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KATA ALUAN PENGARAH POLITEKNIK MELAKA

Assalamu'alaikum Warahmatullahi Wabarakatuh Dan Salam Sejahtera "Melakaku Maju Jaya, Rakyat Bahagia, Menggamit Dunia"

Alhamdulillah, bersyukur ke hadrat Ilahi atas limpah kurnia dan izin-NYA, penerbitan e-Prosiding Projek Pelajar, Politeknik Melaka Volume II, 2021 dapat dilaksanakan dengan jayanya.

Saya mengucapkan tahniah dan syabas kepada semua pelajar Semester 5 dan pensyarah penyelia dari Jabatan Kejuruteraan Awam dan Jabatan Perdagangan, Politeknik Melaka, Politeknik Port Dickson serta peserta dari Indonesia yang telah menyumbangkan idea dan tenaga untuk menghasilkan penyelidikan, inovasi dan penulisan dalam buku e-prosiding ini. Ucapan terima kasih ini juga di kepada Unit Penyelidikan, Inovasi dan Komersilan (UPIK) PMK atas usaha dan inisiatif dalam menerbitkan naskah e-prosiding projek pelajar tahun akhir pada peringkat antarabangsa.

Buku e-Prosiding projek pelajar, Politeknik Melaka merupakan himpunan idea, penyelidikan, inovasi dan penulisan pelajar-pelajar Semester 5 hasil bimbingan daripada pensyarah penyelia dan juga pelajar dari Indonesia. Hasil projek ini juga telah dipertandingkan di peringkat politeknik yang dinilai oleh pihak luar. Saya yakin pengalaman yang diperolehi ini akan memberi nilai tambah kepada pelajar dan seterusnya meningkatkan kemahiran soft-skills, pengetahuan dan dapat memupuk minat terhadap penyelidikan dan inovasi dalam bidang masing-masing. Saya bersyukur kerana penerbitan kali ini juga telah disertai oleh warga dari Institusi Pengajian Tinggi di Indonesia. Ini menunjukkan bahawa penerbitan buku ini juga diiktiraf oleh pihak luar yang berkepentingan.

Harapan saya dengan adanya usaha berterusan dalam penerbitan buku e-prosiding ini akan memberi motivasi dan nilai positif kepada generasi PMK dalam menghasilkan penyelidikan, inovasi dan penulisan untuk dijadikan sumber rujukan pelajar dan pensyarah pembimbing pada masa akan datang.

Akhir kata, semoga penerbitan buku e-prosiding ini dapat memberi impak kepada semua warga PMK agar terus cemerlang dalam bidang penyelidikan, inovasi dan penulisan projek pelajar dalam usaha melahirkan graduan berkualiti dan berdaya saing di peringkat nasional dan antarabangsa.

Sekian, Wassalam.

Selamat Maju Jaya

Sr. HJ. RAZALI BIN JOHARI
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PRAKATA

Penerbitan e-Prosiding Projek Pelajar, Politeknik Melaka Volume II, 2021 adalah selaras dengan pertandingan inovasi: Innovation Competition, Conference & Career Exhibition (I3Ce) siri ke-3 peringkat Politeknik Melaka (PMK). Pertandingan ini adalah sebagai usaha berterusan Unit Penyelidikan, Inovasi dan Pengkomersilan (UPIK) dengan kerjasama Penyelaras Projek Pelajar Jabatan Akademik Politeknik Melaka dalam memperkasakan hasil penulisan dan inovasi projek pelajar semester 5 yang berkualiti.

Himpunan e-Prosiding volume II ini telah menghimpunkan sebanyak 25 prosiding terbaik projek pelajar bagi kategori ilmiah dan produk yang telah dipertandingkan dari semua jabatan akademik PMK iaitu Jabatan Perdagangan (9) dan Jabatan Kejuruteraan Awam (11) dalam Pertandingan I3Ce Siri Ke-3 tahun 2021. Disamping itu, e-Prosiding kali ini juga telah menerima satu penyertaan dari Politeknik Port Dickson (PPD) serta institusi pengajian dari negara Indonesia iaitu sebanyak empat kertas penyelidikan. Keseluruhannya, e-Prosiding Volume II menghimpunkan sebanyak 25 kertas penulisan ilmiah dan produk dalam pelbagai bidang kejuruteraan elektrik & elektronik, kejuruteraan awam, kejuruteraan mekanikal & pembuatan, perniagaan dan pengurusan, serta komputer dan ICT.

Umumnya proses penilaian projek pelajar melibatkan pembentangan pelajar, pemantauan oleh penyelia dan penulisan laporan. E-prosiding ini sebagai medium untuk memantapkan kemahiran pelajar dalam menghasilkan penulisan laporan teknikal mengikut format yang standard. Semua kertas prosiding telah disemak dan dinilai oleh jawatankuasa penilai (reviewer) berdasarkan format yang telah ditetapkan. Akses e-prosiding terbuka boleh dilihat atau dimuat turun menerusi http://event.polimelaka.edu.my/eprosiding_pelajar/2021.html

Mewakili Jawatankuasa Editor, saya ingin mengucapkan setinggi-tinggi penghargaan kepada Jawatankuasa e-Prosiding Projek Pelajar, terutamanya kepada Pengarah PMK selaku Pengerusi Penganjur, Sr. Hj Razali Bin Johari serta semua penyelia dan penilai kertas kerja dalam usaha mereka yang tidak jemu menyemak dan menilai kertas prosiding projek pelajar. Tidak lupa juga kepada semua penulis dari institusi selain PMK dan institusi dari Indonesia.

Sekian, terima kasih.

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Kertas Penyelidikan

ISI KANDUNGAN

e-PROCEEDING OF INNOVATION COMPETITION, CONFERENCE & CAREER EXHIBITION (I3CE 2021) Volume 2 (2021)

Kertas Penyelidikan

KAJIAN PELAKSANAAN PENGURUSAN SISA PEMBINAAN TAPAK BINA DI NEGERI MELAKA

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Abstrak: Melaka merupakan sebuah negeri yang pesat membangun dari segi pembangunan dan juga perkembangan ekonomi yang berteraskan teknologi hijau. Negeri ini sedang gigih bersaing dengan negeri-negeri lain untuk mencapai satu tahap yang cemerlang sebagai negeri yang maju dan berpendapatan tinggi. Pembangunan yang pesat membangun akan menyumbang kepada peningkatan sisa binaan. Namun begitu, terdapat pelbagai jenis sisa binaan yang boleh dikitar semula. Pengurusan sisa binaan yang tidak terancang akan menyebabkan sisa binaan yang boleh dikitar atau diguna semula akan terhapus. Oleh yang demikian, kajian dibuat bagi mengenalpasti tahap pengetahuan kontraktor tentang pengurusan sisa binaan. Seterusnya, kajian ini juga dijalankan bagi mengenalpasti masalah yang dihadapi oleh kontraktor dalam pengurusan sisa binaan di tapak bina. Selain itu, kajian ini dijalankan bagi menentukan kaedah pengurusan sisa binaan yang diamalkan oleh pihak kontraktor dan pemaju. Kaedah borang soal selidik digunakan untuk mendapatkan hasil kajian. Sebanyak 11 respondan menjawab borang soal selidik yang diedarkan. Hasil kajian dianalisa menggunakan Microsoft Excel dan mendapati 76% daripada responden mengetahui akan pengurusan sisa binaan. Kesimpulannya, hasil kajian ini mampu memaparkan tahap pengetahuan kontraktor tentang pengurusan sisa binaan dan juga dapat mengenalpasti masalah yang dihadapi oleh kontraktor dalam pengurusan sisa binaan. Selain itu juga, hasil kajian ini mampu menentukan kaedah pengurusan sisa binaan yang diamalkan oleh kontraktor di Negeri Melaka

Kata Kunci: Kontraktor, pengurusan, sisa binaan, pengetahuan, Negeri Melaka

1. PENGENALAN

Melaka merupakan sebuah negeri yang pesat membangun dari segi pembangunan dan juga perkembangan ekonomi yang berteraskan teknologi hijau. Negeri ini sedang gigih bersaing dengan negeri negeri lain untuk mencapai satu tahap yang cemerlang sebagai negeri yang maju dan berpendapatan tinggi.

Pembinaan merupakan aktiviti yang penting dalam memajukan sesebuah negara. Melaka adalah sebuah bandaraya yang sedang pesat membangun dan sedang mengalami transisi ke abad 21. Populasinya meningkat sebanyak 40% dalam tempoh 15 tahun lalu dengan jumlah populasi seramai 902,881 penduduk dicatatkan pada tahun 2015. Pertumbuhan pesat penduduk ini mendorong permintaan untuk pembangunan bandar-bandar baharu, penambahbaikan perkhidmatan yang lebih baik dan pembinaan infrastuktur baru bagi menyokong pertumbuhan ini (Melakakini). Pertumbuhan ini turut menyumbang pertambahan sisa pembinaan di negeri ini. Fenomena ini boleh mengakibatkan pencemaran tanpa pengurusan sisa buangan yang teratur dan sistematik. Pengurusan sisa binaan yang tidak terancang juga akan menyebabkan pelupusan sisa

binaan yang boleh dikitar atau diguna semula. Hal ini akan memberi kesan negatif kepada Tapak Pelupusan Sampah Sungai Udang yang menganggarkan penerimaan sebanyak 1,000 tan sehari sisa buangan dan jumlah ini melebihi kapasiti yang ditetapkan iaitu 852.77 tan sehari (SWCORP, 2018).

Objektif kajian ini dilaksanakan ialah untuk mengenalpasti tahap pengetahuan kontraktor tentang pengurusan sisa binaan, mengenalpasti masalah yang dihadapi oleh kontraktor dalam pengurusan sisa binaan di tapak bina, dan yang terakhir untuk menentukan kaedah pengurusan sisa binaan yang diamalkan oleh pihak kontraktor atau pemaju. Kajian ini dilaksanakan dengan merujuk kepada Akta 672, Akta 133 dan Peraturan Pengurusan Sisa Binaan yang dikuatkuasa pada 1 Januari 2020. Akta dan peraturan ini menekankan aspek mengurangkan sisa binaan yang dilupuskan dan menggalakkan kaedah kitar dan guna semula.

2. KAJIAN LITERATUR

2.1 Definisi Sisa

Sisa merupakan bahan buangan yang terhasil daripada sesuatu aktiviti ataupun proses yang dilakukan oleh manusia, haiwan dan juga tumbuhan. Sisa juga boleh ditakrifkan sebagai sesuatu bahan yang dihasilkan oleh aktiviti manusia dan industri serta tidak mempunyai nilai (Alarcon, 1994).

2.2 Sisa Binaan

Sisa pembinaan fizikal ditakrifkan sebagai sisa yang dihasilkan daripada aktiviti pembinaan, pengubahsuaian, perobohan, penggalian tanah, pembinaan bangunan, pembersihan tapak, pembinaan jalan raya dan pembaikan bangunan-bangunan yang rosak. Seterusnya, sisa pembinaan dan pencerobohan juga ditakrifkan secara amnya sebagai sisa yang dihasilkan daripada industri pembinaan dengan aktiviti pembinaan, pengubahsuaian bangunan, pembinaan awam dan bangunan. Selain itu, sesetengah sisa pembinaan ditakrifkan sebagai sisa pepejal yang terdiri daripada pasir, bata, blok, keluli, konkrit, jubin buluh,plastik, kaca, kayu, kertas, tumbuh-tumbuhan dan lain-lain bahan organik (Nagapan & Asmi, 2012).

2.3 Pengenalan Dasar Pengurusan Sisa Pepejal

Dasar Pengurusan Sisa Pepejal Negara (DPSPN) telah diluluskan oleh Jemaah Menteri pada 13 September 2006 dengan matlamat seperti berikut:

i. Mewujudkan sistem pengurusan sisa pepejal yang menyeluruh, bersepadu, kos efektif, mampan dan diterima masyarakat yang mementingkan pemeliharaan alam sekitar, pemilihan teknologi yang mampu membayar dan menjamin kesihatan awam.
ii. Melaksanakan pengurusan sisa pepejal berdasarkan "waste management hierarchy" yang memberi keutamaan kepada pengurangan sisa melalui Reduce, Reuse and Recycle (3R) rawatan perantaraan dan pelupusan akhir (https://www.kpkt.gov.my).

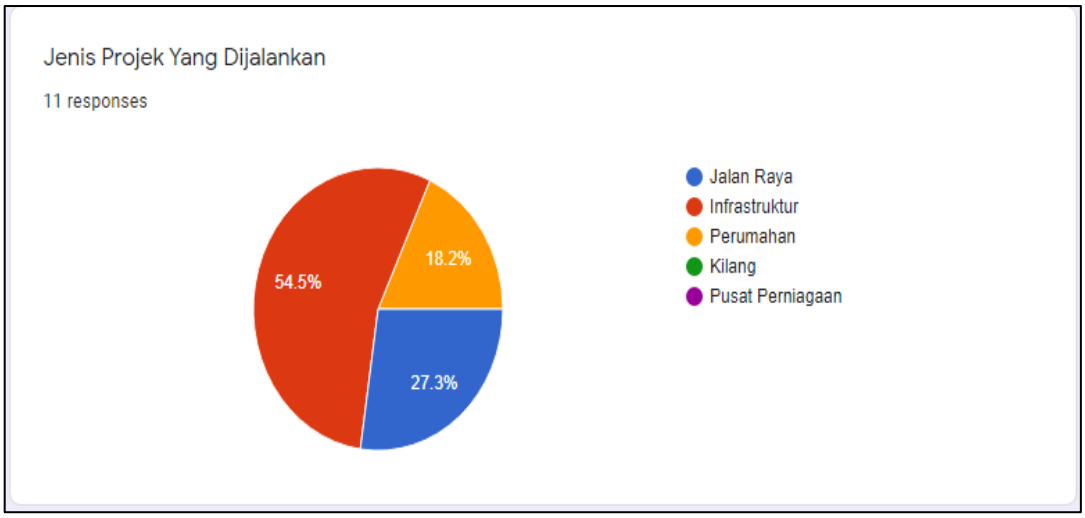
3. METODOLOGI KAJIAN

Kaedah yang digunakan dalam mengumpul data untuk kajian ini adalah dengan menyediakan borang soal selidik yang dijawab oleh kontraktor (responden) di Melaka sahaja. Borang soal selidik diedarkan kepada kontraktor dengan menggunakan kaedah di atas talian iaitu "google meet". Selain itu, bilangan soalan terbahagi kepada 4 iaitu bahagian A,B,C dan D. Untuk bahagian A terdapat 10 soalan, bahagian B terdapat 7 soalan, bahagian C terdapat 5 soalan dan bahagian D terdapat 5 soalan. Seterusnya,

kaedah yang digunakan untuk menganalisa data ialah menggunakan kaedah "Microsoft Excel" dan output yang dikehendaki ialah peratus.

4. ANALISIS DATA

Responden dalam kajian ini adalah sebanyak 11 kontraktor pembinaan iaitu 4 dari daerah Alor gajah dan 7 dari daerah Melaka Tengah. Kontraktor yang terlibat kebanyakannya terdiri daripada Gred 1 sebanyak 10 syarikat dan Gred 7 sebanyak 1 syarikat. Carta 4.1 menunjukkan dapatan mengenai peratusan bagi pengkelasan jenis projek yang dilaksanakan oleh responden. Jenis projek infrastuktur mencatatkan peratusan tertinggi iaitu sebanyak 54.5%. Nilai ini mewakili bilangan 6 daripada 11 responden. Manakala projek jalan raya adalah 27.3% (3 responden) dan projek perumahan adalah 18.2% (2 responden).



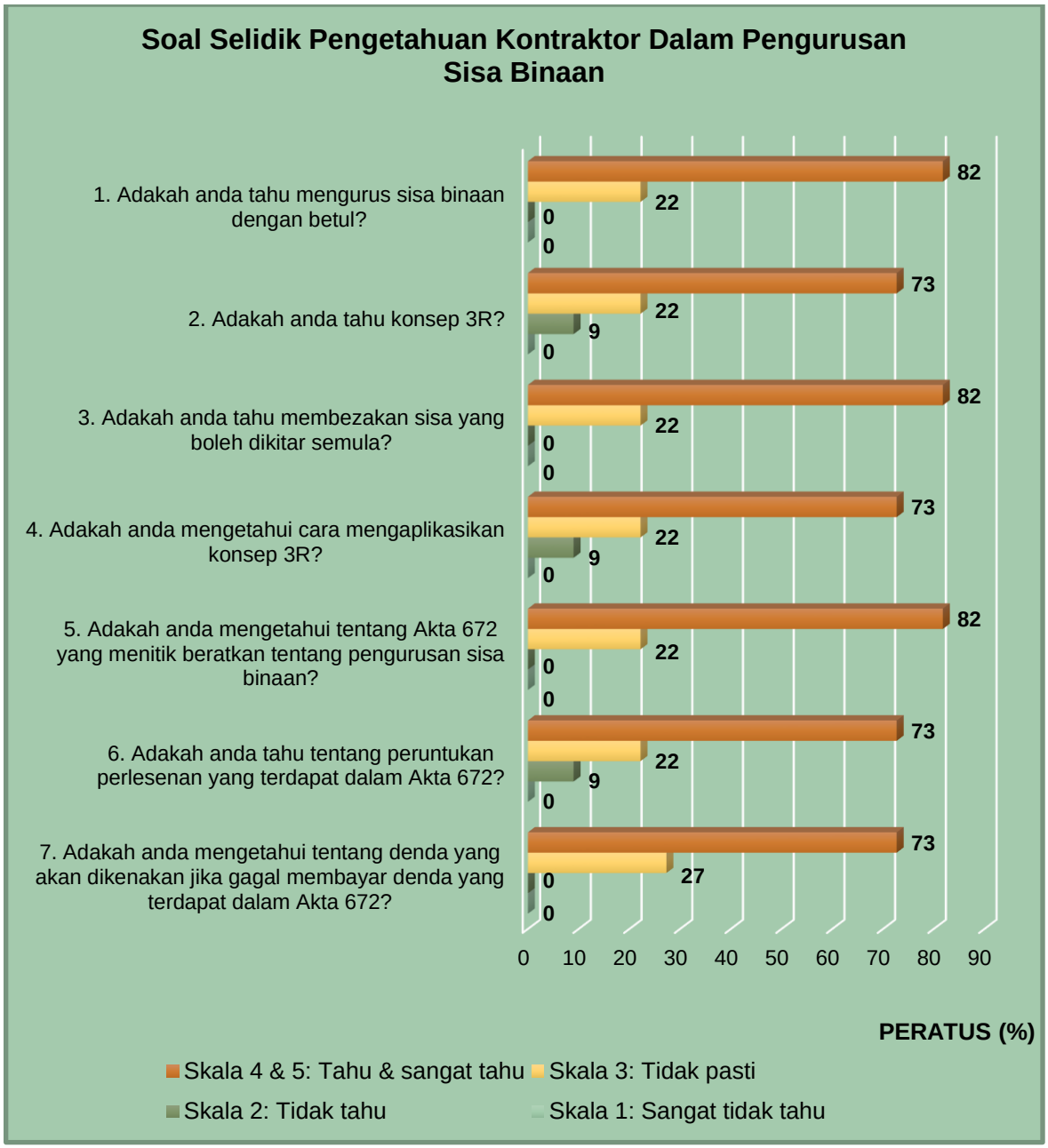
Carta 4.1: Peratusan bagi pengkelasan jenis projek yang dijalankan oleh respondan

Proses menganalisis data dibuat melalui kajian soal selidik yang diedarkan melalui secara atas talian. Bagi mencapai objektif kajian, berikut adalah senarai data yang telah digariskan dalam kajian ini:

i. Tahap pengetahuan kontraktor tentang pengurusan sisa binaan.
ii. Masalah yang dihadapi oleh kontraktor dalam pengurusan sisa binaan.
iii. Kaedah pengurusan sisa binaan yang diamalkan oleh kontraktor.

4.1 TAHAP PENGETAHUAN KONTRAKTOR TENTANG PENGURUSAN SISA BINAAN

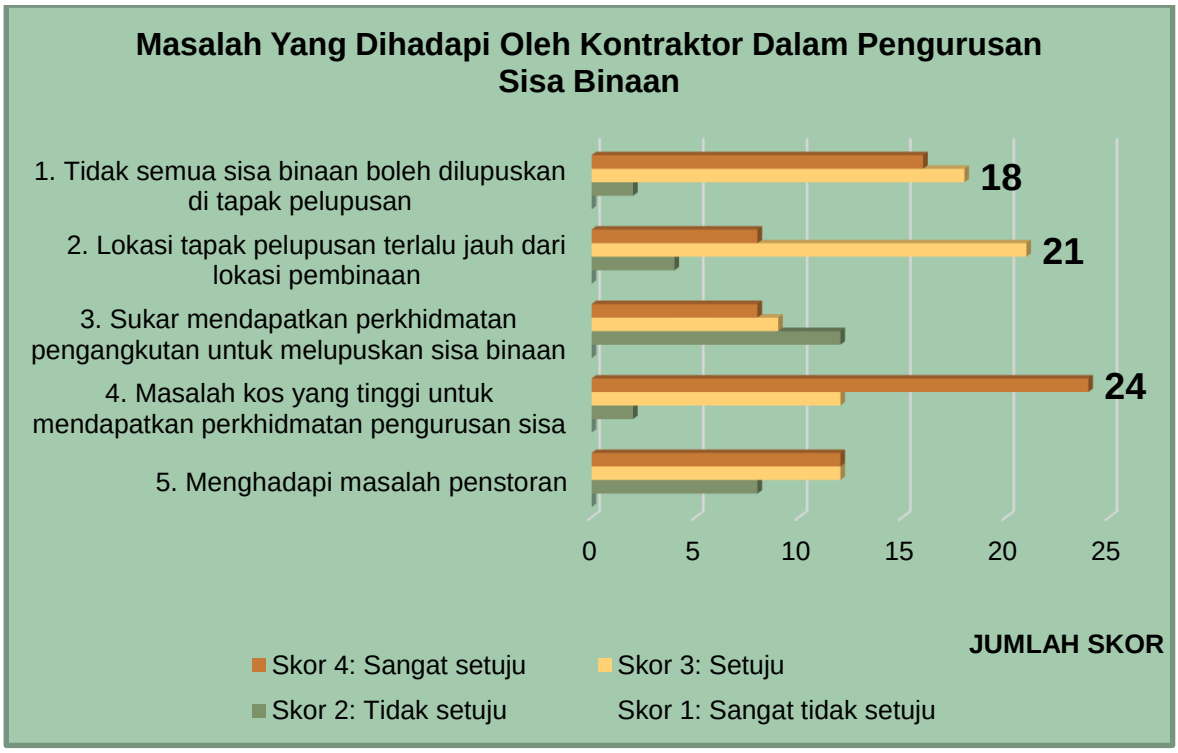
Carta 4.2 menunjukkan nilai purata 76.6% daripada bilangan responden adalah mengetahui tentang pengurusan sisa binaan. Semua responden kerap memilih skala 4 (tahu) dan 5 (sangat tahu) dalam menjawab soal selidik ini.



Carta 4.2: Soal selidik mengenai pengetahuan kontraktor dalam pengurusan sisa binaan

4.2 MASALAH YANG DIHADAPI OLEH KONTRAKTOR DALAM PENGURUSAN SISA BINAAN

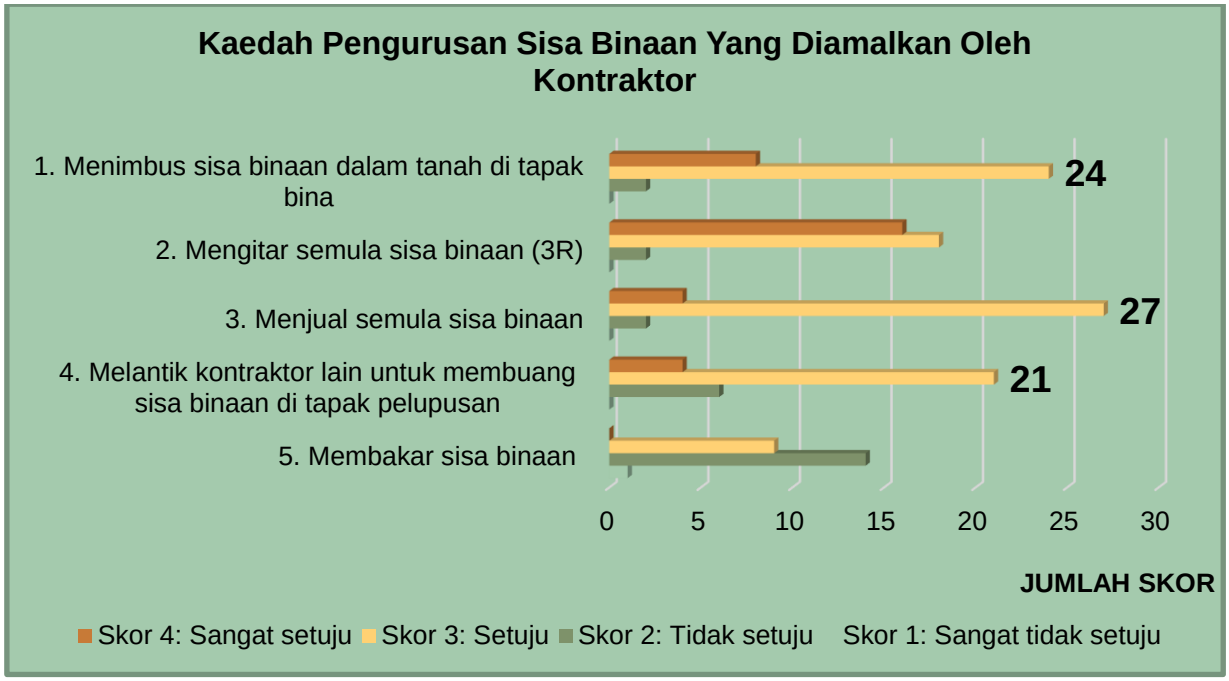
Carta 4.3 menunjukkan dapatan kajian mengenai masalah yang kerap dihadapi oleh kontraktor dalam pengurusan sisa binaan. Daripada lima (5) masalah yang disenaraikan, masalah keempat iaitu kos yang tinggi untuk mendapatkan perkhidmatan pengurusan sisa telah mencatatkan skor tertinggi (24) dengan bilangan 6 daripada 11 responden memilih skala 4 (sangat setuju). Masalah kedua yang kerap menjadi pilihan responden dengan nilai skor 21 ialah lokasi tapak pelupusan terlalu jauh dari lokasi pembinaan.



Carta 4.3 : Masalah yang dihadapi oleh kontraktor dalam pengurusan sisa binaan

4.3 KAEDAH PENGURUSAN SISA BINAAN YANG DIAMALKAN OLEH KONTRAKTOR

Carta 4.4 menunjukkan dapatan mengenai kaedah yang menjadi pilihan kontraktor dalam usaha menguruskan sisa binaan. Daripada lima (5) kaedah yang disenaraikan, kaedah menjual semula sisa binaan telah mendapat skor tertinggi (27) di mana 9 daripada 11 responden memilih skala 3 (Setuju). Manakala kaedah membakar sisa binaan mencatatkan skor paling rendah (14) dengan bilangan 7 responden memilih skala 2 (tidak setuju).



Carta 4.4 : Kaedah pengurusan sisa binaan yang diamalkan oleh kontraktor

5. KESIMPULAN DAN CADANGAN

Kesimpulannya, kajian ini berjaya mencapai objektif yang ditetapkan. Keputusan kajian menunjukkan hampir semua kontraktor (responden) mempunyai pengetahuan dalam pengurusan sisa binaan. Analisis data juga menunjukkan antara masalah utama yang dihadapi oleh kontraktor dalam pengurusan sisa binaan adalah kos yang tinggi untuk mendapatkan perkhidmatan pengurusan sisa dan lokasi tapak pelupusan terlalu jauh dari lokasi pembinaan. Dapatan kajian terdahulu juga mendapati bahawa kos yang tinggi menjadi masalah utama dalam pengurusan sisa binaan (Mohdazryaa, 2007). Kajian ini juga menunjukkan kontraktor bersetuju bahawa tindakan menjual semula sisa binaan adalah kaedah terbaik yang perlu diamalkan dalam pengurusan sisa binaan. Lima puluh peratus (50%) daripada kontraktor tersebut melupuskan sisa binaan mereka dengan menghantar sisa tersebut ke tapak pelupusan sampah (Mohdazryaa, 2007). Dapatan kajian ini boleh dikongsi bersama dengan pihak berkuasa tempatan dan warga industri binaan dalam usaha mengurangkan kuantiti sisa binaan yang dihantar ke tapak pelupusan.

Cadangan bagi penambahbaikan kajian ialah menambah bilangan responden (kontraktor) untuk menjawab soal selidik. Seterusnya, memperbanyakkan lagi soalan di setiap bahagian soal selidik bagi mengukuhkan dapatan analisis. Selain itu, menetapkan kelas kontraktor mengikut gred dan memperluaskan skop kajian seperti menjalankan kajian di negeri lain.

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POTENSI LIGHTWEIGHT PANEL LIFTER TERHADAP PRODUK IBS

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Abstrak. Dalam era globalisasi kini, pembinaan di Malaysia semakin pesat membangun. Kebanyakan pembinaan menggunakan tenaga kerja untuk mengangkat panel IBS seperti 'Innovative Solid Panel'. Pernyataan masalah berdasarkan kaedah sedia ada adalah melibatkan faktor keselamatan dan kesihatan terhadap pekerja. Justeru, kajian ini dijalankan bagi menghasilkan 'Lightweight Panel Lifter for Industrialised Building System (IBS)'. Antara objektif produk ini adalah merekabentuk alat 'lightweight panel lifter' dan untuk mengetahui potensi 'lightweight panel lifter' di tapak bina. Produk ini dihasilkan menggunakan bahan seperti besi, roda, kereta sorong, 'hidraulic jack', 'bolt' dan 'nut'. Soal selidik yang digunakan adalah aplikasi 'survey monkey' yang melibatkan seramai 22 responden. Pencapaian terhadap produk 'Lightweight Panel Lifter' bagi objektif 1 dan 2 telah berjaya dilaksanakan. Antara penambaikan produk ialah menggunakan roda kereta sorong bagi menampung beban dan penggunaan 'hydraulic jac'k bagi proses mengangkat. Kesimpulannya, produk ini telah mencapai objektif dan mengikut spesifikasi yang dirancang serta memenuhi ujian yang dijalankan.

Kata kunci : 'Innovative solid panel', 'Industrialised Building System', tapak bina, 'panel installer', 'hydraulic jack'

1. PENGENALAN

Alat 'Lightweight Panel Lifter' untuk memudahkan pekerja di tapak pembinaan terutama pemasang panel (Panel Installer). Nama untuk projek ini adalah Lightweight Panel Lifter kerana alat ini mampu mengangkat panel jenis 'Innovative Solid Panel'. Pengangkat (lifter) tersebut boleh ditegakkan kepada 90°. Ciptaan projek ini mampu memberi manfaat kepadapekerja dari pelbagai aspek terutama aspek keselamatan dan penjimatan tenaga kerja. Produk ini dicipta dengan ciri-ciri tertentu bagi memudahkan dan meningkatkan keberkesanan projek ini. Tujuan mencipta projek ini adalah mensasarkan kepada pekerja di tapak pembinaan terutama pemasang panel (Panel Installer) bagi proses mengangkat dan pemasangan panel. Projek ini dihasilkan untuk menyelesaikan masalah mengangkat panel di tapak pembinaan. Panel ini menggunakan panel jenis 'Innovative Solid Panel'. Kaedah sebelum ini adalah menggunakan tenaga kerja sahaja. Kesannya boleh mengakibatkan kecederaan tulang belakang (slip disc) kepada pekerja. Projek ini membantu pekerja di tapak bina bagi menjalankan kerja mengangkat panel.

Selain itu, atas dasar keselamatan pekerja semasa menggunakan 'Lightweight Panel Lifter', produk ini dicipta dan diinovasikan dengan ciri-ciri keselamatan serta mampu mengurangkan kecederaan terhadap pekerja ketika proses pemasangan panel. Justeru, matlamat projek ini adalah untuk memudahkan pekerja mengangkat dan mendirikan panel di tapak pembinaan. Objektif kajian ini adalah mereka bentuk 'Lightweight Panel Lifter' dan seterusnya untuk mengetahui potensi 'Lightweight Panel Lifter'. Akhir sekali, 'Lightweight Panel Lifter' yang dicipta ini mampu memberi manfaat kepada pekerja di tapak pembinaan. Ciptaan yang telah dihasilkan ini juga mempunyai ciri-ciri tertentu serta mempunyai kos penyelenggaraan yang rendah dan kaedah penyimpanan yang mudah.

2. SOROTAN KAJIAN

Sorotan kajian ini membincangkan serba sedikit berkenaan projek yang dilaksanakan iaitu kajian terdahulu yang merangkumi kajian daripada sumber internet dan sumber yang berhubung kait dengan 'Lightweight Panel Lifter' yang akan dihasilkan. Jika dibandingkan dengan kaedah sebelum ini, pekerja di tapak bina tidak menggunakan sebarang alat bantuan untuk mengangkat panel tersebut. Malahan, 'innovative solid panel' diangkat dengan menggunakan tenaga kerja sahaja.

Oleh itu, terdapat beberapa masalah yang dihadapi pekerja semasa proses pemasangan panel tersebut. Masalah yang dialami ketika kerja pemasangan panel di tapak pembinaan adalah keselamatan dan kesihatan terhadap pekerja yang boleh mengakibatkan kecederaan tulang belakang (slip disc) (Richard, 2009). Ini kerana pekerja perlu mengangkat panel tersebut tanpa menggunakan alat atau mesin. Pekerja juga perlu mengangkat dan membawa panel tersebut ke tapak bina bagi proses pemasangan. Apabila tiba di tapak bina, pekerja perlu menegakkan panel tersebut bagi proses seterusnya. Selain itu, jumlah tenaga kerja untuk memasang panel juga adalah satu masalah. Ini kerana proses mengangkat panel memerlukan 3 hingga 4 orang pekerja kerana panel mempunyai kapasiti yang berat. Menurut Richard (2009), mengangkat berat atau cara mengangkat yang tidak betul adalah salah satu punca yang boleh menyebabkan kecederaan tulang belakang (slip disc)'.

Justeru, produk yang telah dicipta dapat mengurangkan masalah tersebut iaitu 'Lightweight Panel Lifter for IBS'. Produk ini dapat memudahkan proses mengangkat dan memasang panel terutama sekali bagi panel jenis 'Innovative solid panel'.

3. METODOLOGI KAJIAN

Metodologi kajian ini meliputi cara, kaedah dan pendekatan yang digunakan untuk mencapai objektif dan matlamat kajian. Metodologi kajian menjadikan kajian yang dijalankan lebih bersistematik dan perjalanan kajian lebih terarah dalam mencapai objektif.

3.1 Bahan yang digunakan

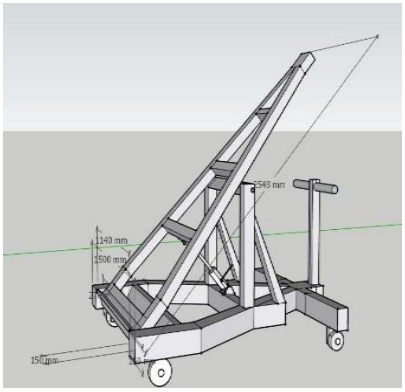
Bahan yang digunakan dalam penghasilan produk ini ialah menggunakan roda kereta sorong bagi menampung beban dan penggunaan 'hydraulic jack' bagi proses mengangkat. Antara bahan yang digunakan ialah besi yang tahan lasak serta mampu menampung beban. Seterusnya, roda kereta sorong ini dipilih kerana mampu digunakan di permukaan yang rata dan tidak rata. Skru, 'bolt' dan 'nut' juga digunakan dalam produk ini bagi menyambung dan mengikat sesuatu komponen. Di samping itu, 'hydraulic jack' digunakan untuk proses mengangkat beban. Tali 'rachet' pula digunakan bagi aspek keselamatan.

3.2 Prosedur kajian

Prosedur produk ini adalah membuat lakaran reka bentuk produk. Seterusnya, merujuk lakaran reka bentuk produk kepada tukang besi untuk mendapatkan maklumat tentang pemilihan bahan yang digunakan. Selain itu, ukuran dan diameter lakaran reka bentuk produk adalah mengikut size panel yang digunakan. Disamping itu, proses pembuatan produk ini, mengambil masa selama dua bulan serta kos yang bernilai RM900.

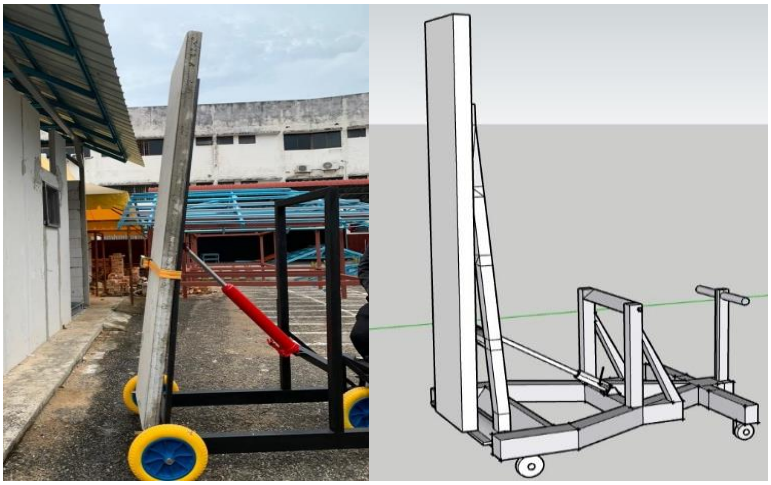
4. KEPUTUSAN DAN ANALISIS

Objektif 1 – Mereka bentuk alat 'lightweight panel lifter'



Rajah 4.1(a) : Gambaran lakaran reka bentuk 'Lightweight Panel Lifter for IBS'

Rajah 4.1(b) : 'Lightweight Panel Lifter' produk yang diletakkan panel



Rajah 4.1(c) : Panel yang berukuran panjang 3m dan berat 70kg diangkat oleh 'Lightweight Panel Lifter'

Keputusan dan analisis mendapati reka bentuk berjaya dihasilkan seperti yang dirancang. Keputusan mendapati alat ini berjaya mengangkat panel yang berukuran berat 70kg (maksimum) dan panjang 3m serta mampu ditegakkan kepada 90°. Selain itu, kesemua komponen berfungsi dalam keadaan baik semasa proses pengujian dilakukan.

Objektif 2 - Untuk mengetahui potensi 'Lightweight panel lifter 'di tapak bina

Analisis dilakukan menggunakan soal selidik iaitu melalui aplikasi 'survey monkey'. Bilangan responden yang menjawab ialah 22 orang terdiri daripada buruh, 'panel installer' dan kontraktor. Jadual 4.1 menunjukkan soalan-soalan yang berkaitan dengan potensi Lightweight Panel Lifter for IBS'.

Jadual 4.1 – Potensi 'Lightweight Panel Lifter for IBS'

NO	SOALAN	BILANGAN RESPONDEN (%)				
		SANGAT SETUJU	SETUJU	TIDAK PASTI	TIDAK SETUJU	SANGAT TIDAK SETUJU
1	Adakah 'Lightweight Panel Lifter for IBS' mudah dikendalikan di tapak bina ?	6	11	5	0	0
2	Adakah produk ini mampu mengurangkan kecederaan terhadap pekerja di tapak bina ?	2	15	5	0	0
3	Adakah 'Lightweight Panel Lifter for IBS' sesuai digunakan di tapak pembinaan ?	6	13	3	0	0
4	Adakah Lightweight Panel Lifter for IBS' membantu untuk proses mengangkat panel ?	5	16	1	0	0
5	Adakah produk ini mampu menjimatkan masa untuk mengangkat panel ?	3	16	3	0	0
6	Adakah 'Lightweight Panel Lifter for IBS' ini sesuai dipasarkan ?	9	11	2	0	0

Berdasarkan kepada Jadual 4.1, didapati seramai 15 orang atau bersamaan dengan 50% responden bersetuju alat 'Lightweight Panel Lifter' ini mudah dikendalikan di tapak bina. Manakala, 23% responden memilih tidak pasti kerana alat ini tidak diuji secara teknikal. Selain itu, berdasarkan soalan 2 seramai 68% responden bersetuju produk ini mampu mengurangkan kecederaan terhadap pekerja di tapak bina. Manakala 23% responden memilih tidak pasti. Seramai 59% responden bersetuju alat ini sesuai digunakan di tapak pembinaan. Manakala 14% responden memilih tidak pasti. Seterusnya, berdasarkan soalan 4 seramai 73% responden bersetuju alat ini membantu untuk proses mengangkat panel. Manakala 5% responden pula memilih tidak pasti.

Berdasarkan soalan 5 pula dapatan menunjukkan 73% responden bersetuju alat ini mampu menjimatkan masa untuk mengangkat panel. Manakala 14% responden memilih tidak pasti. Akhir sekali, 50% responden bersetuju alat 'Lightweight Panel Lifter' ini sesuai dipasarkan. Manakala 9% responden memilih tidak pasti kerana tiada pengujian dilakukan atas alat ini di tapak bina.

Kesimpulannya, dapatan menunjukkan 80% responden yang telah menjawab soal selidik ini bersetuju dengan soalan – soalan yang telah dinyatakan dalam soal selidik tersebut. Dengan itu, ianya mendapati produk yang telah dicipta ini mampu mengurangkan kecederaan, menjimatkan masa, membantu untuk proses mengangkat panel, sesuai digunakan, sesuai dipasarkan dan mudah dikendalikan dipermukaan yang tidak rata di tapak bina.

5. KESIMPULAN

Kesimpulannya, berdasarkan produk yang telah dihasilkan dapat membantu pekerja di tapak bina terutama 'panel installer' dalam proses mengangkat dan pemasangan panel. Cadangan untuk kajian pada masa akan datang adalah menggunakan roda tayar hidup (boleh dipam) dan menggunakan 4 roda supaya alat dapat kestabilan yang baik serta menguji 'Lightweight Panel Lifter for IBS' di tapak bina sama ada panel boleh diangkat menggunakan 'hydraulic jack'.

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EFFECT OF WASTE ROOF TILES ON REPLACEMENT OF FINE AGGREGATES IN CONCRETE

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Abstract: The construction industry is one of the most important industrial sectors in every country. This industry is moving at a fast paced and involves a lot of other parties and some parties do not care about the impact on the environment. Unsystematic construction waste management can cause problems to the environment. Therefore, the first objective of this study is to design concrete mixes using roof tile waste (RTW) as a substitute for fine aggregate that follows the requirement of Department of Environment (DOE). Second, to determine the optimal slump test between RTW concrete and conventional concrete. Finally, to determine the optimum compressive strength of green concrete that uses RTW as aggregate substitute. Every component involved in conducting this research will be explained, from the preparation of the methodology flow chart, research design, material proportions and test methods. The test methods used are slump test, compressive strength, and specific gravity test. The results obtained through the test showed show the reading value on concrete that used tile residue as substitute for fine aggregate is better than the traditional prepared concrete where its value for average strength from 10.90% to 16.67% for 3 days. In conclusion, the use of tile waste as a fine aggregate in concrete can be a new trend in construction and can quickly reduce the problems that occur in waste management at construction sites.

Keywords: waste tiles, environment, fine aggregate

1. INTRODUCTION

According to Begum et al, (2007) industry is one of the most important industrial sectors in any country. In the 10th Malaysia Plan, the Economic Planning Unit of the Prime Minister's Department (2015) shows that strong economic growth for a continuous period has increased the capacity and rapid development of the development sector in Malaysia. Along with the rapid development in Malaysia, the use of building materials has also increased, and the waste of construction waste has also occurred. It is necessary to look seriously at the problem of construction waste case and how to implement a systematic and safe waste management of building materials. This is because, poor construction waste management has negative impacts on the environment, especially for items that cannot be disposed of. Zimbili et al. (2014) stated it is clear that ceramic wastes are suitable to be used in the construction industry, and more significantly on the making of concrete. Ceramic wastes are found to be suitable to be used as substitution for fine and coarse aggregates and partial substitution in cement production. In solving the problem of environmental pollution, this research seeks to conduct research related to non-disposable ceramic tiles. Ceramic tile is one of the materials that industries manufactured as building materials. This research used roof tiles made from ceramic tiles as a substitute for fine aggregates for concrete. Concrete is a composite building material consisting of cement and aggregates. The form of coarse aggregate particles from roof tiles are largely similar with ordinary

crushed concrete stone. The important specifications of the aggregate are its shape, texture, and maximum size. The specifications of roof tiles aggregate make it better than ordinary crushed stone aggregates. The surface texture and mineral traits improve the bonding of the aggregate and the patch, as well as the pressure at which micro -cracking begins. It also helps to improves the strength of the aggregate that it creates higher strength concrete. Special characteristics of ceramic wastes are suitable to be used as Pozzolanic materials and are therefore suitable in the manufacture of concrete. The objectives are to design concrete mixes using roof tiles waste (RTW) as a substitute for fine aggregates according to the Department of Environment (DOE) guidelines, to determine the optimum slump test between RTW concrete and conventional concrete, and to determine the optimum compressive strength of green concrete that used RTW as fine aggregates replacement. The limitation of this project are these experiments of using RTW as replacement for fine aggregate were limited to one laboratory testing, and compression test.

2. LITERATURE REVIEW

According to Mbereyaho et al. (2019), tests conducted with all used natural aggregates confirmed their suitability for use in structural concrete. The grain size distribution test of the studied ceramic tiles wastes showed that this material belonged to the category of fine sand under Zone III, and therefore suitable to be used as fine aggregate. As all used natural aggregates were suitable for the designed concrete M20, test results showed that its strength characteristics were adequate (around 22MPA for compression strength at 28 days). Regarding the strength characteristics of the new concrete, results showed that all strengths, i.e., compression strength, split tensile strength and flexural strength for this concrete slightly increased by around 4%, 11% and 5% respectively until the partial replacement of natural sand by ceramic tile waste in the concrete gets 5%. Then a progressive decreases for every further and significant replacement where at 15% of replacement the reduction of strengths were around 14%, 19% and 21% respectively. Ramadevi (2017) conducted a total of three tests that show 50% tile residue replacement gained strength and gave better results than other control percentages and mixtures. It is concluded that ceramic waste can be used in concrete up to 50% and it can increase strength as well as save natural resources.

3. METHODOLOGY OF THE STUDY

3.1 Study area

This study was conducted in the concrete laboratory of Malacca Polytechnic.

3.2 Research Materials and Methods

The materials used in this project are cement, sand, coarse aggregate, and clean air. Portland Cement (CPC) composites was used and BS12: 1996 was applied. River sand was used in this study and BS882: 1996 was applied. Sand was sieved and separated from organic matter by the action of air currents until it reached the uniform grain size. Coarse aggregates with a nominal size of 20 mm used in the manufacture of concrete and the requirements of BS882: 1996. Clean air is used for mixing.

3.3 Tests performed

Specific gravity test

Based on Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate, this method includes the determination of specific gravity and absorption of coarse aggregates. Specific gravity can be expressed as bulk specific gravity, bulk specific gravity (SSD) (saturated-surface-dry), or explicit specific gravity.

Slump test
BS EN 12350-2:2009 (BS,2009) stated on how to test fresh concrete. The purpose of this test is to determine the workability or consistency of the concrete mix prepared in the laboratory or construction site during the progress of the work. Concrete deterioration tests are performed from batch to batch, to check the uniform quality of concrete during construction

Compressive strength test
BS 1881: Part 116: (1983) (BS 1983) stated the method to determine the compressive strength of concrete. The purpose of this test is to determine the behaviour of the material under load. The maximum pressure that a material can withstand in a period of time under load (fixed or progressive) is determined. The compressive strength of concrete was given in terms of the compressive strength characteristics of a cube measuring 150mm or 100mm and was tested after 28 days. In the field, compressive strength tests were also performed in a shorter period, like after 7 days to confirm the expected compressive strength after 28 days.

4. RESULTS AND CONCLUSION

Figure 4.1 shows the graph of coarse aggregate sieve analysis. Based on the result, sample of coarse aggregate in all size is within the limitation and can be considered as perfectly graded.

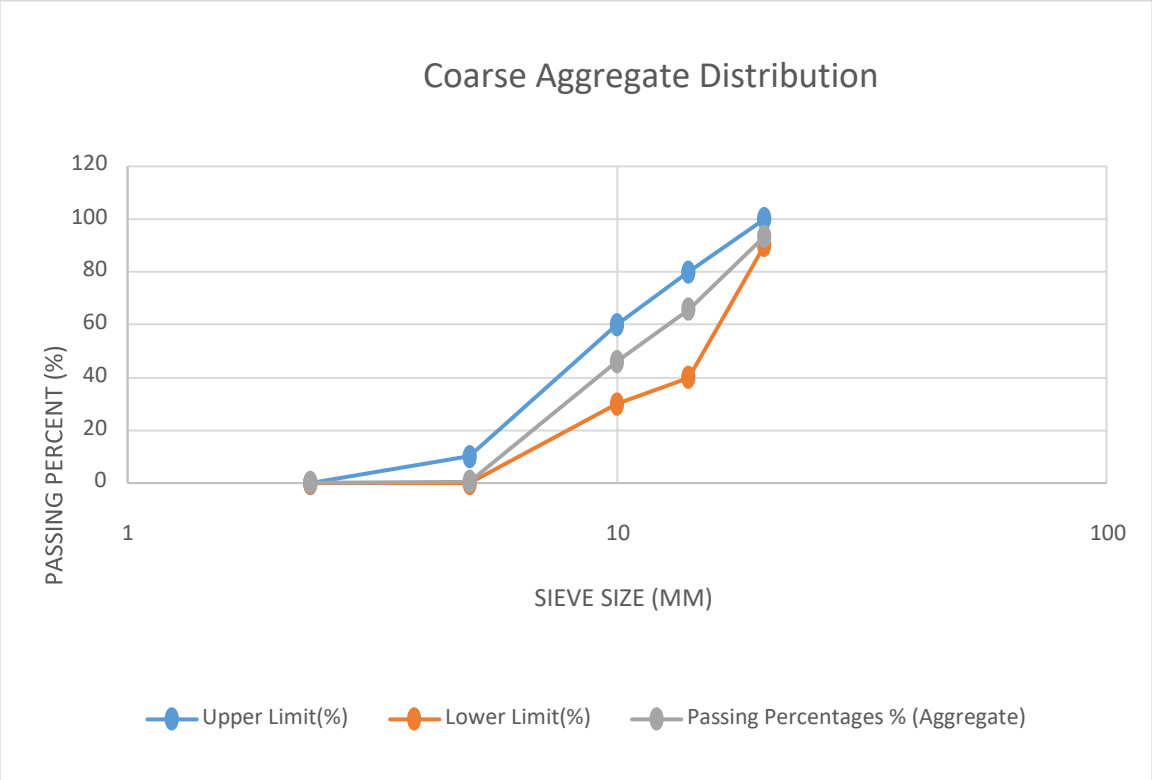

Figure 4.1: Graph on Sieve Analysis of Coarse Aggregate

Figure 4.2 shows the graph of river sand analysis of fine aggregate. Based on the results, sample of the river sand in all size is within the limitation and can be considered as perfectly graded.

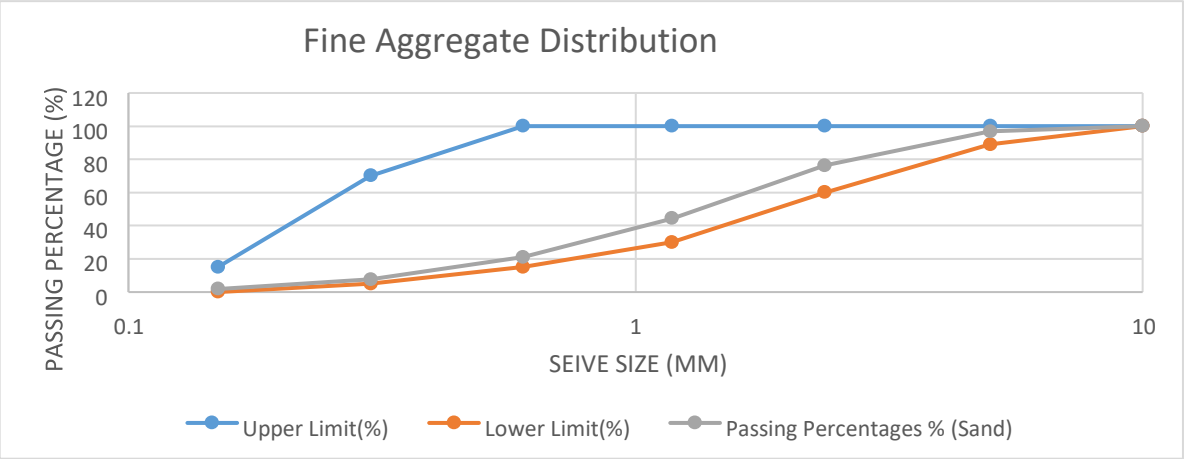

Figure 4.2 : Graph on Sieve Analysis of Fine Aggregate

4.1 Specific Gravity Data

Table 4.1: Data of Specific Gravity

CALCULATION	
Weight of oven-dry sample in air (A) g	1980g
Weight of SSD sample in air (B) , g	2000g
Weight of SSD sample in water (C) , g	1214.4g
Bulk specific gravity ,Gb = A (B-C)	2.52
Gb (SSD) Bulk specific gravity = B / (B-C)	2.55
Apparent specific gravity , Ga = A/(A-C)	2.59
Absorption (%) = 100 ((B-A)/A)	1.01%

The result of the table shows that the absorption for specific gravity is 1.01% and the specific gravity for mortar is 2.55.

4.2 Mix Design Concrete Ratio

Table 4.2 : Mix Design Concrete Ratio

Materials	**Ratio 1 (Batch 1) (0%Rtw) Per m³**	**Ratio 2 (Batch 2) (5%Rtw) Per m³**	**Ratio 3 (Batch 3) (10%Rtw) Per m³**	**Ratio 4 (Batch 4) (15%Rtw) Per m³**
Cement	590.00	590.00	590.00	590.00
Sand	761.8	723.71	685.62	647.53
Coarse Aggregate	703.20	703.20	703.20	703.20
W/C	0.44	0.44	0.44	0.44
RTW	-	38.09	76.18	114.27
Ratio	1:1.3:1.2	1:1.1 :1.2	1:1.1 :1.2	1:1.1:1.2

This table shows the ratio used in this concrete study that is the water cement ratio used is 0.44. However, there are changes in the replacement of sand with tile. Each weight of sand is different due to the replacement with tiles which are at 5%, 10% and 15% starting in the 2nd to 4th batch.

4.3 Slump Test

Figure 4.3 shows result of slump test for grade 25 concrete mix design. From the results, Batch 1 slump test result is the highest, but it goes down in Batch 2, Batch 3, and Batch 4 after the RTW was added. The slump test shows decreasing trend, but the compressive strength is increase.

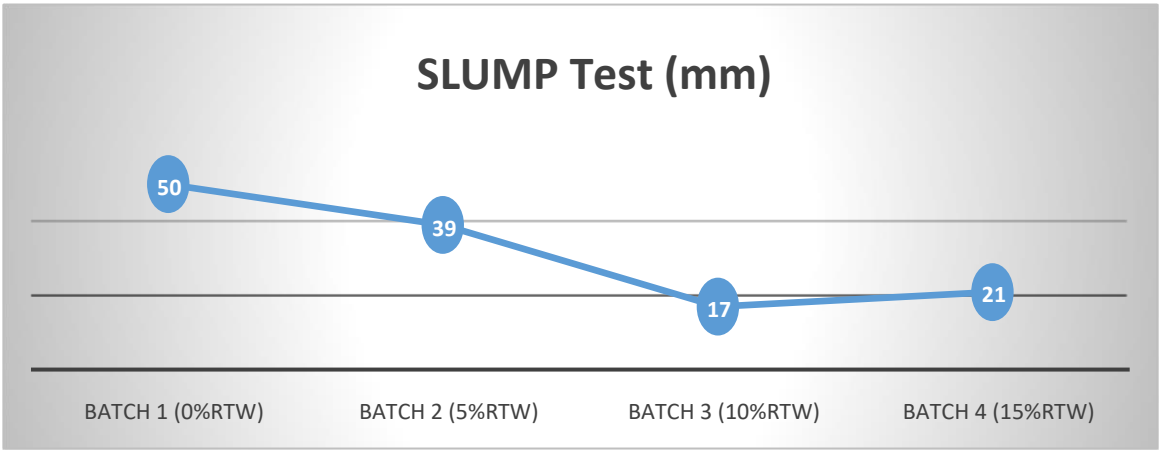

Figure 4.3 : Graph of Slump Test

4.4 Compressive Strength Test

Figure 4.4 shows the graph of the compressive strength. Compressive strength was performed at concrete ages 7, 14 and 28 days. In general, it is observed that the compressive strength increases and slightly decreases from the control device. The compressive strength of concrete increases with age. The highest compressive strength of 37.67 N / mm2 was seen in the 2nd group for 10% of tiles at 28 days compared with the control specimen of 38N / mm2 the increase in compressive strength may be due to the replacement of tile residues for fine aggregates.

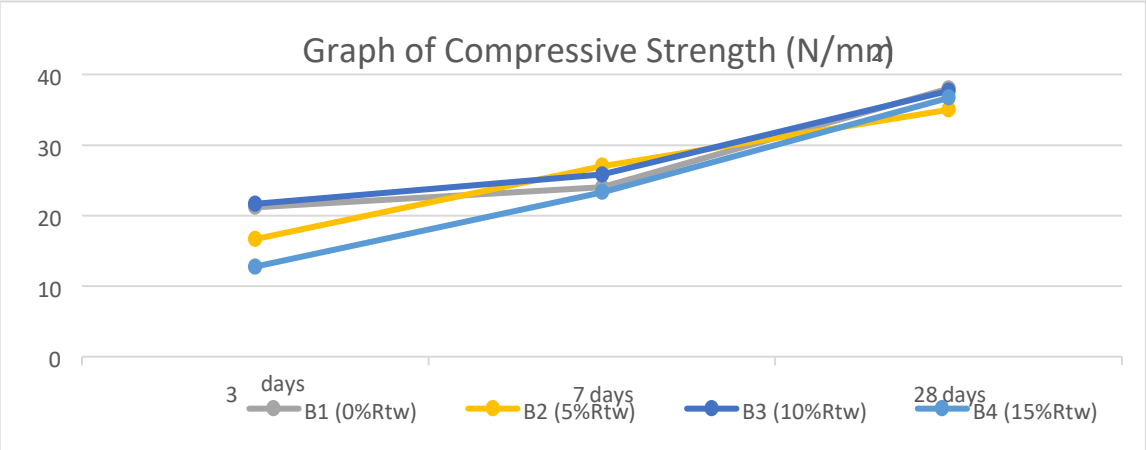

Figure 4.4 : Relationship between Compressive Strength and Differences of Batch Mix Design Concrete

5. CONCLUSION

In this study, waste tiles were used as a substitute for fine aggregate. Based on this study, the replacement of tile in fine aggregates significantly increases the strength of concrete. The result of slump test indicates a decrease in each of the batch tested because the tiles that replace sands restrict some water absorption and cause the concrete to become a little dry. Figure 4 shows that the optimum compressive strength and considered the best concrete mix ratio at 28 days 37.67 N / mm2. Concrete compressive strength decreased slightly in the 4th group with a compressive strength of 36.67%. This study is also closed to achieve the desired objective and only need to improve slightly in terms of ratio.

RECOMMENDATION

For the future this study will make a better innovation by adding additive that can help the water absorption of the concrete or study the ratio used by adding more water so that the concrete produced is not too dry.

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Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate

The_Use_of_Ceramic_Tiles_Waste_in_Concrete_as_Partial_Replacement_of_Fine_Aggregae

POTENTIAL OF STRENGTH BETWEEN NOTCHED AND GUSSETS JOINT ON PRATTBRIDGE MODEL

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Abstract The type of joint used on a bridge can change its strength drastically. The study of The Strength Between Notched and Gussets Joint on Pratt Bridge Model using Balsa Wood is conducted to find out clearly which joint is the strongest to accommodate the maximum loads. Pratt model is selected because the Pratt model is stronger than other types of bridge truss. The Pratt model was redesigned with two different joint which is notched and gussets joint. Finally, the study objectives are achieved when it is proven that one of the two different joints can withstand the maximum loads on the load test. The maximum load achieved is 90N for notched joint and 70N for gusset joint. In conclusion, the notched joints are stronger to accommodate more loads than gusset joint. The project was successfully achieved in theoretically and used a bridge model to test and prove the theory.

Keywords: Joint, load, bridge, accommodate

1. INTRODUCTION

A bridge is a structure built to span physical obstacles such as a body of water, valley, or road, for the purpose of providing passage over the obstacle. The type of joint used on bridge can drastically change its strength. From the previous observation through Polytechnic UNGKU OMAR (PUO) Bridge Competition, most of the failures were in terms of connection in which some participants used notches or gusset joint. From this experience, some research that need to be done regarding this matter in order to identify which connections are more strength. This study was undertaken to meet the 3 goals. Firstly, to construct a Pratt Truss bridge model with notched and gussets joint. Next goals are to obtain the load between notched and gussets joint of the Pratt Truss model using load test. Lastly, to determine the maximum load between both joints. The scope for this study is to build a Pratt Truss model using balsa wood measuring 5mm x 5mm, 10 sticks (competition rules - PUO), span of the truss is 1000mm, height of the truss is 70mm and the deck width is 100mm.

2. LITERATURE REVIEW

Balsa wood is commonly used as the structural core material in sandwich composites. Balsa core sandwich composites are used in load-bearing structures in ships, buildings, and offshore platforms. Balsa wood is a natural cellular material with excellent stiffness to weight and strength to weight ratio as well as superior energy absorption characteristics by Valle Tager et al. (2014). Parenchyma are a second type of cells that are radically arranged in groups thatperiodically penetrate the tracheas (rays). Subsequently, under displacement controlled compression, a stress plateau is traced associated with the gradual spreading of crushing of the cells through the material. The material is less stiff and weaker in the tangential and radialdirections study by Carrillo et al. (2011). Compression in these directions crushes. The local misalignment of in zones penetrated by rays ranged from 4 to 10 and axial compression results in shear in these zone.

Gussets plate connections are typically used to join members in steel truss bridges. A gussets plate connections usually consists of two plates joined by truss members on both sides. Most gussets plate connections are designed to provide sufficient thickness to withstand tensile and shear forces as well as compression buckling based on simple arrangements. According to Bo- SHUAN Wang, "Analytical Study of Gussets Plate Joints in Steel Truss Bridges and Development of Assessment Procedures" (2013), element modelling methods are used to simulate gussets plate connection sub-assemblies including precise proper treatment of boundary conditions which have been validated to produce the results for the gusset plate interior emphasizing a relatively distant distance from the rivet and was found to occur to study the behaviour of the gusset plate.

2.1 Balsa Grain — Learn How to Identify All Three Grain Types

2.1.1 A-Grain

Sheet balsa has long fibered that show up as long grain lines.

2.1.2 B-Grain

Sheet balsa has some of the qualities of both type A and type C. Grain linesare shorter than type A and it feels stiffer across the sheet.

2.1.3 C-Grain

Sheet balsa has a beautiful mottled appearance. It is very stiff across the sheet and spits easily.

2.1.4 End Grain

It is a diffuse porous which is large porous in no specific arrangement, solitary and radial multiple 2 - 3. It is growth rings indistinct, rays visible without lens and parenchymatypically not visible with lens.

2.2 Joint

According to Garret Boon (2016), there are a few types of joint:-

2.2.1 Lap Joint

The lap joint is one of the strongest and should be selected to use it. It helps members in compression to resist bending. The lap joint has a potential weakness.

2.2.2 End Joint

The end joint is not a very strong joint especially for tension members. Intension, the two pieces of wood will just pull right away from each other. In compression, thisjoint will allow the piece to bend in a perfect arc. The lap joint holds the piece stiff, whichdoes help it to hold more.

2.2.3 Notched Joint

The notched joint gives more strength than the end joint, but less than the lap joint. And if the notch is too big, it will cause weakness in the notched members.

2.2.4 Gusset Joint

Sometimes it is impossible to avoid using an end joint on bridge. But a gusset can be added to get all the benefits of a lap joint. In fact, making two gussets can make the joints stronger.

2.3 Pratt Variation

According to Frank Griggs et al. (2015), the common type has many variations and Pratt trusses managed to make the transition from wood to metal designs. Pratt trusses use vertical members for compression and horizontal members for tension. The basic identifying feature is the diagonal members that form the V-Shape. The middle part usually has a transverse diagonal member. Additional counter buffers can be used and make

identification more difficult but Pratt and his variations are the most common type of all trusses where the truss has a top chord that is not parallel to the bottom chord. This creates a lighter structure without losing strength.

3. METHODOLOGY

A bridge model has been tested until achieve the maximum strength value.The strength of bridge model depends on some factors. Therefore, the purpose of this project is to find the strength between notched and gusset joint on Pratt bridge model. Based on previous research, the strongest bridge model is the Pratt Model as documented. It that can accommodate the maximum load and has a larger number of compression members. MD-Solid software also has been used to check the number of compression members which were greater than tension members.

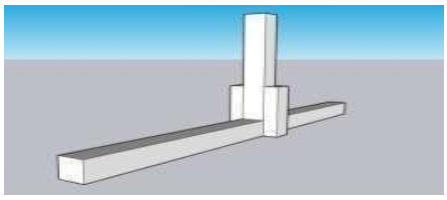


Figure 3a: Gusset Joint

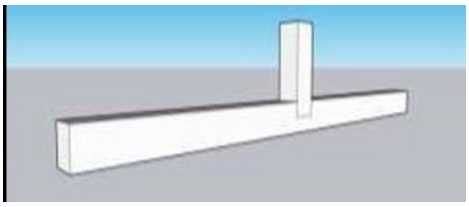
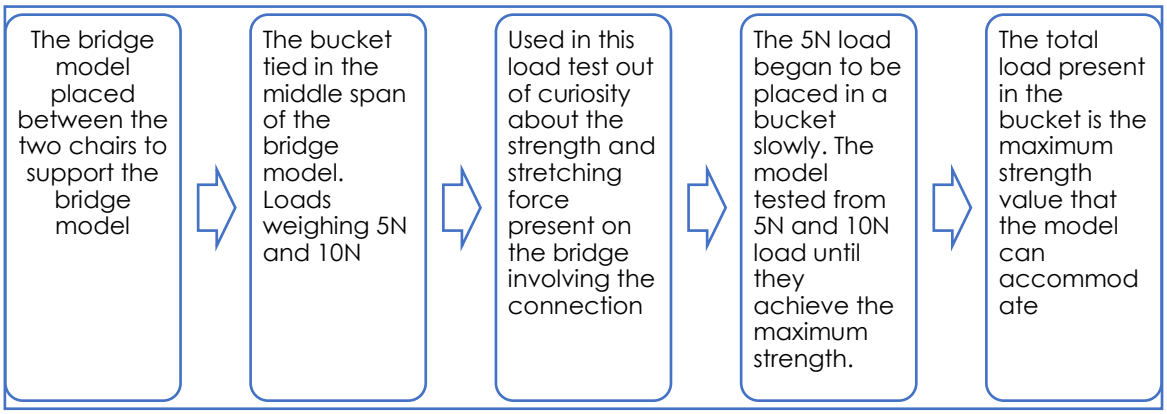


Figure 3b: Notched Joint

3.1 Procedure of Conducting a Load Test



3.1.1 Technique Methodology

3.1.2 Material Used

To produce a bridge model, several materials are used. The following are the materials used and its function. Balsa wood is the main material for construction of a bridge model. In general, it is very easy to work with a non-dull effect on the cutter; however due to its very low density, blurred surfaces can be a problem when using dull cutters. It is also soft so that's why it can be defined as a lightest. It is very efficient in terms of weight and strength that makes it worthwhile. There are 3 types of cutting; 1) Cutting sticks, 2) Straight cuts in thick sheets, 3) Cross grain knife cuts. Rope can be used as an additional material in order to bind each member to become strong.

3.1.3 Material for Model Test

After finishing the construction of the model, the model is tested. The material used to perform the load test on this model was two laboratory chairs as supports to support the bridge model. Then load hanger was required to hanger the load and a bucket to place the load.The load values used (5N, l0N) is to get the maximum strength.

3.1.4 Technique Testing

The actual response of a bridge to loads is usually better than what the theory dictates. Factors that contribute to the differences of load capacity include unintended composite action, load distribution effects, participation of parapets, railings, curbs, and utilities, material property differences, unintended continuity, participation of secondary members, effects of skew, portion of load carried by deck and unintended arching action due to frozen bearings. Load testing is recommended by AASHTO as an "effective means of evaluating the structural response of a bridge." The purpose of conducting load testing on existing bridges is to evaluate their structural response withoutcausing damages. Therefore, load testing is usually conducted in a non-destructive mannerand is sometimes referred to as non-destructive load testing. The goal of this type of testing isto compare field response of the bridge under test loads with its theoretical response. Non- destructive load testing can be further categorized into diagnostic testing and proof testing. Diagnostic testing methods provide the measurements necessary to analysis differential loading effects (moment, shear, axial force, deflection) present in various structural membersdue to applied loads. Proof-load testing aims at determining the magnitude and configuration of loads that cause critical structural components to approach their elastic limit.

3.1.5 MD-SOLIDS Program Software

MD-solids software is the most suitable solution as a course authoring tool that can help translate instructional design into teaching materials and test. MD-solids software has been integrated with various tools needed in computational analysis in the material mechanics. Advantages of using software MD-solids: versatile in the types of problems that can be solved strongly in visualto illustrate the behavior of materials informative in explaining how and why the calculations are performed, intuitive and easy-to-use so that the information is presented to the students with just the right amount.

4. DATA ANALYSIS

Objective 1- To construct a pratt truss bridge model with notched and gussets joint.

Pratt truss calculations were calculated using MD-solid software. In this analysis, compression and tension force of each member had been shown in Figure 4.1(a).The bridge model has a total of 33 members,17 members are compression and another 16 members are tension. A strong bridge model must have a greater of compression members than tension members in figure 4.1(b) and figure (c).

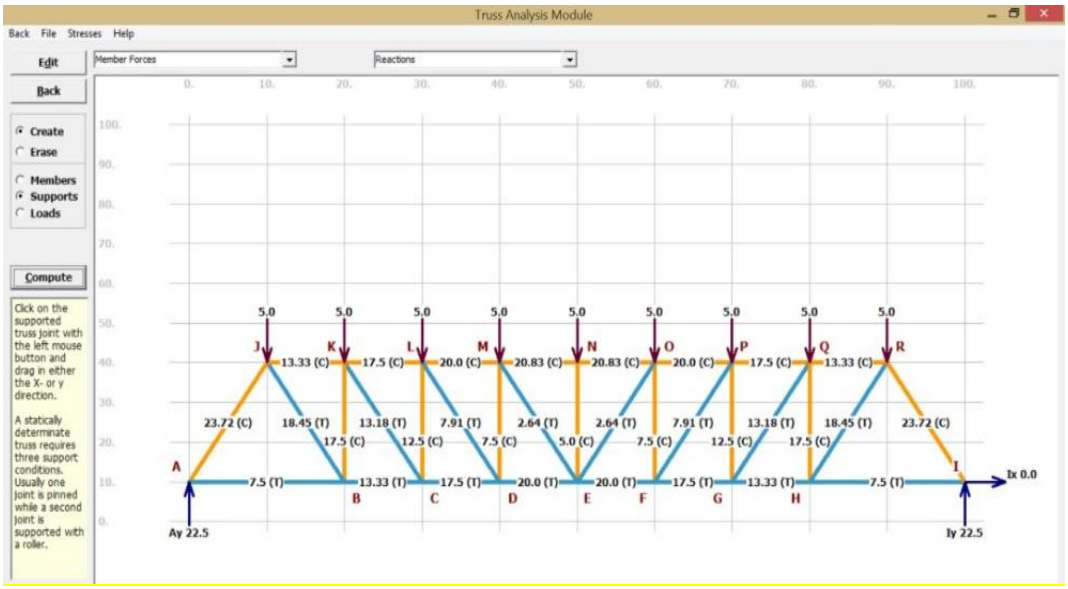


Figure 4.1(a): Design MD-SOLID

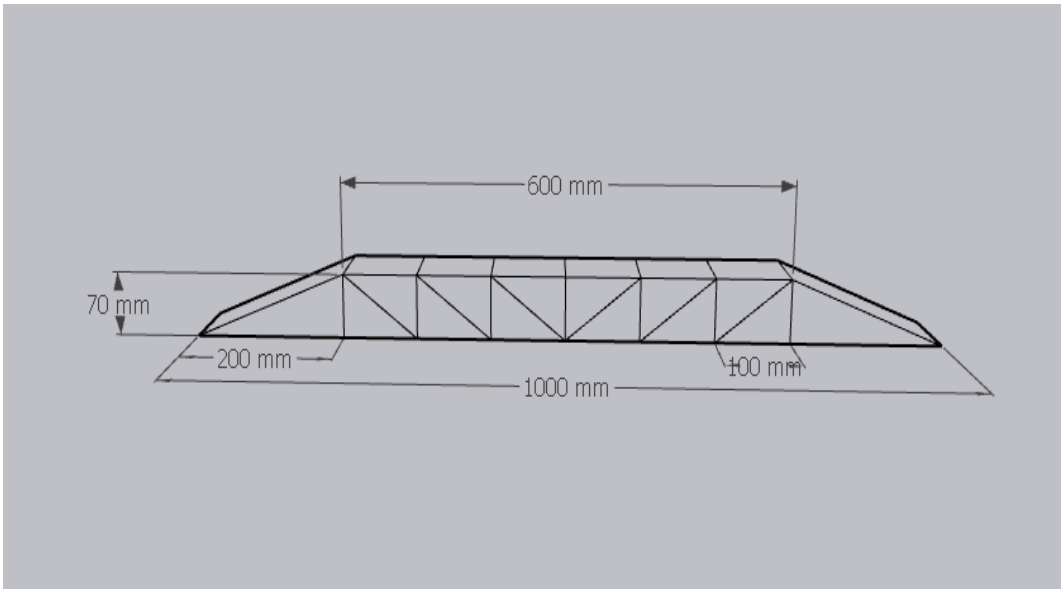


Figure 4.1(b): Design on Bridge

Figure 4.1(c): Pratt Bridge Model

Objective 2 - To obtain the load between notched and gussets joint of the Pratt Truss model using load test.
Figure 4.2 shows the notched joint can sustain the maximum load compared to gusset joint. This can be concluded that truss with notched joint is stronger than truss with gussets joint.

Figure 4.2 : Graph Load vs Type of Joint

Objective 3 - To determine the maximum load between both joints.
The objective 3 can be achieved after obtaining the data between the notch joint and the gusset of the Pratt Truss model by using the load test. Notched joint is stronger than gusset because it can distinguish between different loads. Lastly, to achieve the objective 3, and based on the result in Table, 4 shows that the load value of notched joint with 9.177 kg is greater than the load from the gusset joint with 7.138 kg. From this value, it can be proved that model with notched joint is stronger than the model with gusset joint.

Table 4.1 – Pratt Truss Model

Pratt Truss Model		
Model with type of joint	**Weigh (g)**	**Load test**
Pratt with gussets joint	53 g	70 N = 7.138 kg
Pratt with notched joint	50 g	90 N = 9.177 kg

5. CONCLUSION

In conclusion, this study has been successfully achieved in line with the theory that has been validated by Garrett Boon (2016), who has confirmed that notched joints are stronger than gusset joints. This is because the notched joints have mortise that can further strengthen the bridge structure to accommodate more loads imposed on the bridge model. Compared to a gussets joint, a gusset plate is added to the end joint to gain strength to withstand the load. For future research, the construction of a bridge model designed with a familiar design can be upgraded to a more ecstatic and attractive design. In addition, the quality of the balsa wood to be used for the construction of the model must be taken care of. Wood grooves must not be broken or damaged. Choose wisely on balsa wood because most of the wood strength is decrease due to environmental factors such as wind factor. The measurement and the cutting technique also have a huge contribution. The selection of connections at each member also very important to ensure each of them can sustain the maximum load imposed on it.

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INOVASI 'DUAL FUNCTION ROLLER' UNTUK KERJA MENGECAT

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Abstrak. 'Dual Function Roller' (DFR) merupakan inovasi penggelek cat dwifungsi dengan ciri boleh laras yang mampu menukar bentuk penggelek cat sama ada lurus ataupun bersudut. Mengecat penjuru dinding atau permukaan bersudut perlu dilakukan dengan lebih teliti supaya mendapat hasil kemasan yang sempurna dan ini mengambil masa yang lebih lama jika menggunakan penggelek cat biasa. Produk ini membolehkan dua sisi pada penjuru dinding dicat secara serentak dengan hanya menggunakan satu batang penggelek sahaja. Objektif kajian ini ialah menghasilkan alat penggelek cat dwifungsi, membandingkan masa penggunaan alat penggelek cat dwifungsi dengan penggelek sedia ada dan menganalisa data keberkesanan alat penggelek cat dwifungsi dengan penggelek sedia ada. Skop kajian ini terbatas kepada buruh, pembantu awam dan kontraktor. Soal selidik dijalankan dengan cara memberi video penggunaan produk kepada responden tersebut kemudian mereka diminta untuk menjawab soalan di aplikasi "Survey Monkey" kerana kekangan pandemik Covid-19 yang menyekat pergerakan dan responden berada di tempat berbeza dan jauh. DFL diperbuat daripada dua penggelek cat biasa dan ditambah baik dengan mencantumkan kedua-dua penggelek cat biasa dan engsel di bahagian tengah melalui proses kimpalan. Manakala kaedah temubual juga dilakukan bersama 25 orang responden yang mahir dalam kerja mengecat menggunakan kaedah soal selidik untuk menguji DFR dari segi masa mengecat. Soal selidik kemudiannya dianalisa menggunakan jadual untuk melihat peratusan yang menjawab ya atau tidak. Dapatan kajian mendapati DFR dengan inovasi cantuman dua penggelek cat biasa dapat dihasilkan. Manakala kesemua responden bersetuju bahawa DFR menjmatkan masa mengecat terutama pada bahagian penjuru dinding dan mudah untuk digunakan. Kesimpulan yang boleh dibuat adalah objektif kajian tercapai dengan mendapati penggunaan DFR untuk mengecat penjuru dinding menjimatkan masa dan memudahkan kerja berbanding penggelek cat biasa.

Kata kunci : Penggelek cat dwifungsi, kerja mengecat, DFR, penjuru dinding

1. PENGENALAN

Masalah yang biasa dialami ketika kerja mengecat dilakukan adalah masa yang diambil untuk mengecat bahagian bersudut dan permukaan dinding yang rata menggunakan satu penggelek adalah agak lama kerana perlu mengecat dua sisi yang berbeza secara satu persatu. Situasi ini akan mengakibatkan sakit bahu dan lengan kepada tukang cat. Berdasarkan petikan dari artikel kajian bertajuk 'Kecederaan Otot Bahu Pada Pengecat' menyatakan bahawa penggunaan lengan di atas paras bahu telah digambarkan sebagai faktor risiko untuk mendapat kecederaan otot bahu menurut Loew M, Doustdar S, Drath C, Weber MA, Bruckner T, Porschke F, et al (2019). Beban kerja yang lama pada bahu pengecat akan mengakibatkan peningkatan risiko untuk mendapat kecederaan otot bahu. Selain itu, tukang cat yang tidak mahir akan mengalami kesukaran untuk mengecat bahagian dinding yang bersudut kerana bahagian ini memerlukan ketelitian supaya dapat kemasan yang terbaik.

Objektif kajian ini ialah menghasilkan alat penggelek cat dwifungsi, membandingkan masa penggunaan alat penggelek cat dwifungsi dengan penggelek sedia ada dan menganalisa data keberkesanan alat penggelek cat dwifungsi dengan penggelek sedia ada. Skop kajian ini terbatas kepada buruh, pembantu awam dan kontraktor. Soal selidik dijalankan dengan cara memberi video penggunaan produk kepada responden tersebut kemudian mereka diminta untuk menjawab soalan di aplikasi "Survey Monkey" kerana kekangan pandemik Covid-19 yang menyekat pergerakan dan responden berada di tempat berbeza dan jauh. DFL diperbuat daripada dua penggelek cat biasa dan ditambah baik dengan mencantumkan kedua-dua penggelek cat biasa dan engsel di bahagian tengah melalui proses kimpalan.

Produk inovasi ini dihasilkan bertujuan untuk menyelesaikan masalah mengecat penjuru dinding. Ia juga bertujuan untuk memudahkan pengguna melakukan kerja mengecat. Jadi pengguna dapat mengecat semua jenis permukaan dengan hanya menggunakan satu penggelek sahaja dan sekaligus dapat menjimatkan kos pengecatan.

2. KAJIAN LITERATUR

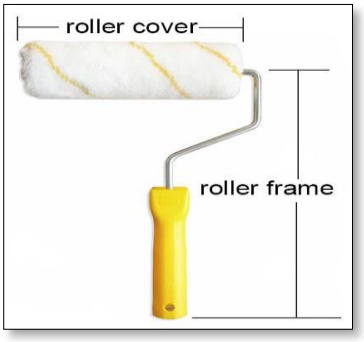
Semasa proses mengecat, kualiti dan pemilihan warna yang sesuai adalah penting, namun alat untuk mengecat juga untuk mengecat juga harus diberi perhatian supaya dapat memperolehi hasil pengecatan yang memuaskan. Peralatan yang boleh digunakan untuk mengecat dinding, kayu atau besi adalah berus, cat, penggelek cat, dulang cat dan lain-lain. Penggelek cat adalah peranti pembinaan ringkas yang terdiri daripada pemegang dan bingkai bentuk melengkung, di mana silinder pewarna dengan permukaan yang berbeza dipasang. Berfungsi untuk mengecat permukaan di dinding dengan lebih efektif. Berdasarkan petikan dari artikel kajian bertajuk "Reka bentuk lukisan dinding" menyatakan bahawa mengecat dilakukan secara klasik oleh manusia dan secara amnya memerlukan usaha fizikal yang menyeluruh menurut I.Aris et.al (2005).

2.1 Ciri-ciri

Berikut merupakan ciri-ciri penggelek cat sedia ada di pasaran. Berdasarkan petikan dari artikel kajian yang bertajuk "Cat dinding " menurut Imelda Akmal Architecture (2013)

- Pemasangan yang mudah untuk berus cat.
- Mengurangkan kos kerana ketahanan penggelek cat ini.
- Penggelek yang berbentuk silinder dan diletakkan pada sisi yang bertentangan dengan mengikat dari pegangan.

2.2 Rekabentuk penggelek cat biasa



Rajah 2.1: Rekabentuk Penggelek Cat Biasa

2.3 Cara-cara penggelek cat berfungsi

- Penggelek cat mewujudkan tekstur pada permukaan dinding.
- Digunakan untuk bekerja dengan penyebaran air, varnis, minyak, cat dan komposisi yang mempunyai pelarut.

3. METODOLOGI

Berikut merupakan kaedah metodologi yang digunakan untuk kajian produk ini:

3.1 Penghasilan Produk

Produk ini dihasilkan daripada gabungan dua penggelek cat. Penghasilan penggelek cat ini melibatkan proses kimpalan yang bertujuan untuk mencantumkan kedua dua bahagian menggunakan engsel. Engsel ini bertujuan untuk melaraskan atau mengubah penggelek kepada bentuk sudut dan rata. Bahan-bahan yang digunakan untuk menghasilkan DFR terdiri daripada dua penggelek biasa, berus cat, engsel, 'bolt' and 'nut' yang bersaiz 10 dan penutup skru plastik.

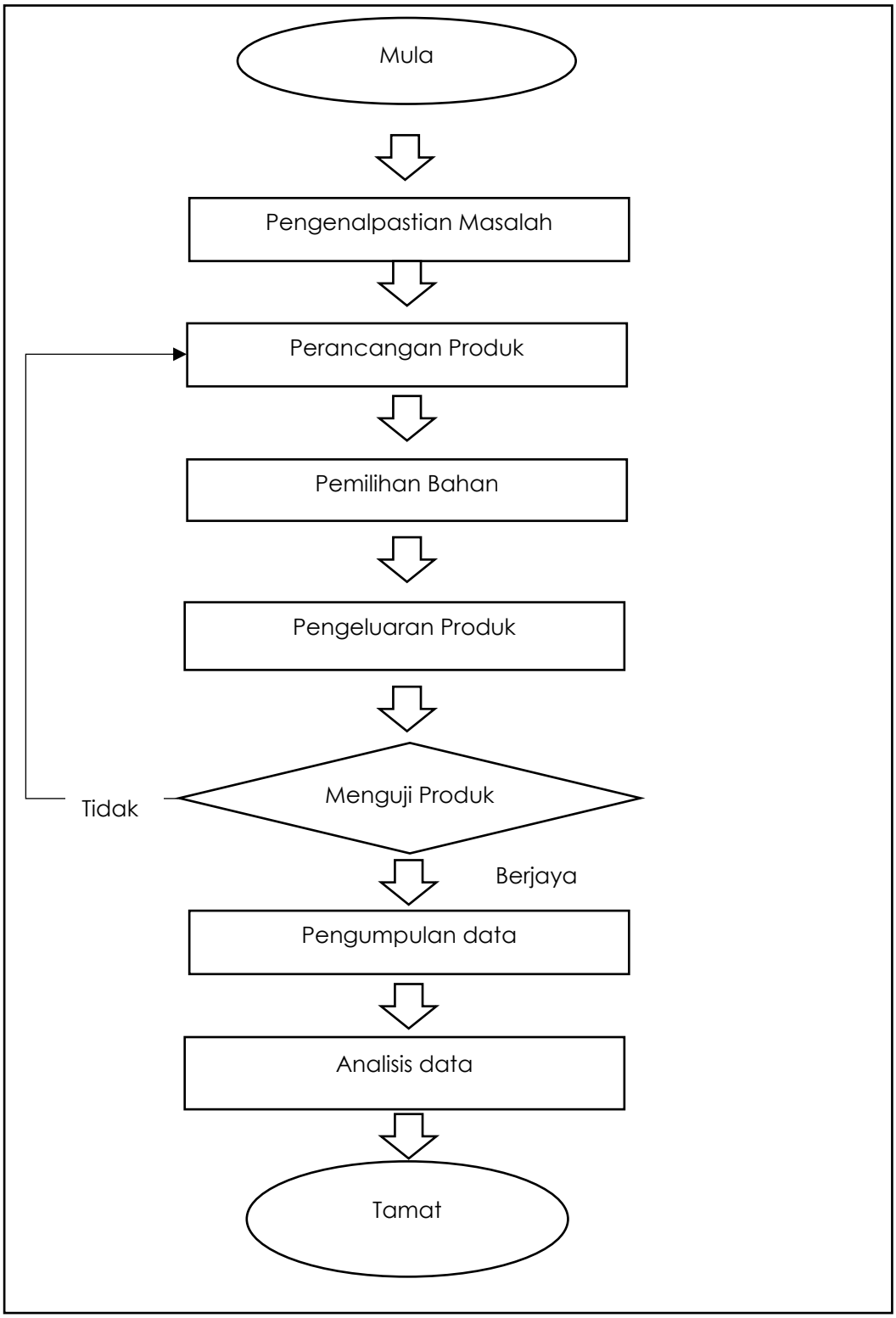
3.2 Ujian Perbandingan Masa

Kaedah ujian perbandingan masa dilakukan oleh pengguna A dan pengguna B. Pengguna A menggunakan penggelek cat biasa manakala pengguna B menggunakan DFR. Mereka mengecat permukaan dinding yang masa dalam masa serentak. Jenis sudut dinding yang digunakan ialah dinding yang bersudut dalam dan juga dinding bersudut luar. Keluasan permukaan dinding semasa ujian dijalankan ialah 0.8m.

3.3 Soal selidik

Kajian keberkesanan DFR telah dilakukan dengan membuat kaedah soal selidik menggunakan aplikasi Survey Monkey. Kaedah soal selidik dilakukan untuk mendapatkan respon mengenai keberkesanan DFR. Responden terdiri daripada 25 orang yang berpengalaman dalam bidang mengecat. Bilangan soalan yang diberi dalam soal selidik tersebut ialah 10 soalan. Soal selidik tersebut diedarkan dengan memberi pautan soal selidik kepada reposnden serta video mengecat menggunakan penggelek cat dwifungsi.

3.4 Carta Alir



Rajah 3.1 : Carta Alir Pelaksanaan

4. ANALISIS DATA

Bahagian ini akan membincangkan hasil dapatan yang diperolehi daripada responden. Setelah kesemua data dan maklumat diperolehi, analisis dilakukan bagi melihat berkesanan DFR. Keputusan yang diperolehi dalam bab ini merupakan keputusan yang diperolehi hasil daripada soal selidik yang telah dijalankan. Data yang terhasil daripada ujikaji dianalisis dengan lebih terperinci untuk membuat kesimpulan berdasarkan objektif kajian yang telah dinyatakan.

4.1 Objektif 1 – Menghasilkan Alat Penggelek Cat Dwifungsi

DFR ini dihasilkan menggunakan dua penggelek cat biasa yang dicantumkan melalui proses kimpalan dan diletakkan engsel di bahagian tengah DFR iaitu di antara dua penggelek cat biasa tersebut. Ianya supaya DFR dapat digerakkan pada permukaan rata atau bersudut. 'Bolt and Nut' pula berfungsi untuk mengunci pergerakan DFR semasa dalam keadaan bersudut atau dalam keadaan rata.

Rajah 4.1 : Alat Penggelek Cat Dwifungsi

4.2 Objektif 2 – Membandingkan Masa Penggunaan Alat Penggelek Cat Dwifungsi Dengan Penggelek Sedia Ada

Jadual 4.1 Perbandingan masa di antara Pengguna A dan Pengguna B

Pengguna	Sudut Dalam	Sudut Luar
A (Penggelek biasa)	33.63 saat	15.28 saat
B (Dual Function Roller)	23.22 saat	8.54 saat

Jadual 4.1 menunjukkan perbandingan masa antara Pengguna A dan Pengguna B. Pengguna A menggunakan penggelek biasa manakala Pengguna B menggunakan 'Dual Function Roller'. Pada bahagian dinding yang bersudut dalam, data menunjukkan Pengguna A menggunakan masa yang lama iaitu 33.63 saat berbanding Pengguna B iaitu 23.22 saat. Pada bahagian yang bersudut luar pula, Pengguna A juga mengambil masa yang agak lama berbanding dengan Pengguna B. Pengguna A mengambil masa sebanyak 15.28 saat manakala Pengguna B mengambil masa sebanyak 8.54 saat. Nilai sudut DFR ialah 90 darjah dalam keadaan bersudut manakala dalam keadaan rata ialah 180 darjah. Berdasarkan artikel kajian yang bertajuk "Spray Painting Hazards'' menyatakan bahawa cat semburan adalah cara terpantas untuk melukis kawasan besar di mana anda tidak memerlukan ketepatan yang banyak, seperti dinding luaran, manakala penggelek cat baik untuk dinding dalaman di mana anda perlu mengelakkan cat pada permukaan lain dan berus membantu anda membuat kerja terperinci menurut Jakob Jakobsen (1939).

4.3 Objektif 3 – Menganalisa Data Keberkesanan Alat Penggelek Cat Dwifungsi Dengan Penggelek Sedia Ada

Kajian keberkesanan DFR telah dilakukan dengan membuat kaedah soal selidik menggunakan aplikasi Survey Monkey. Seramai 25 orang telah menjawab soal selidik ini. Responden terdiri daripada 4 orang buruh,12 orang bekerja sendiri, 8 orang kontraktor dan seorang jurutera terlibat dalam soal selidik ini.

Jadual 4.2 : Dapatan Soal Selidik

SOALAN SOAL SELIDIK	PERATUSAN MENJAWAB 'YA'	PERATUSAN MENJAWAB 'TIDAK'
Adakah penggunaan penggelek cat dwifungsi menjimatkan masa untuk mengecat permukaan bersudut?	92 %	8 %
Adakah penggunaan penggelek cat dwifungsi mudah dikendalikan ?	88 %	12%
Berdasarkan video, adakah anda rasa penggelek cat dwifungsi mengalami sebarang masalah?	22%	78%
Adakah penggelek cat dwifungsi dapat memenuhi kehendak pengguna ?	91%	9%
Sebagai seorang pengecat yang mahir, adakah anda ingin memilih penggelek cat dwifungsi atau penggelek cat sedia ada yang dijual di kedai ?	83% (penggelek cat dwifungsi)	17% (penggelek cat sedia ada)
Pada pendapat anda, adakah penggelek cat dwifungsi terbukti keberkesanannya dibandingkan dengan penggelek cat sedia ada di kedai?	96%	4%
Pada pendapat anda, adakah produk ini boleh dipasarkan?	91%	9%

Jadual 4.2 menunjukkan kaedah soal selidik yang dijalankan melalui aplikasi ''Survey Monkey'' yang terdiri daripada 25 orang responden. Soalan soal selidik mengandungi tujuh soalan. Soalan pertama, kedua, keempat, keenam dan ketujuh menunjukkan bahawa kebanyakan responden menjawab 'Ya' berbanding dengan 'Tidak'. Pada soalan yang kedua pula kebanyakan responden menjawab 'Tidak' berbanding dengan 'Ya' kerana DFR tidak mengalami sebarang masalah. Pada soalan kelima, kebanyakan responden memilih untuk menggunakan DFR berbanding dengan penggelek cat biasa. Berdasarkan petikan dari artikel "Kecederaan Otot Bahu Pada Pengecat" menyatakan bahawa kebanyakan pengecat mengalami masalah apabila mengecat pada bahagian otot bahu. Sebaliknya, kecederaan di bahu dominan yang pernah atau sedang dialami menyerang 75% kumpulan lelaki yang sesuai dengan usia yang secara profesional bekerja sebagai pengecat iaitu sekurang-kurangnya 10 tahun (rata-rata 21 tahun) dan kerap memegang penggelek cat di atas paras bahu semasa melakukan kerja pengecatan. Lebih daripada separuh pekerja dari peratusan tersebut telah menerima rawatan perubatan untuk kecederaan tersebut. Mobiliti sendi bahu pengecat yang aktif dan pasif dilarang dalam semua tahap kebebasan berbanding dengan populasi normal dan lebih daripada separuh daripadanya mengalami kesakitan menurut Loew M, Doustdar S, Drath C, Weber MA, Bruckner T, Porschke F, et al (2019).

5. KESIMPULAN

Hasil dari ujikaji yang telah dijalankan ke atas penggelek cat dwifungsi, dapat dirumuskan bahawa produk ini telah mencapai objektif kajian iaitu menghasilkan alat penggelek cat dwifungsi, membandingkan masa penggunaan dan menganalisa data keberkesanan alat penggelek cat dwifungsi dengan penggelek sedia ada.

Cadangan penambahbaikan untuk "Dual Function Roller" ini ialah menambah butang kawalan pada bahagian pemegang DFR untuk menukarkannya menjadi bentuk yang bersudut ataupun rata. Tujuan butang kawalan diletakkan adalah untuk menjadikan DFR ini dapat digunakan secara automatik dan lebih mudah untuk digunakan dan dikendalikan.

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POTENSI *TWIN HOLLPROPS* SEBAGAI TUPANG UNTUK MENYOKONG RASUK TERGANTUNG SEMASA PEMBINAAN

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Abstrak. Inovasi terhadap sesuatu produk dilihat membantu dari segi mengurangkan kos pengeluaran dan menambahkan produktiviti kerja di dalam pembinaan. Penggunaan tupang kayu yang selalu digunakan sebagai penyokong kepada struktur kekal dan sementara akhirnya akan dijadikan sebagai sisa binaan selepas penggunaannya. Ini akan menyebabkan berlakunya pembaziran pembelian bahan binaan dan mencemarkan alam sekitar. *Twin Hollprops* merupakan produk inovasi yang berkesan mampu menggantikan tupang kayu yang sering kali menjadi pilihan kontraktor untuk menyokong struktur kekal semasa pembinaan. Matlamat utama kajian ini adalah untuk mereka bentuk produk inovasi tupang. Kajian ini telah menggariskan 2 objektif iaitu merekabentuk produk inovasi tupang iaitu *Twin Hollprops* dan mengenalpasti keberkesanan penggunaan *Twin Hollprops* berbanding tupang kayu. Skop kajian ini adalah untuk menyokong rasuk tergantung semasa pembinaan dan bahan yang digunakan adalah besi keluli lembut berongga. Proses kerja untuk merekabentuk T*win Hollprops* dan kaedah temu bual tidak berstruktur bersama industri digunakan dalam kajian ini untuk mengetahui keberkesanan produk dari segi pemilihan bahan, perbandingan kos pembuatan, kos bilangan penggunaan dan pandangan mengenai ciri-ciri *Twin Hollprops*. Hasil kajian mendapati rekabentuk *Twin Hollprops* sangat sesuai dijadikan pengganti kepada tupang kayu. Sementara itu pemilihan bahan, perbandingan kos pembuatan, kos bilangan penggunaan dan ciri-ciri *Twin Hollprops* adalah bersesuaian dengan produk inovasi ini. Cadangan kajian pada masa akan datang adalah menambahbaik lubang laras dan rekabentuk produk supaya boleh dilaras ketinggiannya menjadi lebih mudah dibawa dan disimpan selepas menggunakannya.

Kata kunci: rasuk, tupang, inovasi

1. PENGENALAN

Pada masa kini, kepelbagaian, standardisasi dan pengkomersialan tupang dilihat sebagai satu inovasi yang bermanfaat dalam industri pembinaan. Secara amnya penggunaan tupang banyak digunakan untuk pelbagai jenis kerja sementara dan kekal dalam fasa pembinaan. Tupang merupakan struktur sementara yang boleh dikategorikan sebagai elemen yang penting semasa proses membina struktur kekal bermula. Ianya bukan sahaja memainkan peranan yang penting dalam menyediakan sokongan kepada struktur utama seperti rasuk dan tiang bahkan fungsinya juga secara tidak langsung menjadikan struktur utama itu kekal selamat dibina (Trikha, 1999). Selain itu penggunaan tupang juga turut memberikan keselesaan dan keselamatan kepada pekerja yang bekerja dan akhirnya dapat menghasilkan mutu kerja mengikut standard yang ditetapkan (Nawi, et al., 2011; Nawi, 2014).

Tupang yang digunakan di dalam pembinaan sering diperbuat daripada kayu, besi dan buluh. Namun begitu kecederungan penggunaan kayu terpakai yang digunakan sebagai tupang juga secara tidak langsung boleh membahayakan nyawa pekerja yang sedang bekerja kerana kayu mudah pecah dan patah (Ismail dan Ghani, 2012). Di samping itu, pengabaian dalam perancangan keselamatan dan rekabentuk tupang kayu juga

merupakan salah satu faktor penyumbang kepada kegagalan tupang tersebut (Lee et al.,1999). Menurut Musa S. et al. (2009); Che Ahmad et al. (2014), tupang kayu yang bersifat mudah reput menjadikan ia sebagai bahan binaan utama yang sering dibazirkan di tapak bina selepas penggunaannya. Berdasarkan kajian yang dibuat oleh Begum et al. (2006) mendapati bahan binaan menyumbang kepada penjanaan kuantiti yang besar kepada sisa pembinaan.

Matlamat utama kajian ini adalah untuk mereka bentuk produk inovasi tupang. Kajian ini telah menggariskan 2 objektif kajian iaitu merekabentuk produk inovasi tupang iaitu *Twin Hollprops* dan mengenalpasti keberkesanan penggunaan tupang inovasi berbanding tupang kayu. Hasil kajian ini tertumpu kepada penghasilan tupang untuk rasuk tergantung dan bahan yang digunakan adalah besi keluli lembut berongga. Temubual tidak berstruktur dipilih dalam kajian ini dengan penglibatan responden dari kalangan industri untuk mendapatkan respon mengenai keberkesanan *Twin Hollprops* berbanding tupang kayu.

2. METODOLOGI

Proses kerja untuk merekabentuk T*win Hollprops* dan kaedah temu bual bersama industri untuk mengetahui keberkesanan produk dari segi perbandingan kos pembuatan, kos bilangan penggunaan dan pandangan mengenai ciri-ciri *Twin Hollprops* antara soalan-soalan yang dikemukakan bagi menjawab objektif kajian.

2.1 Bahan dan Kaedah kajian

Bahan yang digunakan dalam kajian ini adalah besi keluli lembut berongga dengan ketebalan 1.6mm. Pembuatan produk ini perlu melalui beberapa proses kerja iaitu bermula dengan pemilihan bahan dan diikuti dengan proses pemotongan, penggerudian, kimpalan, pembuatan pin kunci serta proses mengecat dan penyemburan anti karat.

2.1.1 Perbandingan kos pembuatan *Twin Hollsprops* dan tupang kayu

Jadual 2.1 menunjukkan perbandingan kos pembuatan *Twin Hollprops dan* tupang kayu. Jika dibandingkan dengan kos pembuatan tupang kayu, kos produk *Twin Hollprops* adalah agak mahal. Walau bagaimanapun produk yang diperbuat daripada besi ini boleh digunakan lebih 100 kali penggunaannya (Das et al. 2016) berbanding tupang kayu yang akan digunakan sebanyak 7 kali sahaja (Kazi & Parkar, 2015). Jadual 2.2 menunjukkan kos bagi pembuatan tupang kayu.

Jadual 2.1 : Kos *Twin Hollsprops*

Bil	Bahan	Kuantiti (No)	Harga seunit (RM)	Jumlah
1	Besi lembut keluli berongga saiz 0.06m x 0.06m	1	87.00	87.00
2	Besi lembut keluli berongga saiz 0.04m x 0.04m	1	90.00	90.00
3	'Bolt' dan 'nut'	3	2.50	7.50
4	Kepingan plat	2	10.00	20.00
			Jumlah Keseluruhan	RM 404.50

Jadual 2.2 : Kos Tupang Kayu

Bil	Bahan	Kuantiti	Harga seunit (RM)	Jumlah
1	Kayu 1'x 2'	2	1.50	3.00
2	Paku	15	0.50	7.50
			Jumlah Keseluruhan	RM 10.50

2.1.2 Perbandingan kos bilangan penggunaan *Twin Hollprops* dan tupang kayu

Jadual 2.3 menunjukkan perbandingan kos bilangan penggunaan *Twin Hollprops* dan tupang kayu. Bilangan penggunaan *Twin Hollprops* untuk 3m panjang rasuk atas (binaan biasa untuk rumah setingkat) adalah minimum 2 dan maksimum 3 tupang (3m panjang rasuk / 1.2m panjang *Twin Hollprops*). Manakala bilangan tupang kayu yang digunakan ialah minimum 7 dan maksimum 9 tupang. Bilangan tupang ini diperolehi daripada pemerhatian terhadap penggunaan tupang kayu yang digunakan pada rasuk tergantung di tapak bina. Perbandingan kos penggunaan *Twin Hollprops* dan tupang kayu ini dibuat berdasarkan kepada 1 kali dan 100 kali bilangan penggunaan tupang di tapak bina dengan mengambil kira bilangan maksimum *Twin Hollprops* dan tupang kayu yang digunakan untuk rasuk tergantung.

Jadual 2.3 : Perbandingan kos bilangan penggunaan *Twin Hollprops* dan tupang kayu

Bil	Item	*Twin Hollprops*	Tupang kayu
1	Kos 1 kali penggunaan	RM404.50/100 = RM4.05	RM10.50/7 = RM1.50
2	Kos 100 kali penggunaan	RM4.05 x 100 = RM404.50	RM1.50 x 100 = RM150.00
3	Kos bilangan penggunaan tupang untuk 1 kali penggunaan	3 tupang x RM4.05 = RM12.15	9 tupang x RM1.50 = RM13.50
4	Kos bilangan penggunaan tupang untuk 100 kali penggunaan	3 tupang x RM404.50 = RM1213.50	9 tupang x RM150.00 = RM1350.00

2.1.3 Perbandingan ciri-ciri *Twin Hollprops* dan tupang kayu

Twin Hollprops direkabentuk dengan mengambil kira beberapa faktor seperti mudah dikendalikan, produk yang boleh dilaraskan mengikut kesesuaian ketinggian bangunan serta memberikan kestabilan ketika menyokong rasuk tergantung. Di samping itu terdapat juga pertimbangan untuk faktor keselamatan dengan adanya lubang kunci pada bahagian batang besi yang boleh dilaraskan (Rujuk Jadual 2.4).

Jadual 2.4 : Ciri-ciri Twin Hollprops

Ciri-ciri	Twin Hollprops	Tupang Kayu
Kesediaan penggunaan	• Produk sedia ada • Produk boleh laras mengikut ketinggian	• Perlu dibuat sebelum hendak menggunakannya • Masa yang diambil ialah 15 minit untuk 1 tupang • Tidak boleh dilaras
Mendirikan produk	• Mudah didirikan	• Mudah didirikan
Ciri keselamatan	• Mempunyai 3 lubang kunci untuk keselamatan semasa pemasangan	• Tidak mempunyai ciri-ciri keselamatan
Kestabilan	• Lebih stabil kerana mempunyai 1 batang besi di bahagian atas produk • Tahan lama dan tahan lasak	• Kurang stabil. Menggunakan kayu terpakai • Mudah reput dan tidak tahan lasak

2.2 Temu bual bersama industri

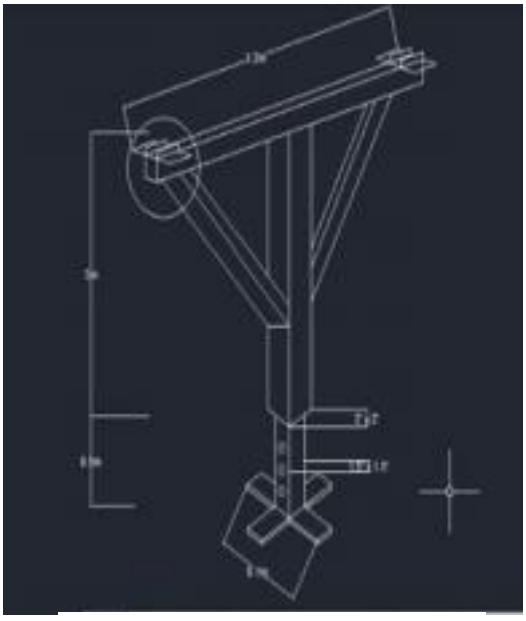
Twin Hollprops yang disiap direkabentuk kemudiannya dibawa ke tapak bina untuk mengetahui keberkesananya dari segi rekabentuk, kos pembuatan, kos bilangan penggunaan dan ciri-ciri *Twin Hollprops* adalah antara soalan yang ditemu bual dalam kajian ini. Seramai 10 orang responden dari industri iaitu seorang jurutera dan 9 orang kontraktor telah ditemu bual bagi mendapatkan pengesahan berkenaan produk inovasi ini. Temu bual tidak berstruktur dilakukan selama 15-20 minit.

3. ANALISA DATA

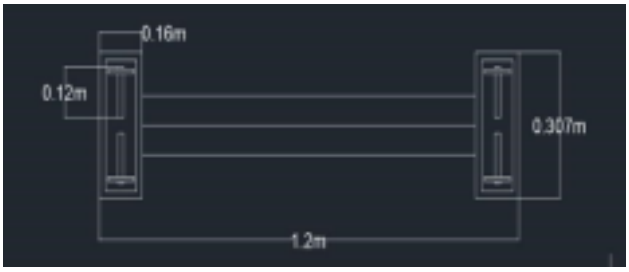
3.1 Objektif 1 : Mereka bentuk produk inovasi tupang

Twin Hollprops ini merupakan produk inovasi tupang yang dibuat bagi menggantikan tupang sedia ada iaitu tupang kayu. Ianya diperbuat daripada besi keluli lembut berongga. Terdapat 2 saiz besi yang digunakan iaitu 0.04m x 0.04m dengan ketinggian 0.5m dan 0.06m x 0.06m untuk ketinggian 3m. Ketebalan besi untuk kedua-dua saiz ini ialah 1.6mm. Terdapat 3 lubang kunci keselamatan disediakan pada ketinggian besi yang berukuran 0.5m itu (Rujuk Rajah 3.1). Produk ini juga mempunyai 1 batang besi berukuran panjang 1.2m x lebar 3.2m yang diletakkan di bahagian atas. Ini bagi meningkatkan tahap kestabilan pada rasuk tergantung berbanding menggunakan hanya satu bahagian besi sahaja. Oleh itu pesongan pada rasuk tidak akan berlaku di samping dapat mengurangkan penggunaan tupang yang banyak pada satu rasuk tergantung yang sama.

Di samping itu penggunaan 2 penyokong besi bersaiz 0.06m x 0.06m yang berukuran panjang 1.5m turut digunakan bagi menyokong besi atas. Selain itu di atas 2 batang besi itu juga terdapat 2 plat kecil yang masing-masing berukuran 0.3m x 0.16m. Tujuan plat kecil diletakkan di hujung 2 batang besi atas ini adalah untuk menambah kekuatan sokongan terhadap acuan rasuk tergantung (Rujuk Rajah 3.2). Kaki *Twin Hollprops* yang berukuran 0.1m x 0.04m pula diletakkan bersilang di bahagian bawah produk tersebut (Rujuk Rajah 3.3). Produk ini juga boleh dilaraskan mengikut ketinggian yang dikehendaki iaitu tidak melebihi 4m. Ringkasan spesifikasi *Twin Hollprops* digambarkan seperti di dalam Jadual 3.1.



Rajah 3.1 : *Twin Hollprops*



Rajah 3.2 : 2 keping plat dan besi

Rajah 3.3 : Kaki *Twin* *Hollprops*

Jadual 3.1 : Spesifikasi *Twin Hollprops*

Jenis	Spesifikasi	Jenis	Spesifikasi
Bahan	Besi keluli lembut berongga	Besi atas	1.2m x 0.06m
Tebal	1.6 mm	2 plat kecil	0.3m x 0.16m
Tinggi	Tinggi keseluruhan: 3.5m	Kaki plat	0.1m x 0.04m
	Tinggi Besi keluli lembut berongga saiz 0.04m x 0.04m – 0.5m	Lubang kunci keselamatan	3 no
	Tinggi besi keluli lembut berongga saiz 0.06m x 0.06m – 3m	2 Penyokong	0.06m x 0.06m

3.2 Objektif 2 – Keberkesanan penggunaan tupang inovasi berbanding tupang kayu.

Hasil dapatan daripada temu bual tidak berstruktur bersama industri mendapati semua responden bersetuju bahawa *Twin Hollprops* ini sesuai digunakan sebagai inovasi penambahbaikan kepada tupang kayu. Bahan yang digunakan adalah ringan, tahan lama, lasak serta menjimatkan masa untuk mendirikan tupang. Walau bagaimanapun 4 daripada 6 orang responden kurang bersetuju dengan kos pembuatan *Twin Hollprops* yang mahal dengan memberi respon bahawa produk ini sesuai digunakan untuk syarikat besar dan syarikat yang mempunyai banyak projek. Selain itu semua responden bersetuju penggunaan besi sebagai alternatif penggantian kepada tupang kayu. Hal ini kerana ianya dapat mengelakkan pembaziran kayu yang akhirnya dibakar sekiranya reput dan rosak. Dapatan ini bertepatan dengan kajian yang dibuat oleh (Mohamed & Abdullah, 2014) iaitu acuan, tupang serta perancah yang diperbuat daripada kayu hanya boleh digunakan beberapa kali sahaja sebelum ianya dilupuskan kerana rosak ketika membukanya.

Dari segi keselamatan pula, semua responden bersetuju dengan penggunaan 'bolt dan 'nut' pada bahagian bawah boleh laras *Twin Hollprops.* Dapatan ini selari dengan *(Mothokho et al*., 2015) yang mendapati kekurangan pengetahuan kontraktor mengenai keselamatan dalam penggunaan struktur sementara seperti acuan dan tupang sering mengakibatkan keruntuhan struktur kekal. Selain itu kegagalan struktur sementara juga adalah penyebab kepada kecederaan, kematian dan kerugian kepada pekerja dan kontraktor yang bekerja berdekatan dengan struktur sementara itu. Bagi rekabentuk *Twin Hollprops pula, 6* orang responden kurang bersetuju dengan penggunaan besi yang terlalu panjang kerana sukar untuk menyimpannya.

4. KESIMPULAN

Produk inovasi *Twin Hollprops* sangat sesuai dijadikan pengganti kepada tupang kayu. Berdasarkan kepada perbandingan *Twin Hollprops dengan* tupang kayu didapati ianya mencapai objektif kajian dari segi pemilihan bahan, kos bahan serta ciri-ciri yang bersesuaian dengan produk inovasi ini. Cadangan kajian pada masa akan datang adalah menambahbaik lubang laras dan rekabentuk produk supaya boleh dilaras ketinggiannya menjadi lebih mudah dibawa dan disimpan selepas menggunakannya.

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RAWATAN AIR DI SUNGAI DURIAN TUNGGAL MELAKA MENGGUNAKAN PENAPIS AIR HAMPAS TEBU

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Abstrak. Air merupakan keperluan asas manusia dan hidupan lain. Sumber air berpunca daripada sungai, saliran, parit, kolam dan sebagainya. Sungai merupakan sumber air semula jadi yang sangat penting bagi sesebuah habitat manusia. Di Malaysia, penilaian kualiti air ditentukan oleh Indeks Kualiti Air (IKA) yang dikeluarkan oleh Jabatan Alam Sekitar (JAS) berdasarkan kelas I, II, III dan IV. Berdasarkan Piawaian Interim Kualiti Air Kebangsaan (INWQS) mendapati Sungai Durian Tunggal berada dalam kelas III iaitu memerlukan rawatan intensif. Justeru, untuk memperbaiki masalah ini, hampas tebu digunakan sebagai alternatif untuk meningkatkan kualiti air. Matlamat utama kajian adalah untuk merawat air sungai. Objekjektif kajian adalah merekabentuk penapis air hampas tebu dan seterusnya untuk mengetahui keberkesanan penapis air hampas tebu dalam merawat air sungai di sungai Durian Tunggal. Penapis air diperbuat daripada paip PVC dengan ketinggian 42cm dan berdiameter 11cm. Lapisan di dalam penapis air tersebut terdiri daripada 3 lapisan iaitu lapisan pertama adalah menggunakan pasir. Untuk lapisan kedua pula, hampas tebu sebagai bahan utama di dalam penapis air tersebut. Manakala, untuk lapisan terakhir pula iaitu lapisan ketiga, mengulangi semula langkah seperti pada lapisan pertama iaitu meletakkan pasir di dalamnya. Hasil ujikaji melaluli penapis air hampas tebu berjaya menapis air sungai dengan menjadikan nilai bacaan pH antara 7.50-7.55. Berdasarkan Indeks Kualiti Air, nilai pH tersebut berada dalam kelas I dengan peratus peningkatan sebanyak 23%. Kesimpulannya menunjukkan penapis air menggunakan hampas tebu mampu meningkatkan kualiti air.

Kata kunci : Indeks Kualiti Air (IKA), Jabatan Alam Sekitar (JAS), Hampas Tebu, pH

1. PENGENALAN

Pencemaran merupakan masalah yang menjadi liputan utama media massa pada masa kini dan ianya menjadi semakin serius sejak akhir akhir ini. Pencemaran adalah suatu perbuatan yang mencemarkan, mengotorkan alam atau perbuatan yang mencemarkan kebersihan alam sekitar dengan sampah sarap dan pembuangan sisa pepejal ke dalam sungai. Sesetengah anggota masyarakat mengambil jalan mudah dengan cara membuang sampah ke dalam sungai. Mereka menganggap sungai sebagai tong sampah. Sungai menjadi kotor dan menyebabkan kehidupan akuatik semakin merosot dan semakin pupus.

Sungai Durian Tunggal ialah sungai Melaka yang dipilih sebagai kawasan kajian. Sungai ini merupakan sungai utama di kawasan tersebut dan mempunyai tahap kualiti air yang kurang memuaskan iaitu pada tahap III (Laporan Kualiti Air JAS 2016).

Merujuk kepada kawasan kajian yang telah dilakukan, penduduk tempatan yang berdekatan dengan kawasan kajian ini juga menggunakan sumber air sungai sebagai sumber utama bekalan air bahan mentah mereka. Dalam pada masa yang sama

penduduk tempatan juga tidak mengetahui bahawa sumber bekalan air mereka itu bersih atau tidak. Tambahan pula penduduk tempatan juga tidak mengetahui tahap indeks kualiti air sungai yang mereka sedang menggunakan.

Matlamat utama kajian ini adalah merawat air. Objektif kajian adalah merekabentuk penapis air hampas tebu dan seterusnya untuk mengetahui keberkesanan penapis air hampas tebu dalam merawat air sungai di sungai Durian Tunggal.

Kajian ini memfokuskan proses pengujian pH sahaja. Sampel air diambil pada satu stesen berdasarkan kedudukan punca air efluen dari kawasan perindustrian yang berdekatan.

2. KAJIAN LITERATUR

Alat penapisan merupakan salah satu kaedah yang yang mudah diaplikasikan dalam merawat air sungai, tasik dan empangan dengan cara meningkatkan nilai pH.

2.1 Hampas tebu

Hampas tebu adalah sisa dari pemprosesan pembuatan dari minuman air tebu. Secara kimia, hampas tebu mengandungi serat di mana di dalamnya terkandung selulosa, poliosa seperti hemiselulosa, lignoselulosa dan lignin (Santosa et al., 2003). Sehubungan dengan itu, hampas tebu memiliki serat dan pori-pori yang cukup besar untuk menampung gula yang sebelumnya terkandung dalam hampas tebu tersebut. Disebabkan hampas tebu mudah didapati serta murah berbanding dengan bahan kimia yang lain, maka hal ini menjadi keuntungan tersendiri dalam penggunaan hampas tebu sebagai penyerap ion logam Cd, Cr, Cu dan Pb (Refilda et al., 2001)

2.2 Nilai pH

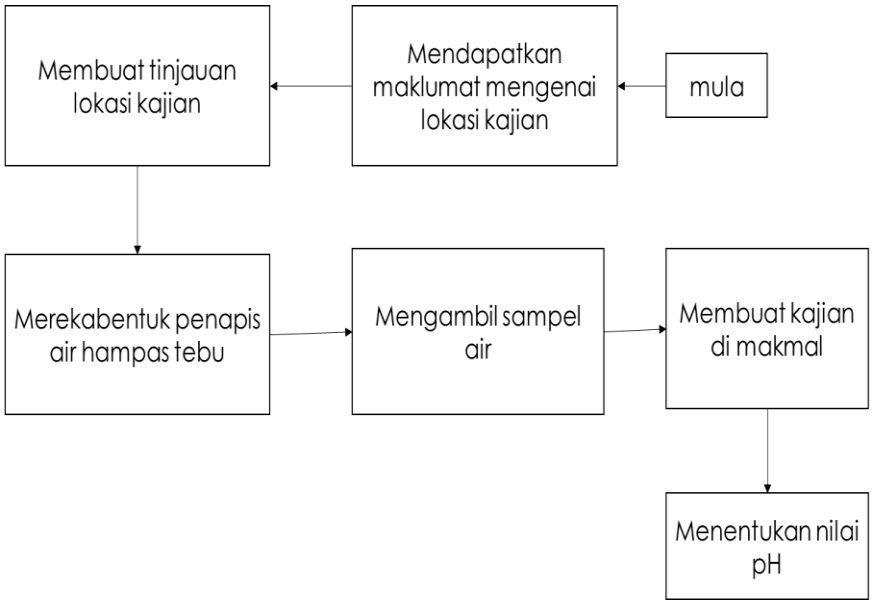
Dalam kimia, pH adalah skala yang digunakan untuk menentukan keasidan atau asas asas larutan berair. Larutan asid diukur mempunyai nilai pH yang lebih rendah daripada larutan asas atau alkali. Skala pH adalah logaritma dan sebaliknya menunjukkan kepekatan ion hidrogen dalam larutan. Dalam rawatan air, pH adalah penting untuk menentukan tindakbalas kimia yang tepat terutamanya untuk proses pengumpalan, pelembutan dan pembasmian kuman.(Sains Dan Kesihatan 2021)

3. METODOLOGI KAJIAN

3.1 Kawasan Kajian dan Kaedah Pengumpulan Sampel

Pengambilan sampel air dilakukan di sungai Durian Tunggal. Sebanyak tiga sampel air diambil untuk mendapatkan purata keseluruhan ujian dan kemudian dibawa ke makmal Politeknik Melaka. Sampel air diambil menggunakan bekas yang berukuran 1.5 liter dan diambil di tiga tempat yang berbeza tetapi di lokasi yang sama iaitu hulu, tengah dan hilir. Hal ini kerana nilai pH di setiap tempat adalah berbeza. Kesemua sampel disimpan dalam tempoh waktu tertentu mengikut parameter yang bakal diuji. Untuk pengujian nilai pH ianya perlu disimpan selama 24 jam berdasarkan jarak dari lokasi sungai Durian Tunggal dengan makmal. Sekiranya lebih 24 jam, ianya perlu disimpan di dalam peti sejuk dan perlu dijauhkan dari cahaya matahari bagi mengurangkan perubahan dalam kandungan air.

3.2 Kaedah Kajian



Rajah 3.1 Carta alir perlaksanaan kajian

3.3 Bahan kajian

Kajian ini menggunakan penapis air hampas tebu yang diperbuat daripada PVC dan ianya amat sesuai untuk ujian yang berasaskan air kerana ia tidak berkarat. Bahan utama dalam kajian ini pula menggunakan hampas tebu.

Rajah 3.2 Proses pengeringan hampas tebu menggunakan oven

Proses mengeringkan hampas tebu adalah dengan cara memanaskan tebu di dalam oven dengan suhu 90 darjah celcius. Selepas melakukan proses pengeringan, hampas tebu diletakkan ke dalam penapis air yang telah disediakan. Hampas tebu tersebut di letakkan di dalam penapis air mengikut lapisan yang telah ditetapkan.

3.4 Ujian nilai pH menggunakan pH meter

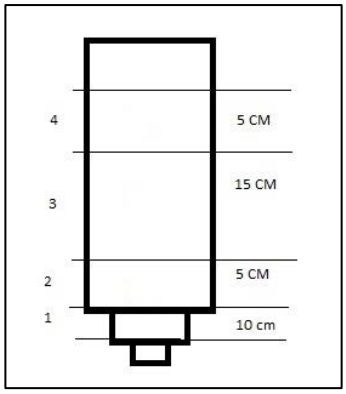
Rajah 3.3 Pengujian Nilai pH Dengan Menggunakan pH Meter

Rajah 3.2 menunjukkan pengujian nilai pH selepas mendapatkan hasil daripada ujian sebelum ini. pH meter digunakan ke atas hasil dapatan daripada ujian dan digunakan ke atas sampel air sebelum dimasukkan ke dalam alat penapis untuk menentukan dan membandingkan nilai pH daripada sampel-sampel tersebut. Cara-cara adalah dengan memasukkan sampel air ke dalam bekas kerana pH meter perlu di masukkan secara menegak untuk mengukur nilai pH air tersebut. Data kemudiannya direkod dan langkah ini diulang sebanyak tiga kali untuk mendapatkan hasil purata daripada ujian. Sampel air yang diambil dari tiga tempat yang berbeza tetapi dilokasi yang sama.

4. KEPUTUSAN DAN ANALISIS

Objektif 1 - Merekabentuk penapis air hampas tebu

4.1 Rekabentuk Penapis Air

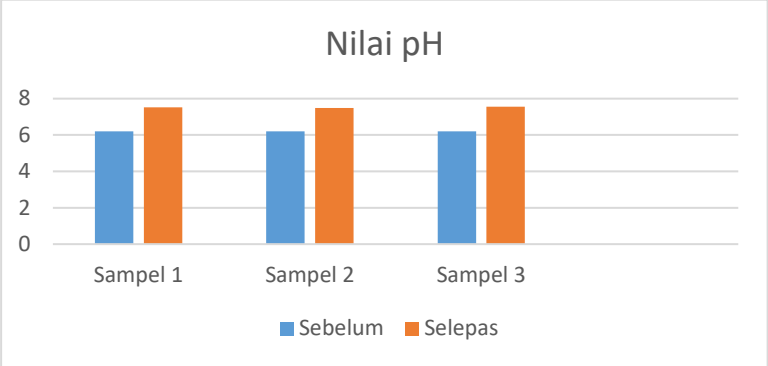


Rajah 4.1(a) Lakaran penapis air hampas tebu

Rajah 4.1 (b) menunjukkan tiga unit penapis air yang dihasilkan

Rajah 4.1(a) menunjukkan lakaran penapis air hampas tebu berbentuk silinder dan dibahagikan kepada 4 bahagian utama. Ia mempunyai muncung yang halus di penghujungnya untuk membolehkan air keluar dan berukuran 2 cm. Ukuran setiap 4 lapisan ini dibuat berdasarkan kuantiti bahan yang akan digunakan dalam ujian. Untuk lapisan pertama, span dimasukkan ke dalam penapis air setinggi 10cm. Seterusnya, pasir dimasukkan ke lapisan kedua setinggi 5cm. Lapisan ketiga akan dimasukkan bahan utama iaitu hampas tebu yang telah dikeringkan setinggi 15cm dan akhir sekali bagi lapisan keempat, sekali lagi pasir diisi dengan ketinggian 5cm. Rajah 4.1(b) pula menunjukkan sebanyak 3 unit alat penapis hampas tebu yang akan digunakan pada Sungai Durian Tunggal bagi menguji nilai pH.

Objektif 2 - Mengetahui keberkesanan penapis air hampas tebu dalam merawat air di Sungai Durian Tunggal.



Rajah 4.2 Keputusan Nilai pH Sebelum dan Selepas Ujian dilakukan

Rajah 4.2 menunjukkan nilai pH sebelum dan selepas menggunakan penapis air yang ditambah dengan hampas tebu. Keputusan kajian menunjukkan setiap sampel menunjukkan peningkatan nilai pH selepas ujian dilakukan. Untuk garisan yang berwarna biru adalah sebelum dan garisan yang berwarna oren adalah selepas. Nilai untuk sampel 1 adalah (7.52 > 6.2). Untuk sampel 2 adalah (7.49>6.2) dan untuk sampel 3 adalah (7.55>6.2). Secara keseluruhan, nilai pH bagi ketiga-tiga sampel berjaya ditingkatkan. Dengan peratusan untuk sampel yang pertama adalah 21%. Peratusan untuk sampel kedua ialah 20% peratus dan untuk sampel ketiga ialah 22%. Nilai pH meningkat sebanyak 23% selepas ujian penapisan dilakukan.

5. KESIMPULAN

Kesimpulannya, penapis air menggunakan hampas tebu boleh digunakan dalam proses merawat air terutamanya untuk meningkatkan nilai pH. Dapatan menunjukkan nilai pH berubah daripada keadaan berasid sehingga air tersebut menjadi neutral (kelas I). Cadangan kajian masa akan datang adalah menambahkan parameter air yang baru seperti ammonia nitrat, kekeruhan, dissolve oxygen dan lain-lain.

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KEBERKESANAN 'SMART OIL AND WASTE TRAP' DALAM MEMERANGKAP SAMPAH DAN MENAPIS MINYAK

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Abstrak. Longkang di sekitar Politeknik Melaka bersih dan tidak tercemar pada awalnya. Akan tetapi, dengan adanya sikap segelintir manusia yang sering membuang minyak dan sampah ke dalam longkang menyebabkan pencemaran. Objektif utama kajian ini adalah merekabentuk *Smart Oil and Waste Trap* untuk kegunaan longkang di kawasan Politeknik Melaka seterusnya menguji keberkesanannya dalam memerangkap sampah dan menapis minyak. Bahan utama yang digunakan adalah besi berlubang dan span penapis akuarium. Ini kerana besi berlubang mudah didapati dan harganya murah. Span penapis akuarium pula sangat sesuai untuk menyerap minyak dan air akan lebih mudah mengalir berbanding span biasa. Ujian yang dijalankan untuk menguji keberkesanan perangkap sampah adalah dengan menimbang sisa pepejal yang terperangkap dalam tempoh 2 jam sekali. Untuk menapis minyak, ujian yang dijalankan adalah ujian *Oil and Grease*. Dapatan kajian menunjukkan jumlah jisim yang terperangkap selama 24 jam sebanyak 16.59 kilogram. Kandungan minyak sebelum ujian ialah 6510 mg/l manakala kandungan minyak selepas melalui penapis ialah 490 mg/l yang mewakili 92.47%. Kesimpulannya, penggunaan produk ini berkesan dalam memerangkap sampah dan menapis minyak seterusnya dapat mengurangkan punca pencemaran sungai yang bermula daripada saliran longkang.

Keyword: Sampah, minyak, penapis minyak, perangkap sampah, pencemaran air

1. PENGENALAN

Merekabentuk perangkap sampah dan minyak merupakan satu proses memilih juzuk yang sesuai bagi mengelakkan pencemaran air dan meningkatkan kualiti air supaya kuantiti air bersih di Melaka terus meningkat dan tidak berlakunya catuan air yang pernah berlaku pada tahun 2019. Selain itu, ini juga dapat mengelakkan longkang tersumbat yang menjadi punca berlakunya banjir kilat. Pemilihan projek perangkap sampah dan minyak ini adalah bertujuan untuk membendung berlakunya pencemaran air sungai yang melalui dari saliran longkang yang kotor dan berbau. Hal ini juga kerana, sikap segelintir masyarakat yang mengambil mudah tentang kebersihan longkang dan membuang sisa-sisa pepejal atau cairan minyak ke dalam longkang. Selain itu, projek ini juga bertujuan untuk mengelakkan berlakunya longkang tersumbat akibat sampah yang dibuang merata tempat terutamanya longkang. Misalnya, akibat sistem perparitan atau saliran yang tersumbat mendorong untuk berlakunya banjir kilat di kawasan-kawasan bandar.

1.1 Pernyataan Masalah

Menurut YB Khoo Poay Tiong (2018) yang merupakan ahli parlimen Kota Melaka, banjir kilat merupakan salah satu masalah utama yang dihadapi oleh penduduk di kawasan Kota Melaka. Ini disebabkan oleh infrastruktur yang sudah terlalu lama. Oleh itu, beliau telah memperuntukan RM1.7 juta sepanjang tahun 2019 untuk menjalankan 21 projek infrastruktur banjir. Ini bersamaan dengan 50% daripada perbelanjaan keseluruhan peruntukan beliau. Hal ini menunjukkan bahawa kawasan Kota Melaka juga sering mengalami banjir kilat dan

melibatkan banyak kos yang diperlukan bagi mencegah berlakunya longkang tersumbat terutamanya mengelakkan longkang tercemar dengan sisa cairan minyak.

Apabila berlakunya pencemaran air di longkang, ini akan mempengaruhi sektor pelancongan di Melaka. Hal ini terjadi kerana sistem perparitan yang mengalir ke Sungai Melaka tercemar yang berpunca daripada gerai makan yang dibuka pada masa sekarang. Kesannya, para pelancong akan kurang selesa dengan air sungai di Melaka akibat pencemaran. Akibat sikap segelintir masyarakat . Ianya juga boleh menjejaskan imej sesuatu kawasan itu dan memberikan gambaran bahawa penduduk dikawasan itu tidak pembersih walaupun hanya disebabkan oleh sebahagian daripada masyarakat sahaja. Selain itu, kebersihan adalah perkara yang amat penting bagi sesebuah premis menjual makanan, ini kerana melibatkan kesihatan orang ramai.

1.2 Objektif Kajian

Berdasarkan kepada permasalahan tersebut, kajian ini dijalankan berlandaskan kepada beberapa objektif. Objektif yang terdapat di dalam kajian ini adalah merekabentuk *Smart Oil And Waste Trap* untuk kegunaan longkang dikawasan Politeknik Melaka. Seterusnya, menguji keberkesanan Smart Oil And Waste Trap ini bagi memerangkap pepejal sampah dan menapis minyak.

2. KAJIAN LITERATUR

2.1 Kepentingan Air

Air merupakan sumber semulajadi yang memainkan peranan yang sangat penting dalam kehidupan. Dalam satu artikel yang ditulis oleh Deborah Ross pada kolum Easy Living untuk terbitan *The Conde Nast Publications Ltd*, beliau menyatakan bahawa sejumlah air terdapat dalam makanan seharian seperti telur yang mempunyai 70 peratus air, timun yang mempunyai 95 peratus air, buah-buahan dan sayur-sayuran mewakili 95 peratus air dan akhir sekali ayam mentah yang mempunyai 65 peratus air tanpa kita sedar. Ini menunjukkan air merupakan sumber penting kepada manusia untuk meneruskan hidup, apabila tubuh badan kekurangan air ianya mengakibatkan badan menjadi letih dan lesu kesan dari dehidrasi. Walaupun boleh dikatakan bekalan air mencukupi untuk semua negara di dunia pada masa sekarang tetapi kita perlu memikirkan risiko kekurangan sumber air pada masa akan datang.

Mengikut Malaysian Standards, MS 1228 kadar keperluan purata kegunaan air untuk satu orang ialah 225 liter per seorang per sehari. Kadar ini bergantung kepada waktu dan tempat. Air digunakan untuk pelbagai jenis kegunaan yang boleh dikelaskan kepada beberapa kategori utama iaitu kegunaan aktiviti harian oleh orang awam domestik, kegunaan industri dan perbandaran, kegunaan bomba dan kehilangan dan pembaziran air harus juga diambil kira. Dua sektor utama dalam penggunaan air ialah kegunaan isi rumah dan kegunaan industri.

2.2 Sisa Pepejal

Sisa pepejal merupakan hasil buangan daripada aktiviti sosio-ekonomi manusia yang mempunyai sifat kotor dan dianggap tidak berguna dan pengurusan sisa pepejal adalah antara masalah utama yang di hadapi oleh kebanyakan bandar di negara membangun. Kuantiti sisa pepejal yang dijana setanding dengan jumlah penduduk yang menghuni sesuatu kawasan. Jadi pertambahan penduduk, peningkatan taraf sosioekonomi dan perubahan gaya hidup (*life style*) yang menjadi semakin canggih dan diikuti oleh peningkatan bahan buangan domestik , perniagaan dan kilang, merupakan faktor utama dalam peningkatan bahan sisa pepejal. Pada masa yang sama kapasiti bagi tapak pelupusan adalah amat terhad. Keluasaan tapak pelupusan di Malaysia biasanya 5 – 36 hektar (20 -150 ekar) bergantung kepada lokasi dan jumlah penjanaan. Di kawasan bandar

di Malaysia purata sisa pepejal yang dihasilkan adalah 760,000 tan per hari berbanding sisa pepejal keseluruhan 1.8 juta tan per hari pada tahun (Zamali Tarmudi et al., 2009).

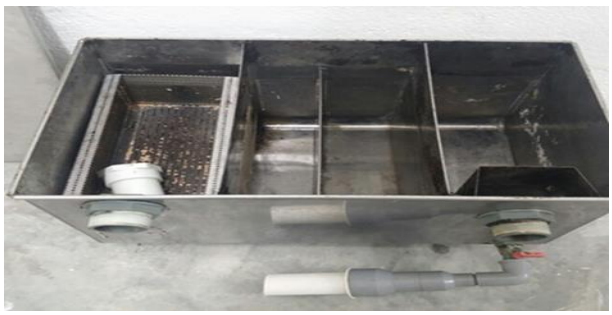
2.3 Sisa Minyak

Minyak masak terpakai mampu dikitar semula bagi menghasilkan pelbagai bahan yang berguna seperti sabun dan juga bahan bakar kenderaan bagi menggantikan petrol dan diesel. Namun, kajian yang dijalankan oleh Wan Nasriha dan Zanaton (2013) mendapati tahap pengetahuan yang rendah tentang amalan kitar semula sisa minyak telah membataskan aktiviti mengitar semula sisa minyak masak.

2.4 Pencemaran Longkang

Masalah pembuangan sampah merata-rata tempat bukan sahaja menyebabkan kecacatan kepada keindahan persekitaran, tetapi menjadi 'musuh' utama kepada sistem saliran air di Melaka. Sampah yang dibuang secara tidak bertanggungjawab itu tentunya akan menyebabkan pelbagai masalah lain seperti penyakit, sistem saliran yang tersumbat yang akhirnya mengakibatkan banjir dan juga gangguan bekalan air. berlaku gangguan bekalan air di Melaka yang disebabkan kerosakan pam air Syarikat Air Melaka Berhad (SAMB) yang tersumbat akibat sampah masuk ke kawasan empangan air apabila berlaku hujan lebat.(Utusan Borneo Online, 2018)

2.5 Jenis Perangkap Sampah Dan Minyak Yang Sedia Ada



Rajah 2.1 : Grease Trap yang digunakan di restoran-restoran pada masa kini.

Rajah 2.2 : Jenis Perangkap sampah yang dipasang pada longkang

Berdasarkan Rajah 2.1, ia adalah sejenis alat yang dipasang di premis makanan untuk mengasingkan sisa makanan dan minyak dari air limbah. Ini bertujuan untuk menapis air sisa dari premis tersebut. Kandungan air sisa dari premis makanan mengandungi kuantiti lemak, minyak dan sisa makanan yang agak tinggi yang berpunca dari aktiviti memasak, mencuci bahan makan dan peralatan memasak.

Rajah 2.2 menunjukkan perangkap sampah yang diletakkan di longkang hanya menyekat kehadiran sampah yang bersaiz besar supaya tidak terus mengalir ke sungai. Selain itu, ia berfungsi untuk menahan sampah terapung seperti daun kering, botol dan plastik.

3. METODOLOGI

3.1 Kajian Lapangan

Kajian yang telah dipilih adalah di kawasan Politeknik Melaka. Kawasan ini dipilih berdasarkan pemerhatian kami, longkang di kawasan ini telah tercemar dan tersumbat disebabkan oleh pembuangan sampah sarap dan pembuangan minyak dari kedai makanan di kawasan tersebut. Selain itu, ia juga menyebabkan pencemaran bau di kawasan itu. Pelajar dan penduduk yang berdekatan sering ke kawasan tersebut kerana mempunyai pelbagai kemudahan dan ini menyebabkan impak yang buruk kepada mereka.

3.2 Prosedur kajian

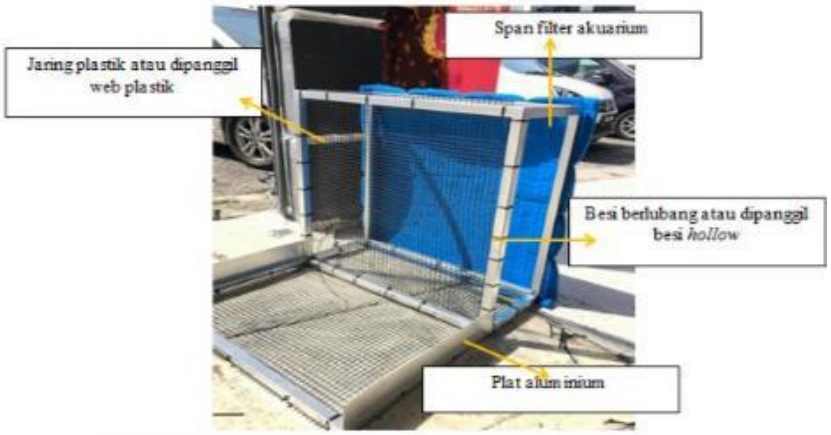
Terdapat dua ujian yang dijalankan bagi menguji keberkesanan perangkap sampah iaitu pertama dengan menimbang sisa pepejal yang tersangkut pada jaring yang telah direka khas untuk memerangkap sampah. Data tersebut diambil dengan menimbang sampah yang terperangkap pada perangkap sampah produk ini setiap 2 jam. Ujian kedua yang dijalankan bagi menguji keberkesanan penapis minyak pula, ialah *Oil And Grease*. Ujian tersebut telah dibuat di NM Laboratory Sdn. Bhd, Skudai, Johor. Ujian ini dijalankan untuk mengukur peratusan minyak sebelum dan selepas menggunakan produk *Design of Smart Oil And Waste Trap.*

3.3 Penyelenggaraan Perangkap Sampah

Tenaga kerja yang diperlukan dalam proses pembuatan produk ini ialah seramai tiga orang. Perangkap sampah mampu memerangkap sampah pada cuaca yang panas mahupun hujan. Perangkap ini perlu diselenggara jika terdapat sampah yang berat seperti kayu bagi mengelakkan produk ini mengalami kerosakan yang teruk. Jika ini berlaku, dikhuatiri produk ini tidak mampu menahan beban dan menyebabkan berlakunya air longkang bertakung dan akan menjadi punca berlakunya banjir kilat. Selain itu , *Smart Oil And Waste Trap* ini mampu perlu diselengarakan jika terdapat sampah yang berat seperti kayu bagi mengelakkan produk ini mengalami kerosakan yang teruk.

4. ANALISIS DATA

4.1 Objektif Kajian 1 - Merekabentuk Design of Smart Oil and Waste Trap



Rajah 4.1 : Rekabentuk Smart Oil and Waste Trap

Rajah 4.1 menunjukkan rekabentuk produk Design of Smart Oil and Waste Trap. Berdasarkan Rajah 4.1 pada bahagian bingkai, produk ini menggunakan besi berlubang berukuran 1cm x 1cm dan menggunakan anggaran kasar sebanyak 30 kaki untuk menghasilkan bingkai berukuran 75 cm x 70 cm x 70 cm. Pada bahagian jaring menggunakan bahan seperti jaring plastik atau dipanggil web plastik, produk ini juga menggunakan sebanyak 2 kaki bersamaan 60cm panjang yang berukuran 75cm x 70 cm.

4.2 Objektif Kajian 2 - menguji keberkesanan Smart Oil And Waste Trap ini bagi memerangkap pepejal sampah dan menapis minyak

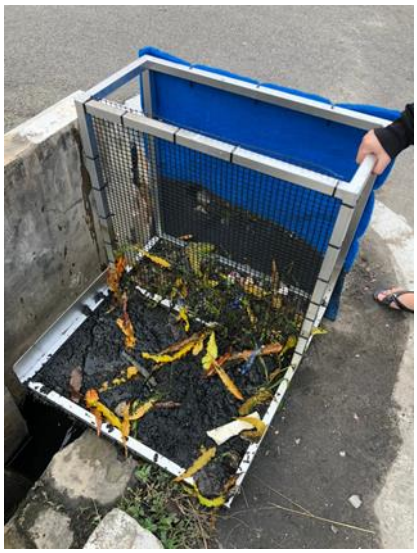
Jadual 4.1 menunjukkan data keputusan jisim sisa pepejal yang terperangkap pada produk selama 24 jam. Data diambil setiap 2 jam. Rajah 4.2 dan 4.3 pula menunjukkan gambar sebelum dan selepas menggunakan *Design of Smart Oil and Waste Trap* di saliran longkang sekitar Politeknik Melaka selama 24 jam.

Jadual 4.1 : Keputusan Jisim Sisa Pepejal di kawasan longkang Politeknik Melaka

MASA	JISIM (kg)
12:00 p.m – 2.00 p.m	1.3
2:01 p.m – 4.00 p.m	1.65
4:01 p.m – 6.00 p.m	2.05
6:01 p.m – 8:00 p.m	2.60
8:01 p.m – 10:00 p.m	3.23
10:01 p.m- 12:00 p.m	5.76
JUMLAH JISIM	**16.59**

Jadual 4.1 merumuskan pertambahan jisim sampah setiap 2 jam. Ujian ini dimulakan pada pukul 12 tengahari dan berakhir pada 12 tengahari pada keesokan hari. Jumlah jisim bagi sampah yang terperangkap selama 24 jam ialah 16.59 kilogram. Ini menunjukkan perangkap sampah pada produk ini berkesan dalam memerangkap sampah sekali gus dapat mengurangkan pencemaran air di saliran-saliran longkang.

Rajah 4.2 : Gambar menunjukkan sebelum menggunakan *Design of Smart Oil and Waste Trap*



Rajah 4.3 : Gambar menunjukkan selepas menggunakan *Design of Smart Oil and Waste Trap*

Jadual 4.2 yang menunjukkan Keputusan Peratusan Minyak sampel A, B dan C yang menggunakan kaedah 'APHA B 5520 Oil and Grease (Liquid Partition-Gravimetric Method) sebelum dan selepas menggunakan produk kami iaitu *Design of Smart Oil and Waste Trap*

Jadual 4.2 : Keputusan Sebelum dan selepas Peratusan Minyak di tiga lokasi iaitu Restoran Ariff Infasha , Warong Rose Imran dan Angee Mart.

Lokasi	Jenis Sampel	Sifat Minyak	Sebelum (mg/l)	Selepas (mg/l)	Peratusan Minyak (%) yang tersekat di penapis minyak
Restoran Ariff Infasha	A	Lemak Tepu	6510	490	92.47
Warong Rose Imran	B	Lemak Tidak Tepu	657	524	20.24
Angee Mart	C	Lemak Tidak Tepu	4950	3650	26.26

Berdasarkan kepada Jadual 4.2, dapat disimpulkan bahawa ialah Restoran Ariff Infasha iaitu bagi sampel A mempunyai sifat minyak tepu iaitu minyak yang mempunyai tekstur yang pekat dan bercampur dengan sisa lemak. Berdasarkan pemerhatian, peratusan minyak yang telah didapati berdasarkan ujian *Oil and Grease* bahan yang digunakan untuk menapis minyak lebih berkesan pada minyak yang mempunyai tekstur yang pekat dan bercampur dengan sisa lemak berbanding sifat minyak yang terdapat di lokasi Warong Rose Imran dan Angee Mart. Sampel air bagi lokasi tersebut telah disifatkan sebagai tidak tepu. Tidak tepu bermaksud minyak yang baru digunakan selepas menggoreng dan tidak bercampur dengan sisa lemak. Berdasarkan keputusan peratusan minyak, bahan yang digunakan kurang berkesan pada minyak yang baru sahaja digunakan. Hal ini kerana, sifat minyak yang tidak tepu lebih halus dan boleh melepasi pori-pori bahan yang digunakan iaitu span filter akuarium.

5. KESIMPULAN

Kajian ini dijalankan untuk menguji keberkesanan *Design of Smart Oil and Waste Trap* dalam memerangkap sampah dan menapis minyak. Melalui ujian dan pemerhatian yang telah dijalankan, produk ini berkesan dalam memerangkap sampah dan kebanyakkan sampah yang terperangkap adalah terdiri daripada plastic, beg plastic, polisterin, kertas, daun kering, tin aluminium dan lain-lain lagi. *Smart Oil and Waste Trap* juga berkesan dalam menapis minyak berdasarkan kepada peratusan minyak yang tersekat di penapis minyak iaitu sebanyak 92.47%, 20.24% dan 26.26%. Selain itu , Smart Oil And Waste Trap ini mampu perlu diselenggarakan jika terdapat sampah yang berat seperti kayu bagi mengelakkan produk ini mengalami kerosakan yang teruk .

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POTENSI HIGH-DENSITY POLYETHYLENE (HDPE) DAN POLYETHYLENE TEREPHTHALATE (PETE) UNTUK KEMASAN JUBIN DINDING PLASTIK

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Abstrak. Sejak tahun 1950-an plastik menjadi bahan penting dalam hidup manusia. Plastik digunakan sebagai bahan mentah kemasan, tekstil, bahagian-bahagian kenderaan dan alat-alat elektronik. Plastik direka dengan kepelbagaian yang sangat banyak dalam ciri-ciri yang dapat menahan panas, keras, kebergantungan dan lain-lain. Digabungkan dengan kemampuan adaptasinya, komposisi yang umum dan beratnya yang ringan memastikan plastik digunakan hampir di seluruh bidang industri. Penggunaan jubin dinding plastik ini adalah untuk mengurangkan kebergantungan kepada alam semulajadi seperti pasir dan simen. Objektif kajian ini adalah untuk mengetahui potensi High-Density Polyethylene (HDPE) dan polyethylene terephthalate (PETE) sebagai bahan dalam penghasilan kemasan jubin dinding plastik. HDPE dan PETE adalah bahan buangan plastik yang dikitar semula untuk dijadikan jubin dinding plastik khusus untuk digunakan di dalam bilik air. Skop kajian ini adalah menggunakan HDPE dan PETE iaitu bahan buangan plastik yang dikitar semula dan jubin plastik yang dihasilkan khusus untuk digunakan di ruang tamu dan dewan sahaja. Eksperimentasi juga dilakukan untuk menganalisis eksperimen tahap keleburan yang sesuai untuk HDPE dan PETE untuk dijadikan Jubin dinding plastik bagi proses kemasan. Analisis menunjukkan bahawa plastik Hdpe mempunyai tahap ketahanan yang lebih tinggi berbanding plastik PETE. Kesimpulannya, dengan jubin dinding plastik dapat mengurangkan pencemaran plastik jenis (HDPE) dan digunakan untuk kemasan di ruang tamu dan dewan sahaja.

Kata kunci: plastik, jubin, kitar semula, hight-density polyethylene, ketahanan.

1. PENGENALAN

Amalan kitar semula kurang dipraktikkan dan berlarutan di kalangan masyarakat. Penggunaan botol plastik meningkat pada kadar yang tinggi berikutan pertambahan populasi penduduk yang semakin meningkat maka bahan dan sisa buangan telah dihasilkan. Sampah plastik menjadi masalah lingkungan berskala global. Plastik banyak dipakai dalam kehidupan seharian, karena mempunyai kelebihan seperti kuat, ringan dan stabil. Namun plastik yang terdapat di pasaran saat ini merupakan polimer sintetik yang terbuat dari minyak bumi yang sukar untuk terurai. Apabila, semakin banyak yang menggunakan plastik, maka semakin meningkat pula pencemaran seperti pencemaran tanah. Oleh karena itu, perlunya langkah untuk membendung masalah ini, salah satunya iaitu mengembangkan bahan plastik biodegradable (bioplastik) Salah satu jalan penyelesaian yang dianggap efektif ialah mengitar semula plastik yang terbuang menjadi perhiasan dalaman rumah yang diperbuat daripada plastik yang terbuang.

Objektif kajian ini adalah untuk mengetahui potensi High-density polyethylene (hdpe) dan polyethylene terephthalate (pete) sebagai jubin dinding plastik untuk kemasan akhir. Skop kajian ini adalah menggunakan HDPE dan PETE iaitu bahan buangan plastik yang dikitar semula dan jubin plastik yang dihasilkan khusus untuk digunakan di ruang tamu dan dewan sahaja. HDPE memiliki sifat dan kelebihan yang tersendiri. Ia bersifat keras, legap dan tahan

suhu tinggi. Kebiasaannya, ia digunakan dalam pembuatan alat permainan kanak-kanak, bekas sabun pencuci dan botol susu. Bahan plastik ini selamat untuk diguna semula kena ia mampu mencegah tindak balas kimia dari mencemari minuman atau makanan yang diisi di dalamnya.

2. SOROTAN KAJIAN

Plastik merupakan satu bahan yang mudah didapat diserta tempat seperti kawasan perumahan, pusat beli-belah, dan sebagainya. Terdapat pelbagai jenis plastik yang terdapat di seluruh dunia. Contohnya, *Polyethylene Terephthalate (PETE), High-Density Polyethylene (HDPE)* dan lain-lain. Terdapat pelbagai kaedah untuk mencairkan dan membentukkan semula semua jenis plastik.

Menurut pernyataan A. Brent Strong (2006), plastik terdiri daripada campuran karbon, hidrogen dan unsur yang bukan logam dan mengambil masa yang lama untuk mereput.ia boleh dibahagikan kepada dua jenis utama iaitu plastik termoset (*thermosetting plastic*) dan plastik haba (*thermoplastic*). Apabila plastik haba dipanaskan, ia akan mencair dan boleh dibentuk menjadi bentuk baru sementara plastik termoset pula adalah bersifat sebaliknya. Apabila dipanaskan ia tidak mencair, sebaliknya ia akan hancur dan tidak boleh dibentuk semula.

2.1.1 Keluli Ringan

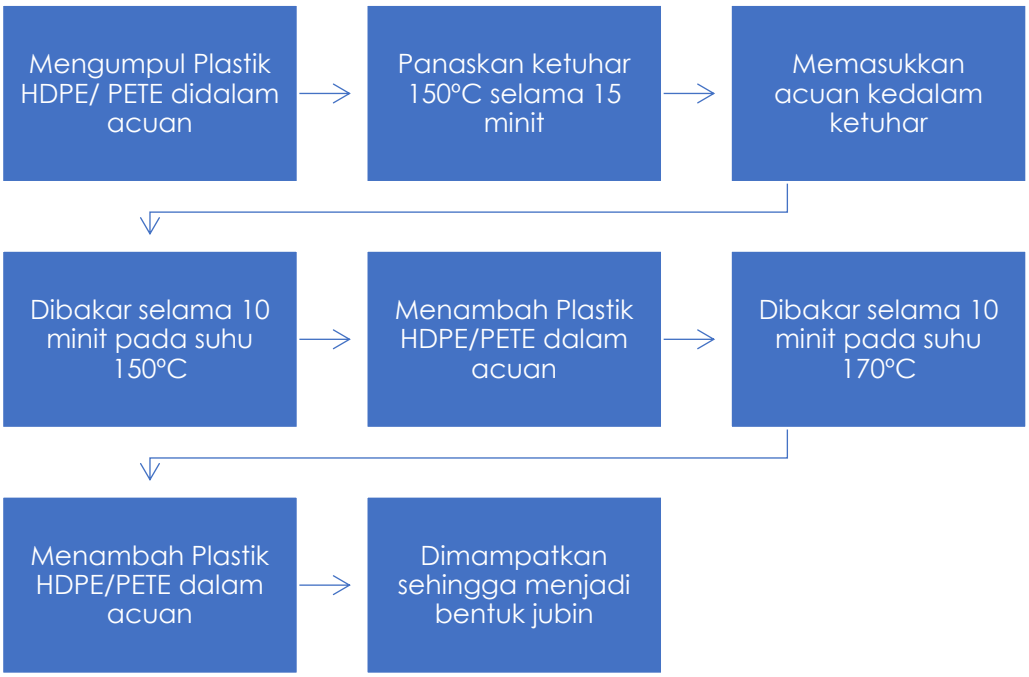
Keluli ringan adalah sejenis keluli berkarbonat dengan jumlah karbon rendah - sebenarnya juga dikenali sebagai "keluli karbon rendah." kesan gentian keluli konkrit berbusa ringan pada pecahan isipadu yang agak rendah (0.2% dan 0.4%) pada sifat mekanik seperti kekuatan mampatan, kekuatan lenturan dan kekuatan tegangan pemisahan. Sekiranya lebih banyak karbon ditambahkan, besi akan diklasifikasikan sebagai besi tuang. Besi ini menjadi pilihan untuk menjayakan kajian tersebut. Oleh kerana kriteria-kriteria besi tersebut menjadi sebab Keluli Ringan dipilih.

2.1.2 Besi Plat

Besi plat adalah bahan mentah utama untuk membuat pelbagai mesin, kenderaan roda empat, kapal, dan keperluan plastik lain. Walau bagaimanapun, plat logam ini juga sering digunakan untuk pelbagai keperluan untuk pembinaan bangunan dan peralatan rumah tangga. Penggunaan besi plat untuk pembinaan sangat baik kerana varian besi, ia mempunyai ketahanan kakisan yang sangat baik. Besi Plat dijadikan tapat bekas ujian untuk menampung kecairan Plastik di dalam bekas ujian tersebut.

3. KAJIAN METODOLOGI

3.1 Kaedah Kajian Pembentukan Jubin Dinding Plastik



Rajah 3.1 Carta Alir Proses Penghasilan Jubin Dinding Plastik Mengunakan HDPE/PETE

3.2 Bahan Kajian

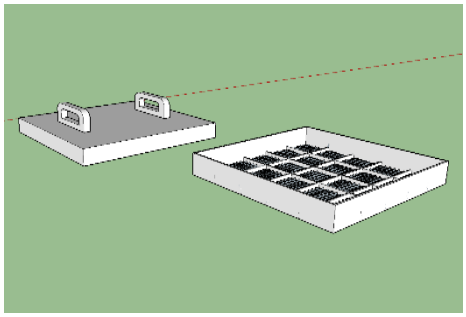
3.2.1 *Plastik HDPE*

High-Density Polyethylene (HDPE) merupakan jenis plastik yang paling banyak dikitar semula. Menurut Musfiroh Jani (2019), Ia disebabkan sifatnya yang keras, kuat, tahan pada suhu tinggi dan suhu rendah. 12% daripada HDPE dikitar semula setiap tahun. HDPE yang pertama telah digunakan sebagai bahan dalam sistem perpaipan.Plastik kategori SPI 2 ini merupakan plastik polietilena yang mempunyai ketumpatan tinggi.

3.2.2 *Plastik PETE*

Polyethylene Terephthalate merupakan salah satu plastik yang paling banyak digunakan di dunia. Menurut Musfiroh Jani (2019), 96% daripada botol plastik yang dihasilkan di Amerika Syarikat adalah daripada plastik jenis PETE, malangnya hanya 25% yang telah dikitar semula. Plastik kategori SPI 1 ini kadangkala menyerap bau dan rasa daripada makanan dan minuman yang disimpan di dalamnya.

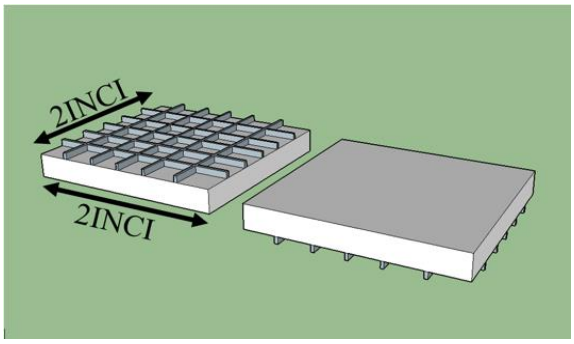
3.2.3 *Bekas Ujian*



Rajah 3.2 Lakaran Bekas Ujian

Bekas ujian (Rajah 3.2) ialah sebuah alat yang direka khas untuk diletakkan Plastik HDPE sebelum ianya dibakar dengan ketuhar. Alat ini diperbuat daripada Keluli Ringan dan ianya sesuai untuk ketahanan suhu yang tinggi. Bekas ujian ini mempunyai reka bentuk yang lebih efisien. Hal ini demikian kerana bekas tersebut mempunyai ciri-ciri yang dapat menahan pada suhu yang tinggi di dalam ketuhar. Lakaran Bekan Ujian adalah dibina berdasarkan rekabentuk jubin dinding yang berukuran 2 x 2 inci.

3.2.4 Lakaran Jubin



Rajah 3.3 Lakaran Jubin Dinding

Jubin dinding (Rajah 3.3) ialah jubin dinding yang direka bentuk khas bagi membentuk plastik HDPE dan PETE setelah terhasil.

3.3 Ujian ke atas Plastik HDPE DAN PETE

Sebanyak 10 penutup botol HDPE dan PETE telah dikumpulkan untuk dijalankan ujian dan dimasukkan ke dalam bekan ujian yang bersaiz 10 inci x 10 inci. Kemudian bekas ujian tersebut dimasukkan ke dalam ketuhar dengan suhu 170°C. Plastik tersebut dileburkan selama 10 minit pada suhu 170°C. Kemudian ditambahkan lagi dengan 10 penutup botol ke dalam Bekas Ujian. Setiap 10 minit, penutup botol plastik HDPE dan plastik PETE akan ditambah ke dalam Bekas Ujian. Kemudian langkah-langkah tersebut diulang dan diperhati keberkesanan untuk menjadi jubin dinding.

4. KEPUTUSAN DAN ANALISIS

Jadual 4.1 menunjukkan keputusan ujian keleburan plastik untuk membentuk jubin dinding plastik. Berikut adalah catatan suhu dan masa yang diambil ketika menentukan tahap keleburan yang optimum bagi HDPE dan PETE.

Jadual 4.1 : Tahap Keleburan HDPE dan PETE

HDPE		**PETE**	
SUHU	**MASA**	**SUHU**	**MASA**
70°C	49 Minit	70°C	37 Minit
90°C	43 Minit	90°C	32 Minit
110°C	35 Minit	110°C	24 Minit
130°C	27 Minit	130°C	17 Minit
150°C	18 Minit	150°C	11 Minit
170°C	**10 Minit**	**170°C**	**7 Minit**

Kajian menunjukkan tahap keleburan yang sesuai untuk meleburkan plastik HDPE adalah 170°C selama 10 minit. Tahap keleburan untuk palstik PETE adalah 170°C selama 7 minit sahaja. Walaupun terdapat perbezaaan dari segi masa iaitu 3 minit, kajian mendapati plastik PETE hangus dan tidak melebur dengan sempurna berbanding plastik HDPE. Ini menunjukkan tahap keberkesanan plastik Hdpe adalah lebih baik untuk pembuatan Jubin dinding plastik.

5. KESIMPULAN

Kesimpulannya plastik HDPE berjaya dikitar semula sebagai jubin dinding plastik. Cadangan pada masa hadapan adalah menambah baik cara untuk meleburkan plastik dan kegunaan kepada tempat lain selain hiasan dalaman rumah dan dewan.

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PENGAMBILAN SAMPEL AIR MENGGUNAKAN EDUCATION WATER SAMPLER

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Abstrak. Air merupakan suatu keperluan yang sangat penting dalam kehidupan seharian. Masalah yang sering dihadapi semasa untuk mengambil sampel air di sungai ialah cerun yang curam untuk turun ke tebing dan mengambil masa yang lama. Objektif kajian ini ialah merekabentuk *Education Water Sampler* bagi memudahkan sampel air di sungai diambil dan seterusnya mengenalpasti keberkesanan *Education Water Sampler* dari segi kecepatan masa mengambil sampel air. Skop kajian ini tidak melibatkan bahan api dan hanya menggunakan botol air dan alatan memancing seperti rod, kili dan tali tangsi. Berdasarkan keputusan yang diperolehi, produk ini dapat menjimatkan masa apabila mengambil sampel air di sungai.

Kata kunci: sampel air, sungai, botol air, menjimatkan masa

1. PENGENALAN

Air meliputi *70%* daripada permukaan bumi. Setiap kehidupan di bumi ini memerlukan air untuk terus hidup. Air merupakan sebatian kimia yang berada dalam bentuk cecair pada tekanan biasa dan pada suhu bilik. Pengambilan air dari dasar perairan yang hasilnya tidak dipengaruhi oleh aliran air atau pergerakan air di dalam botol sampel air tersebut ketika botol diangkat dari dalam air ke atas, sehingga sampel air yang diambil tidak tercemar dengan udara luar. *Education Water Sampler* adalah satu alat yang secara khususnya digunakan untuk mengambil sampel air. Water sampler digunakan untuk mempermudahkan pengambilan sampel air di suatu badan air seperti sungai, laut, dan danau yang bertujuan untuk ujikaji. Pemilihan projek pengangkat sampel air ini adalah bertujuan untuk membendung berlakunya pencemaran air sungai yang berlaku agak membimbangkan di sungai Melaka.

1.1 Pernyataan Masalah

Masalah utama bagi penciptaan produk ini ialah kerana sesetengah pelajar mempunyai masalah untuk terun ke tebing sungai bagi mendapatkan sampel air. Dengan adanya produk ini, ia dapat memudahkan pengguna seperti berada di jambatan ataupun kawasan yang selesa untuk mengambil sampel air.

1.2 Objektif Kajian

Berdasarkan kepada pemasalahan tersebut, kajian ini telah dijalankan berlandaskan beberapa objektif. Objektif yang terdapat di dalam kajian ini adalah mereka bentuk produk *Education Water Sampler* untuk memudahkan pengambilan sampel air. Seterusnya mengenalpasti keberkesanan *Education Water Sampler* dari segi kecepatan masa mengambil sampel air di Sungai Malim, Melaka.

2. SOROTAN KAJIAN

2.1 *Van Dorn Water Sampler*

Alat ini sesuai untuk mengambil sampel air di bahagian dasar danau, sungai. Ia diperbuat daripada tabung acrylic yang berkualiti tinggi dengan kapasiti air 3-5 liter. Alat ini dicipta oleh DR. William Van Dorn dari Oseanografi Scripp, Amerika. Harga pasaran dianggarkan RM3,000.

Rajah 2.1 : ***Van Dorn Water Sampler***

2.2 *Kemerrer Water Sampler*

Alat ini sesuai untuk mengambil sampel air di sungai. Isipadu air yang boleh diambil satu masa ialah 500ml sahaja. Harga di pasaran kurang dari RM1,500. Cukup pada kedalaman tertentu antara 3 hingga 600 kaki. Berfungsi dengan baik semasa menggunakan walaupun di kawasan yang bergelora.

Rajah 2.2 : ***Kemerrer Water Sampler***

2.3 *Weighted Bottle Sampler*

Penggunaan alat ini sesuai untuk sedimen, kawasan masalah alam sekitar, produk agresif kimia, petrokimia dan kawasan bekas perlindungan. *Stainless steel* yang digunakan untuk kestabilan botol bagi pengambilan sampel air di sungai dengan kecepatan terlalu rendah untuk sampler isokinetik. Biasanya botol yang digunakan mulut terbuka atau botol dengan tutup US D-77 atau US D-95 tanpa nosel.

Rajah 2.3 : *Weighted Bottle Sampler*

3. METODOLOGI KAJIAN

3.1 Kawasan Kajian

Kawasan kajian yang telah dipilih adalah di kawasan Sungai Malim Melaka. Kawasan ini dipilih kerana berdekatan dengan kawasan Politeknik Melaka. Selain itu, pengguna mengalami masalah yang sukar untuk mengambil sampel air di kawasan ini kerana terdapat cerun yang curam di sungai itu.

3.2 Prosedur Kajian

3.2.1 Produk *Education Water Sampler*

Produk Education Water Sampler yang akan dihasilkan menggunakan alatan utama seperti joran. Joran adalah salah satu alat penangkap ikan yang pada asasnya terdiri dari beberapa komponen iaitu batang joran, tali, pemberat serta kili-kili. Ia beroperasi dengan dipasang tetap pada suatu perairan atau tempat, ditarik dari belakang perahu atau kapal yang sedang dalam keadaan berjalan atau dihanyutkan pada air.

Pembinaan batang pancing terdiri daripada sekumpulan serat karbon atau gentian kaca yang digabungkan dengan resin epoxy. Bahan dari serat karbon diketahui kuat dan mempunyai daya angkat yang cukup baik dan lebih ringan, Serat karbon tidak begitu fleksibel seperti pancing dari bahan serat. Pembinaan Gentian ditenun seperti tikar dan diberi resin sebagai pelekat. Serat kaca (fiber) terkenal dengan kelenturan dan mempunyai ketahanan yang baik. Oleh itu, pancing yang diperbuat daripada serat tidak mudah hancur ketika jatuh atau terkena sesuatu benda yang keras. Bahan yang digunakan ialah seperti joran, botol air, tali tangsi, paip pvc, klip dan pemberat pancing.

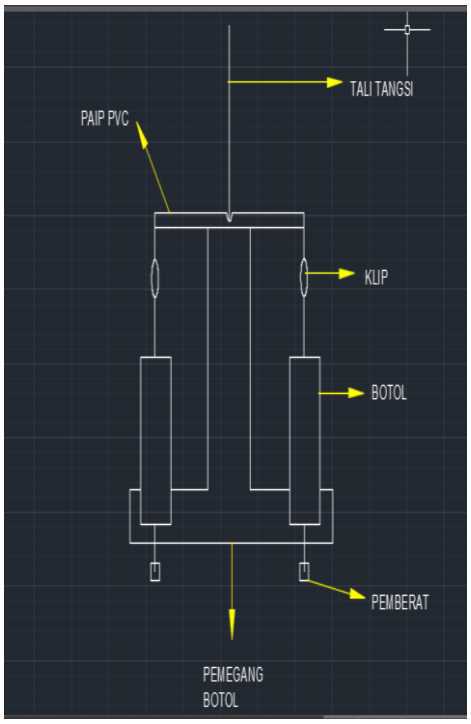
3.2.2 Persampelan

Education Water Sampler berkeupayaan mengambil sebanyak 2000ml sampel air untuk tujuan kajian ini.

4. KEPUTUSAN DAN ANALISIS

Objektif 1 - Merekabentuk *Education Water Sampler*

Rajah 4.1 (a) : Education Water Sampler

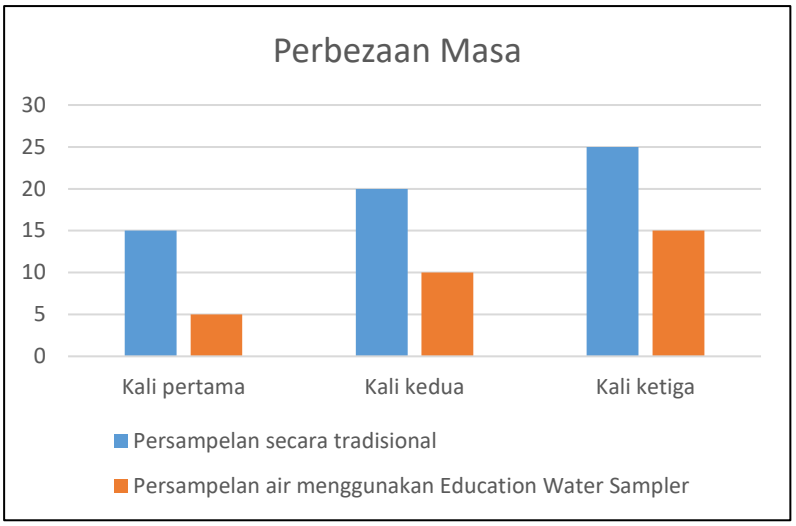


Rajah 4.1(b) : Lukisan skematik Education Water Sampler

Rajah 4.1(a) dan Rajah 4.1(b) menunjukkan produk inovasi *Education Water Sampler*. Ianya mengandungi 2 botol minuman, 2 paip PVC, 220m panjang tali, 3 gelung getah, 15 klip dan 1 besi pemegang. Kesemua peralatan ini diletakkan di dalam satu bekas. Education Water Sampler merupakan salah satu alat yang digunakan secara manual. Hal ini kerana alat Education Water Sampler ini memiliki cara penggunaan yang mudah dan sederhana. Selain itu, alat Education Water Sampler merupakan alatan mudah alih, yang mana ianya dapat dipindahkan ataupun dibawa ke mana-mana sahaja. Pada waktu ini, kebanyakan sampel digigi air dengan menggunakan botol. Ini membolehkan ia terdedah dengan risiko yang ada. Fungsi utama produk ini ialah dapat mengambil sampel air dgn lebih mudah dan menjimatkan masa.

Objektif 2 - Mengenalpasti keberkesanan *Education Water Sampler* dari segi kecepatan masa mengambil sampel air

Keputusan analisa yang ditunjukkan di dalam Rajah 4.2 mendapati penggunaan Education Water Sampler ini dapat menjimatkan masa. Pada kali pertama pengambilan sampel air dilakukan hanya mengambil masa selama 5 minit berbanding secara tradisional selama 15 minit. Pada kali kedua pula mengambil masa selama 10 minit berbanding 20 minit dan kali ketiga selama 15 minit berbanding dengan 25 minit. Data menunjukkan bahawa alatan Education Water Sampler ini mampu menjimatkan masa untuk mengambil sampel air di sungai. Purata keseluruhan penjimatan masa menggunakan produk ini adalah sebanyak 30 minit.



Rajah 4.2 : Perbezaan masa mengambil sampel air di sungai

5. KESIMPULAN

Kesimpulannya inovasi *Education Water Sampler* ini telah berjaya mencapai objektif iaitu menjimatkan masa untuk mengambil sampel air. Cadangan untuk kajian pada masa akan datang adalah menambahbaik Education *Water Sampler* dari segi reka bentuk dan juga penggunaan lebih banyak botol untuk mengambil lebih banyak lagi sampel air di sungai.

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A STUDY ON MECHANICAL PROPERTIES BETWEEN FIBRE WOOD FROM PINEAPPLE LEAF AND NORMAL FIBRE WOOD

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Abstract. Wood contributes majorly as raw material in conventional pulp and paper production worldwide, whereas the depleting forest resources to obtain wood had made a significant impact on the environment and humans. This has searched for alternative fibre in non-wood materials imperative in pulp and paper production. Malaysia and other countries have an abundance of agro-waste materials like pineapple leaves and corn straw that have not been fully utilised. Therefore, this study aims to investigate fibre wood made from pineapples' leaves for making a plank of woodwork stronger and not easily break or damage. The objectives of the study are 1. To compare the weight between fibre wood made from Yankee AC6 pineapple leaves and normal fibre woods. 2. To compare the strength between fibre wood made from Yankee AC6 pineapple leaves with wood cum (epoxy) and normal fibre woods. This study used Yankee AC6 pineapple leaves to make fibre wood. In the sample preparation, four levels of extraction of Yankee AC6 pineapple leaves and four levels of preparation of fibre wood were conducted in the laboratory. The results clearly showed that the mass of the pineapple fibre wood is 1.490kg and the normal fibre wood (MDF) 1.670kg. Meanwhile, the maximum capacity load is 906.39N for fibre wood made from Yankee AC6 pineapple leaves compared to the normal fibre wood with a maximum capacity load is 1367.03N. The suggestion for improving this project with stronger fibre wood can also be applied with material like bamboo fibre to make fibre wood stronger.

Keywords: fibre wood, pineapple leaf, fibre strength.

1. INTRODUCTION

Wood industries have been considered the main consumers of natural resources (wood) and energy(electricity), including water and significant contributors of pollutant discharges to the environment. The demand for wood has increased, because of that, it started to use fibre wood in the wood industry. The fibre wood is made from wood chips and sugarcane fibres in the wood industry. Nevertheless, the fibre is not stronger and durable (Nikhilesh Jasuja, Gauri S, Pooja Sehgal 2013). The fibre wood is made from wood chips cutting off trees and to avoid this issue, a new strategy will be planned by using pineapple leaves which are stronger, more durable and more lightweight. Due to the traditional way, carpenters use the normal fibre wood and the work was easily damaged and can't use for a long period (Nikhilesh Jasuja, Gauri S, Pooja Sehgal 2013). This project can help carpenters and contractors to make last longer and stronger woodwork with this fibre wood made from YANKEE AC6 pineapples' leaves. According to the pineapple fibre wood research woodwork from YANKEE AC6 pineapples' leaves are more eco-friendly compared to others fibre woods and lightweight fibre wood. Nowadays a lot of woodwork has been used to make their house more decorative although the woodwork was easily damaged and can't be used for a long period. The objectives of the study are : (1) To compare the weight

between fibre wood made from Yankee AC6 pineapple leaves and normal fibre woods and (2) to compare the strength between fibre wood made from Yankee AC6 pineapple leaves with wood cum (epoxy) and normal fibre woods. This study used Yankee AC6 pineapple leaves to make fibre woods.

2. LITERATURE REVIEW

This chapter consists of numerous applications and procedures used of pineapple leaves' fibre to replace fibre woods. Research performed by researchers in the zone of experimental study of partial pineapple leaves has adverse effects on the various properties of over addition of the pineapple fibres. Most fibre woods or boards are not too strong and durable (Nikhilesh et al.,2013). The fibre wood needs to be more durable than the normal fibre woods. The fibre made from pineapple leaves must be an eco-friendly product in the wood industry because it can take off the leaves of a pineapple plant when the pineapple is most old or ready for replantation with other plants.

2.1 Theory of Pineapple Leaf

Pineapple leaf fibre (PALF) is one of the waste materials in the agriculture sector, which is widely grown in Malaysia as well as Asia. After bananas and citrus, pineapple (Ananas comosus) is one of the most essential tropical fruits in the world. The tensile strength of PALF single fibre from the current study was compared to other variants of PALF such as Yankee, Sarawak, Moris Gajah and Josapine. It was seen that Yankee's PALF had the highest tensile strength compared to other Malaysian PALF with tensile strength 400mPa (Najeeba M.,2020).

2.2 Theory of Fibre

The inorganic materials were shaped into fibres and mainly used in the apparel, home furnishing, household textiles and building trades. Fibre is the smallest part of the fabric. This single hair-like strand of fabrics was called fibre (Stokke et al., 2014). Traditionally, wood chips and sugarcane fibres are used to make a fibre wood or fibreboard. Fibre can take out from the pineapple plant once the fruit has took-off. Pineapple leaves will be a waste to throw if one doesn't use them. From this process, trees and jungle won't be destroyed by cutting off the trees to make fibre wood with wood chips. These pineapple fibres were also referred to as hard fibre. This fibre wood made from pineapple leaf was eco-friendly to users.

3. METHODOLOGY

3.1 Pineapple Fibre Wood Process

Firstly, collect 5kg of pineapple leaves from the pineapple garden. Then, insert into a feeder for the extraction process. After that, collect extracted leaves and rinse under the sun. Later, cut the extract part of the pineapple leaf and store it in a container. Then, make a wood frame with an inside size (90cm x 20 cm). After that, mix the epoxy hardener glue very well for 5 minutes. Then, pour the epoxy glue mixture on the base of the frame and arrange the fibre on it. Add more fibre to make the fibre wood thicker. Lastly, pour the mixture of epoxy. For this step, there was a ratio of (3:1) that (pineapple fibre: epoxy glue), it's the suitable ratio for making a stronger fibre wood. Then, add them after pouring the epoxy glue. After that, compact the mixture with G-clamp to gain strength. Rinse under the sun for two days. Lastly, take out the frame and wood with the size (12 X 30 X 1.0) cm.

Figure 3.1 Procedure Preparation of Pineapple Fibre Wood

3.2 Measuring mass of fibre wood made from pineapple leaf and normal fibre wood

The procedure of testing was beginning with checking the jointing of the fibre and glue whether they were in good condition to make a fibre wood and measuring the mass of the fibre wood with a weight measuring scale. This testing shows whether the pineapple fibre wood is lighter than the normal fibre wood or not.

Figure 3.2 : Weight Measuring In Scale And Jointing Of Fibre

3.3 Flexural testing for the pineapple fibre wood and normal fibre wood

Tests about the strongest of the fibre wood were also needed. The second testing for this fibre wood or board was tested to find the strongest of the fibre wood. The strongness of fibre wood made of pineapple leaves was tested by comparing the normal fibre wood. This testing has been done in the CTRM Laboratory testing lab in Melaka, Malaysia. From this test, get the maximum load capacity of the fibre woods.

Figure 3.3 : Flexural Testing on Pineapple Fibre Wood And Normal Fibre Wood.

4. DATA ANALYSIS AND RESULT

4.1 Objective 1 - To compare the weight between the fibre wood made from YANKEE AC6 pineapple leaves and normal fibre woods.

Figure 4.1 shows the mass of the pineapple fibre wood is 1.490kg and the normal fibre wood (MDF) 1.670kg. This test shows the pineapple fibre wood was lighter than normal fibre wood.

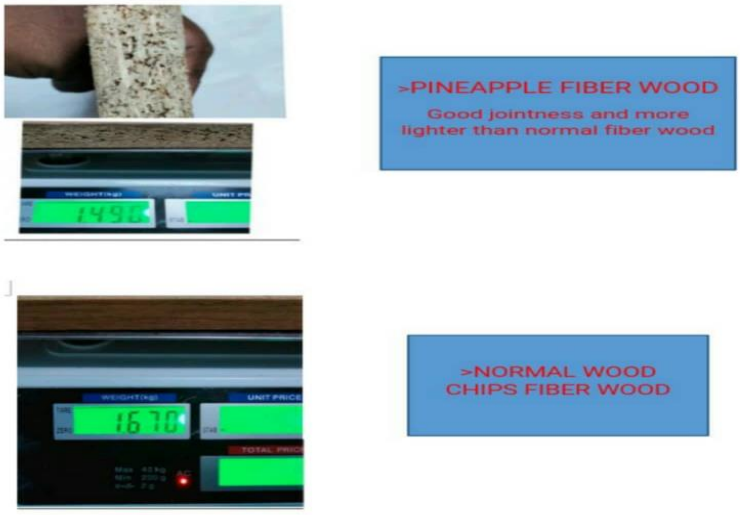

Figure 4.1 : The result for pineapple fibre wood and normal fibre wood's weight.

4.2 Objective 2 - To test the strength of the fibre wood made from Yankee AC6 pineapple leaves with wood cum (epoxy) between normal fibre woods.

Table 4.1 shows the strength of the fibre wood made from pineapple leaves and normal fibre wood-The pineapple fibre wood maximum capacity load is 906.39 N and the normal fibre wood maximum capacity load is 1312.02 N. This shows the pineapple fibre is not stronger than normal fibre wood.

Table 4.1 : The strength of fibre wood made from Yankee AC6 pineapple leaves.

	Thickness [mm]	Width [mm]	Span Length [mm]	Maximum Load [N]	Flexural Stress [MPa]	Modulus Elasticity [MPa]
1	11.85	122.51	190	1064.68	17.601	1235.230
2	12.39	123.22	198	748.09	11.760	664.633
Mean	12.12	122.86	194	906.38	14.681	949.931
S.D.	0.38	0.50	6.11	223.86	4.13	403.47

Average maximum load of fibre wood made from pineapple leaf = (1064.68+748.09)/2 = 906. 39N

Table 4.2 : The strength of normal fibre wood

	Thickness [mm]	Width [mm]	Span Length [mm]	Maximum Load [N]	Flexural Stress [MPa]	Modulus Elasticity [MPa]
1	10.86	117.96	174	942.20	17.652	1739.337
2	9.74	117.05	156	1791.85	37.721	2389.768
Mean	10.30	117.50	165	1367.03	27.686	2064.553
S.D.	0.79	0.64	12.67	600.79	14.19	459.92

Average maximum load of normal fibre wood = (932.2+1691.85)/2 = 1367.03N

Pineapple fibre wood is not too strong but it is lightweight, eco-friendly and suitable for cupboards doors, kitchen layered tabletop and shelf liners for cabinets. According to Yusuf and Mehmet (2017), the minimum load capacity of the kitchen cabinets is 611N and the use of pineapple fibre wood for this study is suitable for that purpose.

5. CONCLUSION

This study had achieved the objectives. The pineapple leaf fibre wood is not suitable for construction works such as house door work and flooring works. The suggestion for improving this project with stronger fibre wood is by using another material like bamboo fibre to make it well constructed.

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DESIGN AND REALIZATION OF AN AUTOMATIC WATER METERING DATA DELIVERY SYSTEM

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Abstract. The Local Water Utility Company (PDAM) is one of the state enterprises that runs and serves the need of drinking water for the people. The water checking process by the PDAM is still not effective as it involves employees sent to the customer's houses to check the analog water meter and then converts it to rupiah. With the spread of Covid-19, it is harder for field staffs to operate the checkings. To solve this, an innovation was made, which is a System that sends the Automatic Water Metering Data to the Website. This System uses water flow sensor that measures the water volume. The collected data is then sent to the admin via telemetry system and then converted to currency value and then sent to Database using a Wemos D1 Wifi module. The Data will be managed in the Database and then sent to the Website using Laravel framework and internet network. Upon testing the water flow sensor using 3 variables, the largest average error percentage was in 1L which is 5.2%. This was caused by the difference in the water pressure and resulted in an unstable water flow. This system is able to transmit data up to 82.52 m within obstacle condition. it managed to upload all of the volume along with the cost to Database (error rate = 0%), it also gets a success rate of 100% in the Website upload test.

Keyword : Water flow Sensor, Database, Telemetry System, Wifi Module, Laravel, Website.

1. INTRODUCTION

Water is a natural resource that is needed in almost every aspect of life, its existence is very crucial for living things. For us humans however, we have lots of activities in life that needs a clean water, this can be seen from the increasing percentage of clean water usage every year. [1]. Clean Water is used mostly in daily life activities, for example, for drinking, bathing, washing, and etc. The distribution of clean water for a daily life in Indonesian cities is quite easy, because the existence of clean water supplier such as PDAM (Perusahaan Daerah Air Minum or Regional Water Utility Company) which have already used the online system. Meanwhile, in suburban and rural areas, the technology for checking and payment for PDAM water is still not effective. For the process of determining the customer's water usage bill itself, which can be obtained from a calculated volume using analog water meter, the field staff must visit customers' houses every month, then take photos of the water meter, recalculate the number measured on the water meter then multiplied by the fixed price of each liters to get the correct information in rupiah (Indonesian currency). This long and manual process may lead to errors in data management, such as problems with payment records.

There had been many technologies created to cope with this problem. It is aim is to create a more of an effective online-automatic system that measures water usage, calculates price, and sends the data output to a hardware or an application software that can be checked directly by the customers. The most commonly used water volume measuring device is the YF-S201 water flow sensor with the error rate of 0.82% [2]. The use of LCD as an output of the system's result is also one of the most popular method in Indonesia [3]. Apart from LCD, other effective solution in output realization would be the use of software platform in showing the result / output. This can be done in the form of mobile apps using the Android

Language. As a whole system, it always be integrated with a data storing and managing system, even though in some of the previously created systems, the data storing and managing function was not put into use. Commonly used Database platforms are MySQL, MongoDB, Firebase, or Thingspeak,[4].

Database is a crucial element in designing this watermonitoring system since it can be used for storing a large number of datas in the long run ranging from the water usage to customer's payment receipt. Otherimportant section of the system is the data processing and a section that sends the water usage data to the output platform. In several literatures, [5], [6], [7], ithas been proven that the Microcontroller module waseasy to implement. Popular modules related to this project are Arduino, ESP8266, NodeMCU, SIM900 GPRS. The use of these modules are very popular since it has a wide function of pins and protocols to run a program suitable to the developer's goal.

This research is aimed to create an online automatic system that measures, and sends the water meter datato website. This project will connect the water source (arthesis well) to customer's houses using water pipes. A solenoid valve is first installed to control thewater's access to the customer. The water flow sensor is then installed to measure the volume from the water flowing in the pipes. The water flow sensor will be connected to Arduino and NRF24L01. The data read in the water flow sensor will be sent to an admin by a telemetry connection (using NRF24L01).The admin then uploads the data to Database, and then to website which was designed using Laravel framework [8]. The website is able to automatically classify the data based on month and show the data inReal Time.

2. RESEARCH METHOD

Designing process is needed to achieve the fullyworking system.

2.1 Overall System Design

In this study, an automatic system of checkingand sending water metering data to the website will be made. Water flows through the open faucet and enters the solenoid valve and then into the water flowsensor, in this section, the water flow sensor will measure the volume of water that comes out. This data will then be converted in the microcontroller into a digital data. And then, this data will be sent via radio telemetry to the receiving microcontroller and the rupiah value will also be obtained. This data willbe stored in the database in a monthly period, the datain the database will be managed by Laravel and thensent to the website. The data on the Website will change according to the data in the Database in Real-Time. The volume to cost conversion formula applied to this system is as follows:

$$Cost = (m^3) \times 3000 \quad (1)$$

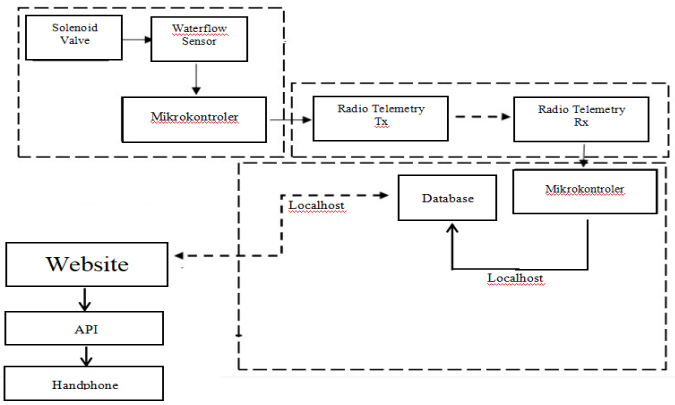

Figure 2.1 : Overall System Block Diagram

2.2 Electronic Scheme

The electronic scheme designed for thetwo data sending parts of this system is as shown in Figure 2, each component of its pins is connected to the Arduino Uno as a control center. Figure 3 is an electronic schematic for the receiver. At the receiver, the NRF24L01+ communication module is connected to Wemos D1 R1 whose board is equipped with a WiFi module and is used to send data to the database.

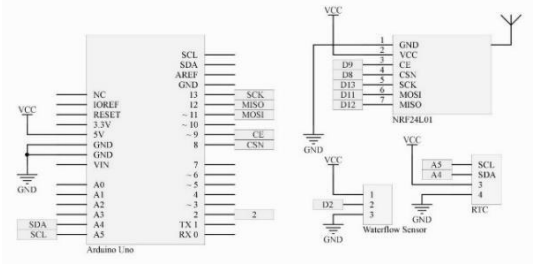

Figure 2.2 : Data Sender Electronic Scheme

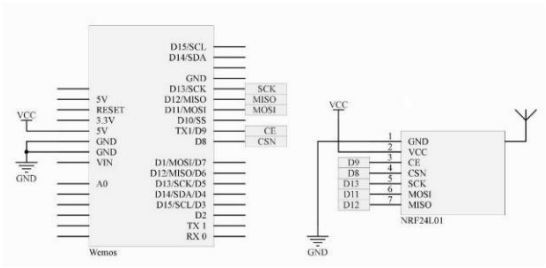

Figure 2.3 : Data Receiver Electronic Scheme

2.3 Database Design

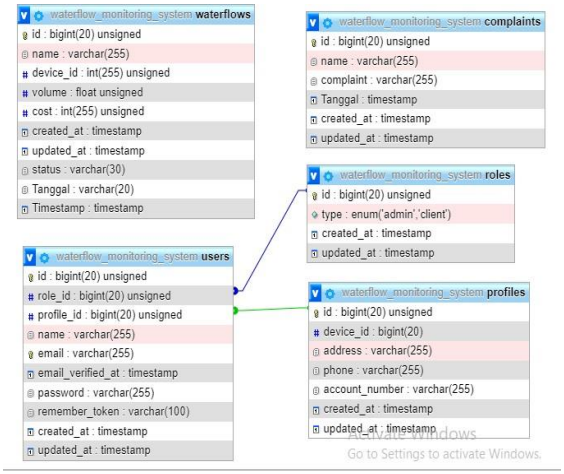

Figure 2.4 : Table Relations in Database

The database on the system must be able to store themain data, mainly the volume and cost of customer water monthly according to customer identity data. To accomplish this, we need a PHP script that manages the data entry conditions in the database. Ifthe

incoming data is still in the same month as the current one, then the data will be inserted into the same row, if the incoming data has new month data (incoming month value > month value in the database), then the incoming data will be moved to anew row as data for the new month.

The main table of this database is User. It stores customer and Admin account data that is used to login. In this table, there are role id and profile_id columns, each of which is foreign to other tables, which are Roles and Profiles. In the Users table, role id will reference the id in the Roles table whichis the primary key. Its function is to sort between Admin users and customers. Then next is profiles_id which is foreign to id in Profiles table, its function isto synchronize data between user data for login withuser's personal data in Profiles table.

Next, is the Water flows table to store volumes and costs from customers. This table contains the Date and Timestamp columns. The date column is to store the date of the RTC from Microcontroller. The Timestamp column is a column to determine thecurrent time in the process of input or update the database. There are also additional columns (created_at, and updated_at) which are columns that are automatically generated by Laravel and serve to simulate tables when entering and updating data. Due to the Website's complaint submission feature, the database also has a Complaints table. Where all complaints from customers will be stored in the table.

The two tables, water flows, and Complaints are not linked / not related to the Users table, this is becausethe Complaints table can automatically take the sender's name according to the account that is logged in to the Website. This can be done by configuring the program using Laravel. Then the water flows table is also not connected to the Users table becausethe name entered in the database has been configuredon the microcontroller.

2.4 Website Design

Figure 2.5 : Real-Time Data in the Client's Main Page

On the Website, the main feature is to display the volume and cost of the customer's water usage in Real-Time. This feature is available on the mainpage, but this website has other features such assetting account data, submitting complaints, and checking archive features to see customer water usage data in previous months.

2.5 Hardware Design

Table 2.1 : Used Component

No	Components	Specs	Qty
1	Arduino Uno	Atmega328P	2
2	Wemos	D1 R1	1
3	Water Flow Sensor	YF-S201	2
4	RTC	DS1307	2
5	Solenoid Valve	12VDC/3A	1
6	Adapter	9V 1A	2

Figure 2.6 Sender Device

Figure 2.7 Receiver Device

3. RESULTS AND ANALYSIS

The following are the test results of the designed system. The results of this test include reading the water flow sensor, transmitting NRF24L01+ data, sending data to the database, and sending data to the website.

3.1 Water Flow Sensor Data Reading TestResults

Water flow sensor data reading test was done tocalculate the accuracy of the device in reading the volume of the flowing water in pipes.

Before testing the Water flow sensor. The solenoid valve must be checked by connecting anddisconnecting the power source connected to thesolenoid valve with an input voltage of 12 V. This test is carried out to determine whether the tool works or not when there is and there is no power source. The results are shown in Table 2.

Table 3.1 : Solenoid Valve Test Result

		12V 3A	1
7	Radio Comms Module	NRF24l01+	3

Table 3.2 : Water Flow Sensor Data Reading Test Results

Test number	Available water volume (L)	Volume Read	Error (%)
1	1	0.95	5
2	1	0.94	6
3	1	0.95	5
4	1	0.95	5
5	1	0.95	5
6	1	0.94	6
7	1	0.95	5
8	3	2.98	0.6
9	3	2.99	0.3
10	3	2.98	0.6
11	3	2.98	0.6
12	3	2.98	0.6
13	3	2.99	0.3
14	3	2.99	0.6
15	5	5	0
16	5	5	0
17	5	5.01	0.2
18	5	5	0
19	5	4.99	0.2
20	5	5	0.4
21	5	5	0.4

Table 3.3 : Average error percentage

Average error percentage at1L (%)	Average error percentage at3L (%)	Average error percentage at5L (%)
5.2	0.51	0.17

3.2 NRF24L01+ Data Transmission Test Results

Data transmission test using the NRF24L01+ radio communication module was conducted to determine the maximum distance the radio communication module (telemetry) can transmit data based on the power amplifier level (power used) and its data rate in conditions obstacles existence.

Table 3.5 RF24L01+ Data Transmission Test Results

Input Voltage (V)	Solenoid Valve Status	Solenoid Valve On/Off Status
12	Opened	On
0	Closed	Off

PA Level (dBm)	Data Rate					
	250KBps		1MBps		2MBps	
	Distance (m)					
	1	2	1	2	1	2
0	82.52	82.52	70.67	70.67	69.03	69.03
-6	77.36	77.36	69.72	69.72	63.54	63.54
-12	74.56	74.56	66.69	66.69	59.96	59.96
-18	72.13	72.13	64.67	64.67	53.31	53.31

3.3 Database Data Insert Test Result

Database data insert test was conducted to calculatethe accuracy of the data sending - receiving processin Database.

Table 3.6 : Database Data Insert Test Result

Available water volume (L)	Volume Read in Wemos (L)	Data Status	Volume Read in Database (L)
7	7.01	Sent to Database	7.01
6	13.06	Sent to Database	13.06
5	18.09	Sent to Database	18.09
4	22.07	Sent to Database	22.07
3	25.04	Sent to Database	25.04
2	26.96	Sent to Database	26.96
1	27.90	Sent to Database	27.90

3.4 Sending Data to Website Test Results

Testing of sending data to the website is carried out to determine the accuracy of receiving data sent fromthe database. The test is conducted when the customer (user) uses the water continuously.

Table 3.7 : Sending Volume Data to Website TestResults

Test number	Volume Read in Database (L)	Volume Readin Website (L)	Result
1	7.01	7.01	Success
2	13.06	13	Success
3	18.09	18	Success
4	22.07	22	Success
5	25.04	25	Success
6	26.96	26.9	Success
7	27.90	27.9	Success

Table 3.8 : Sending Cost Data to Website Test Results

Test number	Cost Read in Database (L)	Cost Read in Website (L)	Result
1	21030	21030	Success
2	39000	39000	Success
3	54000	54000	Success
4	66000	66000	Success
5	75000	75000	Success
6	80700	80700	Success
7	83700	83700	Success

4. CONCLUSION

Based on the results of the tests that have been carried out from this system, the conclusions are:

1) The sender device which is connected to the water flow sensor has succeeded in measuring the volume of the water flowing through the sensor. In the test using the 3 variables, the largest error average is in the 1-liter water measurement. This is due to the difference in water pressure that affects the flow rate of water.

2) Data transmission is carried out using NRF24l01+ by measuring the distance based on the data rate and power amplifier in the communication module, the maximum distance with a data rate of 250KBps and in maximum mode or 0dBm is obtained in an obstacle condition, which is 82.52 m.

3) The required data are successfully sent to Database in a real-time and continuous process using the Wemos Wifi Module.

4) A website to display customer data has been successfully created with the Real-Time data display feature from the database.

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STRATEGIES TO CREATE COMPETITIVE ADVANTAGES THROUGH BRAND IMAGE, PRODUCT PACKAGING DESIGN, AND OUTLET ATMOSPHERE IN THE BEVERAGE FRANCHISE BUSINESS. (Case Study on Janji Jiwa Beverage Business in Bengkalis City)

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Abstract. This study aims to determine strategies in increasing competitive advantage through the factors of brand image, product packaging design, and outlet atmosphere in the franchise beverage business, namely Janji Jiwa beverage business in Bengkalis City. This study uses a qualitative descriptive method, which is to explain systematically and describe accurately and clearly. Data collection techniques used in this research are by using interviews, observation, and documentation. The results of the research that have been conducted indicate that through 3 factors, namely brand image, product packaging design, and outlet atmosphere, the main strategies in increasing competitive advantage are brand image factors. Because a brand image that gives a positive impression on consumers will make consumers interested in these products. Thus, in creating a positive brand image in the eyes of consumers, the product packaging design and outlet atmosphere provided must be able to support this factor to create competitive advantage for Janji Jiwa products in Bengkalis City with other products.

Keywords: Janji Jiwa, Competitive Advantages, Brand Image, Prodcut Packaging Design, Outlet Atmsophere.

1. INTRODUCTION

The development of business today is influenced by the necessities of life which continue to grow and are increasingly diverse. This is directly proportional to economic growth which is related to the increase in average income and can increase the demand for products. Currently the beverage business is quite a lucrative business. Some are small in scale, only limited to a shop at the end of the alley with long chairs or a shop in the campus area with fast wifi service, cool places in malls, star hotels, and cafes on the main road. Responding to this, retailers who play in the beverage business are required to always innovate so that consumer buying interest is maintained and increases. Attracting consumers' buying interest to make purchases can also be done by providing a pleasant shop atmosphere for consumers, providing promotions such as signboards, discounts or door prizes and easily accessible store locations. The method used by producers in increasing sales is by increasing the existing aspects of a product, in order to create consumer interest and purchase interest. One of the aspects in a product that must be improved is the brand. According to Kotler and Keller (2009) "Brand is a name, term, symbol, or design or a combination thereof to identify goods or services from one of the sellers or groups of sellers and to differentiate them from competitors". According to Tjiptono (2005) "Brand image is a description of the association and consumer confidence in a particular brand, brand image is the observation and trust held by consumers, as reflected in the consumer's memory". There are several components to a brand image. Xian and Gou lie journal (2011) "Brand image consists of three supporting components, namely Company Image, Consumer Image, and Product Image". So these two aspects, namely Brand Image and Price, are important things that

need to be considered by the company. Consumers tend to use the brand image as a reference before purchasing a product/service. So, the company must be able to create an attractive brand image as well as describe the benefits of the product in accordance with the wants and needs of consumers so that consumers have a positive image of the brand.

Products with attractive packaging will generate consumer perceptions and can generate enough sensory stimulation for consumers to pay attention and remember. Packaging is one of the product strategies used by companies to display products to make them more attractive in terms of shape, color, so that their quality can be maintained. Currently, many companies are aware of creating attractive product packaging. This is because the company uses the pack at the same time for promotion. This brand image and product packaging can later determine the extent to which a product can compete in the market. Especially in determining the competitive advantages of each company. Store atmosphere can not only provide a pleasant buying environment, but also can add value to the products being sold. Apart from that, the atmosphere of the outlet will also determine the image of the shop itself. A good store image can ensure the survival of the company to survive the competition in forming loyal customers. Store atmosphere as a means of communication that can have positive and profitable results is made as attractive as possible. At a minimum, consumers will feel at home and comfortable in the store and this will make consumers decide to buy at the store. Competitive/competitive advantage is a benefit that exists when a company has and produces a product and or service that is seen from its target market better than its closest competitors (Saiman, 2015). Therefore, it is important for a company to determine a brand image and product packaging that is suitable and memorable in the eyes of consumers in increasing competitive advantages. this study objective is to find out which strategy is most effective to increase competitive advantages in the beverage business franchise *Janji Jiwa.*

2. LITERATURE REVIEW

The brand image according to Kotler and Armstrong (2013) is a set of beliefs in a particular brand. Meanwhile, Setiadi (2003) defines brand image as a belief in consumers towards a particular brand. Consumers who have a good perception of a brand will be more likely to make purchases.

According to Kotler (2003) packaging is an activity of designing and making a container or packaging as a product, while according to Private, Basu (1999) says packaging is activities that are general in nature and planning of goods that involves determining the form or design of the packaging or packaging of an item. So it can be said that packaging is an activity of designing and producing the packaging of a product which includes packaging design and packaging of the product.

Levy and Weitz (2001) stated that: "Store atmosphere aims to attract consumers' attention to visit, makes it easier for them to find the items needed, keeps them in the store for a long time, motivates them to make plans. influencing them to make purchases, and making decisions in shopping".

The store's atmosphere is divided into four key elements, namely exterior, interior, layout and display. The exterior, which is the store front, is the entire physical exterior of the shop which includes the shop's sign, entrance, window display, lighting, construction materials used, the environment and the parking lot.

Competitive advantage is the development of the value a company can create for its buyers. Based on the above definition, competitive advantage cannot be understood by looking at the company as a whole. Competitive advantage comes from the many

different activities that companies carry out in designing, producing, marketing, delivering, supporting their products (Dirgantoro, 2010).

The factors that determine competitive advantage According to Porter (in Rangkuti, 2003) there are 5 (five) competitive forces that will determine the company's competitive advantage, namely:

(i) Threat of newcomers
If the company can enter a special industry easily, the intensity of competition between these companies will increase. New entrants will reduce the profit potential of the old industry because usually the company will bring in new capacity, seek market share and reduce the income of the old company. For old companies, the strategic thing that must be done is to identify new companies that have the potential to enter the market.

(ii) Threat of substitute products
In many industries, companies compete closely with producers of substitute products, for example producers of plastics as substitutes for glass. The presence of these replacement products is a warning to the company before customers switch to these replacement products. Competitor pressure due to substitute products can cause a decrease in product quality because consumers perceive a decrease in prices.

(iii) Bargaining power of suppliers
The bargaining power of suppliers affects the intensity of competition in the industry, especially when there are a large number of suppliers, there are only a few good substitute raw materials and when the cost of switching raw materials becomes very expensive. Usually the best thing that a supplier and a manufacturer should do is help each other at a fair price, improve quality, develop new services, reduce inventory costs in the long run.

(iv) Bargaining power of buyers
If competition is concentrated, large in size and consumers buy in large sizes, then the power of bargaining greatly affects the intensity of competition in the industry. Competing firms may use special services or guarantees to gain customer loyalty if the customer has substantial bargaining power. Bargaining power of customers is also high if the product being sold is standard or undifferentiated.

(v) Competition among companies
Competition among existing competitors is usually the most important competition. There are times when a strategy developed by a company can be successful only by concentrating on increasing competitive advantage which directly attacks the competitor's strategy.

3. METHODOLOGY

This study, the authors conducted study at the *Janji Jiwa* Outlet in Bengkalis City. The object of this study is the product of the *Janji Jiwa*. This type of study is descriptive study. The type of data used in this study is qualitative data. Sources of the data used for this study namely primary data and secondary data. The data collection technique of this study is observation, documentation, interview and the data analysis technique in this study uses descriptive methods. The data collected by live interview with the owner of *Janji Jiwa* in the Bengkalis City.

4. DATA ANALYSIS

Five competitive forces that will determine *Janji Jiwa* competitive advantage.

(i) The Threat of Newcomers

The threat of new entrants to *Janji Jiwa* is moderate/sufficient. The obstacles were not too high and the initial capital to start a coffee brand was not high either. The level of saturation in the industry is quite high. Newcomers can compete with brands like *Janji Jiwa* at the local level. However, their chances of success remain low to moderate. *Janji Jiwa* has achieved a large market share in big cities based on its infrastructure, efficiency and product quality. However, switching costs are low, new brands can attract customers using lower prices, especially in the city of Bengkalis, where the majority of customers are more interested in low-priced beverage products. So, the threat of newcomers remains. However, that can be largely mitigated by brand image, market share and other factors such as brand loyalty. An important factor that gives the *Janji Jiwa* brand a competitive advantage is its access to raw materials, namely coffee and suppliers. Based on its size, scope, and ability to pay, *Janji Jiwa* has access to better quality coffee and a greater number of suppliers globally. All these factors are done to moderate the level of threat posed by newcomers.

(ii) Threat of Substitutes Product

The amount of coffee drinks replacement products for *Janji Jiwa* brand is moderate to high. From juices to teas and other beverages there are several substitutes available on the market. Another source of threat in the region is homemade products that consumers can make at home. Additionally, switching costs are negligible. All of these factors make replacement products a moderate to large threat. However, there are several factors that moderate this threat to some extent. In addition to premium quality coffee, excellent customer service, and an excellent outlet atmosphere, *Janji Jiwa* also sells coffee flavors with different blends compared to other drinks. Premium quality and brand loyalty moderate the threat of replacement to some extent.

(iii) Bargaining Power of Suppliers

Suppliers can only apply low to moderate pressure on the *Janji Jiwa*. *Janji Jiwa* has its own supplier diversity policy which it uses to select suppliers. Ethical sourcing is another major policy at *Janji Jiwa*. The brand takes coffee ethically from several coffee farmers in Indonesia. Moreover, the coffee used by *Janji Jiwa* is a type of Robusta coffee from Sumatra. It also grows with coffee farmers directly which has helped it gain higher control over its supply chain. This eliminates the mediator and starts looking directly from the farmers. Janji Jiwa has developed good relationships with the tea farming community to educate them about better coffee farming practices and help them get the most from it. All of this has succeeded in reducing the influence of mediators and suppliers. In addition, the number of suppliers is high and the *Janji Jiwa* has plenty of room to make choices. So, its excellent supply chain management in recent years has reduced the bargaining power of suppliers and made it low.

(iv) Bargaining Power of Buyers

Bargaining power of buyers of *Janji Jiwa* products is moderate to low. The size of individual purchases is small so that a single buyer does not have sufficient leverage. Additionally, coffee brands have a diverse customer base. Its customers are particularly sensitive to quality and willing to pay higher prices for premium quality products. However, the price cannot be too high because customers notice such trends and will start to switch. Especially in Bengkalis City, which is a small town, where many coffee products are offered at lower prices with best coffee quality. Based on all these factors, buyer power remains low.

(v) Competition Among Companies

The intensity of competitive competition among companies in the industry is moderate to high. This is due to monopolistic competition in the industry and the number of companies

competing for high market share. Small entry and exit barriers. The main factor that moderates competition for *Janji Jiwa* is its market share. In Bengkalis itself, the market share is not too high, while *Janji Jiwa's* target market is the middle to high market share. However, the premium quality and product-based differentiation that *Janji Jiwa* uses also gives it an edge over its competitors. However, the industry has matured and the growth rate has been moderate as many players compete for market share.

From the five elements of porters five force for competitive advantages, only 2 elements can be the obstacles for *Janji Jiwa* in Bengkalis City to increasing their competitive advantages. So, *Janji Jiwa* need to did more inovation for their product to compete with others beverage product in Bengkalis City.

From the three factors, owner *Janji Jiwa* said that to create Competitive Advantages against other beverage products in Bengkalis. Janji Jiwa focuses on developing Brand Images for customers. Because he believes that a good Brand Images will make the existence of Janji Jiwa in Bengkalis last for a long time, and be able to remain competitive with other products. By creating a good brand image impression, of course, also makes Janji Jiwa to provide service and serve good quality drinks at prices that are appropriate for coffee lovers.

With this realization, *Janji Jiwa* can maintain their products in the market and still be able to provide the latest innovations related to flavor variants and also the use of product packaging designs, and also create an outlet atmosphere that gives a positive impression to customers.

5. CONCLUSION

Based on the results of the discussion described in the previous chapters, the researchers in this study can draw the following conclusions:

1) The appropriate strategy for creating Competitive Advantages through the brand images factor is to create an impression. positive brand images in the eyes of customers. By giving a positive impression to customers, of course, it will make customers have a sense of trust in *Janji Jiwa* products. Because of this, it will make *Janji Jiwa* able to compete and create Competitive Advantages against other beverage products in Bengkalis.

2) The appropriate strategy to create Competitive Advantages through the Product Packaging Design factor is to keep following the design that was launched directly by Central *Janji Jiwa*, because the *Janji Jiwa* branch in Bengkalis can only follow the existing design, and the existing designs are as well. has a different design from other beverage product designs in Bengkalis. The designs used by *Janji Jiwa* also vary, there are Regular, Large, and 1liter bottle sizes. With these innovations, making *Janji Jiwa* has its own advantages and is able to create Competitive Advantages against other beverage products in Bengkalis.

3) The appropriate strategy to create Competitive Advantages through the Outlet/Store Atmosphere factor is to prioritize outlets that are able to create a comfortable atmosphere, but still look trendy and up to date. With the use of contemporary-looking interiors, a combination of dim lights, and coffee-scented outlets, it will create a relaxed atmosphere for customers. In the future, *Janji Jiwa* Bengkalis will expand the parking area and also enlarge the air-conditioned room in order to maintain Competitive Advantages against other beverage products in Bengkalis.

4) From the five elements of porters five force for competitive advantages, only 2 elements can be the obstacles for *Janji Jiwa* in Bengkalis City to increasing their competitive advantages. So, *Janji Jiwa* need to did more inovation for their product to compete with others beverage product in Bengkalis City.

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COMPARATIVE STUDY ON CONSUMER SATISFACTION IN CHOOSING SHOPPING PLACES BETWEEN MODERN AND TRADITIONAL MARKET (CASE STUDY: BENGKALIS ISLAND)

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Abstract. This study aims to determine "Comparative Study on Consumer Satisfaction in Choosing Shopping Places Between Modern and Traditional Markets (Case Study: Bengkalis Island)". This study is conducted to compare consumer satisfaction in choosing shopping places between modern and traditional markets, with a case study on Bengkalis Island. This research uses quantitative comparative method. Data collection techniques were carried out by interviewing, questionnaire, and by doing a literature study. The result show, with a sample of 100 people, respondents more satisfied choosing shopping in traditional markets with mean 4,10 compare to the modern markets with mean 2,78. This is due to the price aspect, the prices of goods in the modern market are not affordable. Meanwhile, the reason respondents more satisfied and choosing shopping in modern markets with mean 4,28 compare traditional markets with mean 2,88 is the emotional aspect because modern markets may feel more prestigious and comfortable, clean, and have better quality assurance of goods and better service quality.

Keyword: Consumer Satisfaction, Modern Market, Traditional Market

1. INTRODUCTION

Indonesia is a consumptive society where shopping is an activity that is usually carried out by everyone to meet their daily needs, both men and women. This shopping activity is definitely inseparable from the market, which is one of the places for economic interaction. And now the market or place of shopping has grown so rapidly, where the place to shop is in such a way with various names, such as supermarkets, minimarkets, supermarkets and so on (commonly called modern markets). The growth of the modern market seems to have pushed aside the ordinary market or traditional market.

Along with the development of the times, the existence of traditional markets began to compete or even be shifted by the existence of modern retail businesses. Retail business or commonly known as retail merchants has the meaning of its existence in everyday society. Various kinds of shopping centers appear with different shapes and sizes. In order for traditional markets to survive and develop in a competitive business world in competing for consumers, they must be able to comprehend their consumers as a whole, because consumers are the target market for a product. Acceptance of the product or not depends on consumer perceptions of the product. If consumers feel that the product can meet their needs and wants, then the product will be accessible to the consumer.

In general, consumers will choose traditional markets that are strategically located, such as in the middle of a city, close to these residents. As for choosing the strategic place, it is hoped that it will be easily reached by private vehicles and public vehicles. Consumers who

belong to the lower middle class and do not have private vehicles are more likely to shop in traditional markets, because they are more economical on the cost of transportation.

Goods that are sold in the modern market are of high quality, for example, vegetables that are always fresh because they are put in the cold room. Whereas in traditional markets, there is no cooling space provided. Modern markets are neat, orderly and clean, because they are properly regulated. Whereas in traditional markets are not regular, hot, muddy, and dirty because the location is only. Whereas in traditional markets, most of the sellers come from the middle to lower class.

The existence of traditional and modern markets is also widely known on the Bengkalis Island. According to Central Bureau of Statistics in Bengkalis numbers, Bengkalis is one of the districts in Riau Province, Indonesia. Its territory includes the eastern part of the island of Sumatra and the archipelago, with an area of 8,403.28 km2. Bengkalis has 11 districts including Bengkalis, Bantan, Siak Kecil, Bukit Baku, Bathin Solapan, Pinggir, Talang Muandau, Rupat, Rupat Utara, Bandar Laksamana, and Mandau. (Central Statistics Agency of Bengkalis Regency (2020:5)). And on the island of Bengkalis itself, there are 2 districts, namely Bengkalis and Bantan. Bengkalis Island is right at the mouth of the Siak River, so it is said that Bengkalis Island is the Siak River Delta.

Based on the above background, the writer feels interested in knowing more closely and clearly and clearly with the sample object of the community in Bengkalis. Thus the authors compile this thesis with a title "Comparative Study on Consumer Satisfaction In Choosing Shopping Places Between Modern And Traditional Market (Case Study: Bengkalis Island).

2. LITERATURE REVIEW

2.1 Understanding of the Market

According to Kotler 2010 in Irma Irawati (2019) Market in terms of economic theory is a situation where the buyer (consumers) and sellers (producers or traders) make transactions after both parties have agreed on price versus quantity (quantity) of goods with a certain quantity that is the object of the transaction the buyer and seller, get the benefit of the transaction or market. The buyer expects the desired item to fulfill and satisfy their needs while the seller gets rewarded income.

According to Maiana and Paskarina 2006 in Irma Irawati (2019), the market has a variety a developing definition. From the existing definition, the market can be defined as a group of sellers and buyers who exchange goods can be substituted. The concept and meaning of the market is actually very broad, includes economic and socio-cultural dimensions. In a market economy perspective physically defined as a place where goods and services transactions take place in a certain place, while economically, the market is a place meeting demand and supply, that is, someone offers goods and some want it at a price that both parties agree on.

2.2 Modern market

According to Hutabarat in Choldiah, et al. (2020) The modern market is a market where buyers and sellers do not make direct transactions. Buyers only see the price tag on a product packaging and the buyers are served independently by salespeople, for example supermarkets, minimarkets, and so on.

According to Basu Swasta DH, I Hani Handoko in Ria Agustina (2018), modern markets are markets where sellers and buyers do not transact directly, but buyers see the price tag listed on the goods (barcode), are located in buildings and services are carried out independently (self-service) or served by salespeople. Modern markets are places for selling

household goods (including daily necessities), where sales are made in a retail and self-service manner (consumers take goods from the shelves themselves and pay to the cashier). That is why markets with this format are also called supermarkets. Other opinions also suggest that the modern market is a market that is managed by modern management, generally found in urban areas, as a provider of goods and services. with good quality and service to consumers (generally members of the upper middle class). Modern markets include malls, supermarkets, department stores, shopping centers, supermarkets, convenience markets, convenience stores and so on.

2.3. Traditional Market

According to Sadilah in Andriani, et al (2013) Traditional Market is an open place where the process of buying and selling transactions occurs with a bargaining process. In this traditional market the visitors are not always buyers because they can also be sellers. Traditional markets can be classified into 3 forms, namely special markets, scale markets and daily markets. Traditional markets can be said to be one of the main components in the formation of community communities both in villages and in cities as distribution institutions for various kinds of human needs.

The traditional market also acts as a link between the village and the city. Population and cultural development is always followed by market developments as an important support for everyday human life especially in urban areas. Traditional markets usually stand at the midpoint of an area so that it will make it easier for people from all over the market service area to come. So that the atmosphere of competition between one traditional market and another traditional market is minimal. Only a few residents whose homes are closer to one traditional market shop at another traditional market.

3. METHODOLOGY

This research location at Bengkalis Island. The should be objectives in this study on comparison consumer satisfaction in choosing shopping places between modern and traditional market. The types of study used is comparative research. The types of the data in this study use qualitative data and quantitative data. Sources of the data used for this study namely primary data and secondary data sources. The population in this were the consumer society in two sub district, namely Bantan sub district and Bengkalis sub district as much 123,583 peoples. The amount of samples is rounded up to 100 consumers. The sampling technique in this study is to use non probability sampling, namely purposive sampling. On research uses four types of data collection techniques namely interview for elderly or >30 years old respondents who are easily accessible, questionnaire and literature study. The collected data will be processed data processing. This study uses a Likert scale as a measurement scale. Data analysis methods are descriptive statistics.

4. DATA ANALYSIS

Comparative is research that is comparing. The following is a comparative table for 2 (two) types of markets, namely: Modern and Traditional Market. To compare Consumer satisfaction in choosing shopping places between modern and traditional markets can be seen in Table 4.1.

Table 4.1: Comparative of consumer satisfaction in choosing shopping places between modern and traditional market

Indicator	Modern Market			Traditional Market		
	Total	Mean	Category	Total	Mean	Category
Product Quality	435	4,35	Very High	374	3,74	High
	408	4,08	Very High	297	2,97	Medium
Total	**843**	**4,21**	**Very High**	**671**	**3,35**	**High**
Service Quality	372	3,72	High	413	4,13	Very High
	420	4,20	Very High	374	3,74	High
Total	**792**	**3,96**	**High**	**787**	**3,93**	**High**
Emotional	414	4,14	Very High	288	2,88	Medium
	442	4,42	Very High	288	2,88	Medium
Total	**856**	**4,28**	**Very High**	**576**	**2,88**	**Medium**
Price	1,70	1,70	Low	459	4,59	Very High
	387	3,87	High	362	3,62	High
Total	**557**	**2,78**	**Medium**	**821**	**4,10**	**Very High**

Source: Processed Data, 2021

Based on Table 4.1 above the frequency distribution results that can be explained from the customer satisfaction variable for the first indicator that is product quality, for the first statement on the indicator of product quality in Modern market gets a mean score of 4,35 with a very high category, and to Traditional market gets a mean score of 3,74 with a high category, while for the second statement on the indicator of product quality in Modern market gets a mean score of 4,08 with a very high category, and to Traditional market gets a mean score 2,97 with a medium category. From the results it can be concluded that from each indicator used as a statement to respondents shows that customer satisfaction in the shopping in modern market by getting an average value of 4,21 with a very high category, while the traditional market by getting an average value 3,35 with a high category. So, the modern market is superior in product quality.

Furthermore for the frequency distribution results that can be explained from the customer satisfaction variable for the second indicator that is service quality, for the first statement on the indicator of service quality in Modern market gets a mean score of 3,72 with a high category, and to Traditional market gets a mean score of 4,13 with a very high category, while for the second statement on the indicator of service quality in Modern market gets a mean score of 4,20 with a very high category, and to Traditional market gets a mean score 3,74 with a high category. From the results it can be concluded that from each indicator used as a statement to respondents shows that customer satisfaction in the shopping in modern market by getting an average value of 3,96 with a high category, while the traditional market by getting an average value with a high category. Although both are in the high category level. However, from the average value modern markets are superior to service quality.

Furthermore, for the frequency distribution results that can be explained from the customer satisfaction variable for the third indicator that is emotional aspect, for the first statement on the indicator of emotional aspect in Modern market gets a mean score of 4,14 with a very high category, and to Traditional market gets a mean score of 2,88 with a medium category, while for the second statement on the indicator of emotional aspect in Modern market gets a mean score of 4,42 with a very high category, and to Traditional market gets a mean score 2,88 with a medium category. From the results it can be concluded that from each indicator used as a statement to respondents shows that customer satisfaction in the shopping in modern market by getting an average value of 4,28 with a very high category, while the traditional market by getting an average value 2,88 with a medium category. So, the modern market is superior in emotional aspect.

Furthermore, for the frequency distribution results that can be explained from the customer satisfaction variable for the fourth indicator that is price aspect, for the first statement on the indicator of price aspect in Modern market gets a mean score of 1,70 with a low category, and to Traditional market gets a mean score of 4,59 with a very high category, while for the second statement on the indicator of price aspect in Modern market gets a mean score of 3,87 with a high category, and to Traditional market gets a mean score 3,62 with a high category. From the results it can be concluded that from each indicator used as a statement to respondents shows that customer satisfaction in the shopping in modern market by getting an average value of 2,78 with a medium category, while the traditional market by getting an average value 4,10 with a very high category. So, the traditional market is superior in price aspect.

5. CONCLUSION

Respondents are more satisfied and choosing shopping in traditional markets than in modern markets because of the price aspect. This is because the prices of goods in the modern market are not affordable for some people. Meanwhile, the reason why respondents are more satisfied and choosing shopping in modern markets rather than traditional markets is the emotional aspect. for some people, shopping at modern markets may feel more prestigious. Not only that, respondents also choosing the modern market because modern markets are comfortable, clean, and have better quality assurance of goods and better service quality.

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PORTABLE MOTORCYCLE LOADING RAMP

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Abstract. Portable Motorcycle Loading Ramp are used for carry motorcycle when the motorcycles have problems. The portable motorcycle loading ramp is a device that used for loading and unloading motorcycle from a truck or container. The problem arises when the situation of lifting a motorcycle to the side of a 4-wheel drive vehicle without using a ramp chances of spraining muscles or the load will slip and fall. The project is also to ensure that the motorcycle can be easily lifted into the rear of a 4 -wheel drive vehicle. It can also reduce the use of manpower to lift the motorcycle. Therefore, main objective of this project is to design a portable ramp structure to accommodate the weight of the motorcycle to be lifted to the rear of a 4 -wheel drive vehicle. Besides that, to perform structural analysis using 3D software to obtain readings of strength, strain and tension for the materials used. The idea of producing this project is obtained after looking at the structure and position of the ramp selected where the dynamic loading effects are at a minimum.

Keyword: portable ramp, structural analysis, strain

1. INTRODUCTION

The goal of this project was to design a motorcycle portable ramp focused on the practical maintenance needs of a motorcycle owner that are lacking in affordable lifts. The most common complaint is motorcycle very hard to load into the truck without using loading ramps. The loading ramp is a device that compensates for the differences between the delivery point and the transport vehicle level. Basically, it is used for loading and unloading motorcycle from a truck or container. The Loading ramp is a simple flatbed that carry motorcycle goes down to the ground and to load motorcycles quickly, safely and easily. A loading ramp is beneficial when there is a need ourselves or even the workplace, to regularly transport heavy and large items. Ramps are extremely useful as loading and unloading of vehicles can be done quickly and safely. Risk when using an unreliable piece of timber as a ramp is not capable of holding the weight of the item to load and unload. Like the name implies, the Portable Motorcycle Loading Ramp is designed to lift up a motorcycle both to help and makes it easy for the user to lift the motorcycle without expending much energy. Besides that, using portable ramp safer than lifting without using a ramp. Our goal was to make the perfect motorcycle portable lift as a careful balance of features and cost.

2. LITERATURE REVIEW

In a study related to design of motorcycle characteristics, it was stated that the design motorcycle vehicle is represented by the low-to-medium sized motorcycles (less than 250 c.c.) which were found to be the types of motorcycle most commonly used in Malaysia. The length and width of the motorcycles and the height of the average motorcyclist are major factors that affect the practical capacity when designing facilities for motorcycles (A. Kareem, 2011).

2.1 Loading Ramp

Portable motorcycle loading ramp is the new part for every rider that makes loading the motorcycle efficiently and safely on the vehicle. However, using the right ramp is a very serious matter. Getting the wrong one can lead to serious problems to load the motorcycles talking about in safety and energy. When a force acts upon an object to cause a displacement of the object, it is said that work was done upon the object. There are three key ingredients to work force, displacement, and cause. Loading and unloading motorcycles from a truck or trailer is a bit of a knowledge to study about safe results. Another benefit of knowledge is knowing what kind of ramp to use for different motorcycles, trucks, trailer and conditions. In general, though, the longer and wider the ramp, the easier the loading job will be.

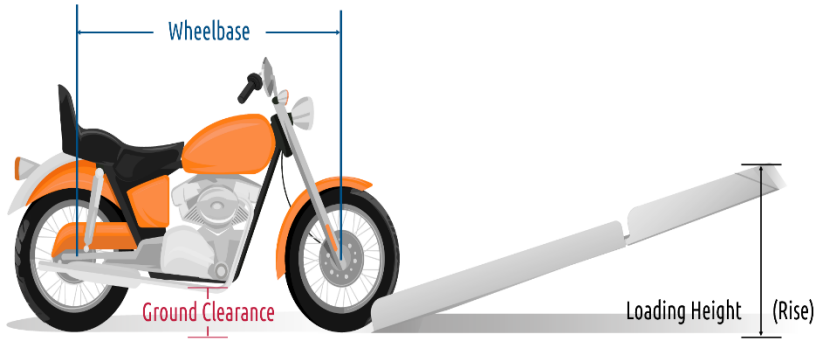

Figure 2.1: Proper Motorcycle Loading Ramp

Source: https://www.discountramps.com/how-to/powersports/motorcycle-ramp-length/a/B6/

2.2 Definition of Work

Work, in physics, measure of energy transfer that occurs when an object is moved over a distance by an external force at least part of which is applied in the direction of the displacement. If the force is being exerted at an angle θ to the displacement, the work done is W = fd cos θ (A Bonanno, 2016).

2.3 Definition of Principle of Stress and Strain

The 1st principal stress gives you the value of stress that is normal to the plane in which the shear stress is zero. The 1st principal stress helps you understand the maximum tensile stress induced in the part due to the loading conditions. Maximum and minimum normal strain possible for a specific point on a structural element. Shear strain is 0 at the orientation where principal strain occurs. Shear Strain: The angular distortion on element caused by shear stress. $\gamma=\tau/G$ (S.T Mckinstry, 2017)

3. METHODOLOGY

3.1 Description of the design

In our concept, length of lift according to the range of cubic centimeter (cc) of motorcycles and the gap between the front and back leg is more than the width of the lift. The distance between ground & truck was properly measured. By using this method given the portable ramp was able to be executed perfectly. The portable ramp measurement of 2.1336 meter in length and 0.46 meter width dimensional angle of view.

3.2 Drawing using Inventor Software

The porta1.07 meter is use as the base of the deck. The second beam with the length of 0.46 meter is use to connect the first beam to support portable ramp stability. The same layout is used to build the other half of the portable ramp. The actual size of the portable ramp is 2.1336 meter in length and 0.46 meter in width.

4. DATA ANALYSIS

The mass of the structure is 7.26 kg because aluminium was used to build the ramp. The mass, area, volume and center of gravity were calculated using environments analysis in Autodesk Inventor Professional 2020. Length x= 3.97m, y= 4.16m and z= 5.3m. In this analysis, work done by gravity force on inclined plane were calculate to study the energy used is different according to the weight capacity of a motorcycle. Assume;

Slope = 30° for motorcycle 110cc

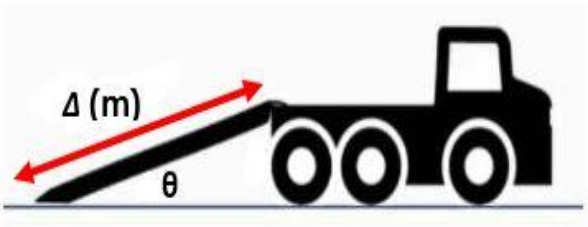

Figure 4.1

Source:

Eq.1: F = Fg sin θ
Eq.2: W = FΔ cos θ

F = Fg sin θ
= (97 x 9.81) sin 30°
= 475.79 N

W = FΔ cos θ
=(475.79 x 2.1336) cos 240°
= -507.57 J

Table 4.1

Cubic Centimeter motorcycle (cc)	Mass (kg)	Force (N)	Work Done (J)
110	97	475.79	-507.57
125	105	515.03	-549.43
150	120	588.60	-627.92
250	160	784.80	-837.22

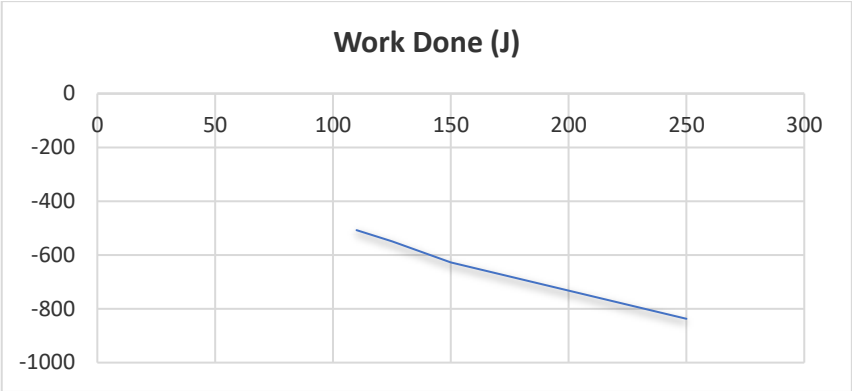

Figure 4.2: Graph Cubic Centimeter Motorcycle (cc) vs Work Done (J)

Result for 1st Principle Stress

The 1st principal stress gives the value of stress that is normal to the plane in which the shear stress is zero. The 1st principal stress helps understand the maximum tensile stress induced in the part due to the loading conditions. In the result, the 1st Principle Stress for 951.57 weight is -467.46 Pa (minimum) and 4015.23 Pa (maximum). For 1030.05 weight, the result is -493.41 Pa (minimum) and 4041.24 Pa (maximum). For 1177.20 weight, the result is -502.03 Pa (minimum) and 4075.37 Pa (maximum). Lastly, for 1569.60 weight, the result is 527.56 Pa (minimum) and 4110.62 Pa (maximum).

Result for 1st Principle Strain

The 1st principal strain gives maximum and minimum normal strain possible for a specific point on a structural element. Shear strain is 0 at the orientation where principal strain occurs. In the result, the 1st Principle Strain for 951.57 weight is -9.62×10^{-15} (minimum) and 4.41×10^{-8} (maximum). For 1030.05 weight, the result is -9.96×10^{-15} (minimum) and 4.69×10^{-8} (maximum). For 1177.20 weight, the result is -1.03×10^{-14} (minimum) and 4.98×10^{-8} (maximum). Lastly, for 1569.60 weight, the result is -1.08×10^{-14} (minimum) and 5.27×10^{-8} (maximum).

Table 4.2 : Result for Stress and Strain Analysis Structure

Weight (W)	1st Principle Stress (Pa)		1st Principle Strain (ul)	
	min	max	min	max
951.57	-467.46	4015.23	-9.62×10^{-15}	4.41×10^{-8}
1030.05	-493.41	4041.24	-9.96×10^{-15}	4.69×10^{-8}
1177.20	-502.03	4075.37	-1.03×10^{-14}	4.98×10^{-8}
1569.60	-527.56	4110.62	-1.08×10^{-14}	5.27×10^{-8}

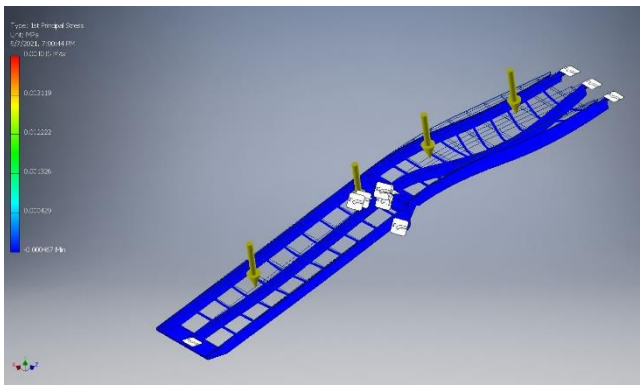

Figure 4.3: Inventor Analysis Result for Portable Motorcycle Loading Ramp

5. CONCLUSION

The main objective for this project is to determine the structure integrity of a portable motorcycle loading ramp. This project provided a description of portable lift and devices currently used in loading and unloading applications. The structure must be strong than the vehicle with their loads. Data collection and information about structure ramp are made by doing experiment on an analysis software. Data that obtained from manual calculation and automatic calculation from the software. In this study, efficiency of this ramp will be determined by the ability of structure ramp. The data between calculated and applied are different because the situation of structure. Applied data must be less then calculating data because that show that the structure is in a stable condition and are safe to use. As the conclusion, this project is successful and achieve the objective that has been have the comparison of data structure.

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UNIVERSAL ROOM CONTROLLER USING THE TEMPERATURE SENSOR AND CAMERA TO AVOID SPREADING OF COVID-19 BASED ON RASPBERRY

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Abstract. This research was designed as a temperature sensor and mask wearing detector in order to unlock automatic door using Arduino Nano and Raspberry. MLXGY-90614 is using to detect the body temperature with infrared. While camera is using to detect the face mask wearing with cascade method and areas of Raspberry interest. The door lock will not open if the body temperature of a person exceeds of 37.5°C or undetected face mask. While, the door will automatically open if the both conditions fulfilled and the result will be displayed on a 16x2 cm LCD screen. However, this detection work automatically so that people can enter to the room with the required health protocols.

Keyword: GY 906 sensor, Ultrasonic sensor, OpenCV, Haar-like feature, Region of interest

1. INTRODUCTION

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), known as Corona virus, quicky transmitted to humans and has spread to almost all countries. The prevent anticipation of Corona virus transmission are body temperature measurement and face mask wearing. Body temperature detectors are often found in various place during the outbreak of Corona virus. Normal body temperature ranges between 36.5°C – 37.5°C. If the body temperature of a person exceeds 37.5°C, the person is required not to enter the room to prevent spreading of Covid-19, as well as person who does not wear a face mask.

However, this checking still can be done manually by the officer, so automatically checker is required. Therefore, we did a research to make a body temperature detector with MLXGY-90614 temperature sensor and camera to scan the face mask wearing of a person. This detector controlled automatically by using Arduino Nano and Raspberry microcontroller to open the door. And finally, the person can enter to a room according to the requires health protocols.

2. LITERATURE REVIEW

2.1 Raspberry Pi

Raspberry Pi is a credit card size, single board computer. The Raspberry Pi has been equipped with all the functions like a complete computer, using an ARM SoC (System on a Chip) which is packaged and integrated on a PCB. This device uses an SD card for booting and long-term storage.

2.2 Arduino

Arduino is a minimum microcontroller system board that has open-source properties. This Arduino board uses the AVR microcontroller IC. On the Arduino Nano, the ATmega 328 or ATmega 168 microcontroller IC is used. Arduino also has its own programming language in the form of C language. Arduino Nano has DC power jack, a USB Mini-B port which is used to upload program source into the microcontroller.

2.3 Infrared Thermometer GY-906 MLX90614 Sensor

The MLX90614 is an infrared thermometer for non-contact temperature measurement. Both IR sensitive thermopile detector chip and signal conditioning ASIC are integrated in the same sensor packing of the TO-39 model. The signal conditioner integrated into the MLX90614 is a low noise amplifier, 17-bit ADC and a powerful DSP unit that the high accuracy and resolution of the thermometer.

2.4 Ultrasonic Sensor

Ultrasonic sensor is a sensor that works based on the principle of sound wave reflection and is used to detect the presence of a certain object in front of it, its frequency is in the area above the sound wave from 40KHz to 400KHz. The ultrasonic sensor consists of two units, the transmitting unit and the receiving unit. The structure of the transmitter and receiver unit is very simple, a piezoelectric crystal is connected by a mechanical armature and only connected by a vibrating diaphragm.

2.5 OpenCV

OpenCV (Open-Source Computer Vision Library) is a software library devoted to real-time dynamic image processing, created by Intel, and now supported by Willow Garage and Itseez. This program is free and is under the open-source BSD license.

2.6 Haar-Like Feature

In general, Haar-Like Feature is used to detect objects in digital images. The name Haar refers to a mathematical function (Haar Wavelet) in the form of a box, the principle is the same as in the Fourier function. Initially, image processing was only done by looking at the RGB value of each pixel, but this method turned out to be ineffective.

2.7 Region of Interest (ROI)

ROI is a certain area in the selected digital image and in the selected area. It is one of the image processing processes where users are able to process images that contain the desired image data information. ROI works by encoding differently on certain areas of the digital image, so that certain areas have better quality than the surrounding area. This process is very important when there are certain areas of the image that are considered more important than other parts. These important areas can then be used for processing with certain methods according to the needs of use.

3. METHODOLOGY

3.1 Hardware Design

In the design of this body temperature and face mask detection system, there are some design steps that are interrelated with one another. In the picture below, some electronic devices are used to complete the design. They are including Arduino Nano, Raspberry Pi 3B+, Camera Pi, Adaptor, GY-906 Sensor, I2C LCD, Relay Driver AND Solenoid Door Lock.

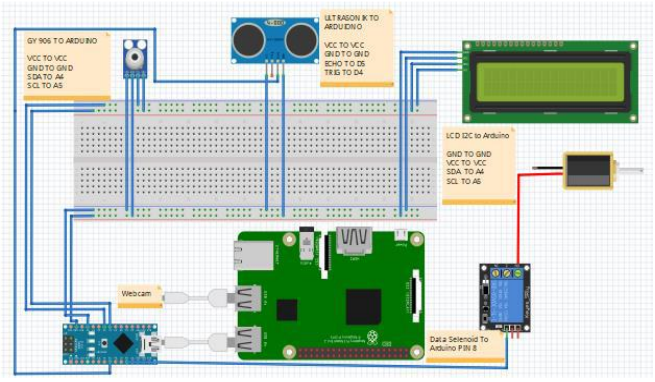

Figure 3.1: Hardware Design

3.2 Block Diagram

The following block diagram shows how a circuit works as a whole and can find out the function of each component used.

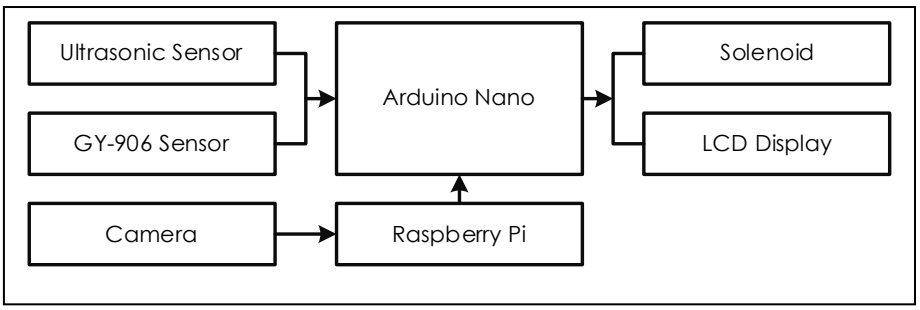

Figure 3.2: Block Diagram

3.3 Flowchart

The following flowchart shows how a circuit explain the whole process of the system.

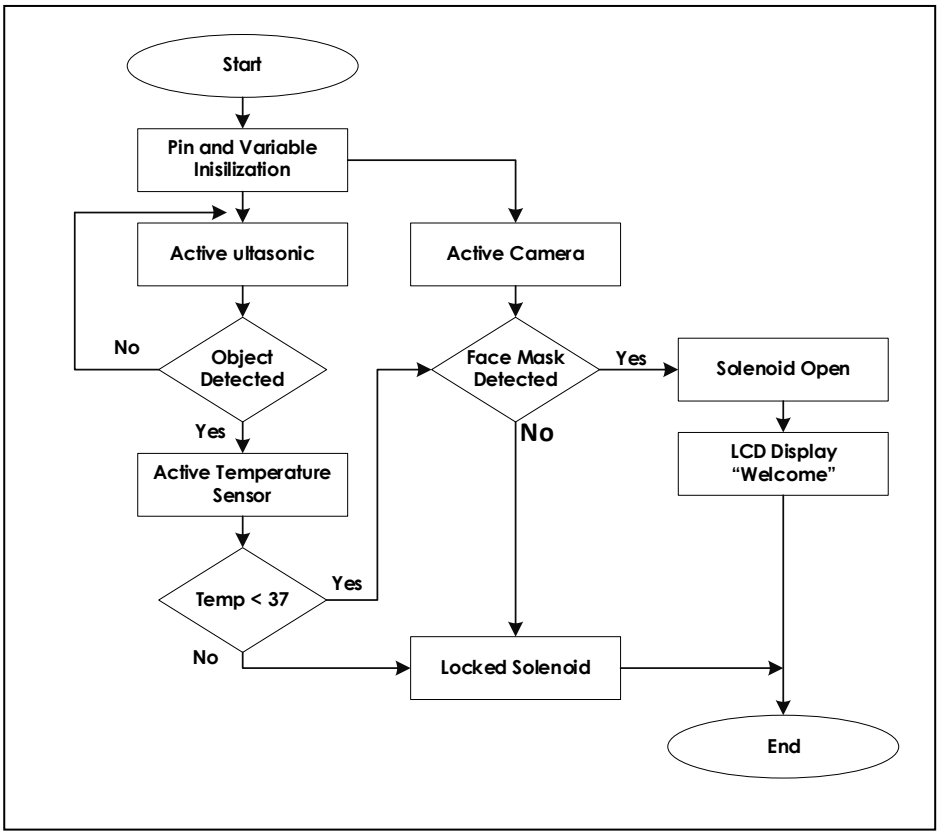

Figure 3.3: Flowchart

4. DATA ANALYSIS

4.1 Temperature Sensor Testing

A thermometer gun is usually used to detect body temperature by officer in office, mall, hospitals and others. In this testing phase, a thermometer gun is used to compare which is intended to determine whether the GY-906 temperature sensor can be used as a body temperature detector tool as standard. Here are the results of the comparison between GY-906 temperature sensor and thermo gun:

Table 4.1: The comparison of GY-906 temperature sensor with thermo gun

No.	Sensor and object distance (cm)	GY-906 sensor (°C)	Thermo gun (°C)	Error (%)
1	2	37.0	37.1	0.2
2	3	37.0	37.1	0.2
3	4	36.9	37.0	0.2
4	5	36.9	37.0	0.2
5	6	36.8	36.9	0.5
6	7	36.6	36.8	0.5
7	8	36.6	36.8	0.5
8	9	36.5	36.7	0.5
9	10	36.4	36.7	0.5

In Table 4.1, it can be seen that there are 9 tests of temperature sensors and thermometer guns as a comparison against object distance. The GY-906 temperature sensor works at a distance of 2 cm. The experiment starts with a distance of 2 cm and when experimenting the temperature sensor output does not stay at one value, it is tested up to 9 times to find out the percentage error or error on the sensor. Based on these tests, it can be concluded that the GY-906 temperature sensor is sensitive to distance because there is a reduction in every increase in distance in checking object temperature. And the GY-906 temperature sensor can be used as a temperature checking standard There is a difference or error in checking the temperature that can still be tolerated. To find the error value, the following formula is used:

Eq.1: %Error = ((GY906 value-thermo gun value)/thermo gun value) x 100%
Eq.2: %Average Error= Number of %error / amount of data

Based on the above equations, the system test results show that the GY-906 temperature sensor can measure body temperature with 0.36% error. This shows that the system that has been created has worked well

4.2 Light Intensity Against Face Detection Testing

In Table 4.2 below, there are 5 experiments with a distance of 100 CM and 50 CM. From these experiments it can be concluded that the system can detect objects at a light intensity of more than 17 lx and when it reaches a value of 1145 lx the object is not detected because it is too bright so the system cannot see objects and the farther away the object is, the smaller the value of lux or intensity. Here are the results of testing the light:

Table 4.2: Light Intensity Against Face Detection Testing

No.	Distance (cm)	Lux meter (lx)	Light	Description
1	100	6	Dark	Undetected face
2	100	11	Dark	Undetected face
3	100	17	Low light	Face detected not wearing a mask
4	50	760	Bright	Face detected not wearing a mask
5	50	1145	Too bright	Undetected face

4.2 Face Mask Color Type Testing

Testing this type of face mask will be based on RGB colors, therefore this test serves to find out the mask colors that can be detected by the system. For the calibration, the researcher used a turquoise color face mask (health worker face mask color) which the RGB values are 139, 201 and 194 with green being dominant 2.9% of blue and 13.1% of red. The research analyzed that, if red face mask more dominant than green and blue, so the system cannot detect that person using a mask (see table in experiment 4 and 5). While, if the green and blue face mask more dominant, the system can be detected that a person wearing a face mask (experiment 1, 2 and 3). However, if a green or blue face mask does not exist, it can be detected as not wearing a face mask (experiment 6). Finally, the value of RGB color of white face mask is equally dominant, so that the system can be detected as wearing a mask Here are the results of testing the colors of the face mask:

Table 4.3: Face Mask Color Type Testing

No.	Color of Mask	Percentage of RGB Color			Description
		Red	Green	Blue	
1	Turquoise	25.5	38.6	35.6	Detected wearing a mask
2	Green	23.5	50.7	16.7	Detected wearing a mask
3	Blue	10	20.7	69.2	Detected wearing a mask
4	Red	76.1	6	17.4	Detected not wearing a mask
5	Yellow	52.8	41.2	5	Detected not wearing a mask
6	Purple	29.4	0	70.5	Detected not wearing a mask
7	White	34.2	33	32.6	Detected wearing a mask

5. CONCLUSION

In conclusion, over all the system can work well that the MLXGY-906 temperature sensor can be used for detecting human body temperature effectively, the process of camera that is used to scan a person wearing a mask, can be done with more light intensity and detect the use of face mask depend n the color. For further development of the system, a Raspberry with specifications above Raspberry 3B+ is recommended for better performance and use a camera with a higher quality. For the detection of more types of masks, you should use other methods such as the Deep Learning method.

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MARKETING KIT FOR ONLINE BUSINESS : SOFT SELL & HARD SELL"

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Abstract. Marketing is known as the action or business of promoting and selling products, including market research and advertising. Nowadays, marketing could be run through an online platform which is easier to generate many customers. However, some companies do not know how to use marketing tools to promote their products such as the soft sell and hard sell sentences. Therefore, a Marketing Kit is introduced to help online business owners to advertise their product. The marketing kit is designed in a form of cards with Qr code which consist of all information about hard sell and soft sell posting advertisements and several application's tutorial in eBook. The cards are packaged in one deck box with a paper ring to keep it safe. This product comes in dual languages which are English and Malay. Moreover, this study is conducted to identify the effectiveness of soft sell and hard sell posting on cognitive response activity, to investigate the effectiveness of soft sell and hard sell posting on manipulation check and to identify the effectiveness of soft sell and hard sell posting on attitude toward the product. Bvrret One Stop Centre, Melaka was selected by researchers to apply the Marketing Kit in helping them to increase their sales by improving their marketing strategy. The marketing kit is also beneficial to any business in helping them to market their product competitively, subsequently increasing their sales and revenues.

Keyword: Marketing Kit, Soft sell, Hard sell, E-book and QR Code.

1. INTRODUCTION

Marketing definition places more emphasis on the consumer relationship, as opposed to a pure exchange process. Philip Kotler(2018) defined marketing as "satisfying needs and wants through an exchange process" in 1980 and in 2018 he defined it as "the process by which companies engage customers, build strong customer relationships and create customer value in order to capture value from customers in return". The Marketing Kit is created with the Qr Code which consists of the information about soft sell and hard sell posting in the food category and also the tutorials of some applications in e-book.

The terms "soft sell" and "hard sell" are well known to advertise a product. Soft sell refers to an advertising and sales approach that features subtle language and a non-aggressive technique. It is designed to avoid angering potential customers and pushing them away. A hard sell refers to an advertising or sales approach that features especially direct and insistent language. It is designed to get a consumer to purchase a good or service in the short-term. As a result, Marketing Kit will help businesses out there to create their advertisement and promotion techniques besides increasing their knowledge on marketing. Therefore, this Marketing Kit iis a convenient way for new business people to market their product and services. In this study, the company that had been selected for this project is BVRRET ONE STOP CENTRE.

2. LITERATURE REVIEW

2.1 Soft-sell Appeals

One in which human emotions are emphasized to induce an effective (feeling) reaction from the viewer. These appeals tend to be subtle and indirect, and an image or atmosphere may be conveyed through a beautiful scene or the development of an emotional story, or via some other indirect mechanism. (Okazaki et al., 2010, p. 7).

2.2 Hard-sell Appeals

There is often explicit mention of information such as comparisons with competing products or specific distinguishing features of the product that gives it an advantage in performance or some other dimension relevant to customers (Okazaki et al., 2010, p. 7).

2.3 Cognitive response to advertisements

"Cognitive responses are the results of information-processing and -structuring activity and thus consist of responses such as recognition, associations, elaborations, ideas, and images" (Petty, Ostrom, & Brock, 1981, p. 37). Under the cognitive response theory, individuals will process the information of an advertisement, and they will react to it either positively, negatively, or neutrally and the cognitive responses directly cause attitude change (Huang & Hutchinson, 2008).

2.4 Manipulation

2.4.1 Soft sell

Items that gauged soft-sell measures included: "The advertisement is creative.", "The advertisement is impression-based", "The advertisement made emotional appeals" etc.

2.4.2 Hard sell

Items that gauged the hard-sell measures included: "The advertisement is factual", "The advertisement is informative", "The advertisement is objective" etc.

2.5 Attitude Toward the Product

An attitude is referred to as a general and steadfast favorable or unfavorable feeling about an object or an issue. Attitude is often viewed as an indicator of the amount to which a person likes or dislikes an object and carries positive connotations (Ajzen & Fishbein, 1980) reflecting a person's analysis or evaluation of an object (Ajzen & Fishbein, 1977).

3. METHODOLOGY

To develop the Marketing Kit, this study implemented the Product Development Process Diagram (2013) as below:

The above diagram shows that in Stage 1 (Concept) includes the idea generation for product concept. Followed by Stage 2 (Research) consists of assessing the market for market requirements. Moreover, Stage 3 (Analysis) includes business analysis for product requirements. Stage 4 (Develop) consists of product development for prototyping and trial production. The last stage (Launch) describes on go to market which is product launch.

Stage 1: Concept

In identifying the concept, the researchers had interviewed the owner of Bvreet One Stop Centre to identify the problems faced by the business owners for the purpose of gathering the idea generation in selecting the target product development needed in the market.

Stage 2: Research
For the second step, the researcher has studied the competitor of the targeted product to be developed as selected in the idea generation process in Stage 1. However, this is a new product, and there is a great opportunity to launch the products as there is no product in the market the same as this product.

Moreover, in stage 2, to investigate the product demand by assessing the market for the product requirements, the questionnaire was used to gather the data from 100 sample representatives from 140 population as referring to Krejcle and Morgan table (1970). The respondents were chosen among the business owners doing the business in the Klebang area which is the location of Bvrret One Stop Centre, the company applying the convenience sampling.

Several posting advertisements in soft sell and hard sell are attached in a questionnaire. The survey is focusing on the research objectives which are the effectiveness of soft sell and hard sell posting on cognitive response activity, the effectiveness of soft sell and hard sell posting on manipulation checks and the effectiveness of soft sell and hard sell posting on attitude toward the product. The measurement for softsell manipulation check Cronbach's Alpha for this 13-item scale is 0.91 adopted from Marisha Ashley Daniels, (2008). Moreover, for hardsell manipulation check, the Cronbach's Alpha for this 13-item scale is 0.93 adopted from Marisha Ashley Daniels, (2008). This study used 5-point Likert Scale for Section A: Softsell Posting Advertisement and Section B: Hardsell Posting Advertisement which were as the following:

1	2	3	4	5
Strongly disagree	Disagree	Neutral	Agree	Strongly agree

Stage 3: Analysis
In stage 3, the analysis conducted is to identify the benefit of the soft sell and hard sell in helping the business owner in captivating the online advertisement. Therefore, this study using SPSS and means analysis in identify the effectiveness of soft sell and hard sell posting on cognitive response activity, to investigate the effectiveness of soft sell and hard sell posting on manipulation check , to identify the effectiveness of soft sell and hard sell posting on attitude toward the product and the process to develop product.

Stage 4: Develop
The development of the prototype was undertaken in this stage. The researcher has identified the materials and features for the products.

Step 5: Launch
In step 5, the researcher will be ready to commercialize the product. However, this study was only conducted until Step 4.

4. DATA ANALYSIS

In analyzing the findings, this study applies Statistical Package for the Social Sciences(SPSS) for Mean analysis that interprets by referring from Sumarni dan Zambri (2018) as the following:

Min score	1.00-2.33	2.34-3.67	3.68-5.00
Interpretation	Low	High	Very High

As mentioned below, the analysis for the questionnaire distribution is focusing on the research objectives which are the effectiveness of soft sell and hard sell posting on cognitive response activity, the effectiveness of soft sell and hard sell posting on manipulation check and the effectiveness of soft sell and hard sell posting on attitude toward the product.

Figure 4.1 : Soft sell and hard sell advertising in the questionnaire

Table 4.1 : Cognitive response activity for soft sell

Item	Responses of questionnaire					Mean
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
This advertisement got me thinking about the product	0	1	30	46	23	3.91
This advertisement got me considering the product's good points	0	2	30	45	23	3.89
This advertisement got me think about the product's attributes	1	3	24	51	21	3.88
After viewing the advertisement, I mentally evaluated the product	0	4	19	55	22	3.95

Table 4.1 illustrates that the advertisement, I mentally evaluated the product as the highest mean (3.95). This is because in the soft sell advertising they have a description about the product.

Table 4.2 : Soft sell manipulation check

Item	Responses of questionnaire					Mean
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
The advertisement is creative	0	5	40	37	18	3.68
The advertisement is impression-based	1	4	29	52	14	3.74
The advertisement made emotional appeals	1	5	35	42	17	3.69

Table 4.2 illustrates that the advertisement is impression-based as the highest mean (3.74). This is because in the advertisement there are promotional elements that are easy to apply.

Table 4.3 : Attitude toward the product

Item	Responses of questionnaire					Mean
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
I evaluate the product promoted in the advertisement is attractive	0	1	27	50	22	3.93
I evaluate the product promoted in the advertisement is favorable	0	2	23	59	16	3.89
I evaluate the product promoted in the advertisement is pleasant	0	1	26	52	21	3.93

Table 4.3 illustrates that I evaluate the product promoted in the advertisement as attractive and pleasant as the highest mean. It is easy to change and also has interesting sentences. (3.93). This is because the product contains promotional sentences by category.

Table 4.4 : Cognitive response activity for hard sell

Item	Responses of questionnaire					Mean
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
This advertisement got me thinking about the product	0	3	25	41	31	4.00
This advertisement got me considering the product's good points	0	2	23	48	27	4.00
This advertisement got me think about the product's attributes	0	2	30	39	29	3.95
After viewing the advertisement, I mentally evaluated the product	0	4	24	44	28	3.96

Table 4.4 illustrates that the advertisement got me thinking about the product and got me considering the product's good points as the highest mean (4.00). This is because in hard sell there are simple sentence features in which the content is very suitable for posting.

4.5 : Hard sell manipulation check

Item	Responses of questionnaire					Mean
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
The advertisement is factual	0	2	24	41	33	4.05
The advertisement is informative	0	2	19	53	26	4.03
The advertisement is objective	0	3	24	41	32	4.02

Table 4.5 illustrates that the advertisement is factual as the highest mean (4.05). This is because hard sell posting has a fact about the products

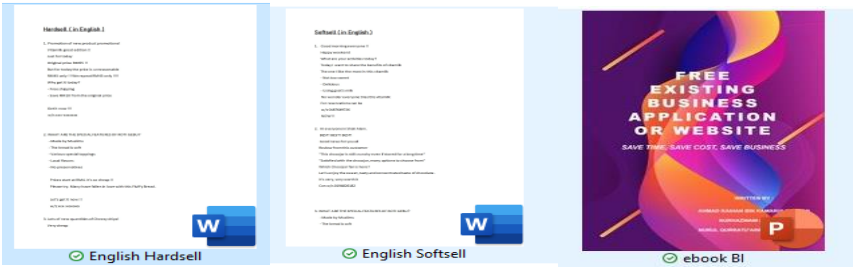
Table 4.6 : Attitude toward the product

Item	Responses of questionnaire					Mean
	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	
I evaluate the product promoted in the advertisement is attractive	0	3	28	42	27	3.93
I evaluate the product promoted in the advertisement is favourable	0	3	29	40	28	3.93
I evaluate the product promoted in the advertisement is pleasant	0	2	28	41	29	3.97

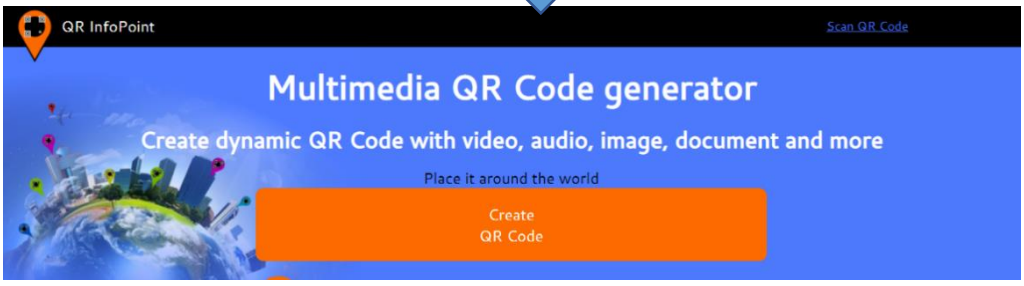
Table 4.6 illustrates that I evaluate the product promoted in the advertisement is pleasant as the highest mean (3.97). This is because the advertisement is very pleasant and easy to understand by everyone.

4.7 Process to develop product

Prepare all the tools to create the marketing kit



Create the soft sell, hard sell and Ebook on the Microsoft Words and Power Point



Open the qrinfopoint.com to generate the QR Code for soft sell, hard sell and Ebook

5. CONCLUSION

Based on the research findings, most people will be attracted to a product because the soft sell and hard sell posting advertisement contains promotional sentences according to the category which includes the price of goods. Therefore, adding soft sell and hard sell sentences in any promotion will be an effective business marketing strategy. Therefore, the application of a Marketing Kit developed by the researchers is capable of helping the business people to produce an effective advertisement by only copying and editing the sentences of soft sell and hard sell according to their product. It also includes proper tutorials on how to use apps and social media to produce advertisements within a short time in the e-book. Hopefully, the Marketing Kit will help Bvrret One Stop Centre and other businesses to develop their marketing strategies effectively and help to increase their sales in the future.

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BEZZY BIZZ APP FOR ONLINE ORDERING PROCESS

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Abstract: This research deals with operation management in BEEZZY BIZZ based on promoting and ordering system. First, from the research gather information about the company and find out the company's operation management should be emphasized. The company facing problem in ordering process. The process is not systematic. By the research trying to solve the problem by creating apps for the company. The study previous researches to gain more information and knowledge on the project. The research descriptive quantitative method to collect data. Then, get a sample size for the research which is 100. For the research distribute questionnaires to the students of the Polytechnic of Malacca through convenience method. The research target 20 customers per day to collect the data by distributing the questionnaires. The data later will be analyzed by the researchers.

Keyword : Online shopping, Shopping cart, Online business, Social media and Ecommerce

1. INTRODUCTION

Food service industry is a business sector that runs sales of prepared meals. There are many institutions that are offering food services. Food based company are the most famous and recognized business organization in food service industry. Business of company management involves many activities such as pre- cooking, packaging, processing order and a lot more. Thus, this business requires an effective business strategy to be sustainable in the industry.

For this research, we choose BEEZZY BIZZ POLITEKNIK MELAKA. This company began as incubator of selling only sauces and marination sauces at BEEZZY BIZZ, the exact location is at No 2, Jalan PPM10, Plaza Pandan Malim, Melaka. The owner of this company is Pn. Farizoh Binti Hamid. The owner first invested capital the company. At the beginning, the business was operated for polytechnic staff and students and only had been prepared few sauces for the customers. Now, this company operates for all the customers. There are some polytechnic staffs are now working in this organization. This research will help the management to identify the problems in the business organization and will suggest the ways to strengthen the business strategy of the company.

2. LITERATURE REVIEW

2.1 Ordering System

The ordering system in a business involves a series of activities such as reserving customers, inquiring, reminding product, placing, processing order and finally self pick up. Currently, the ordering system evolved into more advanced by technology. The research (Mathews Joao Chorneukar, 2014) showed people prefer online ordering and it increase customers' satisfaction too. The online ordering system and e-menu enables efficiency and effectiveness in interaction customers and seller, customers can easily search on menu items and its price and quickly can send the order information to the company and owner via touch-screen interface Arnelyn M. Torres, 2016). Customers can avoid wasting their time at

shops by a simple, safe and convenient online ordering system (Krishna Kumari, 2019). Customer engagement creates value for the firms. Some online ways of engagement are Facebook, Twitter, Instagram, Pinterest, etc. Food-tech companies take a lot of efforts on engaging the customer. Some tradition ways are newspaper ad, ads on TV and radio. There are many food delivery services available in the market. Customer is always in search of offers and discounts. Hence to provide right offer at right time can retain the customer from going somewhere else. As delivery time plays a vital role in creating loyalty with consumer, simultaneously time also affects in keeping food fresh and pure during the time of delivery. Innovation and creativity are the keys to success.

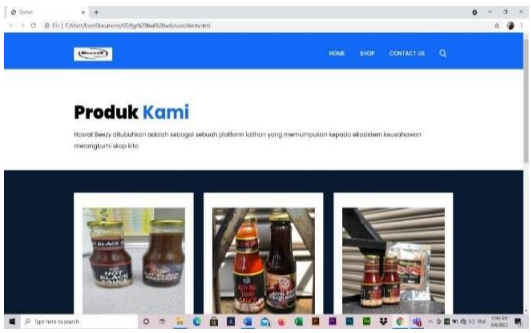
3. METHODOLOGY

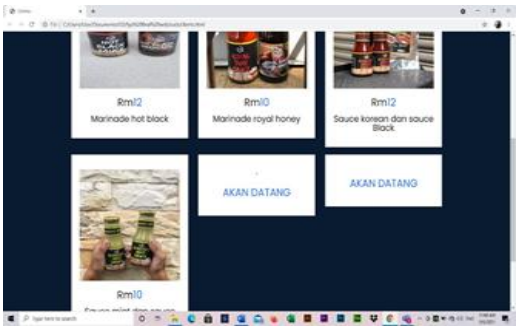
3.1 Population & Sampling Techniques

The population of research select existing and potential customers of BEZZY BIZZ, the students at Polytechnic of Malacca. We obtain 100 students as our questionnaire. Based on the study non-probability sampling technique in this research to get the sample size, a process that doesn't give all individuals in the population equal chances of being selected. Among varieties of non-probability method, we select convenience sampling. Based on the research questions and answer method as it is the easiest method and more suitable for new researchers. Participants will be selected based on availability and willingness to take part.

3.2 System Planning

OpenXcell - Build your own offshore software development team
VironIT - custom software development company
Mtoag Technologies - Designing technology for today's mobile generation
Quantum Mob - We help ambitious companies build successful digital products.
RV Technologies - Your Trusted Mobile App Development Partner





3.3 Research Instruments

These are the fact finding strategies. As the researchers, choose to use questionnaires as the tool to collect the data. The set of questions will be adopted from previous researches and modified according to our research. There will be 1 part in the questionnaire.

In Part, the questions will be based on ordering system at BEZZY BIZZ. The questions will be mainly how to customer can place order efficient and systematic. Did the customer can save time or not and having new normal lifestyle with Bezzy Bizz ordering process in this pandemic situation.

3.4 Data Collecting Technique

In this research, we collect data through questionnaires that should be answered by the customers. The data we collect will be in quantitative form. The research will randomly distribute 100 questionnaire forms to the customers according to the convenience sampling method.

NO OF DAYS	QUESTIONNAIRE
1	20
2	20
3	20
4	20
5	20

Table 3.1 : Amount of questionnaire that should distributed to the customers per day

The researcher hand over 20 questionnaire forms per day and obtain 100 sample within 5 days.

4. DATA ANALYSIS

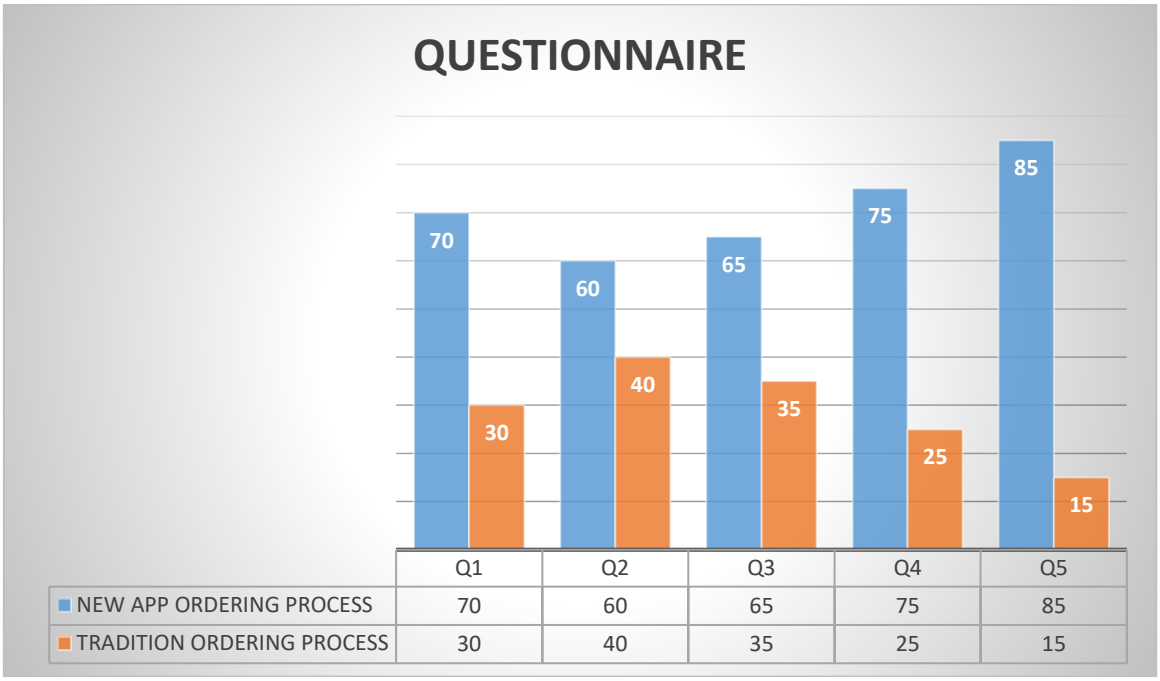


Table 4.1 : Result from questionnaire

Table 4.1 shows a result from questionnaire. The blue bar presents the technology ordering process app and the orange bar present for tradition on ordering process by face to face. The first question is the satisfaction of the students with the new ordering process. 70 students agreed new ordering process satisfied therefore 30 student satisfied with tradition ordering process. This shows that online ordering process more welcoming. Second is the new app is can save the students time for the ordering process. Based on question two 60 students can manage their time well by using new ordering process. Meanwhile 40 students prefer tradition ordering process. Third is that the students can make many orders at once and systematic. 65 students recommended make lot of order at one time with the online ordering process. while, 35 students recommended the traditional ordering process. Fourth is the company can prepare the order systematic and soon. Question 4 show online ordering process highly preferred among the student because its more advance. Tradition ordering process frequently preferred. Fifth is that easier and convenient in daily life. Due to the current lifestyle 85 students most suggested online ordering process therefore 15 students suggested tradition ordering process. The questionnaire it was very useful for us. More over the students prefer our project because from the bar graph can see the differences.

5. CONCLUSION

Creating, developing, and implementing this an ordering process for BEZZY BIZZ proposal was a success. The proposal plans not only met the objectives outlined in the desired goals for technology and modern lifestyle. Each aspect that needed to be adequately addressed and developed was reached in a way that made the ordering process app proposal realistic and feasible. This an ordering process app, once download the ordering process app, will be able to ordering efficiently as well as meet the needs of customer.

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THE STUDY OF CUSTOMER SATISFACTION TOWARDS EFFICIENCY OF E-RETAILING BY USING WEBSITE AND E-BUSINESS CARD

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Abstract : The purpose of this study is to find a solution about customer satisfaction by using website and e - business card. Hasrat Murni Sdn Bhd is a food manufacturer of oriental sauces, such as chilli sauce, tomato ketchup, mayonnaise and soya sauce. The company also produces a range of packed and ready to eat soups. The study population was 546 respondents with a study sample involving 103 respondents. The objective of this study is to investigate whether the e – business card and website developed are easily enhanced with customer satisfaction. The problems of Hasrat Murni Sdn Bhd are the difficulty to find more customers and they are not technologically advanced. This study is in the form of quantitative method. Questionnaire forms have been used as a method of data collection and were distributed to 103 respondents selected randomly in the Puchong Area, Selangor. A Likert scale measuring from scale one to scale five used as an instrument to gain more information and knowledge on our business issue. Based on the findings, it can be concluded that e - business card and using website are among the effective services because most people are using internet and social media. Therefore they prefer buying products with the help of new technology. In conclusion, we made suggestions to improve business strategies of Hasrat Murni Sdn Bhd by creating a website for ordering system, so customers can make orders and get their products quickly. This will help the company to gain more customers and save cost by avoiding a long distance travelling to get order from customer. Hence it will increase the sales and profit of the company.

Keyword : E- business card, Online-ordering system, E-retailing, Website, Digital Technology

1. INTRODUCTION

The U.S. Bureau of Labor Statistics defines food manufacturing as industries that transform livestock and agricultural products into products for immediate or final consumption. Food manufacturing is related to machinery and food transformation. Food production can cover all steps of the food chain such as primary production and food service. Food manufacturing is a process of converting raw material to finished product by using various processes machines. Food manufacturing and processing covers everything from simple processes to complex and sophisticated systems that use expensive equipment to create products bearing little resemblance to their original ingredients.

Hasrat Murni Sdn Bhd is a manufacturer of oriental sauces, such as chilli sauce, tomato ketchup, mayonnaise and soya sauce. The company also produces a range of packed and ready to eat soups. This private company was established in the primary sector of food and beverages.

E-Business Card stand for electronic business card which send information through online process to business parties and the electronic signature are embossed on it which show the reality of the business. People involve in business a lot. In professional meetings, the exchange of business cards is a common way for professionals to build connections. As the

number of business card grows, organizing them becomes a burden. Therefore, e-business card plays a major role in this e-retailing business which can increase large number of customers. Meanwhile, a website is important for a business because it attracts more customer and it's an easier way to get more information. In this issue, websites are the bases on which the whole online marketing for a business is based. Therefore, with things being so easy, there is no excuse left to avoid having a business website. E-retailing empowers company to optimize the online presence of company site to reach customers in a more effective and conversion driven manner.

2. LITERATURE REVIEW

Literature review surveys scholarly articles, books and other resources relevant to a particular area of research.

2.1 Online Ordering System

Food and beverage (F&B) industry is one of the industries in the market that apply these technologies into their business processes that assist them to be much more convenience and efficient. From the message, online ordering system can be defined as a simple and convenient way for customers to purchase food online, without having to go to the restaurant (Khairunnisa, K. and Ayob, J., 2009).

2.2 e-Retailing

The Electronic Retailing also called as e-retailing is the process of sale of goods and services through the internet. E-retailing requires companies to tailor their business models to capture internet sales, which can include building out distribution channels such as warehouses, internet webpages and product shipping centers.

2.3 Digital Advertisement

Digital advertising is the process of publishing promotional material through online platforms such as social media, search engines, websites and any other program that can be accessed digitally (Gary Moynihan, 2018). Digital advertising is a targeted, data-driven advertising strategy for reaching consumers in every stage of the buying funnel and moving them from one stage of the buying funnel to the next (Mathews Joao Chorneukar, 2014).

3. METHODOLOGY

3.1 Population & Sampling Techniques

The selected population are existing and potential customers of Hasrat Murni Sdn Bhd, who are among the residents at Puchong, Selangor. Based on Jabatan Perangkaan Malaysia Negeri Selangor, the population size is 400,000 people but we obtained 104 people only as our sample. We chose non-probability sampling technique in this research to get the sample size, a process that doesn't give all individuals in the population equal chances of being customer. Among varieties of non-probability method, we selected voluntary respond sampling. We chose this method as voluntary response samples are always at least somewhat biased, as some people will inherently be more likely to volunteer than others. Participants were selected based on availability and willingness to take part.

3.2 System Planning

First of all, in planning phase, the system for development was identified and selected in order to solve the problem. Several studies are needed to have more clearly understanding about the system requirement. In addition, the SWOT analysis techniques was used to interpret the strength, weakness, opportunities and limitations of the basic requirement for the propose solution. Next, a project timeline was created to have a clearly understanding

of what should do according to the project life cycle. The project timeline shown in a Gantt Chart which is a graphical depiction of a project schedule. It is a type of bar chart that shows the start and finish dates of several elements of a project that include resources, milestones, tasks, and dependencies.

3.3 Research Instrument

A research instrument is a tool used to collect, measure, and analyze data related to our research interests. These tools are most commonly used in health sciences, social sciences, and education to assess patients, clients, students, teachers, staff, etc. A research instrument can include interviews, tests, surveys, or checklists. The Research Instrument is usually determined by researcher and is tied to the study methodology. These are the fact finding strategies. As the researchers, we chose to use questionnaires as the tool to collect the data. The set of questions were adopted from previous researches and modified according to our research. Interview definition is - a formal consultation usually to evaluate qualifications (as of a prospective student or employee).

3.4 Data Collecting Technique

In this research, we collected data through questionnaires that were answered by the customers. The data we collected will be in quantitative form. We distributed 104 questionnaire forms randomly to the customers according to the voluntary response sampling method. We chose this method because voluntary response samples are always at least somewhat biased, as some people will inherently be more likely to volunteer than others.

NO OF DAYS	CUSTOMERS
1	16
2	24
3	12
4	9
5	30
6	13

Table 3.1 : No of questionnaires

This table shows the amount of questionnaires that were distributed to the customers per day. We distributed questionnaire forms per day and obtained 104 sample within 6 days.

4. DATA ANALYSIS

This questionnaires were prepared to be distributed to respondents for getting information and to complete the requirement to complete this project. The purpose of doing this questionnaire is to get and analyse information or feedback we receive from the respondents. The information that we obtained from the respondent are confidential and will be used for the purpose of this research only.

The below chart shows the percentage of customers satisfaction of Hasrat Murni Sdn Bhd. Questionnaires are a very useful survey tool that allow large populations to be assessed with relative ease. Despite a widespread perception that surveys are easy to conduct, in order to yield meaningful results, a survey needs extensive planning, time and effort.

4.1 The online ordering system is effective for customers to order products.

SCALE (5-1)	NO OF RESPONDENT	MEAN
Strongly agree (5)	30	3.5
Agree (4)	45	2.31
Neutral (3)	29	3.6
Disagree (2)	0	-
Strongly disagree (1)	0	-

Table 4.1

Table 4.1 shows that strongly agree and agree respondents are more than neutral respondents with cumulative means of 5.81. The mean value is 3.6 for neutral. Finding shows that customers agreed that the online ordering system is effective for customers to order products.

4.2 By using e-business card and website, the management can easily share information consecutively.

SCALE (5-1)	RESPONDENT	MEAN
Strongly agree (5)	25	4.2
Agree (4)	48	2.7
Neutral (3)	31	3.4
Disagree (2)	0	-
Strongly disagree (1)	0	-

Table 4.2

Table 4.2 shows strongly agree mean is 4.2 and agree mean is 2.7 while for neutral, the mean is 3.4. the finding shows that customers agreed that by using e-business card and website, the management can easily share information consecutively with them.

4.3 Customer get their products quickly by using website ordering system.

SCALE (5-1)	RESPONDENT	MEAN
Strongly agree (5)	25	4.2
Agree (4)	48	2.7
Neutral (3)	31	3.4
Disagree (2)	0	-
Strongly disagree (1)	0	-

Table 4.3

Table 4.3 shows neutral respondents are 31 and agree respondents are 48 while strongly agree is 25. For the mean value, cumulative means for strongly agree and agree is 6.9 while for neutral is 3.4. The finding shows that customer agreed that they get their products quickly by using website ordering system.

5. CONCLUSION

After a decade, the advancement and innovation of technology help people to manage their task easily and efficiently. After we finalized the website and e-business card, the company tried and get more benefits which their sales increased drastically. The customers are really satisfied and happy with the changeover by the company. Moreover, the new ordering system is so useful and the customers are really appreciated and attracted to that new ordering system.

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MOVEABLE BOOT RACK EFFICIENT WORK SPACE AND SYSTEMATIC

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Abstract. Boot rack is part of the necessity in Asas Matahari Sdn Bhd. The problem occured when the company had not enough space to store their boots. So, the researchers had come up with a solution to create a new rack that was convenient and had more space to keep the boots. All the boots were stored systematically and easy to access. The rack design was created based on the model, type, colour, price and size . This design was more focused on the creation of a multipurpose moveable boot rack. This boot rack can easily move according to their needs. The concept was open and the boots were hung to eliminate bad odours due to the heat exposure of the surroundings. Lastly, this boot rack feature was really strong, sturdy and made of stainless steel.

Keyword: Efficient, systematic, moveable shoes rack, strong and sturdy

1. INTRODUCTION

Shoe or boot racks were created with a variety of designs for the purpose to store and organize the shoes, boots and slippers neatly. Boot rack comes in a variety of designs. According to the Human Resources Manager of ASAS MATAHARI SDN BHD, the company had problems with scattered shoes which can be solved by requiring a certain space, or with the design's rack which can be easily moved from one place to another. This multipurpose boot rack was more focused on the ideal design of multipurpose moveable boot rack. At the same time, this shoe rack can easily be lifted and moved according to their needs. This open and hanging rack concept allows bad odours to be reduced as well as speeding up the dying process of damp boots. Our products have sufficient tools like wheels to help the user to move the rack easily and also it has water drainage holes to remove excess water stored in the shelves. As a result, this product was very user friendly because it was really useful for the worker to store their boots and move the rack according to their needs. This boot rack that we had created had multiple utilities combined all together in a single product which may save more cost. We also had created a product that can store more boots than a normal boot rack which had the maximum storage of 8 pairs of boots. Furthermore, our product had the concept of placing the boot upside down to the bottom in case to protect the boot from the pest. Beside that this boot rack had two in one functions which were becoming boot storage and also as a moveable rack. Lastly, this boot rack was really strong and sturdy and can be used for a long period of time because it was made of stainless steel.

2. LITERATURE REVIEW

Footwear has a very long history, a footwear thought to be at least 5500 years old was recently recovered from a cave in Armenia (Kurup et al., 2012), and over the years, the most natural evolution process of mankind's search for lifestyle improvement took its course, and very soon, footwear became a necessity. Back in those days footwear storage was not needed as footwear were handmade, difficult to create and very limited to be found; but

as innovations in the shoe industry were advanced, especially due to the invention of the sewing machine which was created around the 1800s and it was becoming an automatic shoe-making machine. Thus, the amount of footwear was extremely increased and the need for a storage utility like shoe rack was very high in demand.

In 2006, there was a poll created in America and it was initiated that American women were likely to own an average of 27 pairs of shoes while American gentlemen slightly only own about 12 pairs of shoes (Trippet et al., 2006). With this stupefying amount, it is not astounding that the demand for satisfaction shoe storage elucidation was on the rise. Therefore, the requirement for cozy shoe rack ideas will grow excessively as the users with more shoes preference will need to spend most of time to view, pick and try on with their shoes from the troublesome shoe rack which can also lead to an increases the risk of developing musculoskeletal injuries because of the design is not comfortably made. Ordinarily footwear storage units are self-reliant units made of materials like wood, plastic or metal. There are 3 primary varieties of shoe storage elucidation which were the shoe storage rack, over-door shoe rack and shoe cabinet.

In modern globalisation, designers and researchers have taken more assiduity towards the comfort of a product to revamp its benefits such that it limits existence of endlessly strain injuries. The actual definition for this product usability is that it must become very conducive and easy to use, but astronomical distraction exists while defining its operational usability. The National Physical Laboratory had stated that there are two integral but distinctly perceptible approaches about the usability in products (Bevan, 1995). The reciprocal was product aligned "bottom up" view which classified usability with ease of workforce and "Top-down" approach which aligned usability as the capability to use a product for its predetermined purpose that emanates from human factors.

3. METHODOLOGY

To design the moveable Boot Rack for ASAS MATAHARI SDN BHD, researchers had gone through the steps of the product design process that we adapted and modified from a scholarly article:

1.1 Briefing (Discuss With The Owner)

We have had an interview with ASAS MATAHARI SDN BHD to realize the problem that they want to solve. We found out that the staff of ASAS MATAHARI have problems with the space to store the boots.

1.2 Project Planning (Planning For Design)

After we had received the information from ASAS MATAHARI SDN BHD, our group members started to plan our project which was the moveable boot rack.

1.3 Research Based On Client, Market And Design

Based on the research we found, the boot rack design was very limited in the market, so we did some research on many articles from google scholar and we reviewed the article titled as the innovative shoe rack with seating.

1.4 Design Dieline (Create Get Illustrator)

Based on the research, we had to draw the product on the paper to get an illustrated design.

1.5 Design Concept (Brand Identity, Colour, Customer, Image And Font)

After the illustration had come out, we decided to set up the design concept with brands, colour, customer, image and font. Furthermore, the colour that we had chosen was blue and the product must be easy to use for the users.

1.6 Design Revision (Based On Client's Request)

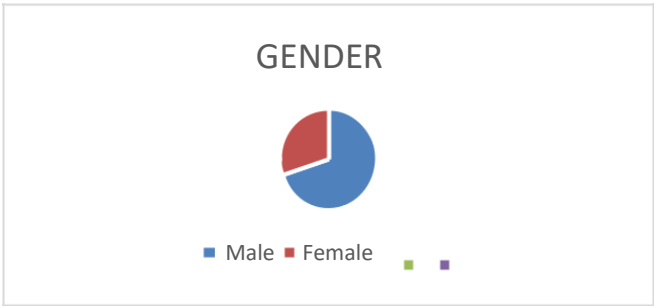
The design revision was based on ASAS MATAHARI SDN BHD's request. For example, the height of the moveable boot rack must be 102 cm, length of moveable boot rack was 92 and the width of moveable boot shoe was 32cm.

1.7 START DEVELOPS THE END PRODUCT (Moveable Boot Rack)

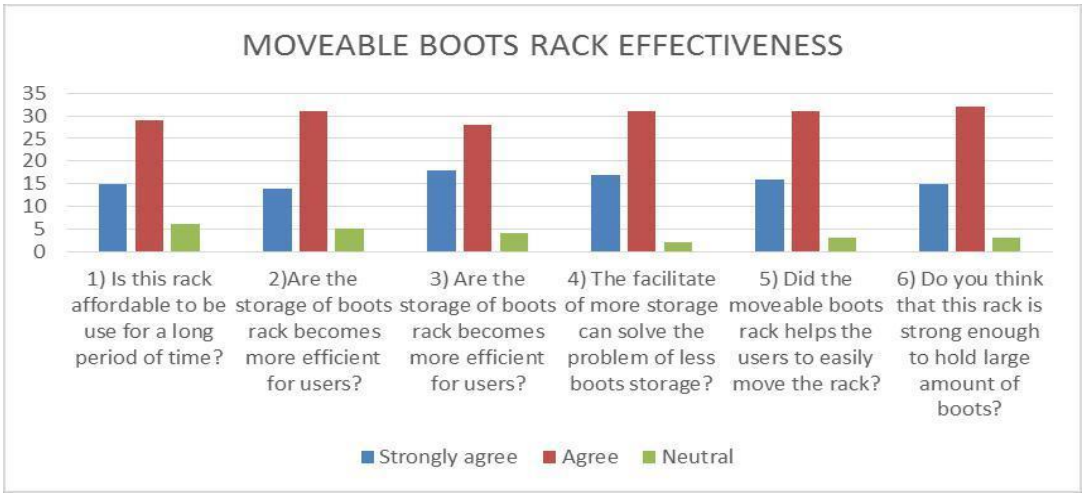
The materials were prepared already and then we started to build the moveable boot rack project.

4. DATA ANALYSIS

This Likert Scale had been made for the purpose of creating the data analysis which needed to be distributed to the respondents for getting details and statistics that are needed to complete the requirement of this project. The justification of this likert scale was for collecting and analysing the data or feedback received from the respondents. The statistics that we had collected from the respondents were very confidential which means that it can only be used for this research only. Graph 1 and 2 showed the percentage of customers' satisfaction towards the layout design of the moveable boot rack and the manual material handling and shelves arrangement which had been seen through graph 1 details as the amount of gender who had answered the questionnaire. While graph 2 showed the total marks obtained from it. This statistic was collected through the survey which had been filled by 50 respondents through questionnaires given via google form for the sake of achieving our objectives.



Graph 4.1: The gender separated by 35% is male and 15% is female



Graph 4.2: Total marks from the questionnaire

From the obtained mean of the questions, we found out that there were 50 respondents that we had collected from our data. The format for the mean calculations were marks given, such as strongly agree to strongly disagree which was 1 until 5 and then multiple it with the total answers from respondents given for each. Later, the total of the mark is therefore divided by the total number of respondents which is 50.

Table 4.3 : Result for questionnaire

ITEM	Strongly agree (5)	Agree (4)	Neutral (3)	Disagree (2)	Strongly disagree (1)	MEAN
1) Is this rack affordable to be use for a long period of time?	15	29	6	0	0	4.18
2) Are the storage of boots rack becomes more efficient for users?	14	31	5	0	0	4.18
3) Are the storage of boots rack becomes more efficient for users?	18	28	4	0	0	4.28
4) The facilitate of more storag e can solve the problem of less boots storage?	17	31	2	0	0	4.3
5) Did the moveable boots rack helps the users to easily move the rack?	15	31	4	0	0	4.22
6) Do you think that this rack is strong enough to hold large amount of boots?	16	32	2	0	0	4.28

5. CONCLUSION

In conclusion, this study showed that the design of the moveable boot rack which was the product design, structure design and material reveal the facts that design concept was the most important element to Asas Matahari Sdn Bhd. In order to design the moveable boot rack for Asas Matahari Sdn Bhd, several elements need to be emphasized such as the design, color, size and material. Moveable boots rack design had been successfully developed by researchers for Asas Matahari Sdn Bhd.

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TECHNOLOGY APPLICATION IN SME RESTAURANT

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Abstract. Malaysia Food & Beverages Industry is dominated by small and medium enterprises (SMEs) which offer various services including restaurant. The primary technology system used in these operations in a restaurant is the point-of-sale system (POS), the purpose of this study is to identify the features of point-of –sale system currently used in business operation of SME Restaurant, to explore the function of point-of-sale application in ordering system of SME Restaurant and to develop a point-of-sale system for Restoran Syarifah. Two experimental variables were chosen for this study, which are features of point-of-sale system and function of technology application in ordering system. The base of employed / employees prepares a quantifiable method to obtain the investigation data by assigning questionnaires to the respondents. It makes the data collection process easier for the experimenter to obtain the data in details. 80 respondents which are the owner of small medium size restaurant were chosen as a sample. A representative is drawn by a random procedure from the sampling frame. This study also provides respective steps in the development of POS system for Restoran Syarifah. The finding showed that the features of point-of-sale technology is not widely used in business operation of SME Restaurant. However, the finding of this study shows that the function of technology application in ordering system is very important for business operation in SME Restaurant. The POS system have developed successfully for Restaurant Syarifah with the affordable price.

Keyword: Point-Of-Sales, SME Restaurant, Ordering System

1.0 INTRODUCTION

The Food & Beverage (F&B) sector is one of the high-potential industries in Malaysia, according to the Department of Statistics Malaysia (DOSM). Malaysia F&B Industry is dominated by small and medium enterprises (SMEs) which offer services like restaurant (Malaysia Food &Beverage Sector Report 2020). As for small restaurant, Sales turnover from RM300,000 to less than RM3 million or full-time employees from 5 to less than 30 (Guideline for SME Definition, 2016). Technological advancements have influenced the restaurant business. Study by Ruth et al., (2015) showed that companies that invested in information technology (IT) were able to achieve revenue growth as well as cost savings.

According to Collins and Cobanoglu (2008), the primary technology system used in these operations in a restaurant is the point of sale system (POS), which is "a network of cashiers and server terminals that typically handles food and beverage orders, transmission of orders to the kitchen and bar, guest-check settlement, timekeeping, and interactive charge posting to guest folios".

Small and medium size (SME) restaurant are frequently forced to make decisions to implement the latest technology innovation in their business operation. However, as expenses rise, competition rises, and the labour market become more difficult, effective technology adoption is critical to any SME operation's success and effectiveness. As for this research, Restaurant Syarifah which is medium size restaurant located in Seremban was chosen. The restaurant serves Malay food, Western food and seafood. Restaurant Syarifah operates every day and have an average of 80 customers per day. In weekend, the

amount of customer increase twice especially on public holiday. According to the owner, the daily sales is roughly around RM600 to RM1,000 per day and will increase more in weekend. Researcher found that this restaurant has problem in implementing the Point-of-sale in their business operation due to the high cost of the system.

Therefore, the research objectives and questions are as the following:

1.1 Research Objective

1. To identify the features of point-of–sale system currently used in business operation of SME Restaurant
2. To explore the function of technology application in ordering system of SME Restaurant
3. To develop a point-of-sale system for SME Restaurants

1.2 Research Question

1. What are features of point-of–sale system currently used in business operation of SME Restaurant?
2. How does the function of technology application in ordering system of SME Restaurant?
3. How to develop for point of sale system?

2.0 LITERATURE REVIEW

2.1 Point-Of-Sale System And Restaurant Industry

According to Gao and Su, (2017) Information Technology (IT) is commonly used in the hospitality industry as well as it can bring many benefits to the restaurant industry. Therefore, IT makes a significant difference and strongly affects restaurants' performance (Devaraj and Kohli, 2003). (Lorden, 2014). According to AH&LA's Food and Beverage Systems Report (2006), many technology applications are used in restaurant operation, including POS systems, POS integrated modules, POS integrated payment applications and some emerging technologies for restaurant operations.

2.2 Technology Application In Ordering System

Kimes (2008) points out that the benefits of technology include shorter time spent in the ordering process (e.g. handheld terminals), enhanced processing in food production (e.g. kitchen technology), quicker service time (e.g. table management systems), faster payment. According to Oronsky and Chathoth (2007), recent IT trends in the restaurant industry include customer feedback systems, repeat business management applications (e-reservation systems, POS integration into online ordering), marketing management systems, restaurant operation systems and human resources management systems. Technology plays a key role in restaurant operations to make it possible to measure and monitor indicators such as inventory, financial status, labor scheduling and productivity, and cost of food (Susskind, 2017).

3.0 METHODOLOGY

This consists of two methods; first phase was descriptive survey. It was conducted by assigning the questionnaire to 80 respondents from small and medium enterprise restaurant in Bangi and Seremban through google form and questionnaire form. The instrument utilized is questionnaire that contained 3 sections, Part A:demographic,Part B: the features of point-of –sale system currently used and Part C:function of technology application in ordering system of SME Restaurant .The questionnaire were adapted from Cavusoglu (2018) and Wong(2019).In Part B, respondent were asked to indicate whether they utilized any point-of-sale technology system in their business operation the form of yes and no option to this question, the option that have plans to add was also given to respondents. In Part C,

respondents were asked whether the function of technology application is important in their business operation. The questionnaires were in the form of Likert Scale (1 -5). Likert-scale is the ideal evaluation for this study due to its high reliability and validity (Chua et al., 2013). Meanwhile, the analysis of the study was conducted using mean, frequency and percentage analysis.

The respondent are 80 owners of small and medium size restaurant. The inspect/respondent was picked and drawn by a random procedure from a sampling frame. It is based on to the table from Cochran Krejcie and Morgan (1970).

The findings of the study were analyzed by using Mean analysis. The mean score obtained will be interpreted based on the five-point Likert scale adapted from Sumarni dan Zambri (2018). as in the table below:

Table 3.0:Mean Score

Min score	Interpretation
1.00 to 2.33	Low
2.34 to 3.67	High
3.68 to 5.00	Very high

The second phase adopted the research process of planning, tools, requirement and the implementation of the system. To set this methodology, we adopted from previous research and modified the final idea according to our research. The methodology were adopted from research by Wong (2019).

The process to develop the POS System:

4.0 DATA ANALYSIS

To acquire the objectives of the study, researchers have assigned the questionnaires to 80 respondents. The following are the data of the study from demographic analysis:

Table 4.1: Demographic analysis

ITEM	CATEGORY	FREQUENCY(F)
Gender	Male	49
	Female	31
Age	20 – 29	15
	30 – 39	30
	40 – 49	25
	50 – 59	10

The total respondent in this study was 80 small and medium restaurants owners. The data reveals that the investigators of male respondents are 47 people (61%) and female respondents are 31 people (39%). The statistical distribution among respondents shows 15 people (19%) aged between 20-29 years, 30 people (38%) aged between 30-39, 25 people (31%), 40-49 and 10 people (12%) consisted of those aged 50-59.

The findings for features of point-of-sale technology currently used in business operation of SME Restaurant are shown in the table below.

Table 4.2: The features of point-of-sale technology currently used in business operation of SME Restaurant

ITEM	The usage of technology		
	Yes	No	Plan to add
POS software	38	9	33
Energy efficient POS	33	21	26
Menu labelling	56	8	16
Table management	44	17	19
Barcode scanner	40	11	29

Referring to table 4.2 above, it can be seen that 38 restaurants (48%) use POS software in their business operation, while 33 restaurants (41%) plan to add the software and another 9 restaurants (11%) did not use the POS software. It can be seen that 33 restaurants (41%) use energy efficient POS, 26 restaurants (33%) plan to add and another 21 restaurants (26%)did not use the feature. As for menu labelling, 56 restaurants (70%) use the features, 16 restaurants (20%) plan to add and 8 restaurants (10%) not use that.44 restaurants (55%) use the table management features, 19 restaurants (24%) plan to add the features while 17 restaurant (21%) did not use the features.40 restaurant (50%) use barcode scanner,29 restaurant (36%) plan to add the features and 11 restaurants (14%) did not use the features.

The findings of function of technology application in ordering system of SME Restaurant are shown in the table below.

Table 4.3: Function of technology application in ordering system

ITEM	Mean	Mean interpretation
The waiters need not to leave the table to process the order	3.49	High
The waiters can spend more times in satisfying the customer	3.58	High
Reduce manual errors made by waiters	3.88	Very High
Encourage restaurant to use modern technology system.	2.92	High
Increasing efficiency and improving services provided to the customers.	4.10	Very High

As for ordering system, it is evaluated by 5 items as showed in the Table 4.2. The average analysis of the overall means score shows that function of technology application in ordering system in SME Restaurant is 'is very high' (Mean=3.59). This indicates that function of technology application in ordering system is very important for business operation in SME Restaurant.

4.4 The process to develop the POS System:

5. CONCLUSION

This study concluded that there were inefficiencies in the SME Restaurant management system. If they have the POS system, the restaurant can track their business transactions accurately and also reduce human error as it is done automatically. The finding for this study shows that 48% of restaurants use POS software in their business operation, 41% of restaurants use energy-efficient POS. It showed that the features of point-of-sale technology are not widely used in the business operation of SME Restaurant.

However, the findings of this study show that the function of technology application in ordering system is very important for business operation in SME Restaurant. The POS system have developed successfully for Restaurant Syarifah with the affordable price. It is recommended that for further study, to carry out several study for the financial management of SME Restaurant.

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DEVELOPMENT OF MULTIPURPOSE TROLLEY TOWARDS MANUAL MATERIAL HANDLING AND SHELVES ARRANGEMENT

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Abstract The purpose of this project is to develop a multipurpose trolley towards manual material handling and shelves arrangement. Based on the interview, observation and survey conducted, we found out that the business operation going on in Roselovemie's company is quite challenging because all the task and activities required the owner and the employees to do it manually. Observation has been made on March 23rd, 2021, from 2 pm to 3 pm located at Dataran Pahlawan, it was found out that, the staff were facing difficulty regarding the activities that involved them carrying, lifting, transferring the products directly to the shelves. Plus, it required them to do the loading and transferring tasks that took time around 30 minutes due to using manual method. From the task it shows by doing it manually, it effected the owner on doing product and shelves arrangement activities and tasks. The purpose of this study are to minimize the manual material handling and physical workload activities by making or developing a multipurpose trolley for the company we conducted our research with. So, the need of developing a suitable tool and equipment for the company is a must since the usage of our multipurpose trolley would be to minimize manual material handling, and that could lead to reduce and avoid a big number of injuries and fatigue. The multipurpose trolley that we develop, help the owner in transferring the stocks to the shelves easily and effectively since they now have a proper tool that simplify their business operation. In our research method, we use descriptive method for collecting data from total 30 respondents which include people in Malacca and Selangor as the requirement for us to complete this project. Data entries excel was used to obtain the mean of the variables for each objective. The novelty or uniqueness of this product would be the front and back walls of the trolley that resulting in having flexible space for the usage and can be used for different purposes and the locked and unlocked wheels that can be used when needed by the users. After the implementation of the trolley, the company's business operation is going smoothly and as we also achieved the three objectives for this study by developing a multipurpose trolley that the outcome is saving time for completing the tasks, improving working conditions as it reduced the discomfort and back pain problem experienced by the owner of the company. Improvement of trolley can be made by upgrading it in the future.

Keyword: Multipurpose trolley, Manual material handling

1. INTRODUCTION

The objectives of this study are to identify the elements and characteristics of efficient trolley, to develop the trolley design and to investigate the time saving when using the trolley. In this case, things become complicated as those involved in business operation especially employees using the manual method which is manual material handling on doing tasks and activities that required them significant energy to do it. Activities involved in manual material handling are pushing, pulling, lifting and carrying while loading and unloading process. The amount of load involved when doing the tasks, involve the repetitive motions, awkward posture, jerking, stretching, twisting lift, and exertion. Based on the research, it can give injury

to soft tissues of the body including muscles, tendons, ligaments, disc, cartilage, and nerves (Milania & Prabaswari, 2021).

In some cases, we still could see some of the companies including small medium enterprise, grocery store, are still practicing this method. According to Baba, Dian & Ishak (2015), their study defines a Manual Material Handling (MMH) was preferred over machineries due to high flexibility and being relatively low in cost. In this situation, we could see it give advantage to some companies if they preferably use this method during and only for sample and light material transfer. However, if they continuously doing MMH tasks or activities especially when it required heavy loads, and involved wrong transfer position, wrong body posture, it could be the risk for workers of a serious case of Lower Back pain (LBP) during working. Hence, there is a need for develop a suitable tool or material handling that can be used for the company usage. The aims of this project, in hoping to develop the tool, it can reduce and minimize the lower back pain, any injuries caused by performing the manual tasks or activities. The material handling equipment we are developing mainly and specifically is a multipurpose trolley that helps the company or users in transferring products to the shelves and simplify the shelves arrangement activities and resulting to minimizing the manual material handling tasks.

2. LITERATURE REVIEW

2.1 Elements or Characteristics Of Efficient Trolley

According to Zhang et al (2019) by referring to Lutters et al, (2014), state characteristics of techniques and tools are more efficient, credible and useful in capturing the essence of tools than collecting endless lists of existing tools. In other words, the key to effectively understanding and evaluating various design tools is to identify comparable characteristics.

2.2 Develop The Trolley Design

Research conducted by Ganesh et al, (2016), by referring to Chan (2002), selection of material handling process is an important key factor in the design of material handling system, and thus it is crucial step for facilities planning. Production can be enhanced by proper material handling equipment which may give effective utilization of manpower and improve system flexibility.

2.3 Time Saving When Using The Designed Trolley

Survesh & Aithal (2019) agreed that time management is one important element in effective and efficiency performance. The activities involve using of raw materials, human effort, machinery etc. The output could be counted in numbers probably, but the outcome is measurable only in terms of time. i.e., how much work has been accomplished within specific time or how much time need to achieve the target.

Since time serves the function of benchmarking, the whole question of efficiency of a manager depends on how much time is utilized, more appropriately how much time is saved. In addition, utilizing the time to keep work (activity) going, but saving time is about increasing the speed of work and simultaneously reducing the loss of time.

3. METHODOLOGY

3.1 Problem Identification

Define the problem base from the interview with the owners. The owner does not have a tool that can help them to do work at once. As a result, they got the back pain problems.

3.2 Option of product

A product option is used for products that come in different variations. Size and colour are common examples of product options, and the product is trolley.

3.3 Set a creativity skill /technique.

The skills and techniques of ours to target a best solution of the problems that they faced. The designed is done based on following creativity techniques such as Brainstorming, Creative, Problem Solving, Dimension Analysis and Listing.

3.4 Collecting the raw materials

Table 3.1: Raw Materials of Multipurpose Trolley

Plywood	It is the one types of manufactured board, and this is the main ingredients of our products.
Screw	It is an externally threated fastener capable to be inserted into holes in assembled parts.
Door lock	This is additional space that can help the owner to carry glass and heavy items to avoid falling.
Wheels (lock)	Usually unlocked with portable electronic device that carried by owner.
Steels	We choose steels is because the durability of the iron is very strong and sturdy so that the owner can use it with satisfaction.
Dimension	The Dimension of the products is by following specifications. Length of product =300MM Internal diameter= 600MM External diameter= 1500MM

3.5 Interpretion of Questionnaire Data

The questionnaire set consists of two part of information, demography and variable measurement with 12 questions. Data will interpret by referring Chan Yaw Piaw (2006) measurement.

Table 3.2: Interpret Measurement of Mean Score

Min score	1.00-2.00	2.01-3.00	3.01-4.00	4.01-5.00
Interpretation	Low	Medium Low	Medium High	Very high

4. DATA FINDINGS & ANALYSIS

Data obtain from our survey was answered by 30 respondents through set of questionnaires and interviewed. Based on Graph 1, majority respondent at 43.3% at age 36-45 and at age range 46+ with a low percentage rate of 20%. The gender of the respondents was equal where men and women who stated the same percentage of 50%.

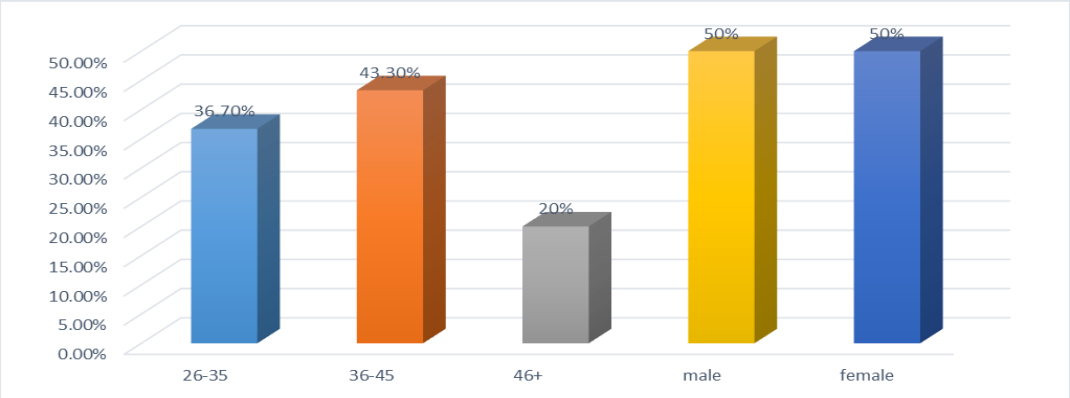

Figure 4.1 : Demography of respondent

There has three research objective conduct in this study and were measured by mean score interpretation.

4.1 Elements and Characteristics of The Efficient Trolley

Table 4.1 show the highest mean (score = 4.5) that trolley items must be able to arrange goods smoothly while the lowest mean number was 4.2 for items Trolley handle must keep good body posture during transferring tasks, then the total height indicates an effective trolley must be easy for arranging goods smoothly and provide space when they are needed. Overall, the need of characteristics of need identified is higher at mean score 4.4. Respondent 1 from interview session also agreed that component of trolley should be durable for loading and unloading task. This is because a durable trolley can support the number of loads that carried by using this trolley. And it must be easy when it comes to arranging products to the shelves. According to Zhang et al, (2019) characteristics of techniques and tools efficient, credible, and useful are required in order fulfill the satisfaction towards users. This mean that to develop the product, most common design is user friendly concept.

Table 4.1: Mean Score of Items in Elements & Characteristics

	Item	Mean	interpretation
ELEMENTS & CHARACTERISTICS OF THE EFFICIENT TROLLEY	Trolley must be able to provide space that I needed	4.4	Very high
	Trolley must be easy for arranging goods smoothly	4.5	Very high
	Trolley must be durable for loading and unloading tasks	4.5	Very high
	Trolley handle must keep good posture of body during transferring tasks	4.2	Very high
	Total Mean Score	**4.3**	**Very high**

4.2 Develop The Trolley Design

The second objective, from the Table 4.2 it shows the highest that have recorded which is a total of 4.5 for trolley design that offers additional space when needed while the lowest mean recorded a total of 4.1 for trolley design can help users arrange products of various sizes to shelves easily, then high mean indicates that additional space able to attract the attention of users because of its uniqueness. Overall, the need of a good design trolley has the higher mean score. Respondent 2 from the interview session also agreed that good design trolley should be able to provide extra or additional space when needed.

Table 4.2 : Mean Score of Items in Develop the Trolley Design

	Item	Mean	Interpretation
DEVELOP THE TROLLEY DESIGN	Trolley design can help users for arrangement of multi size product to the shelves easily	4.1	Very high
	Trolley design can offer extra space when needed	4.5	Very high
	Trolley material can stand pressure of usage	4.3	Very high
	Trolley design can reduce my back pain issue when handling transferring tasks.	4.2	Very high
	Total Mean Score	**4.3**	**Very high**

4.3 The Time Saving When Using The Designed Trolley

The third objective, from Table 4.3 is the highest that have recorded which is a total of 4.4 for two in one trolley concept which can help users do not have to go back and forth picking up goods from certain places while the lowest mean recorded a total reading of 3.9 for trolley layers' numbers is to meet, the needed requirement to load products. Then a high mean number indicates that the trolley produced can save time. Overall, the time saving when using the designed trolley has higher mean score. Respondent 3 from interview session also agreed that by using the trolley, they do not have to go back and forth lifting items or products from certain places.

Table 4.3 : Mean Score of Item in Saving Time

	Item	Mean	Interpretation
THE TIME SAVING WHEN USING THE DESIGNED TROLLEY	Layers number of trolley is to meet the requirement for product load.	3.9	Medium high
	Two in one concept trolley were able to help user so they does not have to go back and forth lifting items from certain places	4.4	Very high
	Usage of this trolley can prevent user from doing repetitive tasks (load – unload – arrangement	4.0	Medium high
	Usage of this trolley can reduce task taken for loading product and shelves arrangement	4.1	Very high
	Total Mean Score	**4.1**	**Very high**

5. SUMMARY AND CONCLUSION

Overall result shows that the product design was able to give satisfaction to user in term of goods loading and unloading process and time used management. This is tally with finding result in Milania (2021) and Wenwen (2019) that good assistant product equipment could help the good outcome of performance. To conclude this project we conducted, this development of multipurpose trolley is proven to be useful for the usage of our company as this brings out good results and outcome for the company on daily basis and in the future. Managing stocks and activities required the owner transferring the products to the shelves manually are no longer an issue since they now have efficient trolley as the main material handling equipment and perfect tool to perform the tasks effectively. Besides, based on the trolley design itself, the back pain problem suffers by the owner were reduced and improvement of good work and body posture has been achieved by developing this trolley.

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DEVELOPMENT OF SCHEDULING SYSTEM AT TAMAN SARI LEGACY HOLDINGS SDN. BHD.

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Abstract. Small and Medium-sized firms (SMEs) are critical to a country's economic, industrial, and social development (Dar, Ahmed & Raziq, 2017). Scheduling is primarily done by human professionals in major corporations using proper technology. However, many small and medium businesses lack the capacity to do so. The creation of a scheduling system for small and medium businesses is described in this study. Using Microsoft Project is about optimising the event booked by Taman Sari Legacy's customers. Due to an increasing number of customers demanding for Taman Sari Legacy services, this company has a problem in properly managing the event date given by their customers. Therefore, this study focuses on the development of a scheduling system for Taman Sari Legacy. The objectives of this study are to identify the problem of event scheduling faced by Taman Sari Legacy Holdings Sdn. Bhd. and to make suggestions and recommendations to Taman Sari Legacy Holdings Sdn. Bhd. and other companies. A total of 30 samples were gathered from respondents. By using Microsoft Excel, the findings show that respondents mostly strongly agreed on item with easy to follow procedures when using existing methods. So, in this system people are more comfortable using existing methods because the way is easy and familiar to them. Respondents also agreed when scheduling deadlines are met using existing methods in their works. Make it easy for workers to know and alert on their work deadlines. Following that, for all the questionnaires, respondents have a minimal amount of vote for strongly disagree and disagree. Most people are capable of using the existing methods and which is easier than the new methods. Therefore, in creating this questionnaire we know how to measure opinions of respondents in understanding of planning and scheduling and what they use or are comfortable with.

Keyword : Scheduling Methods, Scheduling System in Business.

1. INTRODUCTION

The production scheduling system has the main goals or objectives. First, it involves due dates and avoiding overlapping tasks and jobs. Second, to avoid a delay in the completion of jobs. The third goal is throughput times, Taman Sari Legacy Holdings Sdn. Bhd wants to reduce the time spent in writing one by one tasks in the paper, from opening shops until it is closed in operating hours. This study was concerned about the utilization of work centres.

Scheduling can't be done without the knowledge of work being planned. Furthermore, an incomplete planning process might affect the worth of the schedule and this can lead to an uncontrolled flow of project progress. Tracking of project schedule can be achieved properly if effective controls took place. Project planning represents proactive steps in detecting and correcting the schedule. In this aspect, the separation between the two processes could be overlapping and partial duplication in resolving resource constraints in the schedule.

To identify effectiveness and examine current practices of planning and scheduling using Microsoft Project in Taman Sari Legacy Holdings SDN BHD. The study included perspectives of practitioners' familiarity with common planning and scheduling methods, perceptions

about schedule development and control processes, and awareness and knowledge-related planning and scheduling concepts. The outcomes of this study is to examine which tools the company preferred for scheduling. Moreover, the study may provide the effective scheduling strategies and tools needed to improve the understanding of planning and scheduling concepts in current practices of business.

2. LITERATURE REVIEW

2.1 Scheduling System

There are several standards of scheduling systems available, the technological uniqueness of different purpose environments make it difficult to come up with a general scheduling approach (Brandimarte et al., 2000). Usually, the code developed for customization of a packaged scheduling software turns more than half the code of the final version (Pinedo, 2007). The data collected from researchers at Taman Sari Legacy staff were analyzed using Likert type 5-point scale of qualitative data analysis (Bernard, 1995). Data analysis was carried out on the completion of data collection. Development of a customized information system includes those which do not depend on the software development process adopted (kurbel, 2008). Moreover, customized manufacturing scheduling systems are appropriate, by definition, different for each company, also it is clear that some activities in the development process may be common to all companies. As more companies refer to the high-level descriptions of the purpose of the system.

Scope of the development scheduling system refers to business functions targeted to avoid any overlapping tasks and to manage all appointments by date, time, and days. This has two levels of views in the scheduling system. The first one a higher-level used the output of production planning to set up the dates for each job on each machine but for Taman Sari Legacy Holdings Sdn. This higher-level is used to record all the dates of activities, tasks, appointments, and events from clients. The second one is a lower level involved with real-time appointment planning, to write the exact time. The important point of understanding the schedulers doesn't carry out all tasks, it is just reminded and aligned with all the activities. The scheduling system of all the time also changes over time because of external factors including instability and uncertainty of the business environment.

3. METHODOLOGY

The word "research methodology" refers to the systematic procedure of conducting research. There are numerous methods employed in various forms of research, and the phrase is commonly used to refer to study design, data collection, and data analysis. Traditionally, research approaches have been widely characterised as qualitative or quantitative, resulting in a significant difference among researchers, particularly in the social sciences (Onwuegbuzie and Leech, 2005). The distinction between these two strategies has been highlighted in numerous research methodology papers (Howe, 1988; Neuman, 1997). For example, Myers (2009, p. 8) distinguishes between qualitative and quantitative research, stating that qualitative research focuses on text and analyses general tendencies across populations, whereas quantitative research focuses on numbers. Quantitative research is based on determining the quantity or amount of something. A process is described or stated in terms of one or more quantities in this case. Qualitative research is concerned with quality-related qualitative phenomena. It is non-numerical, descriptive, reasoning-based, and verbal. Its goal is to determine the situation's significance, emotion, and description. Using the terminology from Hentschel's (1999) Research Methodology-Data Framework, random sample surveys typically yield quantitative data that may be statistically analysed with the goal of measuring, aggregating, modelling, and predicting behaviour and relationships. Contextual approaches, on the other hand, are applied to a specific location, case, or social environment, and therefore compromise population coverage and statistical generalisability in order to dig deeper into concerns (Booth et al, 1998).

Besides that, taking more informed decisions when dealing with real-time disturbance management, research methodology refers to the process of gathering data for research undertakings. The results of the case study show that it is feasible to use the developed framework to identify the optimal preservation activity timing for an infrastructure system whose level of service is subject to disruptions from a neighbouring system. Data can be collected for theoretical or practical study, such as management research, operational planning approaches, and change management. Therefore, researchers decided to use the method of system collecting data. Data was gathered from both primary and secondary sources in order to conduct the study. The primary data were acquired from 30 respondents using a structured questionnaire with a Likert type 5-point scale, and convenience sampling was utilised to choose the respondents. Other than that, researchers also conducted telephone interviews instead of face-to-face interviews with the owner of Taman Sari Legacy Holdings Sdn. Bhd. due to the Movement Control Order. Secondary data was gathered from manuals, academic publications, and books, as well as current and available information from Internet sources. Collected data were computed and analyzed by the researchers using Microsoft Excel.

4. DATA ANALYSIS

The questionnaire utilized a 5-point Likert scale (i.e., 1 = strongly disagree, 5 = strongly agree) in an attempt to examine respondents' level of agreement with a set of statements. Jamieson (2004). Most of our respondents are public servants who follow their work schedules and a quarter of them are not working and students. In this case the highest score is 4.63 for item number 6 which is "Easy to follow procedures when using existing methods" because, when people are already accustomed to using the old method, learning a new system will be difficult for them to adapt and apply it. From the data analysis, the lowest score is 4.1 from item 8 which is "Customers have understood the scope and purpose of planning and scheduling" it is because when customers have to make an appointment with the company they should know the company scope before make an appointment so it can be easier to the company set the date and rescheduling for customer.

Firstly, Question 1, 13 of them from people who work selected number 5 in 44.8% because they agree that every plan made will affect all aspects of the job and following number 4 in 41.4%. Next, question 2 the higher vote is number 5 most of respondent strongly agree by 13 people that have 44.8% because schedule system is the priority to every company to update term to latest date so easy to employee doing their work by this scheduling. Question 3 higher vote goes to number 4 by 21 in 55.2% because mostly scheduling includes the deadlines and starts to be used as a reference for employees and the least votes are number 1 and 2 that is zero. Question 4 most of the respondents picked number 5 for strongly agree by 17 that have 44.8%. Question 5, which has 58.6% respondents pick number 5 for strongly agreeing with existing methods, is easy and understanding to use for organization in the company so it will be hard to use new scheduling.

Question 6, most of the respondents voted number 4 in 50.9% and the least voting was number 1 at only 1.9%. Question 7, 41.5% voted for number 4 because scheduling is a must in every company because it will interact with all organizations in the company to produce a smooth and systematic work. As for Question 8, 47.2% of respondents voted number 4. It is important for customers to know the scope or purpose of the company so they have to make an appointment first. And the least vote is number 3 at 22.6%. Question 9 in 45.3% respondents voted for number 4. Lastly, question 10, the scheduling system has to be controlled by someone as the system needs to be updated regularly to keep people well-informed. Most of the respondents picked number 4 in 37.7% followed by number 5 of 35.8%. In conclusion, samples collected from the respondents marked most of them strongly agreed (5) and agreed (4) with the questions given.

The table below shows frequency and mean gained from the questionnaires.

Table 4.1: Result of the questionnaire

No.	Items	Strongly Disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly Agree (5)	**Mean**
1	Planning reflects all inputs and needs	0	0	5	12	13	**4.27**
2	Scheduling systems are updated in terms of latest date	0	0	5	12	13	**4.27**
3	Scheduling deadlines are met using existing methods	0	0	1	21	8	**4.23**
4	Updating of event sequences or priorities is controlled by using scheduling system	0	0	8	5	17	**4.3**
5	Easy understanding of existing methods across organization	0	0	5	9	16	**4.4**
6	Easy to follow procedures when using existing methods	0	0	3	5	22	**4.63**
7	Scheduling is a critical area where works interacts in the organization	0	0	5	14	11	**4.2**
8	Customers have understood the scope and purpose of planning and scheduling	0	0	5	17	8	**4.1**
9	Accurate estimates of schedule uncertainty using existing methods	0	0	4	15	11	**4.23**
10	Updating of event durations (days) is controlled by using scheduling system	0	0	3	14	13	**4.3**

Source: Assessing Understanding of Planning and Scheduling Theory and Practice on Construction Projects (Hammad AlNasseri & Radhlinah Aulin, 2015)

All Equations used for data analysis should be numbered, plus, divided and formed in the center of the paper. For example:

$$\frac{5(3) + 12(4) + 13(5)}{30} = 4.27$$

5. CONCLUSION

Planning and scheduling provide the road map for organizations concerned with timely delivery of projects and the efficient use of resources. The study was used to identify and rank identified factors based on a survey capturing the views of different project stakeholders within the construction industry. There are some important limitations of the study as conducted. This scheduling does not reach the level of suitability for the company and it is not directly to the employee or customers.

- Most practitioners tend to use traditional methods and tools in planning and scheduling, despite the existence of other modern management approaches. The reason seems to be that the fundamentals of traditional methods are easier to comprehend and share with co-workers than newer, more sophisticated approaches.
- Despite most practitioners recognizing the importance of input factors for building and managing schedules, there is awareness of the shortcomings of current scheduling approaches and a call to enhance the effectiveness of these approaches.

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RAW MATERIAL CALCULATION 1.0

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Abstract. The project of Raw Material Calculation is carried out based on the sauce. The main purpose of this project is to develop a formula for the calculation of raw materials in the sauces production process by using Microsoft Excel as a calculation tool. This project can avoid wastage of raw materials during sauces production in a more systematic approach. Furthermore, the raw material formula also plays an essential role in referring to all the costs incurred by the company. This formula is used to determine the budget of an ingredient per unit to produce a sauce. In addition, it can also help determine the cost applied to make the product. The cost per unit formula (total cost of product), the number of units produced and selling price must be equal to or greater than the cost of product per unit to avoid losses.

Keyword : Raw Material Calculation , Develop Formula , Microsoft Excel , Calculation tool

1. INTRODUCTION

The calculation is a procedure being performed several ways, depending on the practices of the user or the company. Methods used may depend on a complexity, significance, level of calculation and application created by a designer. There are intensive calculators intended for a specific field of calculating raw material and all-purpose calculators to be used more superficially. Consequently, the letters are more flexible, but they need more control from the user. Raw Material Calculation adopts Microsoft Excel that will apply in the industry for conversion to finished products. The calculation of raw materials also plays an important role in preventing losses in the company. In addition, the calculation method assists in estimating raw materials before producing a product. This method will reduce the time to make the product.

As a result, raw material calculations will help other companies to enhance their knowledge about calculation methods. They can use these calculation tools in their daily routine. In this study, the company chosen for this project implementation is INCUBATOR BEEZZY BIZZ.

2. LITERATURE REVIEW

Small-scale food processing enterprises play a vital role in the Malaysian economy, for example, as an employment generation, income distributor, and the training ground for entrepreneurs before they invest in larger enterprises. (Ghani Senik, 1995).

Incubator Beezzy Bizz is one of food processing industry, located in MALIM, MELAKA, which produces sauces such as chilli sauce, black pepper sauce, Thai sauce and Korean sauce. The main ingredients for chilli sauce are chilli, while black pepper sauce are black peppers. Both chilli sauce and black pepper sauce products have a broad market in West Malaysia. A small company like the Incubator Beezy Bizz needs a systematic method of calculation. In addition, they calculate the raw materials using a manual method by referring to recipe books. Therefore, this study developed the raw material calculation tool for the benefit of the company itself.

Based on interviews with supervisors at Incubator Beezzy Bizz, the researcher found that many problems in their business. Meanwhile, the main problem is to find accurate calculations of raw materials. So the researcher develops calculator tools using Microsoft Excel to solve their problem.

Excel Software offers the user a possibility to build up a calculation formula for their purpose at any time. The calculation can be saved as independent files and archived as evidence of raw material in the future. (Samuli Lampinen, 2016).

3. METHODOLOGY

The methodology is a vital beginning step and has become the spine of this study. It could be a challenging data collection point in this circumstance. In this situation, this project will be beneficial to develop a formula for the calculation (of raw materials) to produce sauces more systematically. So, this raw material calculation by using a calculator in excel will be converted into a system to make it easier for them to make calculations in larger quantities. They need to key in raw material in this calculation system and get accurate raw material to produce their product. This way will make it easier for them to reduce the time for making the products.

On the other hand, using this method indirectly can avoid mistakes in producing products and maintain product quality. This method assumes that the calculator tools described would be a prototype that would shape the future, and there remains much to do in terms of development and improvement.

4. DATA ANALYSIS

Data obtained from our survey was answered by 30 respondents through a set of questionnaires and interviewed. Based on Figure 4.1, there are three different categories of respondents of age, comprising 28 respondents (69.8%) from the age 12-29 years old. 7 respondents (18.6%) from the age of 18- 29 years old. 4 respondents (9.3%) from the age of 41-60 years old.

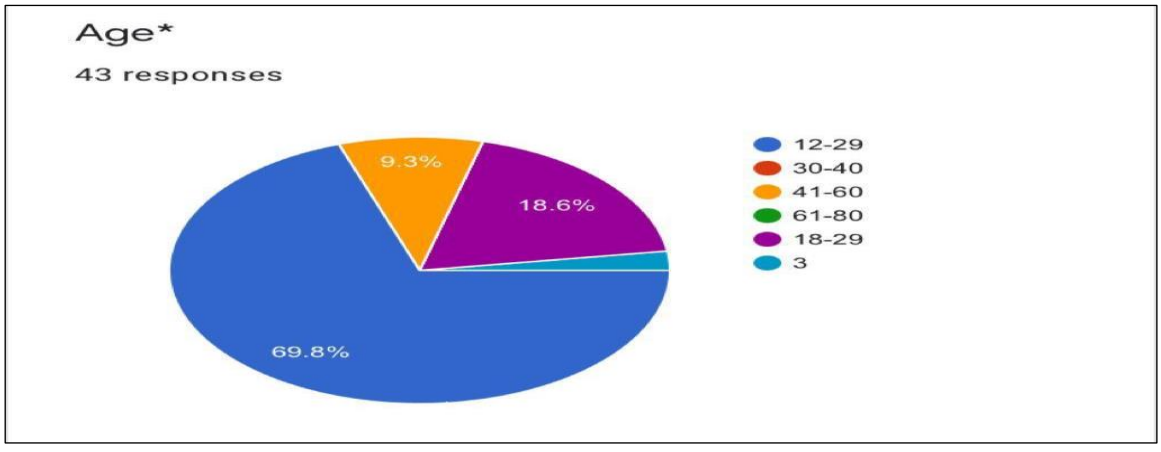

Figure 4.1: Demography of respondent

The questionnaire set consists of two parts of information, demography and variable measurement with 9 questions. Data will be interpreted by referring to Chan Yaw Piaw (2006) measurement.

Table 4.1 : Interpret Measurement of Mean Score

Min score	1.00-2.00	2.01-3.00	3.01-4.00	4.01-5.00
Interpretation	Low	Medium Low	Medium High	Very high

4.1 To Identify The Characteristics Features Of An Affective Raw Material Calculation

Based on the first objective, the highest mean recorded 4.2 to develop a company specific Excel tool for raw material calculation while the lowest mean number 3.7 they haven't performed raw material calculation in their career. Most of the respondents believe that we should develop a company specific Excel tool for raw material calculation so that they can learn how to use the calculation tool during their career. Overall they agree to compose calculations using Microsoft Excel when needed because this calculation method will help them to improve the method of calculation during processing the sauce product.

Table 4.2 : Mean Score of Items in Elements & Characteristics

	Item	Mean	interpretation
TO IDENTIFY THE CHARACTERISTICS FEATURES OF AN AFFECTIVE RAW MATERIAL CALCULATION	Have you performed raw material calculation with Excel during your career?	3.7	Very high
	Have you composed calculations using an Excel calculator when needed.	4.0	Very high
	Is it worthwhile to develop a company specific Excel tool for raw material calculation.	4.2	Very high

4.2 Develop A Raw Material Formula Effective Raw Material Cost Calculation

Based on the second objective, the highest mean recorded total of 4.4 for excel can calculate more quickly than using a calculator because it's more accurate while the lowest mean recorded a total of 3.98 for them to think about calculation differently when using a calculator. Then high mean indicates that excel can simplify the calculation because of its uniqueness. Overall the formula in excel is better than using a calculator.

Table 4.3 : Mean Score of Items in Develop A Raw Material Formula

	Item	Mean	Interpretation
DEVELOP A RAW MATERIAL FORMULA EFFECTIVE RAW MATERIAL COST CALCULATION	Excel can calculate more quickly than using a calculator.	4.4	Very high
	You think about calculation differently when you use Excel than when you use a calculator.	3.9	Medium high
	Excel is more accurate than a calculator for calculating raw material.	4.3	Very high

4.3 To Assess The Effectiveness For Raw Material Calculation

Based on the third objective, the highest mean recorded a total of 4.4 for this system demonstrates a fast and easy method to create a calculator in Microsoft Excel while the lowest mean is using an excel for calculating raw material more systematically. The respondents also believe that this system makes it easy for them. Overall, the respondent approved the effectiveness for raw material calculation because it is more systematic to use.

Table 4.4 : Mean Score of Items for the Effectiveness of Raw Material Calculation

	Item	Mean	Interpretation
TO ASSESS THE EFFECTIVENESS FOR RAW MATERIAL CALCULATION	Does this system demonstrate a fast and easy method to create a calculator in Microsoft Excel.	4.4	Very high
	Using excel for calculating raw material is more systematic.	4.3	Very high
	Does this system make it easy for you?	4.4	Very high

5. CONCLUSION

As a result, raw material calculations will help other companies to enhance their knowledge about calculation methods. We propose a method of calculating raw materials by using a calculator in excel and will be converted into a system to make it easier for them to make calculations in larger quantities. This system will solve many problems and prevent them from making mistakes in the balance so that there are no losses. As a suggestion, this system too should be implemented by using formulation on the online application for future research.

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SMART SHOPPING USING MOBILE APPS (QUICK SHOP APPS)

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Abstract. In today's world, purchasing and shopping at supermarkets and malls are becoming part and parcel of urban life. The huge rush in the markets and malls can be noticed on holidays as well as on the weekends. The problem occurs which leads customers to find their likely products and to pay the bills standing in long queues; both of these are time consuming and tiring. In this paper, the topic discussed is about an all new complete smartphone application Quick Shop Apps which will make our shopping experience completely smart and hassle free. Particularly during and after the COVID-19 situation, social distancing and human health will become the foremost priority of modern civilization. This will help the management to make sure the customers follow the SOP. This is the ideal situation to make use of this all new technology in which the customer can purchase his/her needful products at one's fingertips by visiting the nearby market without spending much time to checkout his/her needful products. This entire shopping system will be controlled by our own indigenous developed mobile apps. Customers can scan the barcode of the product they pick and total up the bill on their own without depending on the cashier. This smart apps not only save time for the customer but also helps the developer to reduce cost spent on labour. Therefore, this paper intends to design an application, which is able to add products into mobile shopping carts by scanning the barcode through smartphone camera and make auto billing.

Keyword: Social distancing, mobile apps, barcode scanner, reduce labour cost, auto billing.

1. INTRODUCTION

From the past two decades, the usage of mobile devices has greatly increased, which has led to ease of carrying out day to day activities. Nowadays, wireless networks have taken over the entire world. Financial transactions can now be done easily anywhere and anytime and secured for all purposes like business, shopping and more. Using the Internet, connections can be established with any device and can share information among people from any part of the world. They are only a few clicks away through our smartphones to accomplish tasks faced in our daily lives.

Sometimes customers have problems regarding the incomplete information about the product and waste of unnecessary time at billing counters. Continuous improvement is required in the traditional billing system to improve the quality of shopping experience to the customer. Today we have a growing technology where we can do a lot of things in just a short period of time. By using the latest technology we can replace the traditional billing system which consumes a lot of time into something much more easier and quicker. That's what motivates researchers to find solutions to the problem that discovered in this research.

2. LITERATURE REVIEW

The retail industry has been advocating "Smart Shopping" for many years by adopting various technologies to enhance the shopping experience in the retail environment. The vision of smart shopping promises is to provide on-the-spot information about various discounts, schemes, etc. at consumers' fingertips (Borkar & Ansingkar, 2015). The advantages of mobile commerce are that it can create customer satisfaction and cost saving. Other than that mobile commerce can also create new business opportunities which allow for considerable profit and improvement of customer relation.

While coming across various technologies such as online shopping where items are purchased online through various websites, the drawbacks encountered were fraud, shipping cost, deprives consumer tangibility and lack of option (Nagra & Gopal, 2013). In traditional shopping methods various difficulties faced are long queues, huge waiting time and lack of product information.

This paper assumes that the application described would be a prototype that would shape the future and there still remains much to do in terms of development and improvement of the existing models. Applications created with ease of understanding and the design can be created and tailored to the shopping process to make it more effective and user friendly, thus making it easier and convenient for the users to do the entire shopping process with the use of this application. In the proposed work, the users will scan the item which they want to purchase with the help of a scanner provided by this apps. After scanning of the item a web service will get called which will create a connection with the database of the shop. As the connection is established, the users are now synched with the database and information related to that item provided. In this whole procedure the overall time of scanning of individual items is saved and thus reducing the time of the shopping. The assumptions for the apps are to have mobile or Wi-Fi facility and users have installed the apps.

3. METHODOLOGY

Methodology is a vital beginning step and has become the spine of this study. It could be a challenging data collection point in this circumstance. In this situation, this project will be beneficial for the society in this pandemic situation in order to have a contactless shopping experience and also for the management to maintain with a limited number of staff. This paper assumes that the application described would be a prototype that would shape the future and there still remains much to do in terms of development and improvement of the existing models. The Agile model has been used as an application development method because it is one of the simplest and effective processes to turn a vision for a business need into software solutions. Applications created with ease of understanding and the design can be created and tailored to the shopping process to make it more effective and user friendly, thus making it easier and convenient for the users to do the entire shopping process with the use of this application. On the other hand, questionnaire distribution method is also used as it is one of the effective methods of getting direct results from people.

4. DATA ANALYSIS

4.1 Flow Graph

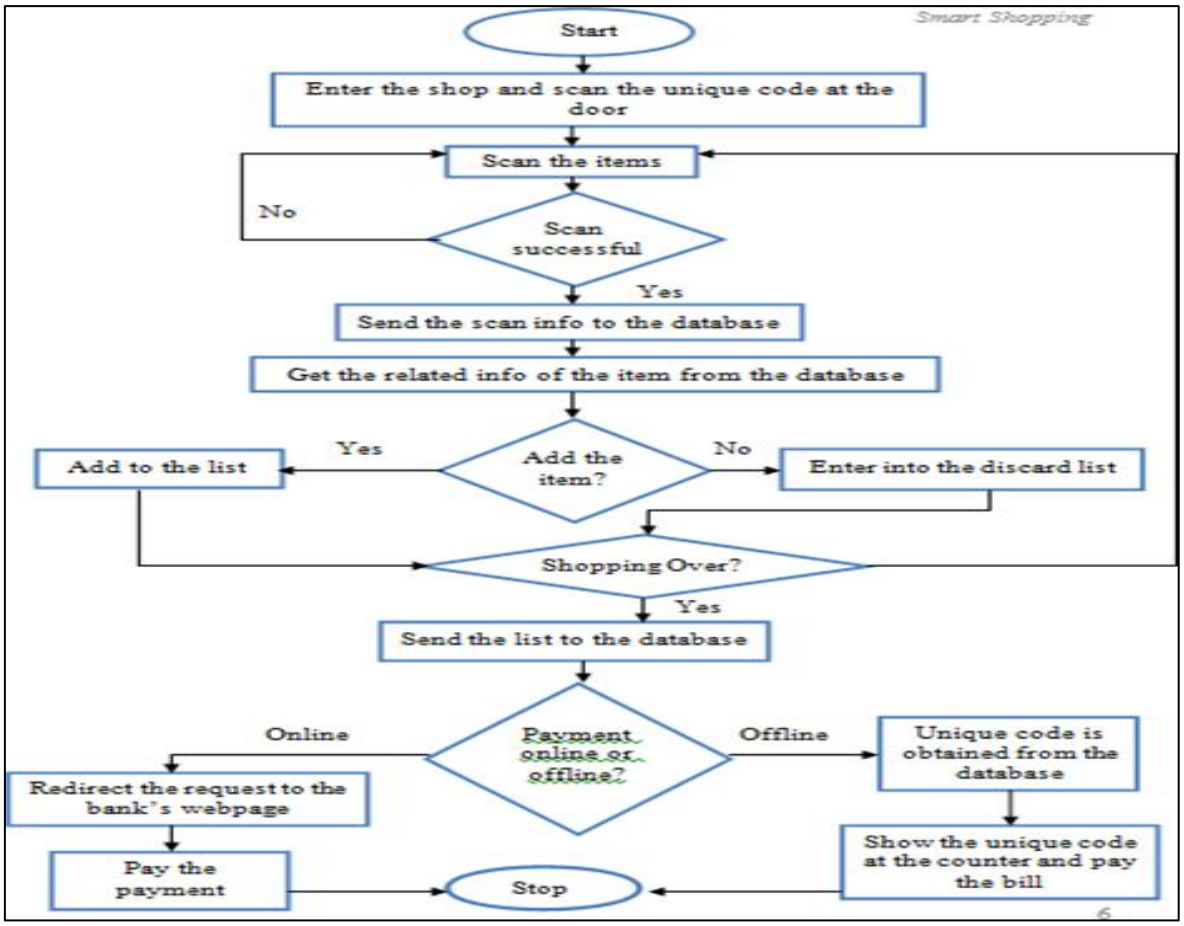

Figure 4.1: Flow Graph

4.2 Web Service

A web service is software which can connect any device that is active on the internet to another and establish communication between them. It uses HTTP as a common communication protocol. Web service is required to establish communication between android device and shop's database to exchange information.

4.3 Database

The shop's database is designed using a suitable interface system. It provides an interface with the help of which any database can be easily designed. The shop's database consists of six table:

- Inventory system- It provides information about the availability of the items, their unique id, product id etc.
- Item table- It provides detailed information of each item from its manufacturing date, price, weight, etc.
- Shopper details- The customer's information will be stored in this table including his address and phone number that will be used at the time of online payment.
- Shopper session- This table will have information about the time when customer has logged in after scanning the shop's barcode till the successful payment completion.
- Store details- This table will have detailed information about the shop's name, its branch and unique id (barcode) that will be retrieved at the time of scanning of the shop's barcode.
- Final order table- This table maintains customer information about his purchases, total cost, session id and all that information that is required to generate a final bill.

4.4 Application Features

Quick Shop apps has following features-

- Reduces scanning time
- Maintains History of purchased products
- Auto billing
- Provide product information

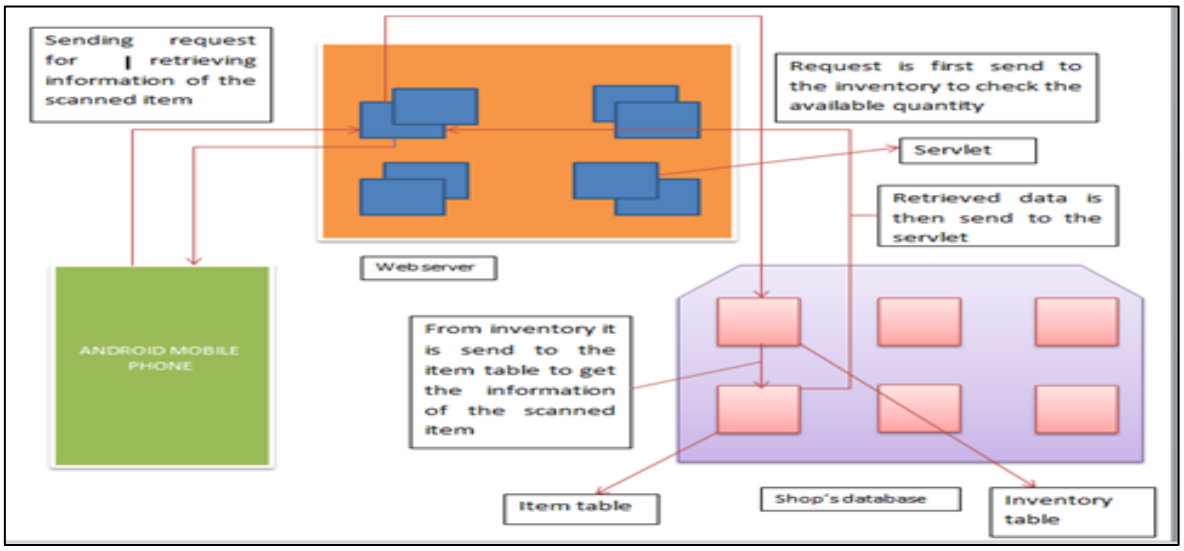

Figure 4.2 : Working of The Apps

A survey was conducted at two shops at Plaza Pandan Malim, Angee and Econsave. The issues analysed are the time taken for billing, SOP breaching and whether this idea could reduce labor cost or not. The following data was collected from 80 respondents which consist of local residents of Melaka Tengah who shops regularly at Angee and Econsave Malim.

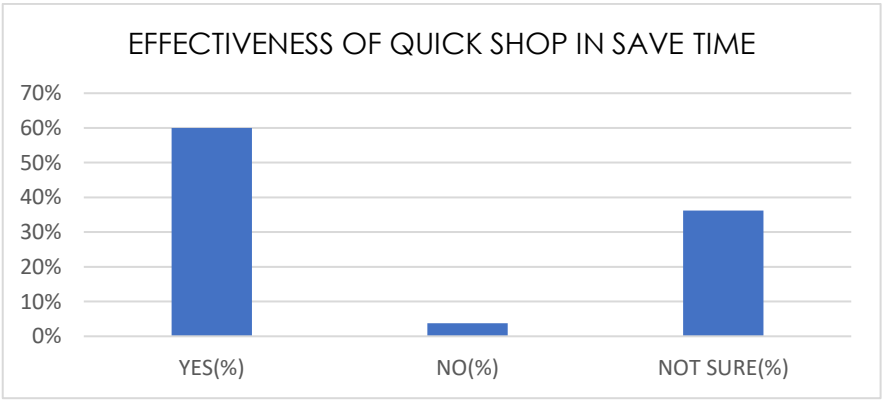

Figure 4.3: Effectiveness of Quick Shop in Save Billing Time

Figure 4.3 shows the result of a survey conducted in order to find out how smartphone billing apps can reduce the time taken for billing. Most of the respondents believe that usage of such an application can save their precious time and also help in maintaining social distance between customers. As for the management, they believed that the usage of this type of application can reduce the labor cost spent to hire more workers in cashier department.

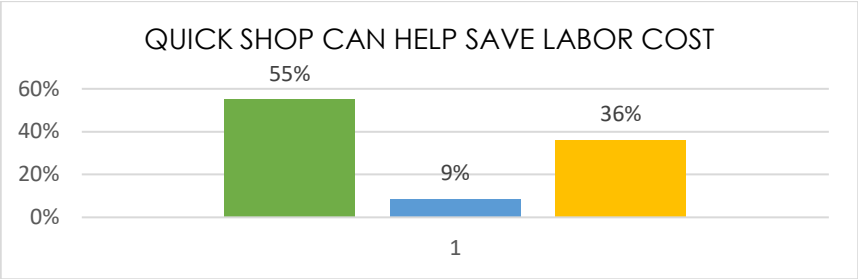

Figure 4.4 : Usage of Quick Shop Apps in Reducing Labor Cost

As shown in Figure 4.4, the green bar indicates the number of management staff that agreed with the effectiveness of the quick shop apps in reducing labor cost and the yellow bar shows the amount of management staff that were still unsure about how the apps can reduce the labor cost.

5. CONCLUSION

As the demand for quick shopping is increasing the requirement of more secure, safe and reliable transactions is of utmost demand. Smart phones, that have become an important part of today's life, have reduced all the efforts that are required for shopping. With a camera feature in it, the users can scan the barcode of the item to be purchased and then directly add it into the cart. There are two advantages of it which are first, there is no need to stand in the queue for a long time in malls just for scanning the item and second it will help to reduce labor cost for the shop. Other than that, this type of technology usage in shops helps to maintain social distance and avoid other SOP breaching. The items so far purchased by the customer will be maintained in the app. This quick transaction will only need a few cashiers to handle a huge amount of customers. We would like to highlight a few strong points that might help this application to be developed better in the future. This application also can be improved with an online payment method or user wallet in order to save more time. This application's scanner can be improved to scan RFID which will be more useful in future.

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