang betul, dan 95.3% menyatakan produk ini membantu pelupusan minyak secara lebih efisien. Reka bentuk mesra pengguna membolehkan penggunaannya meluas tanpa memerlukan kemahiran teknikal tinggi. Inovasi ini menyokong Matlamat Pembangunan Mampan (SDG 6 dan SDG 12) serta menunjukkan potensi tinggi untuk dikembangkan secara komersial, disokong oleh dua agensi teknikal tempatan, selari dengan agenda Revolusi Industri 4.0 dan pembangunan lestari negara.

Kata Kunci: *pengurusan minyak masak terpakai, kitar semula, penunjuk aras, kelestarian alam sekitar, SDG 6 & SDG 12*

1. Pengenalan

Pengurusan sisa minyak masak terpakai adalah isu penting dalam usaha memelihara alam sekitar dan mengurangkan pencemaran. Minyak masak yang dibuang tanpa kawalan boleh menyebabkan pencemaran air dan penyumbatan dalam sistem pembetungan, memberi kesan negatif terhadap ekosistem dan kesihatan awam. Seiring dengan perkembangan masyarakat yang semakin pesat, amalan pengurusan sisa minyak masak terpakai sering diabaikan, sekaligus memberi impak buruk terhadap persekitaran sekitar kita. Oleh itu, satu pendekatan yang sistematik dan praktikal diperlukan untuk menangani masalah ini secara lebih efektif.

Dalam konteks ini, penggunaan penunjuk aras pada tangki penyimpanan minyak masak terpakai di singki berpotensi menjadi satu kaedah yang praktikal untuk memudahkan pelupusan minyak masak terpakai secara lebih teratur. Reka bentuk sistem ini mengintegrasikan penunjuk aras visual sebagai mekanisme pemantauan tahap isipadu minyak secara langsung, seterusnya memberi amaran awal bagi tindakan pelupusan yang efisien dan terancang. Ini dapat mempertingkatkan keberkesanan amalan pengurusan sisa minyak masak di peringkat kediaman serta mengurangkan pencemaran yang disebabkan oleh pelupusan yang tidak betul.

1.1 Penyataan masalah

Amalan membuang minyak masak terpakai secara terus ke dalam singki atau saluran perparitan tanpa kawalan yang sistematik dikenal pasti sebagai punca utama pencemaran dan penyumbatan sistem pembetungan. Tindakan ini, yang sering dipandang remeh di peringkat kediaman, menyebabkan pengumpulan lemak dan gris dalam paip, sekali gus mengganggu aliran air sisa dan mencetuskan kerosakan sistem saliran. Situasi ini berpotensi

meningkatkan risiko banjir kilat serta penularan penyakit bawaan air dan vektor seperti nyamuk. Implikasi jangka panjang bukan sahaja menjejaskan infrastruktur awam, malah mempercepatkan kemerosotan kualiti alam sekitar dan kesihatan komuniti.

Menurut laporan Sinar Harian (2022), amalan membuang sisa makanan dan minyak terus ke dalam singki atau longkang masih berleluasa dalam kalangan masyarakat, menyumbang kepada gangguan sistem perparitan dan meningkatkan risiko banjir kilat. Tambahan pula, laporan Kosmo (2023) yang memetik kenyataan Ketua Pegawai Teknologi Arus Oil, Louis Ong, menjelaskan bahawa amalan ini bukan sahaja mencemarkan persekitaran, malah membahayakan kesihatan awam dan menyebabkan kerosakan infrastruktur pembetungan.

Rajah 1: Keratan akhbar berkaitan isu minyak masak terpakai.

(Sumber : Jangan buang sisa makan, minyak ke singki atau longkang. (2022, Disember 14). Sinar Harian. *https://www.sinarharian.com.my/article/235979/berita/nasional/jangan-buang-sisa-makan-minyak-ke-singki-atau-longkang* dan Kitar semula minyak masak terpakai. (2024, Oktober 25). Kosmo. *https://www.kosmo.com.my/2023/10/25/kitar-semula-minyak-masak-terpakai/*)

Walaupun pelbagai inisiatif telah dilaksanakan untuk meningkatkan kesedaran masyarakat terhadap kepentingan pengurusan bahan buangan domestik secara lestari, termasuk usaha mengitar semula minyak masak terpakai kepada biodiesel, kebanyakan isi rumah masih tidak memiliki kaedah yang sistematik atau peranti khusus bagi mengendalikan minyak masak terpakai secara berhemah. Kelemahan pada aspek infrastruktur yang mesra pengguna serta ketiadaan ekosistem pengurusan sisa yang komprehensif menjadi antara punca utama kegagalan inisiatif sedia ada untuk mencapai impak lestari dalam pengendalian minyak masak terpakai di peringkat isi rumah.

1.2 Objektif

1.2.1 Mereka bentuk integrasi sistem penunjuk aras pada tangki simpanan minyak masak terpakai di singki dapur bagi memudahkan pengurusan dan pelupusan minyak secara lebih teratur, cekap dan lestari.

1.2.2 Menilai tahap keberkesanan dan penerimaan pengguna terhadap penggunaan penunjuk aras dalam pengurusan sisa minyak masak terpakai sebagai sokongan kepada amalan kelestarian.

1.3 Skop Kajian

Kajian ini tertumpu kepada pengurusan minyak masak terpakai di kediaman di sekitar Kampung Batu 7, Dungun, Terengganu. Skop kajian melibatkan pembangunan dan penilaian penggunaan penunjuk aras pada tangki simpanan minyak masak terpakai, khusus untuk digunakan di kediaman. Kajian ini tidak melibatkan sektor komersial seperti restoran atau kafeteria, dan hanya menumpukan pada kediaman dengan fokus utama pada proses pengurusan minyak masak terpakai di rumah.

1.4 Kepentingan Kajian

Kajian ini mempunyai kepentingan yang besar dalam usaha pemeliharaan alam sekitar dan pembangunan mampan. Dengan mengurangkan pencemaran air dan penyumbatan dalam sistem pembetungan akibat pembuangan minyak masak terpakai yang tidak terkawal, kajian ini secara langsung menyumbang kepada kelestarian alam sekitar. Selain itu, kajian ini turut berperanan dalam meningkatkan kesedaran masyarakat terhadap kepentingan pengurusan sisa secara bertanggungjawab. Melalui penggunaan penunjuk aras pada tangki penyimpanan minyak masak terpakai di singki, pendekatan ini boleh dijadikan inisiatif pendidikan yang praktikal, mudah difahami, dan mudah dilaksanakan di peringkat isi rumah.

Tambahan pula, produk inovasi ini menawarkan penyelesaian yang mesra pengguna serta tidak memerlukan kos yang tinggi atau kemahiran teknikal yang rumit. Ia memperkenalkan satu kaedah pengurusan sisa yang lebih sistematik, sesuai untuk pelaksanaan dalam komuniti setempat. Lebih penting lagi, kajian ini turut menyokong Matlamat Pembangunan Mampan (SDG), terutamanya SDG 12 yang menekankan penggunaan dan pengurusan sumber secara bertanggungjawab, serta SDG 6 yang berkaitan dengan penyediaan air bersih dan sistem sanitasi yang mampan. Oleh itu, kajian ini bukan sahaja memberi manfaat dalam konteks tempatan, malah berpotensi menyumbang kepada agenda global ke arah kelestarian alam sekitar.

Oleh itu, terdapat keperluan untuk memperkenalkan inovasi produk yang bukan sahaja mampu mengurus sisa dengan lebih sistematik, malah mudah digunakan di peringkat isi rumah. Reka bentuk tangki penyimpanan minyak masak terpakai yang dilengkapi dengan penunjuk aras berupaya memberi isyarat kepada pengguna mengenai tahap pengisian tangki. Produk inovasi ini secara tidak langsung dapat membantu dalam merancang masa pelupusan dan menggalakkan amalan pengurusan sisa yang lebih teratur, efisien dan lestari.

2. Kajian Literatur

Penggunaan sistem pengesanan paras dalam tangki sisa telah terbukti sebagai pendekatan efektif dalam pengurusan sisa domestik. Teknologi seperti sensor mampu memberi amaran awal kepada pengguna, seterusnya mengurangkan risiko limpahan dan pencemaran (Wahab et al., 2021). Sokongan terhadap inovasi penunjuk aras turut didorong oleh dapatan bahawa kekurangan peranti mesra pengguna menjadi antara punca utama pembuangan minyak masak secara tidak terkawal. Pendekatan visual yang mudah difahami dapat membantu pengguna membuat keputusan pelupusan secara lebih bertanggungjawab (Ahmad & Chong, 2022).

Dalam satu kajian lain, penggunaan indikator paras yang berkos rendah telah meningkatkan kesedaran pengguna dan mengurangkan pencemaran sistem pembetungan sehingga 40%, membuktikan kesan langsung terhadap kelestarian persekitaran (Tan et al., 2023). Laporan Agensi Alam Sekitar Malaysia (2020) turut mengiktiraf pentingnya teknologi pemantauan sisa isi rumah dalam menyokong Matlamat Pembangunan Mampan, khususnya SDG 6 dan SDG 12.

Rajah 2: Matlamat Pembangunan Mampan
(Sumber: https://sgs.upm.edu.my/artikel/matlamat_pembangunan_mampan_sdg-81260)

Dari aspek kesedaran, masih ramai pengguna menunjukkan tahap amalan yang sederhana dalam pengurusan minyak masak, dipengaruhi oleh pengetahuan, budaya pengumpulan dan kesedaran alam sekitar (Satinah et al., 2015). Maka, penunjuk aras yang praktikal boleh menjadi alat pendidikan tidak formal yang berkesan. Sementara itu, kajian terhadap premis makanan turut membuktikan bahawa kegagalan mengurus minyak masak menyumbang kepada pencemaran saliran, dan situasi ini memberi gambaran keperluan intervensi di peringkat kediaman (Nurul Syazrina et al., 2017).

Akhir sekali, walaupun akses kepada air bersih di Malaysia berada pada tahap tinggi (Indikator SDG, 2019), aspek sanitasi domestik termasuk pengurusan minyak masak terpakai masih memerlukan inovasi yang sistematik. Penunjuk aras dalam tangki simpanan pada singki

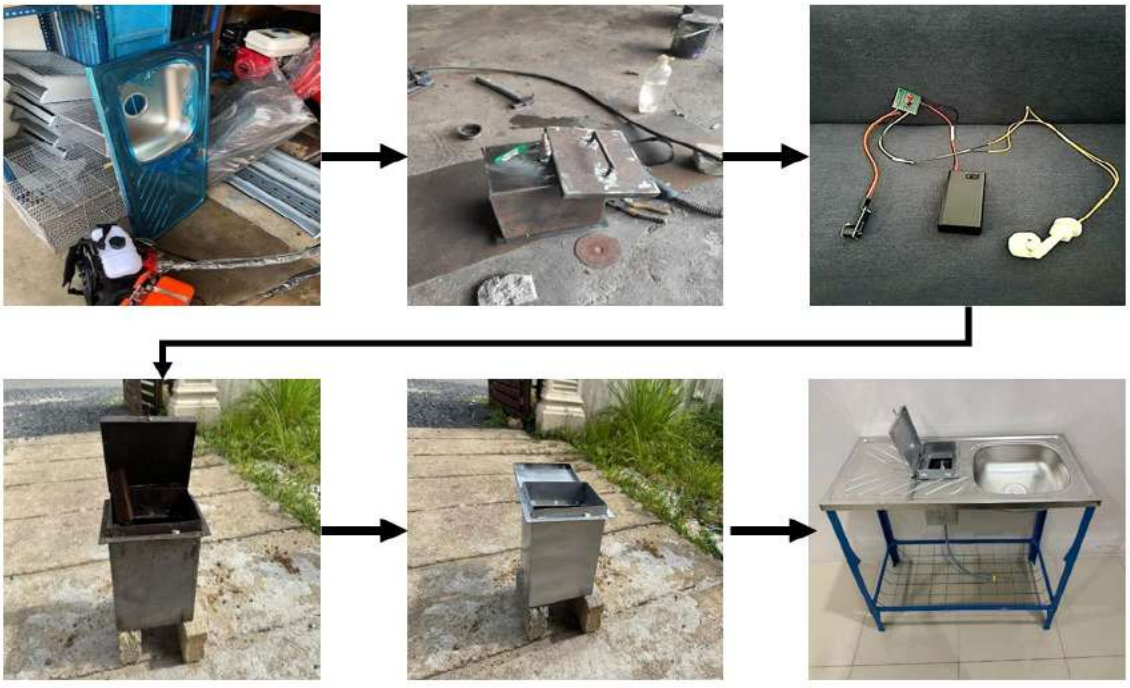
bukan sahaja memudahkan pengurusan minyak masak terpakai di peringkat kediaman, malah berpotensi menjadi sebahagian daripada penyelesaian mampan ke arah persekitaran yang lebih bersih dan lestari.

3. Metodologi dan Bahan

3.1 Reka Bentuk Produk

Produk inovasi ini direka bentuk dengan tujuan untuk memudahkan amalan pelupusan minyak masak terpakai di peringkat domestik secara lebih sistematik dan mesra pengguna. Reka bentuk produk ini mengintegrasikan struktur singki dapur dengan tangki penyimpanan khas yang diperbuat daripada keluli tahan karat setebal 5 mm dan berkapasiti 5 liter. Dimensi tangki ialah 25 cm tinggi, 15 cm lebar, dan 20 cm panjang.

Tangki ini dilengkapi dengan penderia pengesanan aras yang sensitif, berfungsi mengesan tahap minyak masak terpakai yang dibuang ke dalam tangki simpanan. Apabila minyak mencapai aras maksimum, sistem akan mengaktifkan bunyi buzzer dan nyalaan lampu LED sebagai amaran kepada pengguna. Isyarat ini bertujuan memaklumkan pengguna bahawa tangki perlu dikosongkan segera. Minyak masak terpakai boleh dialirkan keluar dengan mudah melalui paip saliran khas yang dipasang di bawah tangki, di mana pili pengalir yang boleh dikawal membolehkan pemindahan minyak ke dalam botol untuk tujuan pelupusan atau kitar semula secara sistematik dan mesra alam. Sistem ini bukan sahaja mengelakkan limpahan dan pencemaran, malah memudahkan proses pengurusan minyak masak terpakai secara lebih teratur, cekap dan lestari.

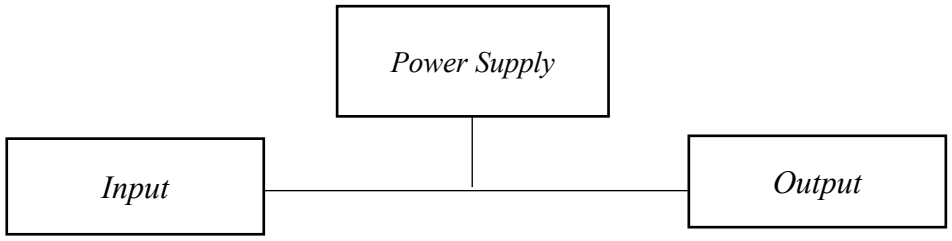


Rajah 3: Carta alir pembangunan produk

Dua agensi telah terlibat dalam proses validasi dan penilaian penambahbaikan reka bentuk iaitu *Green World Service Sdn. Bhd*. dan Jabatan Pengairan dan Saliran (JPS) Daerah

Dungun. Kedua-dua agensi turut mengeluarkan Surat Perakuan Sokongan sebagai pengiktirafan kepada keberkesanan produk inovasi ini dalam menyokong amalan kelestarian.

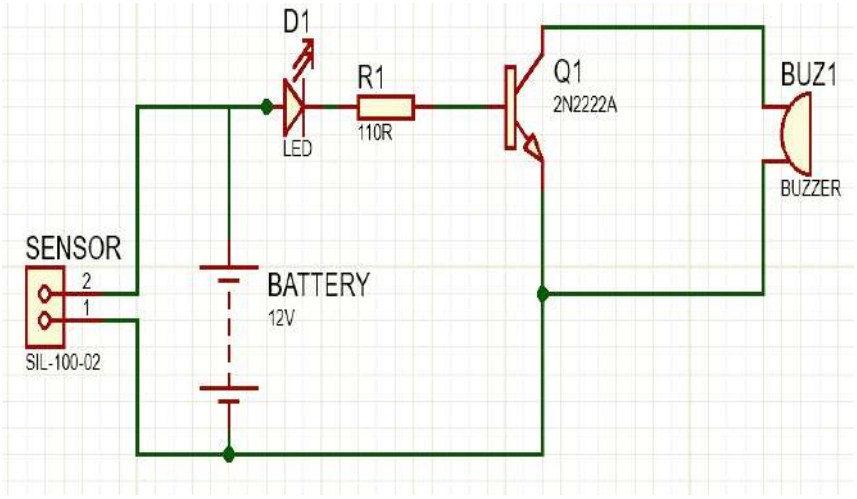
3.1.1 Gambarajah Blok dan Gambarajah Litar



1. Penderia pengesanan aras *(Levelling Sensor)*

1. Penderia pengesanan aras *(Levelling Sensor)*
2. *LED*

Rajah 4: Blok pembangunan produk



Rajah 5: Litar pembangunan produk

3.2 Pengumpulan Data

Data diperoleh menggunakan kaedah borang soal selidik dan temubual separa berstruktur. Seramai 86 orang penduduk Kampung Batu 7, Dungun telah dipilih sebagai responden secara rawak. Skop pemilihan responden adalah berdasarkan kriteria pengguna aktif dapur rumah tangga, berumur antara 20 hingga 60 tahun.

Borang soal selidik kajian ini dibahagikan kepada empat bahagian utama. Bahagian B, C dan D masing-masing mengandungi lima item dan menggunakan skala Likert empat mata. Bahagian B menilai aspek rekabentuk produk dari segi keselamatan, kefungsian indikator, kemudahan penggunaan serta keberkesanannya dalam memudahkan pengurusan minyak masak terpakai secara sistematik dan efisien. Bahagian C mengukur kesedaran responden terhadap kelestarian alam sekitar, termasuk peranan produk dalam mengurangkan risiko

penyumbatan pembentungan dan menyokong amalan pengurusan sisa yang bertanggungjawab. Bahagian D pula menilai persepsi pengguna terhadap kebolehfungsian produk dari sudut aplikasi di rumah atau premis makanan, potensi pasaran serta sumbangan kepada penjanaan pendapatan melalui penjualan minyak masak terpakai. Secara keseluruhan, struktur soal selidik ini membantu memperoleh gambaran menyeluruh terhadap penerimaan, keberkesanan dan potensi peluasan inovasi dalam kalangan komuniti.

Kajian rintis telah dijalankan ke atas 30 responden di lokasi berbeza sebelum pengumpulan data sebenar. Borang soal selidik direka berdasarkan struktur oleh Noraini Idris (2018) dan disesuaikan dengan konteks pengurusan sisa minyak masak. Hasil kajian rintis menunjukkan nilai kebolehpercayaan Alpha Cronbach sebanyak 0.90, yang menunjukkan instrumen mempunyai tahap kebolehpercayaan yang sangat baik. Ini sejajar dengan penemuan oleh Sekaran dan Bougie (2016) yang menyatakan bahawa nilai alpha melebihi 0.80 menunjukkan konsistensi dalaman yang tinggi.

3.3 Analisis Data

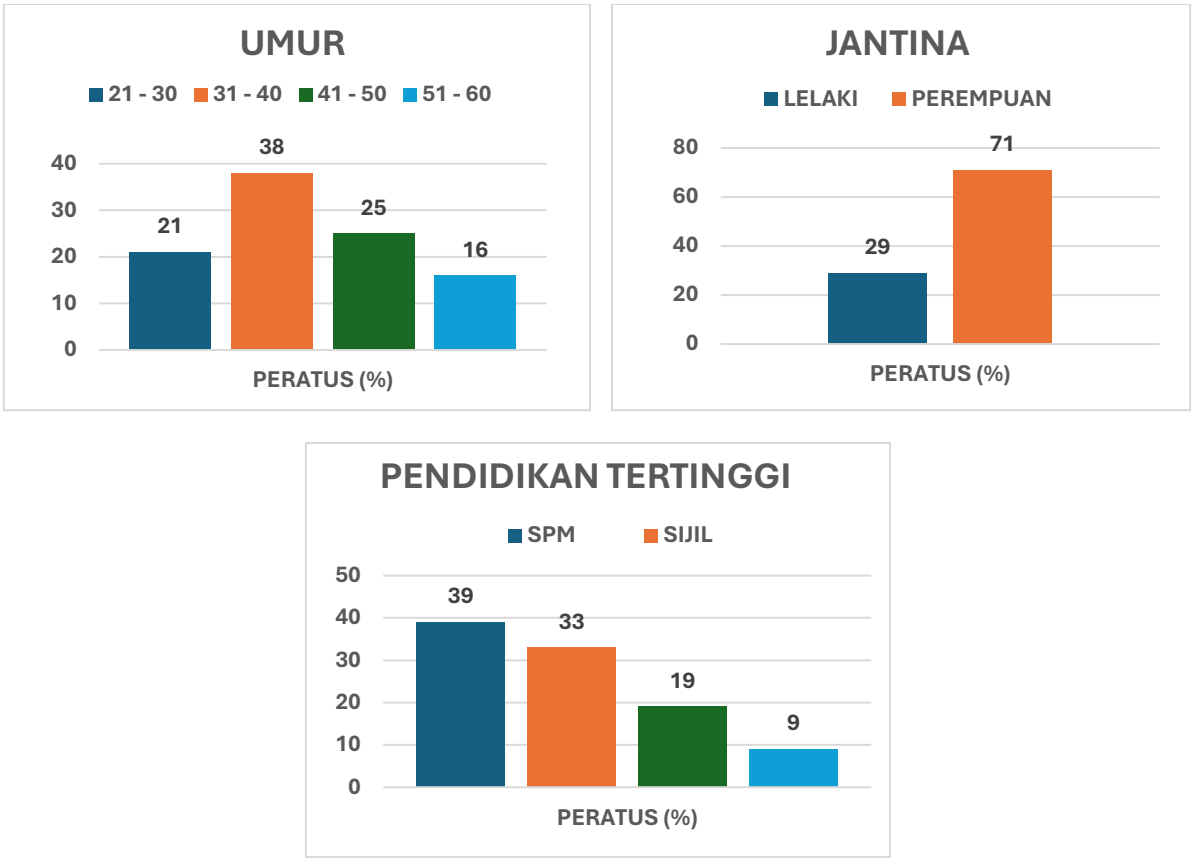
Data dianalisis secara deskriptif melalui kaedah frekuensi dan peratusan (%) bagi setiap item soal selidik. Hasil analisis digunakan untuk mengenal pasti tahap kesedaran, amalan semasa, serta penerimaan pengguna terhadap produk inovasi ini. Kaedah ini membolehkan penilaian dibuat secara sistematik dan jelas terhadap aspek reka bentuk, kelestarian, dan kebolehfungsian produk.

4. Keputusan

Rajah 6 menunjukkan carta pai analisis berkaitan umur, jantina dan pendidikan tertinggi responden. Hasil kajian terhadap 86 orang responden menunjukkan majoriti berumur antara 31 hingga 40 tahun (38%), diikuti oleh kumpulan umur 41–50 tahun (25%), 21–30 tahun (21%), dan hanya 16% terdiri daripada mereka yang berumur 51–60 tahun. Dari aspek jantina, 71% responden adalah perempuan, manakala 29% adalah lelaki, mencerminkan penglibatan aktif wanita dalam hal ehwal dapur dan pengurusan sisa rumah tangga.

Dari segi pendidikan tertinggi, responden dengan kelulusan SPM mencatatkan peratusan tertinggi iaitu 39%, diikuti oleh sijil (33%), diploma (19%), dan ijazah (9%). Data ini menunjukkan keperluan kepada produk inovasi yang mesra pengguna dan mudah dikendalikan tanpa memerlukan kemahiran teknikal yang kompleks.

Secara keseluruhan, profil demografi ini menyokong pembangunan inovasi yang ringkas, praktikal dan sesuai digunakan di peringkat isi rumah, khususnya dalam usaha memperbaiki sistem pengurusan minyak masak terpakai.



Rajah 6: Bahagian A – Demografi

Hasil dapatan bagi Bahagian B, seperti ditunjukkan dalam Jadual 1, memperlihatkan tahap penerimaan yang sangat tinggi terhadap rekabentuk produk inovasi ini. Kesemua lima item menerima respons positif daripada majoriti responden. Sebanyak 90% responden sangat bersetuju bahawa produk ini selamat digunakan, manakala 91% bersetuju bahawa indikator yang disediakan berfungsi dengan baik dan mudah difahami. Dapatan ini mencerminkan bahawa elemen keselamatan dan kefungsian produk berada pada tahap yang memuaskan serta direka bentuk mengikut keperluan pengguna sebenar di persekitaran domestik.

Bagi aspek kebolehgunaan, 83% responden sangat bersetuju bahawa produk ini mudah dikendalikan tanpa memerlukan kemahiran teknikal yang tinggi. Selain itu, 88% sangat bersetuju bahawa produk ini memudahkan proses pengurusan minyak masak terpakai, manakala 84% menyatakan produk ini membantu dalam melaksanakan amalan pengurusan minyak secara sistematik dan efisien.

Secara keseluruhan, dapatan ini membuktikan bahawa reka bentuk produk inovasi ini bukan sahaja diterima baik oleh pengguna dari sudut keselamatan, kefungsian, dan kemudahan penggunaan, tetapi juga dilihat sebagai penyelesaian berimpak dalam meningkatkan kecekapan pengurusan sisa di kediaman. Potensi penggunaannya secara meluas adalah tinggi, khususnya dalam usaha memperkenalkan amalan kelestarian yang mudah dan praktikal di peringkat isi rumah.

Jadual 1: Bahagian B - Rekabentuk Produk

Bil.	Soalan	Sangat Tidak Setuju		Tidak Setuju		Setuju		Sangat Setuju	
		N	%	N	%	N	%	N	%
1	Rekabentuk produk inovasi ini selamat digunakan.	0	0	0	0	9	10	77	90
2	Semua indikator yang terdapat pada produk inovasi ini berfungsi dengan baik dan mudah difahami.	0	0	0	0	8	9	78	91
3	Produk inovasi ini mudah dikendalikan.	0	0	0	0	15	17	71	83
4	Rekabentuk produk inovasi ini mampu menjadikan amalan pengurusan minyak masak terpakai terpakai menjadi lebih mudah.	0	0	0	0	10	12	76	88
5	Rekabentuk produk inovasi ini dapat membantu pengguna mengguruskan minyak masak terpakai dengan sistematik dan efisien.	0	0	0	0	14	16	72	84

Merujuk kepada Jadual 2, hasil dapatan bagi Bahagian C menunjukkan tahap persetujuan yang tinggi terhadap sumbangan produk inovasi ini dalam aspek kelestarian alam sekitar. Sebanyak 90% responden sangat bersetuju bahawa penggunaan produk ini dapat mengurangkan risiko penyumbatan sistem pembentungan, manakala 92% menyatakan bahawa ia berupaya meningkatkan kecekapan sistem pembentungan di kawasan kediaman. Dapatan ini membuktikan bahawa inovasi yang diperkenalkan berpotensi menjadi penyelesaian praktikal dan berkesan dalam menangani isu pencemaran sisa domestik secara lebih sistematik.

Selain itu, 94% responden sangat bersetuju bahawa produk ini mampu menarik minat orang awam untuk mengamalkan pengurusan sisa secara betul, sekali gus membantu membentuk budaya yang lebih bertanggungjawab terhadap alam sekitar. Tambahan pula, 93% menyatakan sokongan bahawa produk ini merupakan satu inisiatif yang baik untuk kelestarian alam sekitar, sejajar dengan keperluan semasa terhadap teknologi mesra pengguna dan lestari. Akhir sekali, 88% responden sangat bersetuju bahawa produk seumpama ini wajar dihasilkan secara lebih meluas sebagai satu usaha menyokong saranan kerajaan dalam memelihara alam sekitar.

Secara keseluruhannya, dapatan ini menunjukkan bahawa produk inovasi ini bukan sahaja diterima baik, malah dilihat sebagai satu langkah proaktif ke arah penyelesaian lestari yang menyumbang kepada pengurusan sisa domestik yang lebih bertanggungjawab, efisien dan mesra alam.

Jadual 2: Bahagian C - Kelestarian Alam Sekitar

Bil.	Soalan	Sangat Tidak Setuju		Tidak Setuju		Setuju		Sangat Setuju	
		N	%	N	%	N	%	N	%
1	Saya bersetuju produk inovasi ini dapat membantu mengurangkan risiko masalah sistem pembentungan tersumbat.	0	0	0	0	9	10	77	90
2	Saya bersetuju produk inovasi ini dapat membantu meningkatkan efisiensi sistem pembentungan pada kediaman dan kawasan persekitaran.	0	0	0	0	7	8	79	92
3	Saya bersetuju produk inovasi ini mampu menarik minat orang awam untuk mengamalkan amalan pengurusan sisa dengan cara yang betul.	0	0	0	0	5	6	81	94
4	Saya bersetuju produk inovasi ini merupakan satu inisiatif yang baik bagi mengekalkan kelestarian alam sekitar.	0	0	0	0	12	14	74	86
5	Saya bersetuju produk inovasi seumpama ini perlu dihasilkan sebagai satu usaha menyokong saranan kerajaan dalam mengekalkan kelestarian alam sekitar.	0	0	0	0	10	12	76	88

Merujuk kepada Jadual 3, dapatan bagi Bahagian D turut memperlihatkan tahap penerimaan yang amat positif terhadap kebolehfungsian dan potensi masa depan produk inovasi ini. Sebanyak 92% responden sangat bersetuju bahawa produk ini sesuai diaplikasikan di rumah kediaman, manakala 94% pula menyatakan persetujuan tinggi terhadap potensi perluasan penggunaannya kepada pengusaha restoran atau kafeteria, menunjukkan fleksibiliti produk dalam pelbagai konteks penggunaan.

Tambahan pula, 93% responden sangat bersetuju bahawa produk ini mempunyai potensi untuk dikomersialkan pada masa hadapan, menandakan keyakinan pengguna terhadap nilai pasaran dan kelestarian produk tersebut dalam jangka panjang. Dari segi ekonomi domestik, 86% responden menyatakan persetujuan bahawa produk ini boleh dimanfaatkan untuk menjana pendapatan sampingan melalui aktiviti penjualan semula minyak masak terpakai. Malah, 95% sangat bersetuju bahawa produk ini mampu menjadikan proses pengurusan minyak terpakai lebih sistematik, mudah dan berkesan.

Kesimpulannya, dapatan ini membuktikan bahawa produk inovasi ini tidak hanya memberi manfaat dari aspek teknikal dan kelestarian, tetapi turut dilihat berpotensi tinggi untuk dikembangkan secara komersial serta menyumbang kepada aspek ekonomi dan kebolehgunaan jangka panjang.

Jadual 3: Bahagian D - Persepsi Pengguna Terhadap Kebolehfungsian Produk

Bil.	Soalan	Sangat Tidak Setuju		Tidak Setuju		Setuju		Sangat Setuju	
		N	%	N	%	N	%	N	%
1	Saya bersetuju produk inovasi ini sesuai diaplikasikan di rumah kediaman.	0	0	0	0	7	8	79	92
2	Saya bersetuju produk inovasi ini boleh ditingkatkan penggunaannya dikalangan pengusaha restoran atau kafeteria.	0	0	0	0	5	6	81	94
3	Saya bersetuju produk inovasi ini boleh dikomersialkan pada masa akan datang.	0	0	0	0	8	9	78	91
4	Saya bersetuju produk inovasi ini mampu membantu pengguna menjana pendapatan dengan penjualan semula minyak masak terpakai.	0	0	0	0	12	14	74	86
5	Saya bersetuju produk inovasi ini mampu menjadikan proses pengurusan minyak masak terpakai lebih berkesan.	0	0	0	0	4	5	82	95

Rajah 7 menunjukkan Surat Perakuan Sokongan yang dikeluarkan oleh dua agensi iaitu *Green World Service* Sdn. Bhd. dan Jabatan Pengairan dan Saliran (JPS) Daerah Dungun, sebagai pengiktirafan terhadap keberkesanan produk inovasi ini dalam menyokong amalan kelestarian. Penglibatan kedua-dua agensi ini dalam proses validasi dan penilaian penambahbaikan reka bentuk membuktikan bahawa idea penghasilan produk ini adalah relevan serta selari dengan usaha ke arah pencapaian Matlamat Pembangunan Mampan (SDG), khususnya SDG 6 dan SDG 12.

Rajah7: Surat Perakuan Sokongan daripada *Green World Service Sdn. Bhd.* dan Jabatan Pengairan dan Saliran (JPS) Daerah Dungun

5. Kesimpulan

Kajian ini telah membuktikan bahawa produk inovasi yang dibangunkan berpotensi tinggi sebagai satu pendekatan alternatif yang praktikal, sistematik dan mesra pengguna dalam pengurusan minyak masak terpakai di peringkat domestik. Dapatan soal selidik daripada 86 orang responden menunjukkan tahap penerimaan yang sangat memberangsangkan, dengan 90.7% menyatakan bahawa indikator pada produk ini berfungsi dengan baik dan mudah difahami, manakala 95.3% pula bersetuju bahawa produk ini meningkatkan keberkesanan pengurusan minyak terpakai. Ini menunjukkan bahawa reka bentuk produk yang ringkas tetapi berfungsi dengan efisien telah memenuhi keperluan pengguna pelbagai latar belakang.

Tambahan pula, 94.2% responden bersetuju bahawa produk ini mampu menarik minat orang awam untuk mengamalkan pengurusan sisa secara bertanggungjawab, sekaligus menyokong matlamat kelestarian alam sekitar. Dapatan ini selari dengan kajian oleh Ramli et al. (2021) yang mendapati bahawa intervensi teknologi yang mudah dan bersifat mesra pengguna mampu meningkatkan penglibatan komuniti dalam pengurusan sisa domestik. Kajian oleh Kamaruddin et al. (2019) turut menyatakan bahawa pendekatan berasaskan inovasi domestik yang berfokus kepada kesedaran alam sekitar dapat mempengaruhi tabiat pengguna terhadap sisa minyak masak.

Penggunaan penunjuk aras pada tangki simpanan produk juga telah meningkatkan tahap kecekapan dan pemantauan sisa, sejajar dengan saranan Zaini et al. (2020) yang menekankan kepentingan integrasi elemen visual dalam teknologi domestik untuk meningkatkan pematuhan pengguna terhadap amalan kelestarian. Tambahan lagi, maklum balas positif dan sokongan daripada agensi berkaitan seperti *Green World Service* Sdn. Bhd. dan Jabatan Pengairan dan Saliran (JPS) Dungun memberi pengiktirafan kepada kebolehgunaan dan keberkesanan produk ini dari sudut teknikal dan alam sekitar.

Secara keseluruhan, inovasi ini bukan sahaja menyumbang kepada pemeliharaan sistem perparitan dan kebersihan awam, malah menyokong Matlamat Pembangunan Mampan SDG 6, iaitu memastikan pengurusan air dan sanitasi yang mampan. Pada masa yang sama, reka bentuk yang memudahkan proses pelupusan minyak masak terpakai secara sistematik dan mudah digunakan turut sejajar dengan SDG 12, yang menekankan penggunaan dan pengeluaran secara bertanggungjawab. Potensi peluasan aplikasi produk ini ke sektor komersial seperti restoran dan kafeteria menunjukkan keupayaannya untuk memberi impak yang lebih meluas dalam jangka masa panjang. Oleh itu, penambahbaikan berterusan dan pengkomersialan produk ini berpotensi menjadi pemangkin kepada inovasi masa depan yang lebih teratur, cekap dan lestari, selaras dengan agenda kelestarian negara.

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Assistive Mobility and Health Management System for Paralysis Patient

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Abstract
Paralyzed patients cannot move any part of their body. This makes it difficult for them to do their daily routine by themselves. They need people to care and help them. Their guardian is also not necessarily always by their side 24 hours a day. Since it is difficult for these paralyzed patients to communicate over long distances, this project was created to facilitate the work of their caregivers. By combining IoT innovation with healthcare expertise, the project aims to transform the delivery of care for paralyzed patients, improve clinical outcomes, promote independence, and reduce caregiver stress. The need for personalized and accessible healthcare solutions is due to the challenges faced by paralyzed patients. This project uses an accelerometer as a hand movement sensor, a NodeMCU as a processor, and an LCD and buzzer as outputs. Two types of hand movements will be detected, and a message will be displayed on the LCD. The notification will be sent via Telegram. By moving the hand up means they need help, and moving the hand to the left means they need a drink of water. If no movement is detected, it means everything is alright. Patients can use this tool when needed, and caregivers can also use it regardless of whether they are still connected to the same Wi-Fi. With this, caregivers don't have to worry anymore when they are away from the patient. This device can help paralyzed patients live more easily and improve their quality of life. The challenges of doing daily routines will also decrease. This project also has been tested on paralyzed patients at Dungun Hospital, Terengganu and successfully received recognition from the hospital.

Key Words**:** *Paralysis, Patient, Hand Movement*

1. Introduction

As we all know, paralysis is a loss of muscle function in the body parts. It can affect any part of the body at any time, then probably won't feel the affected area. Technical and therapeutic innovations are there to improve the quality of life. This is important to develop a device that should be easy to use and should be affordable, which consists of a basic healthcare monitoring system with nursing care. These people are unable to convey their message or needs. To overcome this problem, this project comes up with a system that helps these patients to display messages by very simple motion.

The Internet of Things (IoT)-based paralyzed healthcare system is intended to assist patients in communicating vivid images and patient information to caregivers, nannies, or their loved ones via the internet. The Internet of Things (IoT)-based paralysis patient health care system is intended to assist patients in communicating with physicians, nurses, or family members while seated at home or at work over the internet. To accomplish this capability, the system uses circuitry based on microcontrollers. It uses a server and client system as well as a hand motion recognition circuit. Using an accelerometer, the hand motion circuit detects hand movements. It then wirelessly transmits this information to the client system using a WiFi module. These commands are intended to be received and processed by the client system and displayed over the LCD display, and notification will be sent via Telegram as well as transmitting the data online over one's mobile application.

This project focuses on IoT for paralysis patient healthcare brings substantial value by enhancing quality of life, providing remote monitoring for timely intervention, supporting caregivers, and enabling data-driven healthcare. They empower patients, drive cost savings and efficiency, foster innovation, and promote global accessibility in healthcare. Overall, these projects have far-reaching implications in improving patient outcomes, advancing healthcare delivery, and driving technological innovation in the industry.

2. **Literature Review**

Based on the research by Prajakta A. Jadhav et al. (2021), many people are suffering from physical disabilities due to paralysis or some accidental problem. Most of these patients are dependent on caretakers. Paralysis is a condition in which there is impairment of one or more muscles in the body. To assist these patients' microcontroller-based circuitry plays a major role in system. Sometime appliances are also controlled by patient's hand motion. This system also monitors patient's heartbeat, if it exceeds normal value then buzzers will be activated, and message will be shown on LCD to doctors and caretakers to attend patient.

J.S Sujin et al. (2021) says IoT based observation and intimation of a paralyzed patient healthcare system, is designed to help the patient to convey their health issues/status and various messages to the doctor, nurses, or to the caretaker over the internet or by sending a message. Our proposed system works by reading the data of the patient, in case of any non-typical value of blood pressure, oxygen level, or any other desired sensor for the patient. Any worst-case scenario will be intimated by a message or over the internet to the doctor or to the caretaker. This system takes care when the patient is most of the time not taken care and any worst scenarios it sends a message through GSM and uploads to the cloud. It also buzzers when it receives a risk message. In this way our project truly automates caretaking ability of the patient which ensures periodically.

Visalakshi Annepu et al. (2023) says their system aims to provide comprehensive care to individuals with paralysis, including symptom monitoring, medical treatment, and rehabilitation. The IoT-based system comprises interconnected devices, such as sensors, wearables, and mobile apps that communicate with one another and with healthcare providers. The system can track patients' vital signs, activity levels, and medication adherence, and provide immediate feedback to healthcare providers. Additionally, the system can aid with rehabilitation exercises, send reminders, and gather data on progress to enhance treatment outcomes. The system's intelligent analytics can also assist healthcare providers in detecting patterns in patient behavior and tailoring treatment plans more effectively. Overall, an IoT-based paralysis healthcare system has the potential to transform healthcare delivery by offering personalized, real-time care and monitoring to individuals with paralysis.

Manoj Dhondiram Patil et al. (2024) with their system, The Paralyzed Patient Monitoring System is a key healthcare innovation designed to improve quality of life and healthcare management for individuals suffering from paralysis or severe motor impairment. This system uses advanced technology and sensors to continuously monitor and provide real-time data on the patient's vital signs, body position and environmental conditions. The primary goal is to ensure the safety and well-being of paralyzed patients while offering valuable insights to healthcare providers and caregivers.

Kruthika Godavari et al. (2024) says IOT-based paralysis patient health care system is a system designed to help the patient convey various messages to doctors, nurses, or his/her loved ones sitting at home or office over the internet. The system makes use of microcontroller-based circuitry to achieve this functionality. It makes use of a hand motion recognition circuit and a receiver plus transmitter circuit. The hand motion circuit is used to detect hand movements using an accelerometer gyro and then transmit this information wirelessly over RF to the receiver system. The receiver system is designed to receive and process these commands and display them over the LCD display as well as transmit the data online over to the IOT gecko server. The IO gecko server then displays this information online, to achieve the desired output.

3. Methodology

3.1 Flow Chart

Figure 1 and **Figure 2** shows the flow Chart for the system. Firstly, the sensor must detect movement so this system can be operated. If there's no movement detected, the LCD will display "All is well," which means the patient is in a good condition. This system can operate wirelessly as long as there is an internet supply. The accelerometer sensor, ADXL345, will read the data from the patient's hand's movement and then send the data to both microcontrollers, which are NodeMCU ESP8266 and ESP32, by using WiFi. NodeMCU ESP8266 will act as the server, and ESP32 will act as the client. The data will be sent wirelessly. Next, the ESP32 will receive the data, and the LCD will display the message. Other than that, the guardian will also get notifications via telegram.

Next, if the patient tilts their hand down a little, notification will be sent by telegram to the guardian, and the LCD will display the sentence "need help" with a buzzer sound to attract the attention of the guardian. The LED will also turn on. If the patient tilts their hand to the right, then the LCD will display "need water drink.".

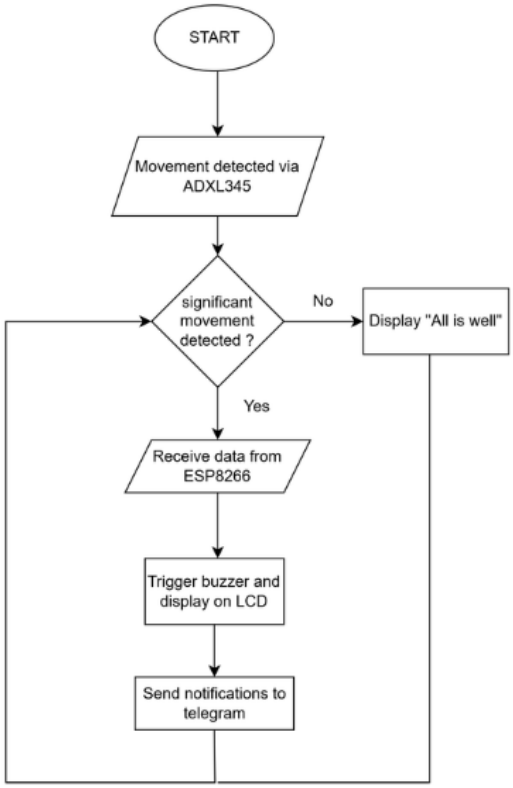

Figure 1: Flow Chart for the User

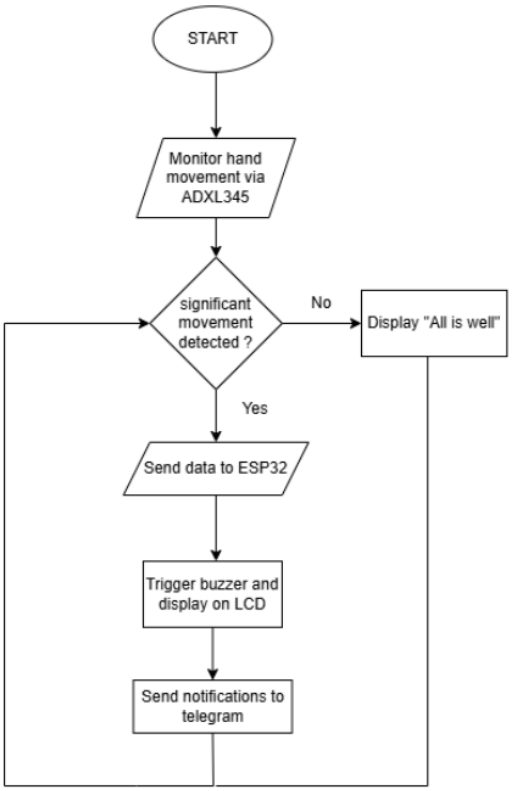

Figure 2: Flow Chart for the Client

3.2 Block Diagram and Schematic Diagram

This project involves an IoT-based system using the ADXL345 accelerometer to detect hand movements of a paralysis patient, with a NodeMCU ESP8266 acting as the server and an ESP32 as the client. This system operates wirelessly over Wi-Fi, sending data between the microcontrollers. Based on detected hand movements, the system triggers different responses, including displaying messages on an LCD, activating a buzzer and

LED, and sending notifications to a Telegram bot for the caregiver. **Figure 3**, **Figure 4** and **Figure 5** shows the block diagram and the circuit for this project.

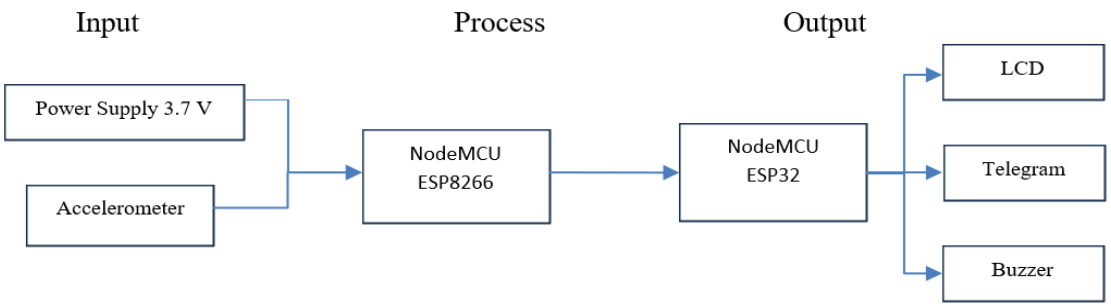

Figure 3: Project's Block diagram

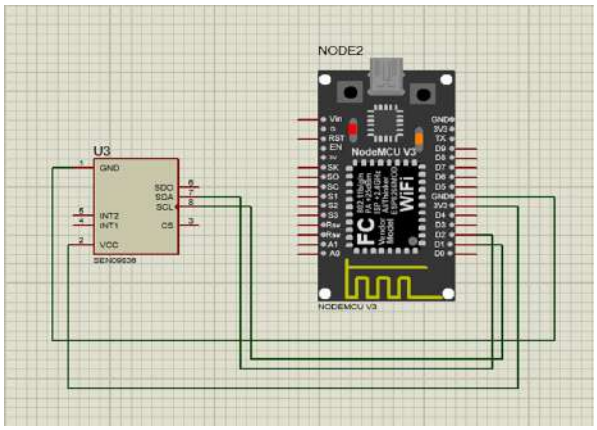

Figure 4: Schematic Diagram for Server

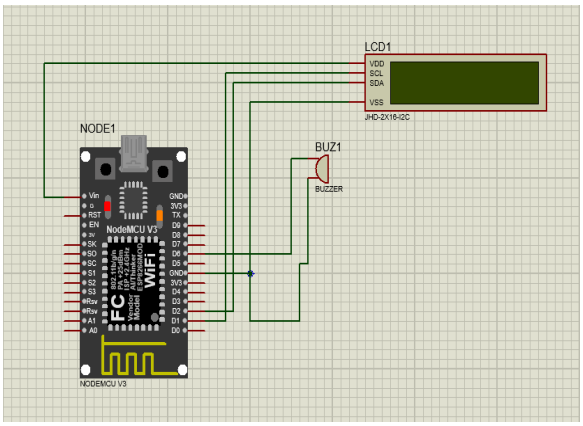

Figure 5: Schematic Diagram for Client

4. Result

The ADXL345 accelerometer plays a central role in detecting hand movements. It reads data from the patient's hand on three axes (X, Y, Z) and sends this information to the NodeMCU ESP8266. The hand movements correspond to specific actions; no movement detected: Indicates the patient is in a stable condition, and the LCD displays, "All is well." Move the hand up, indicating the patient needs help, triggering a buzzer, LED, and a Telegram message to notify the caregiver, while the LCD displays "Need help.". While also sending a notification via Telegram. Move the hand right, indicating the patient needs water, and the LCD displays "Need water drink.". The ADXL345 effectively detects small tilt variations, making it suitable for detecting subtle movements from the patient's hand. Ensuring proper calibration of the accelerometer is critical for accurate movement detection and minimizing false positives or negatives.

The system operates wirelessly by transmitting data from the NodeMCU ESP8266 (server) to the ESP32 (client) via Wi-Fi. The NodeMCU reads the accelerometer data and sends it to the ESP32, which processes the data to control various components like the LCD, buzzer, and LED. NodeMCU ESP8266 is responsible for gathering movement data from the ADXL345

and sending it to the ESP32. Its efficient handling of sensor readings ensures that data is transmitted quickly to avoid delays in the system's response time. The ESP32 receives this data and acts accordingly, displaying the correct message on the LCD and triggering notifications. Its role is crucial in ensuring the system's real-time response. Maintaining a stable Wi-Fi connection is essential for reliable operation, as any interruptions could delay or prevent critical messages from being sent to the caregiver.

The LCD display provides crucial real-time feedback by showing the patient's status based on the detected hand movements. The messages shown on the LCD include "All is well" when no significant hand movement is detected, indicating the patient is stable. "Need help" is triggered by a moving hands-up, indicating the patient needs assistance. "Need water drink" is triggered by a right-hand tilt, indicating the patient requires water. **Figure 6** shows the finishing product for this project.

This project has been tested on paralyzed patients at Dungun Hospital, Terengganu, and successfully received recognition from the hospital. According to the hospital, this project is highly beneficial for application. The patients also agreed, stating that the project is user-friendly and easy to use. **Figure 7** shows the testing that has been done at Female Ward in Hospital Dungun, Terengganu.

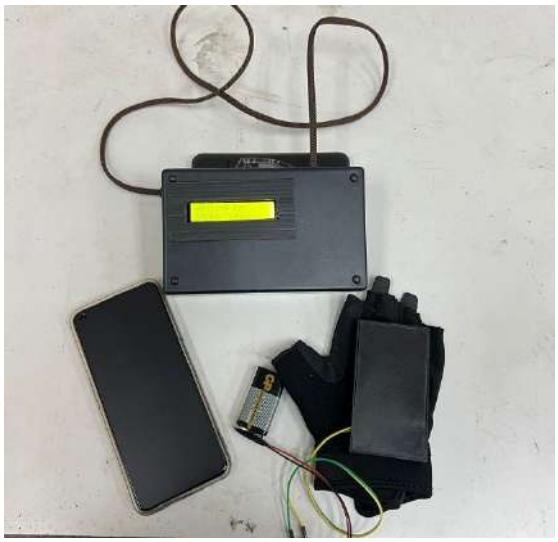

Figure 6: Assistive Mobility and Health Management System for Paralysis Patient

Figure 7: The testing Process at Hospital Dungun

5. **Conclusion**

The IoT-based healthcare system for monitoring paralysis patients has strong commercial potential in various markets, including remote patient monitoring (RPM) and assistive technology. It offers real-time alerts, movement detection, and multi-channel notifications, making it a valuable tool for both healthcare providers and home care. The system is affordable and scalable, with the potential for integration into telehealth platforms, smart home systems, and AI-driven data analytics. It can serve both hospitals and individuals. Customization for other disabilities and elderly care further broadens its market reach, and obtaining healthcare certifications could enhance its credibility. Overall, the system addresses growing demands for accessible and efficient patient care solutions. To enhance this IoT-based healthcare system for monitoring paralysis patients, several improvements can be

made. First, improve movement detection by calibrating the ADXL345 sensor and considering additional sensors like gyroscopes for more accurate readings. Incorporating a backup communication method such as a GSM/4G module will ensure notifications are sent even if Wi-Fi fails. Power efficiency can be optimized by implementing sleep modes and including a battery backup to ensure uninterrupted operation. Adding voice command integration and customizable alerts would offer more flexibility for user interaction, while cloud-based data logging and AI can help track and analyze patient movements over time for predictive insights. To ensure redundant alert systems, consider using multiple channels like email along with louder buzzers or vibrational alerts. Expanding the system to include vital sign monitoring such as heart rate or temperature would provide a more comprehensive health overview. A dedicated mobile app could simplify caregiver monitoring and control, and developing a compact, waterproof, wearable design would allow continuous, unobtrusive monitoring.

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Beca Elektrik : E-Beca

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Abstrak

Projek ini membentangkan reka bentuk, pembangunan, dan pelaksanaan beca elektrik sebagai satu penyelesaian mobiliti lestari di kawasan bandar. Berasaskan reka bentuk tradisional beca kayuh, beca elektrik ini menggabungkan teknologi pendorongan elektrik moden untuk mengatasi kekangan seperti kebergantungan kepada kayuhan manual, kapasiti terhad, dan kesan alam sekitar. Kenderaan ini direka untuk mencapai jarak perjalanan antara 20–40 km bagi setiap cas penuh, dengan kelajuan maksimum 15–30 km/j dan kapasiti beban penumpang sehingga 190 kg. Proses pembangunan merangkumi peringkat konsep reka bentuk, pemilihan komponen, pembinaan prototaip, ujian prestasi, dan penambahbaikan berterusan, dengan penekanan kepada aspek keselamatan, ketahanan, dan kebolehcapaian pengguna. Dengan mengurangkan pelepasan karbon dan menawarkan alternatif pengangkutan jarak dekat yang boleh dipercayai, beca elektrik menyumbang ke arah persekitaran bandar yang lebih bersih, inklusif dan efisien. Projek ini menekankan potensi penyelesaian mikromobiliti elektrik dalam membentuk masa depan pengangkutan lestari.

***Kata Kunci*:** *Beca elektrik, pelancongan, bateri, brushless motor*

1. Pengenalan

Beca merupakan salah satu pengangkutan tradisional yang mempunyai nilai sejarah dan budaya tersendiri di Malaysia, terutamanya di negeri-negeri yang kaya dengan warisan seperti Terengganu. Di Terengganu, beca bukan sahaja berperanan sebagai alat pengangkutan, tetapi juga sebagai simbol identiti tempatan yang menarik minat pelancong dari dalam dan luar negara. Kawasan pelancongan popular seperti Pasar Payang, Kampung Cina, dan dataran bandaraya sering menyaksikan kehadiran pelancong yang ingin menikmati suasana bandar melalui perjalanan beca yang santai dan unik.

Namun begitu, penggunaan beca tradisional semakin berkurangan berikutan kebergantungan kepada kayuhan manual yang memerlukan tenaga fizikal tinggi, menyebabkan ia tidak lagi praktikal untuk digunakan secara meluas, terutama dalam keadaan cuaca panas dan perjalanan jarak sederhana. Hal ini memberi kesan kepada daya tarikan pelancongan dan kemudahan mobiliti di kawasan bandar serta kawasan pelancongan. Tambahan pula, masih terdapat komuniti di kawasan ini yang menghadapi cabaran dari segi akses kepada pengangkutan awam yang efisien dan inklusif. Ini termasuk golongan warga emas, pelancong yang kurang upaya, serta peniaga kecil yang memerlukan pergerakan jangka pendek dengan kos yang rendah.

Sehubungan itu, pengenalan kepada beca elektrik atau E-Beca dilihat sebagai satu penyelesaian inovatif dan lestari yang mampu menangani isu-isu tersebut. Tidak seperti beca tradisional yang memerlukan pengayuh menghabiskan tenaga fizikal secara berterusan, E-Beca hanya menggunakan pendikit untuk bergerak, sekaligus mengurangkan keletihan dan meningkatkan kecekapan pemanduan. Inovasi ini juga sejajar dengan keperluan untuk memperkenalkan sistem pengangkutan mesra alam yang menyokong agenda pembangunan lestari dan pelancongan hijau di Terengganu. Menurut kajian oleh Gössling dan Hall (2021), penggunaan pengangkutan elektrik di kawasan pelancongan dapat mengurangkan pencemaran udara, bunyi bising, dan kesesakan lalu lintas, sekali gus meningkatkan kualiti

pengalaman pelancong serta imej destinasi tersebut sebagai lokasi pelancongan mampan. Ini turut disokong oleh laporan UNWTO (2017) yang menekankan kepentingan pengangkutan rendah karbon dalam menyokong matlamat pembangunan pelancongan global yang lebih inklusif dan berdaya tahan.

Projek ini dijalankan dengan tujuan utama untuk mereka bentuk dan membangunkan beca elektrik yang praktikal dan sesuai digunakan dalam persekitaran pelancongan bandar seperti di Terengganu. Proses pembangunan projek ini melibatkan penggunaan perisian kejuruteraan seperti Autodesk Inventor dalam mereka bentuk komponen beca. Seterusnya, kerja-kerja mekanikal dan elektrikal dijalankan untuk membina prototaip E-Beca yang lengkap dan berfungsi. Akhir sekali, kajian ketahanan dan prestasi dijalankan melalui ujian praktikal untuk menilai kebolehgunaan serta daya tahan sistem dalam persekitaran sebenar. Diharapkan projek ini dapat menjadi pemangkin kepada penggunaan beca elektrik yang lebih meluas dalam sektor pelancongan tempatan, sekali gus menyumbang kepada pembangunan pengangkutan bandar yang lebih hijau dan mampan.

Rajah 1: Beca tradisional di Kuala Terengganu

Skop projek pembangunan beca elektrik ini merangkumi aspek-aspek utama seperti reka bentuk, pembangunan, pengujian, dan pelaksanaan sistem yang sesuai digunakan di kawasan luar bandar dan jalan berturap. Projek ini memberi tumpuan kepada pembinaan sebuah beca elektrik yang dapat digunakan secara praktikal dalam persekitaran sebenar dan memenuhi keperluan asas pengguna dari segi kecekapan, keselamatan, dan keselesaan. Keseluruhan reka bentuk dan pemilihan komponen adalah bertujuan untuk menghasilkan beca elektrik yang bukan sahaja mesra pengguna dan mudah diselenggara, tetapi juga mampu menyokong mobiliti lestari dalam persekitaran pelancongan dan komuniti luar bandar.

Beca elektrik yang dibangunkan melalui projek ini direka untuk membawa beban maksimum dengan anggaran sebanyak 200 kilogram, menjadikannya sesuai untuk membawa dua orang penumpang pada satu masa. Dari aspek saiz fizikal, panjang keseluruhan beca ialah dua meter, manakala lebarnya ialah satu meter, memberikan ruang yang mencukupi untuk penumpang dan kestabilan semasa bergerak. Beca ini menggunakan bateri boleh cas semula jenis lead asid 48 volt sebagai sumber tenaga utama. Motor yang digunakan pula ialah motor arus terus tanpa berus (*brushless direct current* – BLDC) dengan kuasa motor yang digunakan 250 watt.

2.0 Kajian Literatur

Dalam era pembangunan lestari, sektor pengangkutan pelancongan memainkan peranan penting dalam memastikan pergerakan pelancong dilakukan secara cekap dan mesra alam. Salah satu pendekatan yang semakin mendapat perhatian ialah penggunaan beca elektrik, khususnya untuk penjalanan jarak pendek di kawasan tumpuan pelancong. Di bandar-bandar pelancongan seperti Kuala Terengganu, pelancong sering melakukan lawatan singkat ke kawasan warisan seperti Kampung Cina, Masjid Kristal, dan Pasar Payang. Penjalanan singkat seperti ini tidak memerlukan kenderaan bersaiz besar atau berkelajuan tinggi, tetapi lebih sesuai menggunakan pengangkutan ringan seperti beca yang menawarkan pengalaman tempatan yang autentik.

Walau bagaimanapun, penggunaan beca tradisional yang digerakkan secara manual mempunyai keterbatasan dari segi tenaga manusia, keletihan, dan keupayaan membawa penumpang dalam jangka masa panjang. Di sinilah peranan beca elektrik menjadi relevan. Kajian oleh Gössling dan Hall (2021) menunjukkan bahawa pengangkutan ringan berasaskan tenaga elektrik, seperti beca elektrik, mampu mengurangkan pelepasan karbon serta bunyi bising di kawasan pelancongan yang padat. Selain itu, ia memberikan keselesaan kepada pelancong sambil mengekalkan elemen warisan tempatan melalui reka bentuk klasik beca.

Penggunaan *Brushless Direct Current* (BLDC) hub motor semakin meluas dalam pengangkutan ringan elektrik seperti basikal elektrik, skuter, dan trishaw elektrik kerana kecekapan tenaga, penyelenggaraan rendah, dan reka bentuk padatnya. Motor jenis ini tidak memerlukan berus karbon, menjadikan operasi lebih senyap dan tahan lama (Sulaiman et al., 2020).Untuk sistem pemanduan beca elektrik, motor BLDC hub sangat sesuai kerana ia terletak terus dalam roda (in-wheel), mengurangkan keperluan bagi rantai atau transmisi luaran. Ini menjadikan sistem lebih ringkas dan mengurangkan kehilangan tenaga mekanikal. Menurut kajian oleh Hasan et al. (2021), penggunaan motor BLDC hub berkuasa 250W hingga 750W mencukupi untuk membawa beban penumpang sehingga 150 kg pada kelajuan purata 25–30 km/j.

Tambahan pula, teknologi seperti motor BLDC dan bateri litium-ion memberikan kelebihan teknikal kepada beca elektrik. Motor BLDC berkuasa antara 250 watt hingga 750 watt mampu menggerakkan beca dengan lancar tanpa keperluan pedal, menjadikannya sesuai untuk kawasan rata dan perjalanan singkat antara 2 hingga 5 kilometer, yang lazim dalam aktiviti pelancongan harian (Liu et al., 2018). Sementara itu, penggunaan bateri litium-ion 48 volt pula menawarkan jangka hayat lebih panjang dan pengecasan semula yang lebih cepat, membolehkan pengusaha pelancongan mengoperasikan beca ini dengan efisien dan kos penyelenggaraan yang rendah (Nykvist & Nilsson, 2015).

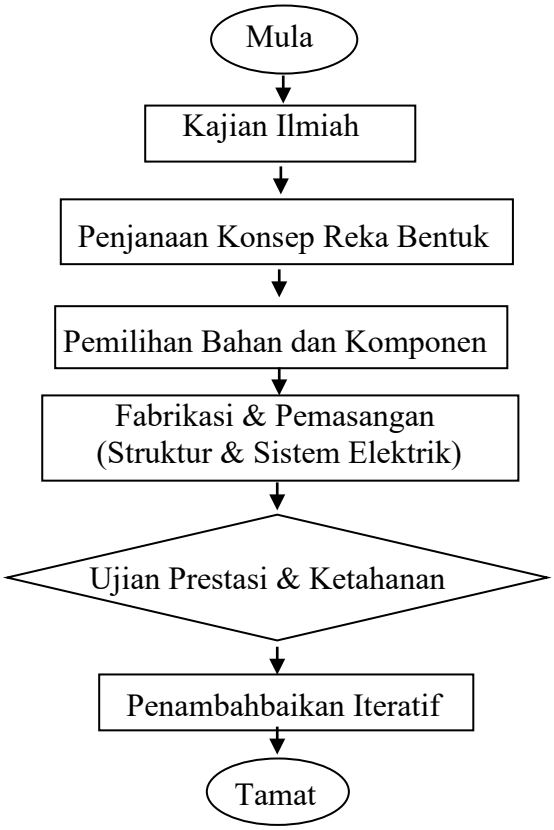
Dari segi prestasi, kawalan kelajuan BLDC hub motor lebih lancar, serta sesuai untuk persekitaran bandar dan pelancongan, khususnya di kawasan bersejarah seperti Terengganu, di mana tahap kebisingan dan pencemaran harus diminimumkan. Menurut Ahmad et al. (2022), sistem beca elektrik yang menggunakan motor BLDC mempunyai kecekapan yang baik dalam aplikasi jarak dekat dan dalam kawasan pelancongan.

Di negara-negara seperti India dan Thailand, penggunaan beca elektrik telah terbukti meningkatkan akses pelancong ke kawasan bandar lama dan warisan sejarah tanpa menjejaskan persekitaran (Sharma & Singh, 2020). Kejayaan ini boleh dijadikan model kepada negeri seperti Terengganu yang turut menekankan keseimbangan antara pembangunan pelancongan dan pemeliharaan alam sekitar. Melalui penggunaan beca elektrik dalam penjalanan singkat, pengalaman pelancong dapat dipertingkatkan secara lebih lestari,

inklusif dan menarik. Literatur terdahulu jelas menunjukkan bahawa beca elektrik bukan sahaja praktikal dari aspek teknikal, malah berpotensi besar dalam memperkukuh ekonomi pelancongan tempatan, menjadikan pengalaman pelancong lebih mesra alam dan menyenangkan.

3. Metodologi dan komponen

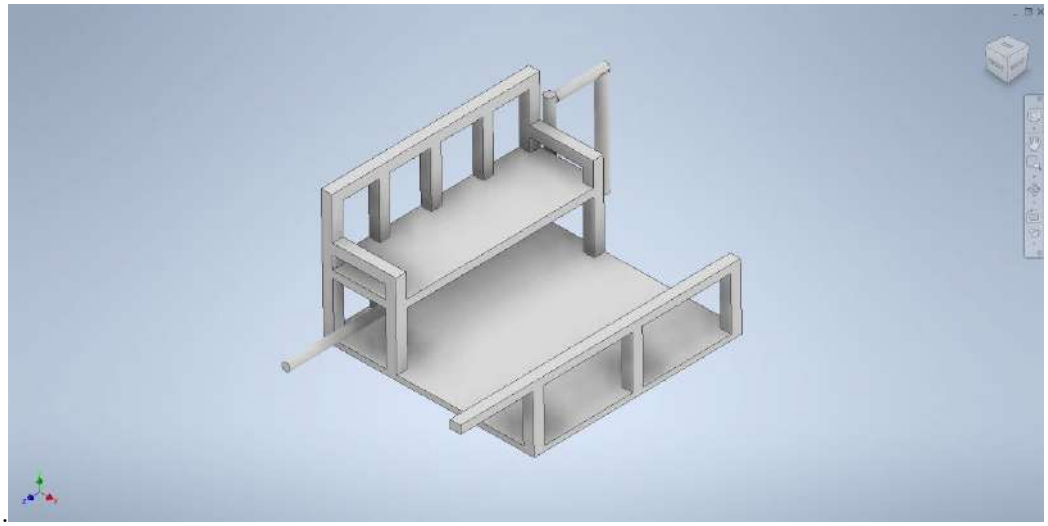
Metodologi dalam projek pembangunan beca elektrik ini merangkumi beberapa fasa utama yang dijalankan secara berperingkat bagi memastikan hasil akhir menepati keperluan dari segi reka bentuk, fungsi dan keselamatan. Kaedah yang digunakan merangkumi pendekatan praktikal kejuruteraan yang melibatkan reka bentuk menggunakan perisian CAD, pemilihan komponen, pemasangan sistem mekanikal dan elektrik, serta ujian prestasi dan ketahanan seperti yang ditunjukkan dalam Rajah 2 carta alir projek E-Beca.



Rajah 2: Carta alir projek E-Beca.

3.1 Rekabentuk Konsep

Perisian Autodesk Inventor digunakan untuk penjanaan konsep reka bentuk kerangka tempat duduk penumpang. Dalam fasa ini, struktur asas beca elektrik direka dengan mengambil kira aspek ergonomik, saiz, anggaran kapasiti beban maksimum sebanyak 200 kg, serta keperluan untuk menampung dua orang penumpang. Lukisan teknikal tiga dimensi dibangunkan sebagai panduan untuk proses fabrikasi. Rajah 3 menunjukkan rekabentuk kerangka ruang duduk muatan dua penumpang E-Beca yang akan dipasang pada basikal yang bersaiz rim 24 inci. Manakala Rajah 4 pula menunjukkan rekabentuk akhir E-Beca yang di pasang BLDC hub motor dan ruang duduk penumpang serta berbumbung.



Rajah 3: Rekabentuk kerangka ruang duduk penumpang

Rajah 4: Rekabentuk e -beca

3.2 Komponen

Komponen yang digunakan dalam membangunkan E-Beca ini ialah seperti berikut:

1. Basikal bersaiz rim 24 inci
2. Hub motor elektrik Brushless *Direct Current* (BLDC) 250 Watt, 32-48 Volt
3. Pengawal motor elektronik (*Electronic Speed Controller* – ESC) dan pendikit elektrik (*throttle*)
4. Empat bateri bateri plumbum-asid *(lead-acid battery)* 12 Volt
5. Keluli lembut berongga 1inci x 1 inci dan 1 inci x 2 inci untuk rangka beca

Rajah 5: Set hub motor BLDC, pengawal motor elektronik dan pendikit elektrik

3.3 Proses Fabrikasi

1. Penyediaan reka bentuk dan komponen
   Reka bentuk lengkap E-Beca dirujuk termasuk dimensi rangka, lokasi komponen elektrik, dan susun atur tempat duduk.
2. Pemotongan besi berongga
   Besi berongga dipotong mengikut ukuran yang ditetapkan dalam lukisan teknikal dengan menggunakan pemotong logam tepat
3. Kimpalan MIG
   Kaedah kimpalan MIG digunakan untuk membina rangka utama tempat duduk penumpang serta struktur bumbung. Kimpalan ini dipilih kerana kekuatan dan kemasan yang baik.
4. Pemasangan rangka basikal
   Rangka basikal utama disambungkan ke casis tempat duduk penumpang untuk membentuk struktur lengkap E-Beca dengan dua bahagian utama.
5. Kerja pengukuran dan penyesuaian komponen elektrik
   Ukuran pek bateri diambil dan lokasi pemasangan ditentukan di bahagian belakang E-Beca untuk keseimbangan berat yang optimum.
6. Penutupan casis dengan plat logam
   Plat logam dipotong dan dipasang untuk melengkapkan casis serta memberikan perlindungan kepada bahagian dalaman termasuk komponen elektronik.
7. Pemasangan tempat duduk
   Tempat duduk penumpang dan pemandu dipasang pada casis menggunakan bolt dan rangka penahan bagi memastikan kestabilan dan keselesaan.
8. Pendawaian sistem elektrik
   Pendawaian dilakukan untuk menyambungkan pengawal (controller), pek bateri, motor elektrik, dan komponen elektronik lain seperti lampu, suis, hon, dan paparan bateri.
9. Kerja mengecat rangka
   Cat digunakan untuk melindungi struktur logam daripada hakisan, diikuti dengan kemasan cat warna pilihan untuk penampilan yang menarik.
10. Ujian prestasi
    Ujian dilakukan untuk menilai kelajuan maksimum, dan ketahanan bateri dalam keadaan operasi sebenar.

Rajah 6: E-Beca yang berjaya dihasilkan

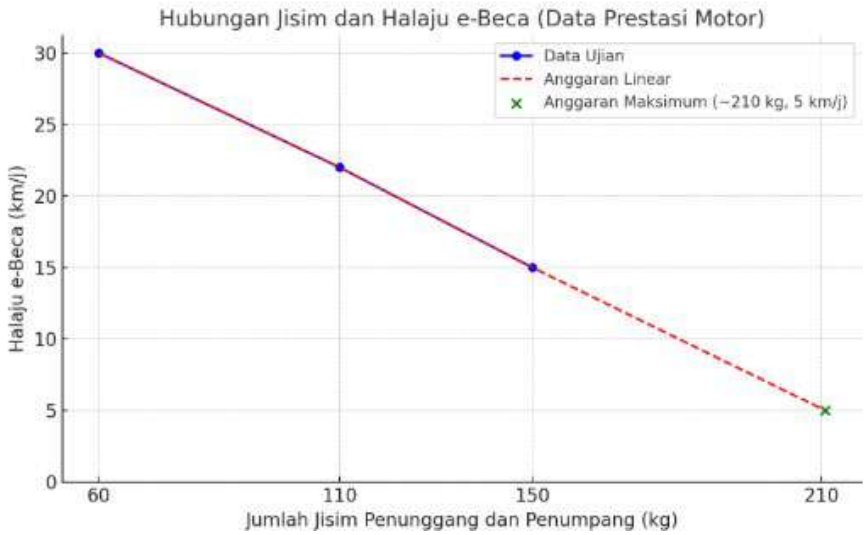
4.0 Pengujian dan keputusan

Dalam projek E-Beca ini, motor elektrik *brushless direct current* (BLDC) jenis hub digunakan dengan kuasa berkapasiti 250W. Pemilihan motor ini dibuat berdasarkan keperluan aplikasi pelancongan yang memerlukan pemanduan yang senyap, lancar, dan cekap dari segi penggunaan tenaga. Motor BLDC juga dikenali kerana kecekapan tinggi, tork yang disalurkan terus ke roda, serta keperluan penyelenggaraan yang rendah berbanding motor BLDC konvensional. Selain itu, motor BLDC jenis hub membolehkan penghantaran tork terus ke roda tanpa memerlukan sistem transmisi luaran seperti rantai atau tali sawat. Ini menjadikan sistem lebih ringkas, ringan, dan meningkatkan kecekapan keseluruhan. Kecekapan penghantaran tenaga ini amat penting bagi memastikan bateri dapat digunakan secara optimum, sekaligus memanjangkan jarak perjalanan bagi setiap pengecasan.

Bagi menilai prestasi motor dalam keadaan sebenar, satu siri ujian telah dijalankan untuk menguji keupayaan BLDC motor dalam menggerakkan E-Beca dengan pelbagai jumlah penumpang dan jisim beban yang berbeza. Ujian dilakukan di laluan rata bagi memastikan hasil yang konsisten. Jadual 1 di bawah menunjukkan keputusan ujian halaju E-Beca berdasarkan jumlah penumpang dan jumlah jisim yang dibawa. Daripada data ujian yang dikumpulkan, didapati bahawa peningkatan jisim penumpang dan penunggang memberi kesan ketara terhadap halaju operasi E-Beca.

Jadual 1: Halaju E-Beca berdasarkan jisim penunggang dan penumpang

Jumlah Jisim (kg)	Halaju (km/j)
60	30
110	22
150	15



Rajah 8: Graf jisim melawan halaju E-Beca

Graf ini menunjukkan hubungan linear antara jumlah jisim dan halaju e-beca berdasarkan data prestasi terbaru. Berdasarkan unjuran, motor 250W dijangka mencapai halaju minimum 5 km/j apabila menanggung jisim sekitar 193 kg. Maka, had beban maksimum yang disarankan untuk memastikan operasi stabil ialah lebih kurang 190 kg. Oleh itu, pemilihan kapasiti motor perlu dipertimbangkan dengan teliti bergantung kepada beban sasaran dan kondisi geografi kawasan operasi E-Beca.

Walau bagaimanapun, kemampuan motor untuk menanggung beban bukan sahaja bergantung kepada spesifikasi kuasa motor semata-mata, tetapi juga sangat dipengaruhi oleh nilai voltan bateri yang digunakan. Voltan yang lebih tinggi membolehkan motor menghasilkan tork yang lebih besar, sekaligus meningkatkan keupayaan E-Beca untuk membawa beban yang lebih berat atau mendaki cerun. Sebaliknya, apabila voltan bateri menurun (contohnya akibat tahap cas yang rendah), prestasi motor juga akan berkurang secara ketara. Oleh itu, pengurusan tenaga bateri yang cekap dan pemilihan sistem bateri yang sesuai dari segi kapasiti dan voltan amat penting untuk memastikan prestasi operasi E-Beca kekal optimum dalam pelbagai keadaan beban.

5.0 Kesimpulan

Projek E-Beca ini telah berjaya mencapai objektif yang ditetapkan, iaitu membangunkan sebuah beca yang digerakkan sepenuhnya oleh kuasa elektrik. Reka bentuk E-Beca yang tidak menggunakan sistem pemacuan luaran seperti rantai atau tali sawat menjadikannya lebih mudah untuk diselenggara, sekaligus mengurangkan kos operasi jangka panjang. Dari sudut estetika, penampilannya yang bersih, moden dan kemas amat sesuai untuk persekitaran pelancongan, terutamanya di kawasan bandar dan destinasi pelancongan pesisir.

Dari segi prestasi, E-Beca menunjukkan kebolehoperasian yang konsisten, dengan kemampuan menampung beban tiga orang dewasa (seorang penunggang dan dua penumpang) secara selesa. Motor elektrik berkuasa 250W yang digunakan adalah mencukupi untuk operasi di kawasan rata pada kelajuan rendah, seperti yang lazim di laluan pelancongan. Namun, untuk penggunaan di kawasan berbukit atau dengan beban berlebihan, pertimbangan terhadap sistem kuasa tambahan seperti bateri berkapasiti lebih tinggi atau bantuan tenaga solar adalah dicadangkan bagi mengekalkan tahap prestasi optimum.

Menariknya, E-Beca ini masih mengekalkan fungsi untuk dikayuh secara manual. Ini memberikan kelebihan tambahan, terutamanya apabila bateri kehabisan atau berada pada

tahap voltan rendah yang tidak mencukupi untuk menggerakkan motor. Bagi memastikan prestasi sistem elektrik berada dalam keadaan terbaik, bateri perlu dicas sehingga penuh sebelum digunakan. Amalan pengecasan penuh bukan sahaja membantu menjamin kelancaran operasi tetapi juga memanjangkan jangka hayat bateri dan sistem motor secara keseluruhan.

Walaupun E-Beca yang dibangunkan menunjukkan prestasi yang memuaskan di kawasan rata dan pada kelajuan rendah, terdapat ruang penambahbaikan dari segi keupayaan operasi di kawasan berbukit atau ketika membawa muatan berlebihan. Oleh itu, satu cadangan yang berpotensi ialah penggunaan sistem tenaga solar sebagai sumber kuasa tambahan. Pemasangan panel solar di atas bumbung E-Beca dapat membantu mengecas bateri secara berterusan semasa operasi, sekaligus mengurangkan kebergantungan sepenuhnya kepada pengecasan berwayar. Inisiatif ini bukan sahaja dapat memanjangkan jarak perjalanan E-Beca, malah menyokong amalan penggunaan tenaga boleh diperbaharui selari dengan matlamat pembangunan lestari. Selain itu, integrasi teknologi ini juga dapat meningkatkan nilai komersial dan daya tarikan E-Beca dalam sektor pelancongan hijau.

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Designing and Developing Web Based System for e-Khairat Kematian For Badan Khairat Mukim Kuala Paka

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Abstract

The Khairat Kematian system is a traditional form of financial assistance provided to families who have experienced the loss of a loved one, aimed at easing the burden of managing funeral arrangements and related expenses. However, the current manual management of this system is inefficient, time-consuming, and prone to human errors, leading to delays in the disbursement of funds and challenges in record-keeping. This research proposes the development of a technology-based management system to address these challenges. The methodology involves designing and implementing a web-based platform that streamlines the process of fund distribution, enhances the accuracy of records, and improves overall efficiency. The system also aims to increase transparency in the allocation of funds, fostering trust among community members. Initial results indicate that the digital platform reduces processing time, minimizes human errors, and ensures timely support for bereaved families. In conclusion, modernizing the Khairat Kematian system through digital platforms not only improves operational efficiency but also reinforces the values of solidarity, mutual responsibility, and communal welfare, making it more relevant and effective for today's society.

Key Words: *Khairat Kematian, Web Based, System*

1. Introduction

Khairat Kematian is a form of donation or financial assistance given to heirs or families who have lost a family member as support in managing the management of the remains and related matters. With the development of information technology, manual death charity management systems are often inefficient and require a lot of time and energy. Therefore, a technology-based death charity management system needs to be developed to increase efficiency and effectiveness in the management of these donations.

In the modern era, the management of Khairat Kematian has evolved along with the advancement of technology. The integration of digital platforms enables a more streamlined process, reducing delays in disbursement of funds and ensuring aid reaches those in need immediately. Furthermore, technology allows for better record keeping and transparency, which is essential for maintaining trust in the community. Therefore, the modernization of Bereavement Management is essential to maintain its relevance and effectiveness in supporting bereaved families.

Finally, death charity also acts as a medium that strengthens the relationship between community members. Through the contributions given by the members of the community, a form of cooperation indirectly exists, where everyone contributes to taking care of the common welfare. This further strengthens social bonds in the community, where concern and sense of responsibility towards fellow community members is enhanced. Good bereavement charity management can also reflect a thriving culture of helping each other in a society.

2. Problem Statement

The Badan Khairat Mukim Kuala Paka currently relies on paper-based records for managing member information, which presents a series of operational challenges. This manual system makes accessing essential data, such as member details in the event of a death, a slow and cumbersome process. The inefficiency of searching through physical records not only delays response times during critical moments but also creates significant organizational burden

(Kumar, S., & Choudhury,2016). As the volume of paper records increases, the need for additional storage space grows, resulting in escalating costs for physical storage and maintenance. Furthermore, the lack of a centralized, digital system limits the ability to remotely access or update records, further hindering operational efficiency (Elbashir, M.Z., & Williams, T., 2012). These challenges underscore the urgent need for a modern, streamlined, and web-based data management system that enhances accessibility, reduces operational costs, and improves overall efficiency. Such a system will support the Badan Khairat Mukim Kuala Paka in providing timely and efficient services to its community.

3. Objective

The proposed studies are listed as below:

i. To identify the requirements for e-Khairat Kematian Management System.
ii. To identify and develop an efficient and effective e-Khairat Kematian Management system.
iii. To test and implement the e-Khairat Kematian Management System.

4. Scope

This system will be organized by Administrator. For the Administrator, they can access all the systems including Head of Zone and Member. Below are the processes that will be operated by the Administrator.

5. Literature Review

Khairat Kematian is a community-based financial aid program in Islamic tradition that provides monetary assistance or services to ease the financial burden on a deceased person's family, covering funeral expenses and related costs. Zhang, X., & Lee, K. (2018) conclude that web-based systems are particularly effective in reducing errors and improving efficiency in times of crisis, such as during a death or emergency event. Turner, H., & Green, S. (2019) in the case study saw the organization saw improvements in service delivery, faster response times during emergencies, and reductions in both operational costs and physical storage needs. It operates through collective contributions from members, typically managed by mosques, religious organizations, or cooperatives, where participants pay a small monthly or yearly fee. In the event of a member's death, their family receives support as outlined by the fund, reflecting the Islamic principle of ta'awun (mutual help) and fostering a spirit of shared responsibility within the community.

The development of a web-based e-Khairat Kematian system creates an online platform to manage funeral aid programs. It starts by identifying key needs, such as registering members, tracking payments, processing claims, and generating reports. The system is designed with a simple interface and a database to store member details, payments, and claims. Developers use modern technologies like HTML, JavaScript, and PHP with secure databases like MySQL. Features include automated notifications and secure user login. After development, the system is tested for errors, security, and compatibility. It is then hosted on a reliable server for online access.

The purpose of a web-based e-Khairat Kematian management system is to streamline and digitize the management of contributions, member records, and fund disbursement processes for Khairat Kematian programs. This system provides a centralized platform for members and administrators to manage data efficiently, ensuring transparency, accuracy, and iaccessibility. Rios, A., & Smith, M. (2024 in their research say it simplifies tasks such as member registration, contribution tracking, fund allocation, and notification of claims, reducing manual work and errors. Additionally, it facilitates real-time updates, improves

communication between members and administrators, and enhances overall service delivery, aligning with modern technological standards while preserving the essence of community support.

6. Methodology

The Agile methodology is a project management approach that involves breaking the project into phases and emphasizes continuous collaboration and improvement. Teams follow a cycle of planning, executing, and evaluating. Furthermore, it is the latest model used by major companies today like Facebook, Google, Amazon, etc. It follows the iterative as well as incremental approach that emphasizes the importance of delivering of working product very quickly. This article focuses on discussing Agile Methodology in detail.

The reason why we choose Agile Model as our Methodology because Agile methodology allows for changes in requirements even in the later stages of development. This flexibility is essential for the e-Khairat Kematian Management System, as the needs and requirements of users (such as administrators, heads of zones, and members) may evolve during the project. In addition, Agile promotes close collaboration between developers and stakeholders. For a community-focused system like e-Khairat Kematian, this ensures that the system aligns with the community's goals and values, fostering trust and cooperation.

Figure 1: Agile Model

6.1 Logical Design

Figure 2 shows the context diagram of E-Permit System. Context diagrams show the interactions between a system and other actors (external factors) with which the system is designed to interface. System context diagrams can clarify the context which the system will be part of. They are used early in a project to get agreement on the scope and can be included in a requirements document. A context diagram shows the entire system as a single process.

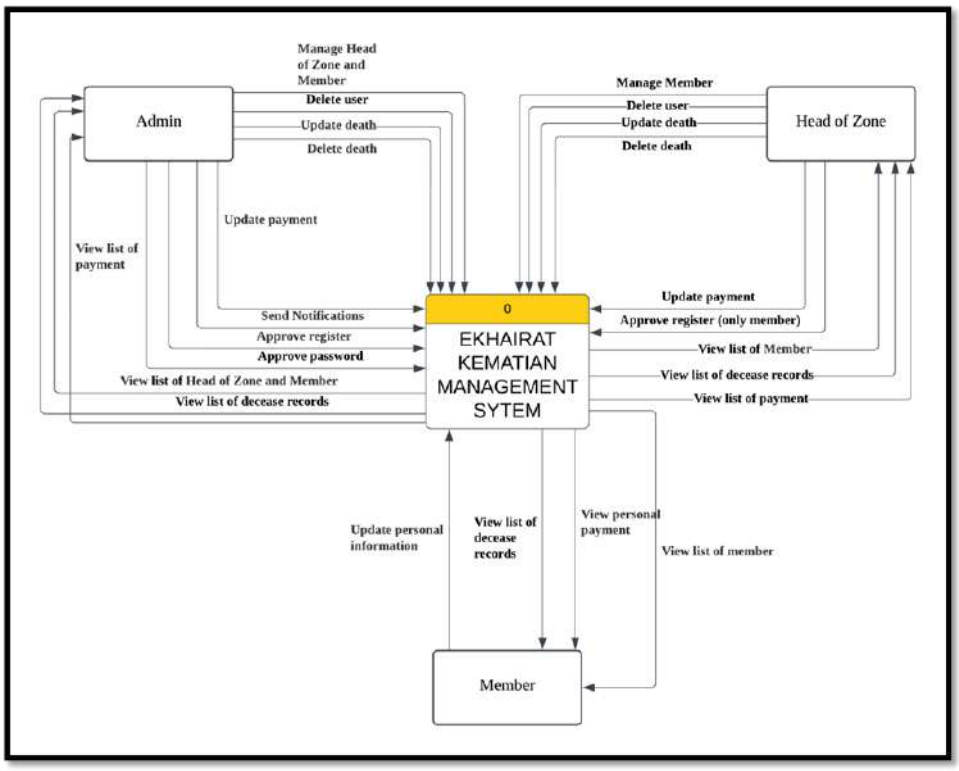

Figure 2: Context diagram of E-Permit System

6.2 Physical Design

The physical design of the e-Khairat Kematian Management System focuses on an organized and user-friendly interface, with intuitive navigation, accessible data entry points, and clear, modern layouts to streamline the management and retrieval of information related to membership and death records.

Physical design relates to the actual input and output processes of the system. It focuses on how data is entered into a system, verified, processed, and displayed as output. It produces the working system by defining the design specification that specifies exactly what the candidate system does. It is concerned with user interface design, process design, and data design. Figures 3, 4, 5 and 6 shows the example of physical design of e-Khairat Kematian Management System.

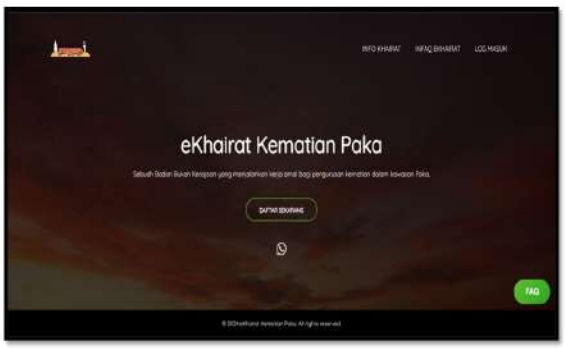

Figure 3: Main Menu Interface

Figure 4: Login Interface

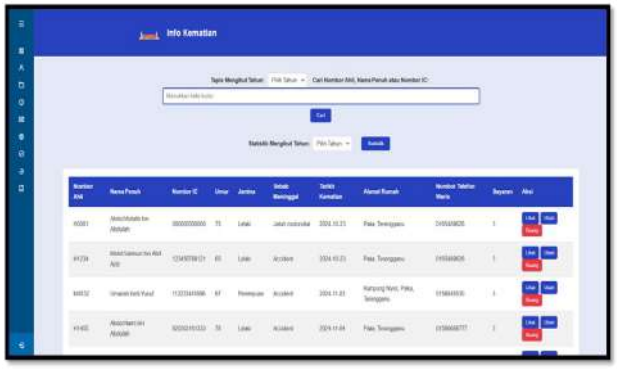

Figure 5: Death Info Interface

Figure 6: Payment Record

6.3 Hardware and Software Requirement

This system was developed using PHP programming language, XAMPP web server, MySQL database, Bootstrap and Cascading Style Sheets (CSS).

7. Data Analysis

After the development phase is completed, unit testing has been done to the process to test the smallest functional unit of code.

7.1 Unit Testing

The purpose of unit testing is to validate that each unit of the software code performs as expected. Table 1 shows the analysis of unit testing that has been done. Based on the analysis, it can be concluded that e-Khairat Kematian Management System passes the testing overall.

Table 1: Unit Testing Analysis

User Scope	Process	Pass (%)	Fail (%)
Admin	Login	100	0
	Manage User	100	0
	Add/View Death	100	0
	Update Death	100	0
	Manage Payment	100	0
	Manage Notification	100	0
	Manage Death Record		
Head Of Zone	Register	100	0
	Login	100	0
	Manage User	100	0
	Manage Payment	100	0
	Manage Notification	100	0
	Manage Death Record	100	0
Ahli	Login		
	Update Personal Info	100	0
	View Payment Record	100	0
	View Death Record	100	0
	View List of members	100	0

7.2 Integration Testing

Integration Testing is a collection of integration tests that focus on functionality. The purpose of this test is to expose defects in the interaction between these software modules when they are integrated. Table 2 shows the analysis of Integration Testing that has been done.

Table 2: Integration Testing Analysis

No	Test Case Name	Test Procedure	Expected Result	Pass (%)	Fail (%)
1	Home button	Click the 'home' button to go back to the home page.	Stay at the homepage.	100	100
2	Menu Button	Click the 'Menu Button button to preview drop downlist	Menu list will appear.	100	100
3	Login Button	Click the 'Login' button to access thesystem	Login popup pagewill appear.	100	100
4	Manage Death Button	Click the Death Info to go to Death Info	Death Info page will appear.	100	100
5	Manage Payment Button	Click the Payment Record to go to Payment	Payment Record page will appear.	100	100
6	ChatBot AI Button	Click the ChatBot button to go to Bunting page	ChatBot AI page will appear.	100	100

8. Conclusion

In the modern world, Khairat Kematian plays a crucial role in providing financial support to families during times of loss, helping manage funeral expenses. However, traditional manual management systems are often inefficient, time-consuming, and prone to errors. To improve this, organizations should develop a centralized digital platform that automates donations and fund distribution, making it easier for both administrators and members to manage contributions. Incorporating technologies like blockchain or cloud systems can enhance transparency and accountability by enabling real-time tracking of funds. A mobile app would improve accessibility, allowing members to contribute, receive notifications, and access support from their smartphones. Continuous training for administrators and users is essential for smooth adoption, and engaging the community to raise awareness will help encourage participation. By embracing modern technology, Khairat Kematian organizations can enhance efficiency, ensure timely fund distribution, and strengthen the community's trust in this important charitable practice.

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Development of a Dynamic Website and AI Assistant for Raise the Bar Fitness

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Abstract

New digital technologies have impacted the fitness industry by requiring sophisticated ways of engaging and managing customers. Most gyms have automated management systems that allow for little to no direct interaction with the customer and do not provide individualized service, reducing satisfaction. This paper outlines the creation of a website that is interactive and has an AI powered assistant designed to improve user experience and facilitate better service delivery and ease in the management of gym activities for 'Raise the Bar Fitness.' Following the Rapid Application Development (RAD) approach, this project is based on iterative cycles where every cycle integrates user input to enhance the robustness and user friendliness of the developed solution. The components of the system include an interactive website, an AI chatbot serving as the customer service representative, and a managerial membership dashboard. Usability testing showed a 35% increase in customer engagement, a 40% improvement in response time, and higher operational productivity. The work demonstrated serves as a step toward the increasing body of research focused on AI powered digital platforms by illustrating the applied use of automation, customization, and thorough analysis in the management of a gym and provides guidance for future developments of fitness solutions using technology.

Keywords*: Dynamic Website; AI Assistant; Rapid Application Development (RAD); Membership Dashboard; Gym Management System.*

1. Introduction

The fitness industry is undergoing a major shift in digitization due to increased use of artificial intelligence (AI), data analysis, and automation. These new technologies have changed the thinking of consumers and their expectations, as members of gyms expect to be served in real-time and offered customized solutions along with systemically available services (Huang & Rust, 2020). Nevertheless, a large portion of the industry continues to use outdated digital systems, disengaged users, which in turn has made operational inefficiency industry norms and customer retention highly evasive (Johnson & Brown, 2020). Despite increased use of AI in other industries, most fitness centers still have poorly integrated digital systems with no provisions for real-time AI assistance, customized workout suggestions, or automated admin functions (Lopez, 2021). Many gym platforms have basic functionality aimed at tracking membership, but do not have intelligent automation that enables behavioral analysis, predictive fitness trend mapping, and providing appropriate assistance (Shumanov & Ewing, 2021). Such inadequacies lead to slow responsiveness, poor decision making, and decreased capability to meet the changing demands of members. In turn, this leads to unsatisfactory member experience and engagement over a period of time.

According to AI-enhanced systems for gym management, operational productivity and customer retention improve significantly (Kapoor & Gupta, 2022). For example, the employment of AI technologies such as chatbots that were installed in fitness platforms showed a 35% increase in user engagement and 40% decrease in time required for responding to customers (Shumanov & Ewing, 2021). Furthermore, gym owners are better able to manage resources and offer personalized services with the use of smart membership dashboards that have predictive analytic capabilities (Johnson & Miller, 2022). Nonetheless, there are still most fitness centers that do not have a well-defined digital environment where AI-enabled

communication, dynamic media dissemination, and automated decision making based on data are combined.

This study focuses on creating a dynamic website alongside an intelligent assistant for "Raise the Bar Fitness," while targeting significant gaps in gym management system automation. In conjunction with a user-friendly website for service provision, this system will utilize an AI chatbot for customer feedback capture, a membership dashboard for data intelligence, and a seamless service interface with the aim of improving member retention and engagement, operational efficiency, and enhancing gym management. Implementation of this project will be based on the Rapid Application Development (RAD) model, which ensures constant user feedback and iterative improvement along with quick delivery of actionable solutions. Meeting these needs, the study adds to the literature on artificial intelligence and fitness management automation by showing how AI-powered automation, data processing systems, and intelligent user interfaces can transform the functioning of a gym while increasing the user's experience.

2. Literature Review

The adoption of artificial intelligence (AI) and digital technologies has brought about a radical transformation within the fitness industry. These innovations have improved operational efficiency, customer engagement, and personalization, making AI permeated solutions indispensable in contemporary gym management (Huang & Rust, 2020). AI applications are now automating customer relations and resource management, driving innovation in the operational side of fitness. Studies show that AI fitness platforms are essential in the ever-changing world of fitness because they enhance retention rates, revenue, and even service delivery (shumanov & Ewing, 2021).

The incorporation of AI technology, such as smart chatbots, smart scheduling, and interactive dashboards, has altered how gyms interact with members, providing automated assistance and tailored fitness recommendations in real-time ‘Lopez, 2021’. AI-powered analytics give actionable data insights to gyms. This enables accurate decision-making regarding membership control, marketing plans, and operational activities ‘Kapoor & Gupta, 2022’. The COVID-19 pandemic has accelerated this shift further by forcing fitness facilities to adopt virtual coaching, AI powered customer services, and integration of wearable fitness devices so they could maintain services ‘Johnson & Brown, 2020’. Research suggests that automation driven by AI technology leads to 35% higher customer engagement and 40% less administrative work, especially in the case of the fitness industry ‘Shumanov & Ewing, 2021’.

AI technology in fitness has moved past operational efficiency, and the ability to improve user satisfaction has become equally important. Users' preferences, performance, and biometric data can now be used to create individualized plans and provide feedback in real-time. AI platforms can also analyze historical data to make predictions (Quytech, 2024). Personalization enhances motivation and adherence to fitness programs, while also improving retention rates in fitness centers by providing a higher value interaction (Johnson & Miller, 2022). There is a higher demand for AI-enabled virtual trainers because users are shifting toward a more adaptive use of technology in exercising (OnGraph, 2023).

AI technology can offer numerous advantages but poses some limitations in fitness management as well. The most prominent of which include privacy and security concerns regarding personal data, reliability of the system, and the frequency with which AI models need to be updated (Forbes, 2023). Fitness recommendations provided by AI must be accurate, adaptable and contextualized in order to provide a safe and effective solution. In addition, the ability to understand user intent to provide contextually tailored experiences requires further

development of Natural Language Processing (NLP) and Predictive analytics in AI. Enhancing health monitoring through IoT, augmented reality workouts, and machine learning coaching are some directions for future innovation to improve user interaction and AI powered gym management.

2.1 Comparison of Fitness Platforms

The key components of mobile usage, subscription conditions, ease of use, and design are examined for three fitness service providers: IFit.com, BelieveFitness.com, and KFitness.com. These fitness websites differ in their subscription policies. IFit.com and KFitness.com have more flexible subscriptions as compared to BelieveFitness.com, which is likely to dissatisfy some of the customers (Lopez, 2021). Shumanov and Ewing (2021) note that most users prefer using mobile apps. While IFit.com and BelieveFitness.com have mobile applications, KFitness.com does not have this feature. This could potentially lead to lower retention rates for KFitness.com.

BelieveFitness.com's customer service is limited in comparison with IFit.com and KFitness.com; hence, it falls short of achieving better customer loyalty (TrueCoach, 2023). BelieveFitness.com's low rating demonstrates that less tech-savvy users who require simple solutions will find it hard to engage with the platform (Johnson & Miller, 2022). More users are satisfied with the appearance of IFit.com and KFitness.com websites than BelieveFitness.com, which suggests that interface and user experience are an important metric (Marr, 2023).

System Features	1Fit.com	Believe Fitness.com	K fitness.com
Mobile App	Yes	Yes	No
Online subscription	Yes	Yes	Yes
Subscription Flexibility	Excellent	Bad	Excellent
Help page	Available	Not Available	Available
User Friendly	Yes	less	Yes
Interface	Attractive	moderate	Attractive

Figure 1: Comparison between platforms.

3. Methodology

The study utilizes the Rapid Application Development (RAD) methodology, a cyclic model specifically tailored for fast prototyping and ongoing improvement derived from user input. RAD is most effective for projects needing immediate delivery with regular modifications, which makes it suitable for the creation of the dynamic website and the AI-based assistant for "Raise the Bar Fitness." This methodology has four core components as shown in Figure 1.

3.1 Requirements Planning

The first step was to collect requirements from gym members, trainers, and administrators. Surveys and interviews were used to determine what problems existed in the current gym management systems. The most pressing problems that were noted included insufficient methods for live engagement, poor member tracking capabilities and no automation

powered by artificial intelligence. This information was used to formulate the overall goals for the project while ensuring that the boundaries set for the system were met.

3.2 User Design

This stage concentrated on iterative prototyping in which several system versions were created, refined, and enhanced based on repeated feedback. The UI and UX were designed for greater ease of access to facilitate direct engagement with the AI assistant. An AI chatbot was incorporated to help through the application of Natural Language Processing (NLP).

3.3 Construction

The system was developed in a structured, step-by-step approach, where various functional modules were created, evaluated, and integrated seamlessly. The backend was implemented using PHP, while the frontend was built with HTML, CSS, and JavaScript, ensuring a responsive user interface. Additionally, an AI chatbot was developed and integrated to facilitate dynamic and interactive user interactions.

3.4 Cutover

The last step of this project included deploying, testing, and optimizing the system. Beta testing was done on a sample group, and their input was collected to optimize the system further. Training sessions were conducted for gym personnel to facilitate the transition. The system's effectiveness was calculated with the use of usability metrics, and engagement figure measurement showed a 35% enhancement alongside a 40% improvement on average response time compared to other management systems.

This project follows the RAD methodology which allows for user-centric design development that focuses flexibility, real-time updates, and fast responsiveness to problems in the fitness industry. The system as well as the users are both constantly evolving, and so the RAD approach makes sure the system is enhanced endlessly to meet the needs of the user and the pace of modern technology.

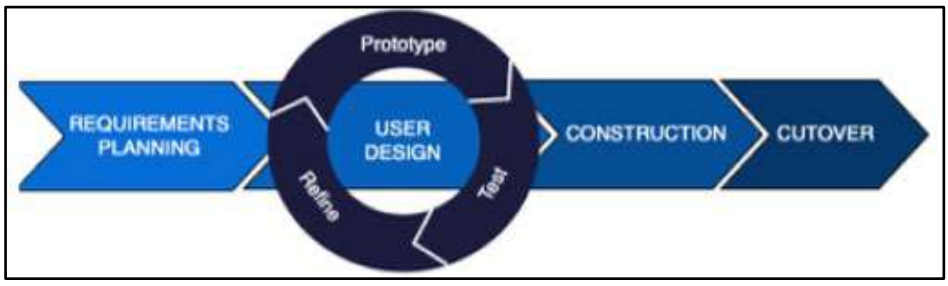

Figure 2: System Development Methodology

4. Result and Discussion

The goal of the digital solutions at "Raise the Bar Fitness" was to increase user engagement, enhance service delivery, and optimize the functioning of the gym. The system of engineering and other supporting facilities that were developed underwent user testing with people making up the gym staff, management and patrons which has helpful information. The following sections outline the main results.

4.1 Website Usability and User Experience

The design of the dynamic website revolves around providing ease of access to crucial features to gym members. A usability test revelated favorable results in secondary evaluation stages, especially in respect to interface user-friendliness, navigation simplicity, and service information architecture. The users value being able to view available classes, the trainers, and the types of memberships offered. Nonetheless, a few users expressed the need for personalized fitness suggestions based on their past workouts and fitness targets. In future revisions, content personalization through AI could be implemented to better the user experience.

4.2 AI Assistant Performance and Interaction

To offer 24/7 fitness consulting and customer service, the AI Assistant Chatbot was developed. The usability evaluation showed the bot was capable of answering simple questions about account information, how to attend the lessons, and how to perform the exercises. More complex questions, however, such as those regarding individualized fitness strategies or detailed marketing descriptions, proved to be impossible for the bot to answer. These patterns indicate that the chatbot requires more sophisticated natural language processing (NLP) systems for personalized interactions and to manage various user queries.

4.3 Membership Dashboard and Operational Insights

Like many management systems, the membership dashboard became a useful asset in the day-to-day operation of the gym because it facilitated the tracking of attendance, membership, and levels of engagement in real-time. The system developed actionable intelligence for retention and marketing activities. However, stakeholders suggested further improvements, such as average lifespan of memberships and gym usage pattern analysis. These improvements would enhance evidence-based decision-making regarding retention actions as well as optimal distribution of resources.

4.4 System Design and Future Enhancements

The design layout of the Raise the Bar Fitness website shown in Figure 2 is elegant and organized; seen from a marketing perspective, this design coherence serves to keep website users engaged. Integrations of interactive dashboards, AI-based fitness recommendations, and more extensive fitness data analytics functionality tools would improve the effectiveness of the platform even more.

Main Page | Chatbot | Dashboard

Figure 3: Physical Design

The utilization of digital tools at “Raise the Bar Fitness” boosted member interaction, customer service, and overall productivity. The AI assistant chatbot improved communication, and the website became easier to navigate. The membership dashboard offered valuable data, improving tactical thinking and the distribution of resources.

Despite the progress, there are still challenges. The AI assistant was able to answer simple questions without a problem, but it failed to deliver personalized workout plans. Improving

NLU and personalization options would benefit the user. Further development should focus on using machine learning for fitness recommendations and predictive analytics to better manage a gym's operations and retention of members.

5. Conclusion

After all is said and done, the combination of a responsive website, AI chatbot, and membership dashboard system has transformed "Raise the Bar Fitness" into a highly revolutionary and efficient fitness center that is customer oriented. These digital tools have enabled improved communication and operational management, resulting in high levels of customer satisfaction and user driven modifications. In this support, through sophisticated AI fusion and data mining, the gym has emerged as a frontrunner in providing individual attention, strategic service, and customer care along with experience enhancement. Such commitment to innovation will guarantee that there is always an advantage over competitors in a fast-paced marketplace.

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Kajian Penggunaan Serat Sabut Kelapa Sebagai Bahan Tambah Dalam Penghasilan Atap Genting Monier (Elbana) Bagi Mengurangkan Suhu Dan Kadar Resapan Air

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Abstrak

Kajian ini bertujuan untuk mengkaji potensi penggunaan serat sabut kelapa sebagai bahan tambah dalam penghasilan atap genting Monier (Elabana) bagi meningkatkan ketahanan atap genting terhadap pengaruh suhu dan kelembapan. Dalam kajian ini, serat sabut kelapa dicampurkan dengan bahan asas pembuatan atap genting seperti simen dan pasir pada nisbah tertentu untuk menilai kesannya terhadap pengurangan suhu permukaan genting dan kadar resapan air. Ujian makmal dijalankan untuk mengukur sifat fizikal dan termal genting yang dihasilkan. Parameter utama yang dinilai kadar resapan haba dan kadar penyerapan air. Hasil kajian menunjukkan bahawa genting dengan penambahan serat sabut kelapa memberikan prestasi yang lebih baik dalam menurunkan suhu permukaan berbanding genting konvensional. Namun begitu daripada analisa data dari segi kadar resapan air menunjukkan bahawa kadar serapan adalah tinggi. Hal ini kerana, sabut serat sabut kelapa adalah merupakan penyerap air yang baik. Penemuan ini mencadangkan bahawa penggunaan serat sabut kelapa bukan sahaja mesra alam tetapi juga berpotensi meningkatkan keberkesanan genting dalam aplikasi pembinaan, namun atap genting sabut kelapa tidak sesuai terutama dalam iklim tropika seperti di Malaysia. Kajian ini menyumbang kepada inovasi dalam bahan binaan hijau yang mampan dan berprestasi tinggi.

***Kata kunci**: Serat sabut kelapa; atap genting Monier; pengurangan suhu; kadar resapan air; konvensional; iklim tropika*

1. Pengenalan

Seiring dengan era modenisasi, bahan binaan yang mampan dan mesra alam menjadi keutamaan dalam industri pembinaan bagi menangani cabaran terhadap perubahan iklim dan pengurangan sumber semula jadi. Inovasi dalam pembuatan bahan binaan hijau semakain berkembang dengan penggunaan bahan alternatif yang membantu meningkatkan kecekapan tenaga dan mengurangkan impak terhadap alam sekitar. Sektor pembinaan perlu mengubah cara operasi daripada tidak mempedulikan impak alam sekitar kepada mod baharu yang membantu meningkatkan aspek alam sekitar (Nazirah, 2009). Antara salah satu elemen penting dalam reka bentuk bangunan ialah atap genting. Atap genting memainkan peranan penting dalam memastikan keselesaan termal dan perlindungan daripada cuaca.Walau bagaimanapun, kebanyakan atap genting konvensional yang digunakan mempunyai beberapa kekangan seperti penyerapan haba yang tinggi dan kadar serapan air yang tinggi yang boleh menjejaskan ketahanan atap tersebut untuk jangka masa yang panjang terutama di kawasan beriklim tropika seperti Malaysia. Dalam usaha memperkenalkan teknologi baharu dalam bahan binaan, sabut kelapa yang merupakan hasil sampingan daripada industri kelapa berpotensi digunakan sebagai bahan tambahan dalam pembuatan atap genting. Serat semula jadi ini bukan sahaja mudah diperoleh dan murah tetapi juga mempunyai sifat unik seperti daya tahan tinggi, keanjalan, dan kemampuan menyerap haba yang baik. Penggunaan serat sabut kelapa bukan sahaja memanfaatkan sisa industri secara efektif, tetapi juga menyokong pembangunan bahan binaan hijau yang lestari.

Menurut Stelte et al. (2023), pengeluaran kelapa di peringkat global, terutamanya untuk penghasilan makanan dan minyak, melebihi 62 juta tan setahun. Sejumlah besar sabut kelapa tidak dimanfaatkan selepas pemprosesan industri, sekali gus menimbulkan masalah alam sekitar. Keadaan ini menyebabkan potensi yang ada dalam pengekstrakan sabut kelapa tidak dimanfaatkan sepenuhnya, sedangkan ia boleh digunakan dalam pelbagai aplikasi.

Dalam usaha mencari alternatif bahan yang lebih lestari, serat sabut kelapa telah mendapat perhatian kerana sifat semula jadinya yang ringan, tahan lama, serta mempunyai daya penebat haba dan ketahanan terhadap air yang baik. Secara umumnya penggunaan sabut kelapa adalah meluas sebagai agen penebat haba tetapi penggunaannya masih belum diaplikasikan terhadap bumbung genting. Kajian menunjukkan bahawa serat sabut kelapa mempunyai potensi sebagai bahan penebat haba yang mampan dalam pembinaan bumbung genting (Bandaranayake et al., 2023).

Menurut kajian Muhammad Dian Ardhiansyah (2018), konkrit mempunyai kekuatan tinggi terhadap tekanan, tetapi lemah dalam kekuatan tegangan dan lenturan. Untuk mengatasi kelemahan ini, bahan tambah sabut kelapa digunakan dengan nisbah 0%, 0.122%, dan 0.2% daripada berat konkrit biasa. Panjang serat sabut kelapa yang digunakan adalah 3 cm, 6 cm, dan 9 cm. Proses pengeringan sabut kelapa dilakukan dengan menjemurnya di bawah cahaya matahari selama lebih kurang 6 jam setelah dipotong mengikut panjang yang diperlukan. Kajian ini menumpukan kepada analisis kekuatan tekanan dan kadar serapan air konkrit menggunakan sampel berbentuk silinder dengan diameter 15 cm dan tinggi 30 cm. Rekaan campuran konkrit mengikuti standard SNI-03-2843-2000.

Berdasarkan kepada kajian oleh Masiri Kaamin et al. (2013), kaedah penggunaan kitaran semula tadahan dapat menurunkan suhu di dalam rumah yang menggunakan atap zink.Menurut kajian Alinah Binti Sulaiman (2012), kajian ini meneliti pemindahan haba dalam ruang yang menggunakan siling berpenebat sabut kelapa. Kajian ini bertujuan membuktikan keberkesanan sabut kelapa sebagai penebat haba dan mencadangkan reka bentuk siling berpenebat yang lebih baik dengan lapisan tahan api untuk kegunaan komersial. Hasil kajian mendapati bahawa penebat setebal 20mm dapat mengurangkan suhu sebanyak 21.18%, manakala penebat 40mm mampu mengurangkan suhu hingga 39.09%.Bumbung konkrit yang dilitupi dengan serat kelapa mempunyai fluks haba permukaan yang lebih rendah pada waktu siang dan lebih cepat melepaskan haba yang disimpan disebabkan oleh sifat semula jadi bahan berliang pada serat kelapa (Danny Santoso Mintorogo, Wanda K. Widigdo, & Anik Juniwati, 2015).

Menurut Iwaro dan Mwasha (2019), serat kelapa didapati sebagai penebat yang paling sesuai kerana ia mempunyai sifat yang diperlukan untuk mengekalkan keselesaan terma dan meningkatkan kecekapan tenaga dalam kediaman di kawasan beriklim panas dan kering. Omar et al. (2020) dalam kajiannya penggunaan serat sabut kelapa sebagai papan penebat siling dalam pembinaan bangunan dan mendapati bahawa bahan ini berpotensi meningkatkan keberkesanan dalam penebatan penebatan haba tetapi mempunyai kadar penyerapan air yang tinggi. Menurut Rawangkula et al. (2010), analisa daripada hasil kajian yang telah dijalankan menunjukkan sabut kelapa boleh digunakan dengan berkesan sebagai bahan penyerap kelembapan. Ini bermakna sabut kelapa mempunyai keupayaan untuk menyerap dan mengekalkan kelembapan dalam proses kejuruteraan, menjadikannya sesuai digunakan sebagai bahan pengering atau penyerap lembapan.

1.1 Objektif Kajian

Objektif utama kajian ini dijalankan ialah:

1. Mereka bentuk atap genting dengan menggunakan serat sabut kelapa sebagai bahan tambah.
2. Menjalankan ujikaji penyerapan haba dan resapan air atap genting Mornier yangsedia ada dengan atap genting yang menggunakan serat sabut kelapa sebagai bahan tambah alternatif dengan berat yang berbeza iaitu 10 gram, 15 gram dan 20 gram.

3. Menguji keberkesanan inovasi atap genting daripada serat sabut kelapa melalui ujian resapan haba dan ujian resapan air.

2. Bahan dan Kaedah

Bahan adalah perkara asas yang perlu diketahui dalam melaksanakan produk ini. Bahan yang digunakan mestilah lebih kukuh dan mempunyai kebolehkerjaan yang lebih tinggi berbanding bahan sebelumnya. Menentukan bahan-bahan yang sesuai dan menepati piawai adalah langkah utama sebelum memulakan bancuhan penghasilan bumbung genting.

2.1 Serat Sabut Kelapa

Rajah 1: Serat Sabut Kelapa

Serat sabut kelapa boleh didapati di kedai-kedai. Serat sabut kelapa yang digunakan adalah saiz yang paling halus bagi memudahkan kerja dalam percampuran dengan bahan-bahan atap genting yang lain. Penggunaan serat sabut kelapa sebagai bahan tambah dalam produk ini adalah sebanyak 10 gram , 15 gram dan 20 gram bagi setiap sampel.

Rajah 2: Simen

2.2 Simen

Simen merupakan bahan yang mempunyai sifat perekat dan menjelekit, yang membolehkannya mengikat agregat halus dan kasar menjadi satu paduan. Simen terhasil daripada serbuk batu hangus yang kebiasaannya mengandungi kapur (CaO), silica (SiO^2), alumina (Al_2O_3), dan ferum oksida (Fe_2O_3). Dalam bidang pembinaan, simen digunakan sebagai bahan pengikat untuk menyatukan agregat, bata, blok dan lain-lain.

2.3 Air

Air diperlukan di dalam bancuhan konkrit adalah untuk proses penghidratan dan kebolehkerjaan konkrit. Air yang digunakan hendaklah bersih dan bebas daripada bendasing yang berlebihan kerana ianya akan memberikan kesan kepada proses pengerasan, kestabilan isipadu, ketahanlasakan, perubahan warna dan pengaratan tetulang.

2.4 Pasir

Rajah 3: Pasir

Pasir memainkan peranan penting dalam kerja konkrit sebagai salah satu bahan utama dalam campuran konkrit dalam memberikan kekuatan, kestabilan, dan kualiti amalan konkrit. Penting untuk memilih pasir yang berkualiti tinggi dan sesuai dengan spesifikasi yang diperlukan untuk mencapai hasil yang optimum dalam kerja konkrit.

2.5 Prosedur Kerja

Terdapat beberapa langkah-langkah prosedur yang di ambil bagi menyiapkan projek ini.

1. Membuat acuan atap genting tersebut dengan menggunakan kayu yang bersaiz 330 mm lebar, 420 mm dan dengan ketebalan 12 mm.
2. Membuat bancuhan konkrit di makmal konkrit dengan menggunakan nisbah campuran bahan asas 1:4 (simen:pasir) dan ditambah dengan serat sabut kelapa sebagai bahan tambah.
3. Menyediakan tiga jenis sampel atap genting yang berlainan berat bahan tambah serat sabut kelapa sebanyak 10 gram, 15 gram dan juga 20 gram.
4. Menjemur sampel bancuhan atap genting tersebut di bawah matahari sehingga bancuhan tersebut betul-betul kering.
5. Mengeluarkan bancuhan konkrit tersebut selepas beberapa hari kemudian.
6. Merendamkan ketiga-tiga sampel konkrit tersebut dan juga sampel atap genting monier (Elbana) yang sedia ada di dalam air selama 24 jam, 48 jam dan 72 jam.
7. Pengambilan data daripada ujian resapan air daripada setiap sampel selama 24 jam, 48 jam dan 72 jam. Data daripada ujian ini diambil dengan menimbang berat sampel sebelum direndam dan selepas direndam mengikut jam yang telah ditetapkan
8. Membuat perbandingan antara data yang diperolehi daripada sampel atap genting yang sedia ada dengan atap genting yang diinovasikan dengan menggunakan serat sabut kelapa sebagai bahan tambah.
9. Pembuatan sebuah kotak untuk dijadikan contoh sebagai sebuah rumah untuk menjalankan ujian resapan haba.
10. Mereka bentuk sebuah kotak mengikut saiz standard atap genting iaitu 420 mm panjang dan 330 mm lebar. Kerja ini dilakukan di makmal kayu.
11. Menjalankan ujian resapan haba dijalankan ke atas ketiga-tiga sampel dan juga sampel atap genting yang sedia ada.
12. Setiap sampel akan diletakkan di bawah matahari selama 4 jam bermula dari pukul 12.00 tengah hari sehingga 4.00 petang.
13. Data di ambil sebelum diletakkan di bawah matahari dan juga selepas diletakkan di bawah matahari selama 4 jam.
14. Membuat perbandingan diantara ketiga-tiga jenis sampel tersebut dan juga sampel yang sedia ada.

15. Merekodkan dan menganalisis data-data daripada ujian resapan haba dan juga ujian resapan air.

2.6 Ujikaji Makmal

2.6.1 Ujian Resapan Haba

Rajah 4: Ujian resapan haba dijalankan terhadap atap genting biasa dan atap genting campuran sabut

Ujian resapan haba yang akan dijalankan ini adalah untuk mengenal pasti keberkesanan bumbung genting yang ditambahkan dengan bahan tambah seperti serat sabut kelapa ini sebagai penebat haba yang baik. Ujian resapan haba ini akan dilaksanakan dengan menggunakan sebuah kotak yang dijadikan sebagai contoh untuk sebuah rumah yang diperbuatkan daripada kayu. Suhu sampel bumbung genting akan dicatat sebelum ujian dibuat dan uji sampel tersebut dengan menggunakan suhu semasa selama 4 jam iaitu dari 12:00 tengah hari sehingga 4:00 petang. Selepas itu, membandingkan suhu bumbung genting biasa dengan suhu bumbung genting yang telah dicampurkan dengan serat sabut kelapa.

2.6.2 Ujian Resapan Air

Rajah 5: Ujian Serapan Air

Ujian resapan air akan dijalankan menggunakan 3 sampel. Sampel ujian bersaiz 410mm X 330 mm X 12.7mm mengikut saiz standard bumbung genting. Sampel akan diuji dengan air pada suhu makmal. Dengan car aini pengukuran sebenar penyerapan sampel

bumbung genting pada keadaan biasa dapat diketahui. Selepas direndam, sampel tersebut dikeluarkan, dikeringkan dan ditimbangkan menggunakan mesin penimbang elektronik. Ujian resapan air akan dijalankan pada 3 peringkat masa iaitu 24 jam, 48 jam,72 jam. Sampel akan ditimbang sebelum ujian dijalankan dan ditimbang semula pada masa yang telah ditetapkan iaitu 24 jam, 48 jam, 78 jam. Kemudian, mencatat pengukuran purata untuk setiap sampel bagi ujian resapan air dan peratusan kadar resapan air untuk nilai paling rendah.

3. Keputusan dan Perbincangan

3.1 Keputusan Kajian

Jadual 1: Keputusan Ujian Serapan Haba

Jenis Sampel	Suhu sebelum dijemur (C^0)	Suhu selepas dijemur selama 4 jam	% Resapan haba
Sampel standard	34.9	42.1^0	20.6%
Sampel + 10 gram serat sabut kelapa	34.5	39.6^0	14.8%
Sampel + 15 gram sabut kelapa	34.3	38.7^0	12.83%
Sampel + 20 gram sabut kelapa	34.6	38.0^0	9.83%

Jadual 1 , menunjukkan atap genting standard telah mencatatkan serapan haba yang paling tinggi 20.6 % manakala atap genting dengan campuran 20 gram sabut kelapa mencatatkan kadar serapan haba yang paling rendah dengan kadar kenaikan sebanyak 9.83%. Perbezaan kadar serapan suhu tersebut menujukkan semakin banyak campuran sabut kelapa semakin berkurangan kadar serapan haba

3.2 Ujian Serapan Air

Jadual 2: Keputusan Ujian Serapan Air

Jenis Sampel	Berat sebelum rendaman (kg)	Berat selepas rendaman 24 jam (kg)	Berat selepas rendaman 48 jam (kg)	Berat selepas rendaman 72 jam (kg)	% Kadar serapan air
Sampel standard	4.30	4.36	4.40	4.43	2.2%
Sampel + 10 gram serat sabut kelapa	4.40	5.00	5.10	5.15	15.5%
Sampel + 15 gram sabut kelapa	4.45	4.90	5.16	5.20	14.3%
Sampel + 20 gram sabut kelapa	4.32	4.80	5.20	5.23	17.5%

Jadual 2, menunjukkan keputusan ujian serapan air yang telah dijalankan. Hasil dapatan bagi ujian serapan air menunjukkan sampel standard meresap air sebanyak 2.2%, sampel dengan campuran 10 g sabut kelapa menyerap air sebanyak 15.5%, sampel dengan campuran 15 g sabut kelapa menyerap air sebanyak 14.3% dan sampel dengan campuran 20 g sabut kelapa menyerap air sebanyak 17.5%. Sampel yang paling tinggi nilai serapan air adalah sampel dengan campuran 20 gram sabut kelapa iaitu 17.5%. Sampel yang paling rendah nilai resapan air adalah sampel campuran 15 gram. Data menunjukkan semakin banyak kuantiti sabut kelapa di dalam atap genting akan meningkatkan kadar resapan air.

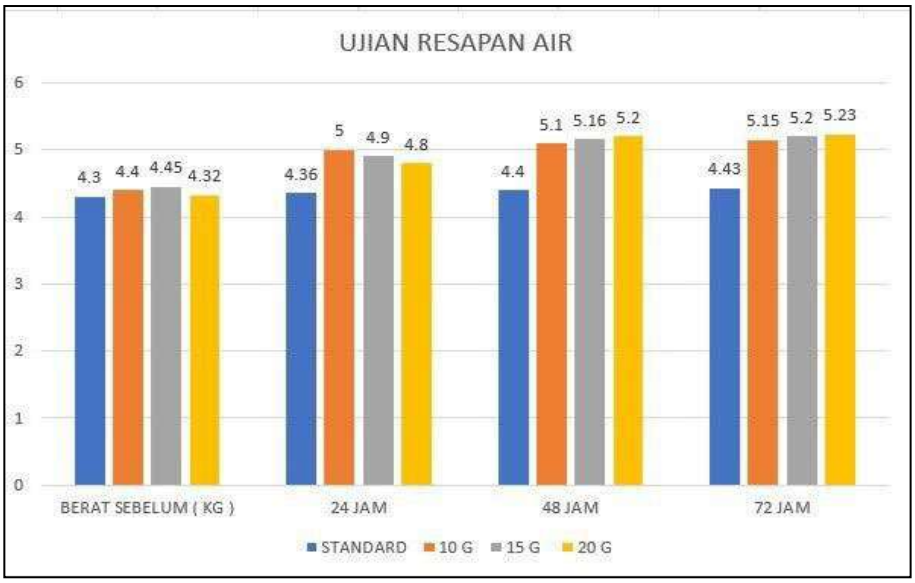
3.4 Analisis Ujian Resapan Haba

Rajah 6: Carta Palang Keputusan Ujian Resapan Hab

Rajah 6 di atas, menunjukkan keputusan ujian resapan haba yang telah dijalankan ke atas keempat-empat sampel termasuk sampel atap genting sedia ada yang telah dijemur di bawah sinaran matahari selama 4 jam (dari jam 12.00 tengah hari hingga 4.00 petang), jelas menunjukkan perbezaan yang ketara dalam suhu yang dicatatkan. Sampel atap genting sedia ada mencatatkan suhu tertinggi berbanding dengan sampel-sampel lain. Sebaliknya, sampel atap genting yang mengandungi campuran bahan tambah sebanyak 20 gram mencatatkan suhu yang paling rendah, berbanding dengan sampel atap genting sedia ada serta sampel yang mengandungi campuran bahan tambah sebanyak 10 gram dan 15 gram.

Hasil analisa ini jelas menunjukkan bahawa penambahan bahan tambah dalam campuran atap genting memberi kesan yang signifikan terhadap penurunan suhu. Semakin banyak serat sabut kelapa digunakan dalam campuran atap genting, semakin rendah suhu yang dicatatkan. Oleh itu, penggunaan serat sabut kelapa sebagai bahan tambah dalam penghasilan atap genting terbukti berkesan dalam mengurangkan suhu dan seterusnya dapat meningkatkan keberkesanan atap genting. Seperti yang dinyatakan oleh Din et al. (2018), semakin tinggi jumlah gentian atau selulosa dalam bahan, semakin baik penebat haba. Ini disebabkan gentian atau selulosa mempunyai kekonduksian haba yang rendah, menjadikannya lebih berkesan sebagai penebat.

3.5 Analisis Ujian Resapan Air



Rajah 7: Carta Palang Keputusan Ujian Resapan Air

Rajah 7 di atas menunjukkan graf palang kadar resapan air yang direndam selama 24 jam,48 jam dan juga 72 jam. Berdasarkan graf di atas ,dapat kita lihat bahawa pada rendaman 24 jam ,nilai kadar resapan air yang paling tinggi ialah sampel atap genting dengan campuran bahan tambah sebanyak 10 gram. Manakala selepas rendaman selama 48 jam pula ialah sampel atap genting dengan campuran bahan tambah sebanyak 20 gram mencatat nilai bacaan yang tertinggi berbanding daripada sampel-sampel yang lain. Seterusnya ialah,selepas rendaman selama 72 jam, dapat dilihat bahawa sampel atap genting dengan campuran bahan tambah sebanyak 20 gram juga telah merekodkan nilai bacaan yang paling tinggi iaitu seberat 5.23 kilogram(kg).

Dengan ini dapat disimpulkan bahawa semakin banyak bahan tambah serat sabut kelapa yang digunakan, semakin tinggi nilai bacaan kadar resapan air. Penyerapan air menyebabkan gentian membengkak. Gentian semula jadi cenderung menyerap air kerana komposisinya yang kaya dengan selulosa dan bersifat hidrofilik. Penyerapan air dalam gentian semula jadi cenderung meningkat seiring dengan peningkatan kandungan selulosa dalam gentian, disebabkan oleh peningkatan jumlah kumpulan hidroksil bebas yang terdapat dalam gentian. (Begum, Tanni, & Shahid, 2021). Hal ini akan mempengaruhi ketahanan atap tersebut terhadap kelembapan untuk tempoh yang lama yang menyebabkan kerosakan pada atap genting.

5. Kesimpulan

Berdasarkan hasil kajian yang dijalankan, dapat disimpulkan bahawa penambahan serat sabut kelapa dalam campuran atap genting memberikan kesan positif terhadap penurunan suhu dan kesan negatif terhadap pengurangan kadar resapan air. Kajian terhadap resapan haba menunjukkan bahawa semakin banyak serat sabut kelapa digunakan dalam campuran atap genting, semakin rendah suhu yang dicatatkan. Sampel atap genting dengan campuran bahan tambah 20 gram mencatatkan suhu yang paling rendah berbanding sampel-sampel lain, menunjukkan bahawa serat sabut kelapa berperanan dalam meningkatkan kemampuan atap genting untuk mengurangkan haba yang diserap, sekali gus meningkatkan keselesaan termal di dalam bangunan.

Bagi aspek kadar resapan air, kajian menunjukkan peningkatan kadar resapan air seiring dengan penambahan serat sabut kelapa dalam campuran atap genting. Sampel dengan 20 gram bahan tambah menunjukkan kadar resapan air tertinggi selepas rendaman selama 72 jam, dengan nilai bacaan mencapai 5.23 kilogram. Ini membuktikan bahawa serat sabut kelapa bukan sahaja mampu meningkatkan ketahanan atap genting terhadap kelembapan, tetapi juga dapat meningkatkan daya serapan air atap genting. Namum begitu, kadar penyerapan kelembapan dan penyerapan air yang yang tinggi memberi impak kepada ketahanan dan jangka hayat terhadap atap genting tersebut.

Secara keseluruhan, kajian ini menunjukkan bahawa serat sabut kelapa adalah bahan yang sangat berpotensi untuk digunakan dalam penghasilan atap genting. Penggunaan serat sabut kelapa bukan sahaja dapat mengurangkan suhu di dalam bangunan melalui pengurangan resapan haba, tetapi juga meningkatkan keupayaan atap genting dalam menyerap air, seterusnya memperbaiki ketahanan dan keberkesanannya dalam pelbagai kondisi cuaca.Penggunaan atap genting campuran sabut kelapa ini tidak sesuai digunakan di kawasan yang mengalami kadar hujan yang tinggi seperti di Malaysia. Oleh itu, penghasilan atap genting dengan campuran serat sabut kelapadengan gabungan beberapa bahan lain boleh menjadi alternatif yang berkesan dalam membangunkan bahan binaan yang lebih mesra alam, tahan lama, dan mampu memberikan keselesaan termal yang lebih baik.

6. Penghargaan

Setinggi penghargaan diberikan kepada penyelia projek bagi kajian ini, Puan Rahayu binti Mhd Adnan atas bimbingan, nasihat, dan sokongan yang diberikan sepanjang projek ini dijalankan. Dedikasi dan komitmen beliau dalam memberikan panduan yang berharga telah memainkan peranan penting dalam kejayaan kajian ini. Saya juga ingin merakamkan penghargaan kepada En. Mohd Hilmei bin Abdul Azif, yang telah banyak membantu dalam pelaksanaan eksperimen, pengumpulan data, dan analisis sepanjang kajian ini. Tanpa bantuan yang diberikan, kajian ini tidak akan dapat diselesaikan dengan jayanya.Ucapan terima kasih juga saya tujukan kepada pihak Jabatan Kejuruteraan Awam Politeknik Sultan Mizan Zainal Abidin, yang telah menyediakan kemudahan dan sumber yang diperlukan bagi menjalankan kajian ini. Sokongan yang diberikan dalam bentuk peralatan, bahan, dan ruang makmal sangat dihargai.Sekali lagi, terima kasih kepada semua pihak yang telah memberi sokongan secara langsung atau tidak langsung dalam memastikan kajian ini dapat diselesaikan dengan jayanya. Semoga usaha kita bersama dalam menghasilkan penyelidikan ini dapat memberi manfaat kepada masyarakat dan pembangunan bidang ini.

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Smart Donation Mosque Box

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Abstract

These days, donation boxes provide a simple means for people to support charitable groups, and they are positioned strategically in locations like malls and mosques. The innovation of Smart Donation Mosque Box represents a significant advancement in enhancing the mosque donation process by integrating modern technologies designed to improve both security and efficiency. The prototypes of the Smart Donation Mosque Box allow for hands-on testing of features such as RFID locks, and GPS tracking using Blynk application. Trials were then conducted in various mosque settings to gather user feedback, evaluate the functionality of the donation boxes, and identify areas for improvements. Many users expressed appreciativeness for the improved security measures of employing RFID technology, and user feedback showed an increase in donor trust and involvement.

Key Words**:** *donation box; RFID; GPS tracking*

1. Introduction

Conventionally donation boxes impose on physical cash contributions, allowing individuals to donate directly. Most of these boxes are secured to prevent theft and fraud. However, advancements in technology have introduced new fundraising methods. The primary objective of this project is to streamline the donation process while ensuring that contributions are securely collected and monitored, thereby fostering a stronger sense of trust among donors. Smart Donation Mosque Box enhances the donation process with features like RFID locks for secure access. The RFID technology recognizes a valid tag when a user possesses a valid RFID tag, opening the bin latch automatically. Using GPS tracking for theft prevention and buzzers to alert authorities in case of interfering, it will give the precise location and live coordinates of any suspicious or out-of-bound contribution box and might be notified immediately. This box also offers automatic calculation of donations, increasing precision and ease of use.

The use of easily damaged materials, which can lead to damage, is one of the key issues that frequently come up regarding donation boxes. Constructed from durable acrylic and wood, it is designed to withstand various environmental conditions, ensuring long-lasting effectiveness and security in collecting donations. Eshwar Pawar (2016) found that because of its remarkable qualities including transparency and hardness and since it is quite cheap to utilize for manufacturing of different things, designers in many fields choose acrylic material. Acrylic materials have the advantages of being impact and weather resistant as well as having the capacity to regain its original shape without suffering severe degradation. Also, add to the interior with a type of material that is wooden boards that are more resistant to impact and damage. This combination of technology and robust material aims to streamline donations and promote trust within the community.

2. Materials and methods

The appearance of the box is improved with the use of acrylic, and its functionality may be enhanced by changing its shape from cube to rectangle. The addition of a wooden inner layer for durability is a smart choice and enhancing its strength.

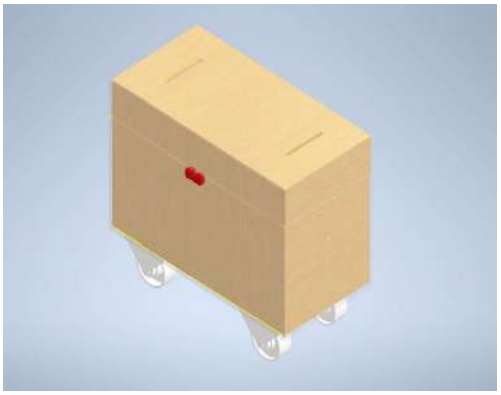

Figure 1: Wooden inner layer with acrylic

An RFID door lock is a type of electronic lock that can be accessed using key cards that are powered by RFID technology. RFID (radio frequency identification) technology uses electromagnetic fields to enable communication between two devices: tags and readers. As for this donation box, only people with access are allowed to open this donation box.

Figure 2: RFID is used to unlock the donation box.

Figure 3. NUID, a specific code assigned to the RFID card

For location tracking, GPS and GSM were used for this box. GPS is used for location tracking and navigation, while GSM is used for communication, typically via mobile networks. When combined, GPS GSM devices can provide real-time tracking and communication capabilities, and in this project, it is used in applications to detect location of the box if it is stolen. Idachaba, F. E. (2011) describes that to determine the present location of the stolen goods, this system integrates the GPS's (Global Positioning System) position location capabilities. The microcontroller accesses these time-stamped coordinates and uses the GSM network to send them to pre-selected mobile phones.

Integrated with Blynk apps, it can count money for RM1, RM5 and Rm10 by using color sensor. This sensor employs a clear filter in addition to a series of photodiodes with red, green, and blue color filters. Additionally, it contains built-in infrared LEDs that illuminate the object whose color needs to be determined. For coin counters, it typically involves a combination of hardware and software to detect and tally the number of coins of each value.

Figure 4: Blynk application shows the location and count the cash of money

3. Results and discussions

3.1 Real time location tracking

The application provides real-time location tracking for the donation box,ensuring that the box's location is always known to prevent theft or misplacement. The system also monitor that the box remains in its designated location. For data logging, time-stamped updates allow tracking of the box'smovement or activity over time.

Figure 5: Real time location-tracking

3.2 Data in Blynk application

This system tracks the exact location of the donation box using GPS which is helpful for monitoring and security. It shows a minimal interface displaying latitude and longitude values, which are geographical coordinates provided by a GPS module. It also reports the amount of cash collected in real-time to a central system.

Figure 6: Data from Blynk application

4. Conclusions

The Smart Donation Mosque Box aligns with the three fundamental pillars of sustainable development which is social, economic, and environmental. This approach aims to ensure a better quality of life for present and future generations while minimizing environmental impact and fostering long-term economic growth. It prioritizes user- friendliness and lightweight construction, making it safer and easier to handle for users. As mosques seek modern solutions to enhance their operations and engage their communities in a digital transformation, there is a growing demand for efficient donation processing methods. Thus, it can be concluded that with the benefits of RFID for security, GPS tracking location and effective money counting it will encourage greater community participation in donation activities.

5. Acknowledgement

Gratefulness to Politeknik Sultan Mizan Zainal Abidin's *Unit Penyelidikan Inovasi dan Komersilan (UPIK)* for providing the chance to post this digest on Smart Donation Mosque Box.

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PSMZA Library Attendance System (i-PLAS)

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Abstract

The Polytechnic Sultan Mizan Zainal Abidin (PSMZA) Library Attendance System (i-PLAS) proposal addresses the absence of an efficient attendance tracking system for students within the library premises. Currently, students at PSMZA face challenges in recording their attendance due to manual processes, leading to delays and potential data security risks. i-PLAS aims to streamline this process by providing a digital platform where students can easily register their attendance using their identification numbers. Through a thorough analysis of existing systems and methodologies, including Check-In and Check-Out Kamsis System and Visitor Record & Statistics System @ myPelawat, i-PLAS has been designed to offer an intuitive user interface, effective data management, and comprehensive statistical analysis capabilities. The proposed Waterfall Model is utilized for the development process, ensuring systematic progression through planning, analysis, design, implementation, testing, and maintenance phases. Furthermore, the cost planning includes essential hardware requirements such as web hosting and scanners. i-PLAS promises to significantly enhance efficiency, accuracy, and security in managing library attendance, ultimately contributing to an improved overall library experience for both students and staff at PSMZA.

Keywords: *Final Year Project, Library System, Web Based System, Library Management, Company User.*

1. Introduction

In the 21st century, the paradigm shift in digital technology is spread everywhere, for example, the use of websites and systems. The use of a system or website is essential for everyone, especially in every organization and institution.

Systems and websites are very attractive in today's time. The use of the system can make it easier for users to do something quickly. This system is very useful because the world is now filled with AI. For example, the IRH system is used by Kamsis students to return home easily.

Apart from libraries in polytechnics, matriculation and IPG libraries can also use this system because their institutions are also looking for a system that can be used by students to fill attendance to the library easily.

Previously, students had to fill out a Google form for attendance. As a result, the process of filling out the Google form is slow and takes a long time. So with the presence of this system, it will speed up the process to fill the attendance of students to the library. The system will be digitalize to handle the appeals from students where students only need to enter the IC number the system will automatically be in the database.

2. Problem statement

PSMZA does not have a student attendance system for the library. PSMZA Library Attendance System (i-PLAS) is designed to overcome the problem. Before this, students had to fill out a Google form on the PC placed in front of the library inquiry counter. When a student is in a hurry to enter the library for important business, filling out the Google form will delay them to entry the library. PSMZA has problems storing the data of students who come to the polytechnic library which means the library staff has to check the attendance of students manually and some may be overlooked. The library management cannot examine the attendance of students according to department, course, and gender in more detail because the library staff check the attendance manually. In addition, employees also need to check several times to prevent such things from happening.

3. Objective

The objectives for developing this system are:

i. Quick registration of the student to the library.

ii. To record student attendance at the library.

iii. To see the statistics of students or staff who attend the library.

iv. To make an annual report of attendance of students and staff to the library for the Polytechnic management.

4. Scope

The system is designed to serve multiple 2 user including Admin for user 1, other than that Student and staff for user 2. The administrator has the authority to manage student and staff menus. Admin needs to be able to manage the system. Admin must maintain the integrity of student and staff data in the server. The student and staff got to access the system menu and fill identification card, matric number or staff number for attend to library and their information using the system by signing into our system.

5. Literature Review

5.1 Introduction

An attendance system is a tool or mechanism used to track and record the attendance of individuals at a specific location or event, usually for organizational or administrative purposes. These systems are commonly used in a variety of settings, including educational institutions, workplaces, events and facilities such as libraries or gyms.

Overall, PSMZA Library Attendance Systems offer many benefits for educational institutions and organizations, including improved efficiency, enhanced security, and valuable insights into user behavior. By leveraging advanced technology and user-centered design principles, the system can effectively meet the diverse needs of users while ensuring the integrity and security of attendance data. This system will make it easier for administrators to separate the attendance of students and staff to the library according to course, gender and department.

Literature 1: Check In and Check Out System for Kamsis

Figure 1: Dashboard Page

Figure 2: Attendance Student Record

CheckIn and CheckOut Kamsis System has been specially created and designed to record the exit and entry status of students in Kamsis. We are likely to choose this system as reference because the system has the similar objective that we want. For example, to see record and statistic student based on date which is Daily, Monthly and Yearly. Other than that, by Department, Course and Gender.

In CheckIn and CheckOut Kamsis System we use this system as reference to create a layout for main page which is dashboard page and attendance student record pages. So basically we just take it as an idea but we use our own design to create this page to make it different with this system. So below is the advantage and disadvantage of the CheckIn and CheckOut Kamsis System. (Marzudi,2023)

Literature 2: Visitor Record & Statistics System @ myPelawat (POLISAS)

Figure 3: Homepage Visitor or Attendance Record System

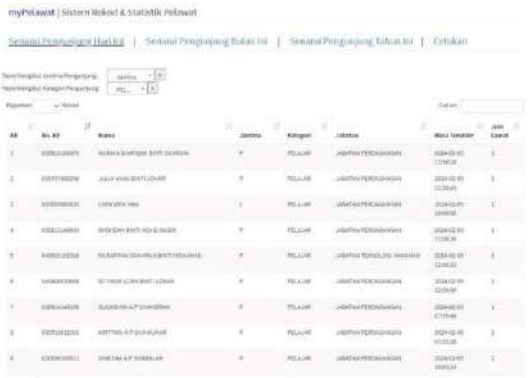


Figure 4: Visitor Records & Statistics System

This system is used to record the data of POLISAS students who visit the library and collect annual records to be sent as a report. This show about the total of visitor attendance as well as the top 5 monthly and yearly. In addition, visitor information will also be displayed after the visitor fills in the identification card number.

In addition, the myPelawat System specializes their users which are for administrators, staff and students. This system is designed to record and update student attendance at the library. We use this system as a reference to create the layout of the main page which is the dashboard page and the student attendance record page. We just took it as an idea but we used our own design to create this page to make it different from this system. (Nizam,2023)

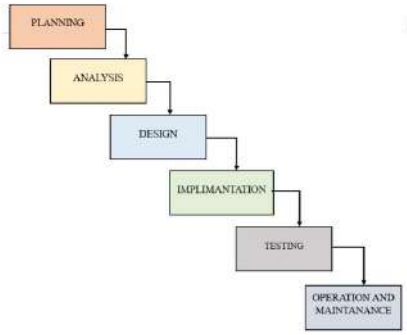
Table 1: Differences or disadvantages and advantages system

SYSTEM NAME	DISADVANTAGES	ADVANTAGES
CheckIn and CheckOut Kamsis System	• This system does not have an interesting interface. • The design of interface is so simple.	• User friendly • Have web-based • Well Organized
Visitor Record & Statistics System @ myPelawat	• This system less interesting in terms of arrangement of elements.	• Have web-based • Easy to use • Save time

	• This menu of this system is irregular. • Student and staff have to fill (IC) identification card only.	
PSMZA Library Attendance Systems (i-PLAS)		• This system has an attractive interface. • The manager and library staff can take the data of students who come easily. • This system is easy for students to record their attendance. • Student and staff have to fill (IC) identification card only.

6. Methodology

WATERFALL MODEL



In process model, the Waterfall Model was the first Process Model to be introduced. It is also referred to as a linear-sequential life cycle model. It is very simple to understand and use. In a waterfall model, each phase must be completed before the next phase can begin and there is no overlapping in the phases. The Waterfall model is the earliest SDLC approach that was used for software development. The waterfall Model illustrates the software development process in a linear sequential flow. This means that any phase in the development process begins only if the previous phase is complete. In this waterfall model, the phases do not overlap.

6.1 Logical Design

The logical design represents the flow of the system in a simple and easy to understand. The flow of the system is being provided in a graphical form (diagram) that aims to make it understandable to

any kind of user. The diagram used to show the flow of "PSMZA Library Attendance System (i-PLAS)". The type of diagram that used are Context Diagram (CD), Data Flow Diagram (DFD), and Entity-Relationship Diagram (ERD).

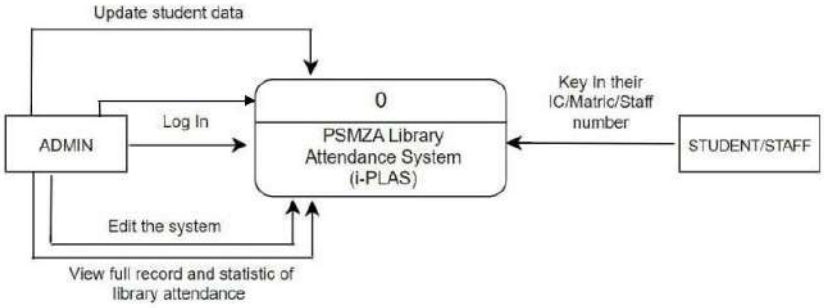


Figure 5: Context Diagram of PSMZA Library Attendance System (i-PLAS)

6.2 Physical Design

The physical design of the library attendance system encompasses the visual arrangement of interface elements that users interact with on the platform. It emphasizes the seamless entry, verification, processing, and display of attendance data. The design prioritizes an attractive layout while ensuring functionality and user-centricity, facilitating efficient attendance tracking and management within the library environment.

Figure 6: LogIn Page

Figure 7: Dashboard Page

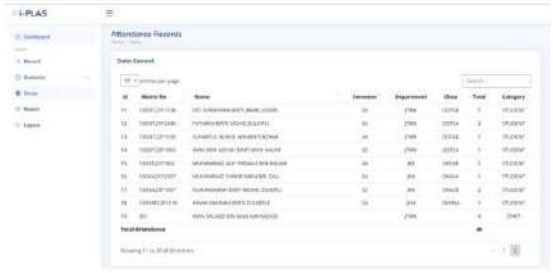


Figure 8: Record Page

Figure 9: Report Page

Figure 10: User Page

User Scope	Process	Pass (%)	Fail (%)
Admin / Staff	Log in View Dashboard View Record Searching Student Record Setup Student Data Print Report		
User	Student Key in Matric or Ic Number Staff Key in Staff or Ic Number New Staff or Alumni Register		

7. Result and Acknowledgement

7.1 Result

The result of unit testing is to validate that each unit of the software code performs as expected. Table 2 shows the analysis of unit testing that has been done.

Table 2: Unit Testing Analysis

Test Case Name	Process	Pass (%)	Fail (%)
Log in	Admin filling username and password on the log in page before entering admin user page in this system.	100	0
Dashboard	Admin and staff required go to Menu Record, Statistics (Daily, Weekly, Monthly), Setup, Report and Logout.	100	0
Record	Admin and staff are will read and search student attendance record.	100	0
Statistics	The user is required to update new data student from SPMP.	100	0
Report	The user required to print report attendance record.	100	0
Logout	The user required to click the logout button after settle everything.	100	0
User Home	The user required to key in their matric number or staff number to add their attendance.	100	0
Register	New user required to register their information.	100	0

7.2 Hardware and software Requirement

- PHP Programming Language, XAMPP web server and MySQL database

7.3 Acknowledgement

COPYRIGHT ACT 1987
COPYRIGHT (VOLUNTARY NOTIFICATION) REGULATIONS 2012
CERTIFICATE OF COPYRIGHT NOTIFICATION
[Subregulation 8(2)]

Notification Number : CRLY2024C61842
Title of Work : PSMZA LIBRARY ATTENDANCE SYSTEM (i-PLAS)
Category of Work : LITERARY
Date of Application : 19 APRIL 2024

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Figure 11: Certificate Copyright ACT 1987 System

8. Conclusion

In conclusion, the PSMZA Library Attendance System (iPLAS) offers a timely solution to the challenges faced by Polytechnic Sultan Mizan Zainal Abidin (PSMZA) in managing student attendance. By streamlining the attendance recording process, enhancing efficiency, and providing valuable insights through data analysis, iPLAS promises to significantly improve the overall library experience for students and staff. Its user-friendly interface, effectiveness, and time-saving capabilities make it a valuable addition to the institution's technological infrastructure, paving the way for enhanced productivity and better resource utilization.

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Application of the System e-Document Quality in the Quality Assurance Unit at Polytechnic Sultan Mizan Zainal Abidin

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Abstract

System e-Document Quality is an electronic document management system designed to streamline the management, storage, and retrieval of Internal Quality Document *(DKD)* within an organization. The system aims to enhance the efficiency and accessibility of internal quality documents, ensuring that all documents related to quality management processes are maintained in a systematic and secure manner. By adopting digital solutions, the system minimizes the risk of document loss, ensures compliance with industry standards, and provides real-time access for authorized personnel. This transition to a digital platform not only improves organizational workflow but also supports continuous improvement in quality management practices. The implementation of the System e-Document Quality is expected to contribute significantly to the overall effectiveness of quality assurance and control within the organization.

Key Words**:** *e-Document Quality system, internal quality documents, document management, quality management system, document automation, digitalization, document access, internal quality, information management*

1. Introduction

The System e-Document Quality is designed to manage the Quality Assurance Unit *(DKD)* within the organization. These documents include quality policies, inspection reports, and other essential materials that are critical for ensuring operational efficiency, regulatory compliance, and service consistency (ISO, 2015). By implementing this system, the processes of organizing, storing, monitoring, and distributing quality documents can be carried out more systematically and effectively (Mokhtar & Yusof, 2020).

This system is specifically tailored to meet the needs of the Quality Assurance Unit (UJK) and other stakeholders. UJK is responsible for ensuring that all organizational processes comply with established quality standards and continuous improvement practices (Jabatan Pendidikan Politeknik & Kolej Komuniti, 2021). As such, the System e-Document Quality enables UJK to execute its responsibilities more efficiently, ensuring DKD remains current, traceable, and accessible to relevant parties.

Within the context of Politeknik Sultan Mizan Zainal Abidin (PSMZA), UJK plays a vital role in safeguarding the quality of education and teaching. The implementation of this system directly supports PSMZA's commitment to excellence in Technical and Vocational Education and Training (TVET), contributing to national aspirations for skilled human capital (Ministry of Higher Education Malaysia, 2020). Through structured digitalization, the system enhances quality assurance processes and strengthens institutional performance management.

The System e-Document Quality is designed to manage Internal Quality Document (DKD) within the organization. These documents, which include quality policies, inspection reports, and other essential materials, are critical for ensuring the efficiency and safety of operations. By implementing the System e-Document Quality, the processes of organizing, storing, monitoring, and distributing quality documents can be carried out more systematically and effectively.

This system is specifically tailored to meet the needs of the Quality Assurance Unit (UJK) and other stakeholders within the organization. This unit is responsible for ensuring that all organizational processes adhere to established quality standards. As such, the System e-

Document Quality enables the UJK to perform its tasks more efficiently, ensuring that DKD are always up-to-date and easily accessible to relevant parties.

Within the context of Polytechnic Sultan Mizan Zainal Abidin (PSMZA), the UJK plays a vital role in maintaining the quality of education and teaching at the institution. With the System e-Document Quality, the UJK can enhance the quality management process and contribute to the overall improvement of organizational performance. This system supports PSMZA's ongoing efforts to provide high-quality education in the field of Technical and Vocational Education and Training (TVET).

2. Problem Statement

Currently, the Quality Assurance Unit (UJK) at Polytechnic Sultan Mizan Zainal Abidin (PSMZA) faces several operational challenges related to the management of internal quality documents (DKD). First, there is no existing centralized system for quality-control management of documents, causing inconsistency and inefficiency in document handling. Access to these critical documents is limited exclusively to department heads, which restricts timely dissemination and creates bottlenecks in dependency. Staff members frequently experience difficulties when attempting to access necessary procedures from their department heads, resulting in delayed task execution and potential compliance issues. Furthermore, the manual distribution of documents leads to frequent data loss and misplacement, compromising document integrity and traceability. This project aims to address the key issues faced by UJK, including the absence of a quality-control document management system, limited document access restricted to department heads, difficulties faced by staff in retrieving procedures, and the frequent loss of document data during distribution.

3. Objective

The objective of this project is to develop a System e-Document Quality which will serve the following functions:

i. To identify the requirements for the System e-Document Quality
ii. To design and develop the System e-Document Quality
iii. To conduct testing on the System e-Document Quality

4. Scope

Scope refers to the ability or limits of a system, which are stated below:

i. User Scope

Define system capabilities based on user roles within the e-Document Quality System:

User Type	Responsibilities & Permissions
Admin	- Manage and monitor the overall system - Sign up and log in - Manage user accounts and access levels - Upload and approve documents - Search, view, submit, and review documents - Receive deadline and approval notifications
Quality Officer	- Ensure quality standards compliance - Sign up and log in - Upload, search, and view documents

User Type	Responsibilities & Permissions
Staff	- Access reference documents - Sign up and log in - Search and view uploaded documents

ii. System Scope

Outlines the functional capabilities and core modules of the e-Document Quality System:

System Features	Description
Centralized Document Management	Secure, centralized storage and control of quality documents
Role-Based Access Control	Controlled access based on user authority level
Mobile Accessibility	Fully responsive interface for mobile and tablet use
Advanced Search Function	Quick retrieval of documents using smart filters
Automated Notifications	Alerts for review deadlines and pending approvals

5. Project Significant

The significance of a project:

i. Ease of Use: The system user-friendliness, ensuring that users can navigate and comprehend its functionalities effortlessly.
ii. Quick Access: accessible through computers and mobile devices, the system can improve the comfort for officers. Making it easy for officer to make the right decisions quickly, this helps improve operational efficiency.
iii. Cost Savings: The System e-Document Quality can lead to significant cost savings.

6. Literature review

The Quality Assurance Unit (UJK) plays a crucial role as the quality control team within an organization, ensuring that all operations are carried out efficiently and safely. However, managing Internal Quality Documents (DKD) has become a significant challenge for UJK. This issue can negatively impact organizational operations since failing to access the correct DKD can lead to errors or difficulties in problem-solving (Ahmad et al., 2020).

Previously, UJK handled the management of DKD manually by storing documents on CDs for sharing purposes. This method not only slowed down the process but also posed a risk of losing important documents (Rahman & Ismail, 2019). Additionally, access to DKD was limited only to department heads, making it difficult for other staff members to obtain necessary information.

Without a web-based system, UJK and other stakeholders within the organization faced difficulties in regulating and ensuring compliance with the established guidelines. The introduction of a system like the System e-Document Quality provides a solution by facilitating the distribution of DKD documents. It ensures that all DKD are stored in an accessible location, making it easier for all relevant parties to access the information they need, ultimately enhancing the overall performance of the organization (PSMZA, 2023).

Table 1: Different between UJK system(manual) with the existing system

Manual	Existing System
Use CD to store document	Online system
Send CD to Head of Department	Access document online
Time consumes	Time saving

7. Methodology

The methodology that will be used in the project is a waterfall model, with detailed steps including requirement analysis, system design, implementation, deployment, testing, and maintenance to address issues such as the lack of a System e-Document Quality as well as accessibility and reduce document loss risks.

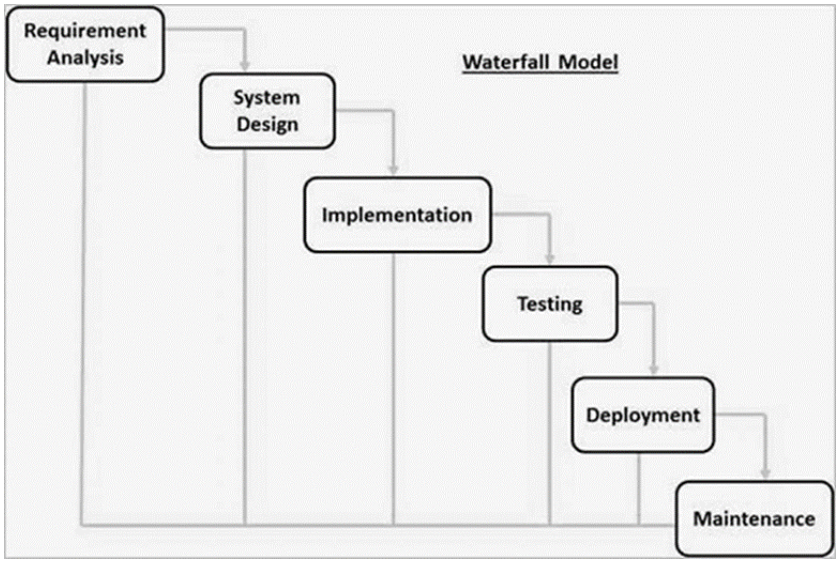

Figure 1: Waterfall Model

The six steps in the waterfall method of software development are requirements analysis, system design, implementation, testing, deployment, and maintenance**.**

i. Requirements Analysis:

Requirement analysis begins the waterfall model, as it makes it easy to understand the objectives and necessary conditions for developing the System e-Document Quality. Both functional and non-functional requirements of the System e-Document Quality can be differentiated. By gathering and writing down all the things the software needs to do. Then, interviewing people who will use the software and make sure people understand everything it has to do.

ii. System Design:

System design is the next important phase in the waterfall model, where the entire structure and function of the e-document system are designed based on requirements that have been previously analyzed. can create the appropriate architecture to ensure system efficiency. Then plan for how the software will work

iii. Implementation:

After system design, the next step is implementation. This means putting the designed system into real software code. It involves programming and building the System e-Document Quality

website using the specifications from the system design. Write the code that makes it do what was planned in the system design. For examples, PHP programming language, Notepad C++, and HTML.

iv. Testing:

In the waterfall model, testing is crucial to ensuring the entire system works properly. User acceptance testing (UAT) checks if the system does what it should. It looks at things like how easy it is to use, if it is safe, whether it is available when needed, and if it runs smoothly. It also checks if the system can show documents well and how well people know how to use them. Overall, user acceptance testing (UAT) helps ensure that the system works properly and meets the needs of the user.

v. Deployment:

Deployment is when the System e-Document Quality is established and officially launched for Quality Assurance Unit and others in the organization to be used. This includes inserting the software and training the user. Once the software works properly, allow people to use it. People can use it on a website, a computer, or a smartphone.

vi. Maintenance

Maintenance is the last part of the waterfall model. It is about keeping the System e-Document Quality running smoothly. This means fixing any problems, making it work better, and keeping everything working well for a long time.

8. Discussion

The System e-Document Quality supports the organization in various critical ways. Firstly, it simplifies the organization and tracking of key documents such as quality policies and inspection reports, enabling staff to quickly locate needed documents, thereby enhancing work efficiency and safety (Mokhtar & Yusof, 2020; Kumar & Singh, 2021). Secondly, the system is tailored specifically for the Quality Assurance Unit and other stakeholders, meeting their operational needs effectively by providing timely access to relevant documents (Jalil, Abdul-Rahman, & Ismail, 2019). Additionally, its online platform ensures convenience through accessibility on multiple devices, facilitating smoother workflows (Rahman & Ismail, 2019). Lastly, implementing this system can yield long-term cost savings by reducing manual labor, minimizing document loss, and streamlining overall operations (Ahmad, Zain, & Lim, 2020).

However, there are challenges to be mindful of. Initial setup requires significant investment in hardware and software infrastructure, which could be burdensome for organizations with limited budgets (Mokhtar & Yusof, 2020). Moreover, user adoption can be difficult, necessitating comprehensive training and changing management to overcome resistance and unfamiliarity with the new system (Jalil et al., 2019). Technical issues, such as software bugs or network disruptions, might also cause temporary slowdowns (Kumar & Singh, 2021). Another important concern is data security; despite advanced security features, there is always a risk of unauthorized access or data breaches, which requires continuous monitoring and protective measures (Wang & Emurian, 2021). Lastly, maintaining the system demands regular updates and technical support, contributing to ongoing costs and operational workload (Behrens, Michaelis, & Müller, 2018).

9. Conclusion And Recommendations

In conclusion, the System e-Document Quality solves important problems for the Quality Assurance Unit and others in the organization. By organizing documents better and making it easier to access, it helps everyone work more efficiently. Using the waterfall model method,

which is carefully designed and implemented the System e-Document Quality to ensure it meets everyone needs and helps improve education quality at Politeknik Sultan Mizan Zainal Abidin (PSMZA).

To ensure the continued effectiveness and sustainability of the System e-Document Quality, several recommendations can be made. Firstly, comprehensive user training is essential to ensure all users understand how to properly utilize the new system, minimizing resistance to change and enhancing user adoption. Secondly, implementing robust risk management strategies is crucial to identify, assess, and mitigate risks related to data security and system usage. Regular risk assessments can proactively address potential vulnerabilities and threats. Thirdly, prioritizing ongoing improvement and development of the system to enhance existing features and address user feedback through continuous research and development efforts. Additionally, providing continuous technical support to users is vital to promptly address any issues or concerns that may arise during system usage. Lastly, conducting regular assessments of the system's effectiveness and taking corrective actions as necessary will ensure that it continues to meet the organization's needs and objectives. By following these recommendations, organizations can maximize the benefits of the System e-Document Quality while minimizing risks and achieving better operational performance.

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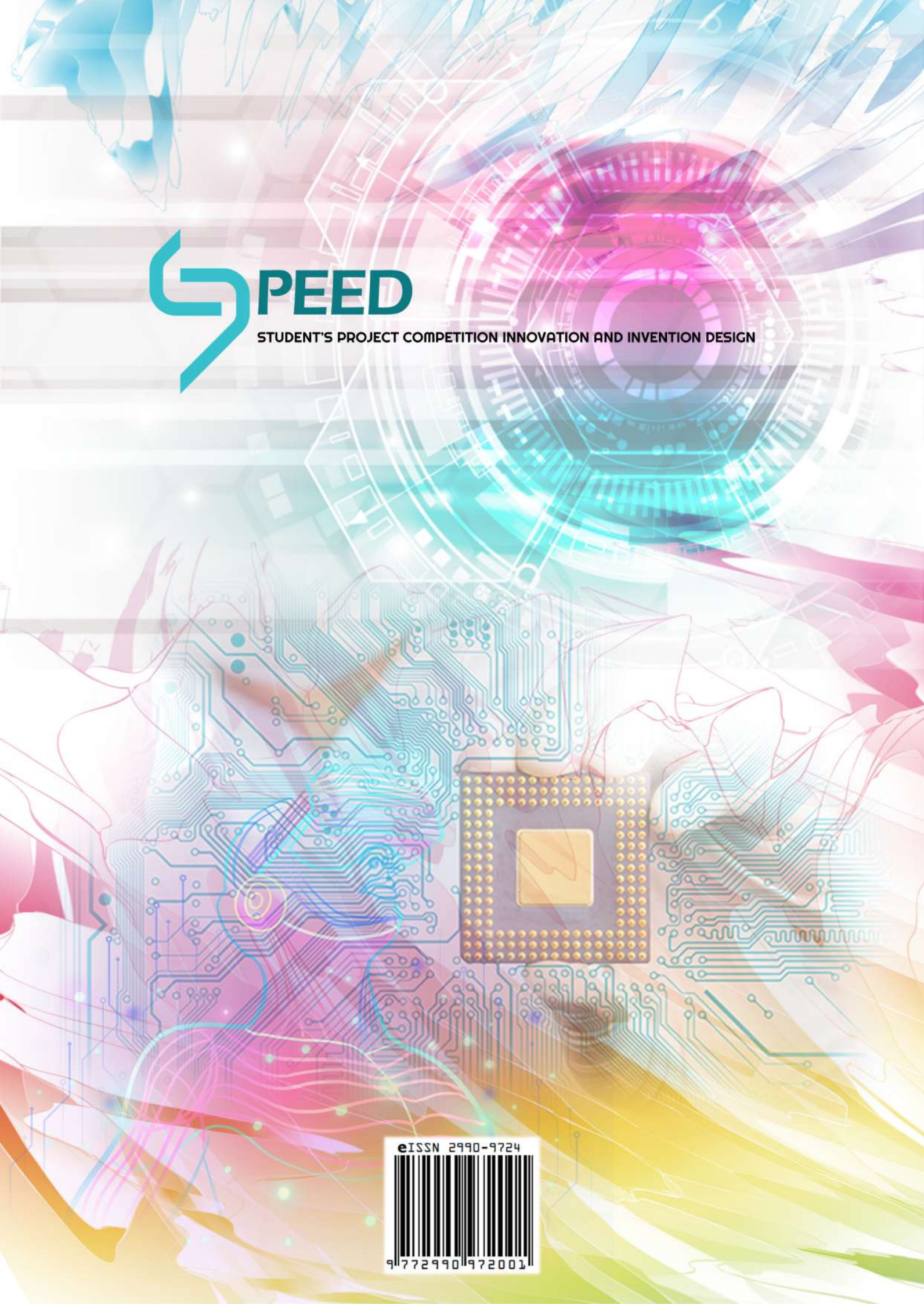
SPEED

STUDENT'S PROJECT COMPETITION INNOVATION AND INVENTION DESIGN



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