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NURUL SHIMA TAHARUDDIN,
MUHAMAD ABDUL AZIZ AB GANI,
NOR IDAYU IBRAHIM, HASLINDA MD NAZRI,
MUHAMMAD REDZA ROSMAN, NIZAR NAZRIN,
ANWAR FIKRI ABDULLAH

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Pendekatan Teori Estetika dalam Karya Jalaini Abu Hassan

Aesthetic Theory Approach in the Works of Jalaini Abu Hassan

Nur Fatiha Aziera Ain Binti Mohd Khime[1], Nurul Huda Mohd Din[2], Mohd Suhaimi Tohid[3]
[1,2,3]Fakulti Seni Lukis dan Seni Reka, Universiti Teknologi MARA, Cawangan Selangor, Kampus Shah Alam, 40450 Shah Alam, Selangor, Malaysia

*fatihakhime99@gmail.com[1], huda_din@uitm.edu.my[2], msuhaimi913@uitm.edu.my[3]
***Corresponding author**

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ABSTRAK

Sebagai tempat penyimpanan ilmu tradisi, peribahasa Melayu dilihat sebagai kebijaksanaan masyarakat zaman dahulu. Peribahasa Melayu berperanan sebagai lambang budaya falsafah, cita-cita moral, dan pandangan hidup bagi masyarakat Melayu. Walaupun pada masa ini terdapat sedikit perbincangan ilmiah mengenai penyelidikan ini, menjadikan peribahasa Melayu menjadi seni visual menawarkan peluang untuk merapatkan jurang antara tradisi lisan dan estetika kontemporari. Gurindam Jiwa (Indian Summer), lukisan kanvas media campuran oleh Jalaini Abu Hassan dari tahun 2000, adalah ilustrasi yang kuat tentang bagaimana peribahasa Melayu boleh diubah menjadi seni visual. Kerangka teori Terry Barrett, yang merangkumi komponen penjelasan, tafsiran, dan penilaian, akan digunakan dalam kajian ini untuk menemui dan menyiasat bagaimana peribahasa Melayu telah diserapkan ke dalam seni visual. Analisis formal karya seni adalah fokus utama kaedah kualitatif, yang ditambah dari katalog pameran, penulisan kritis, dan rujukan kontekstual. Hasil kajian menunjukkan bahawa karya seni Jalaini menggabungkan corak bunga simbolik dengan metafora budaya yang mendalam, yang semuanya disampaikan melalui penggunaan warna dan tekstur yang ekspresif untuk membangkitkan kenangan peribadi dan masyarakat. Lukisan ini bukan sahaja menarik secara visual, tetapi juga menekankan keperluan menggunakan imejan peribahasa bagi memelihara budaya, mengukuhkan identiti Melayu, dan menghubungkan nilai tradisional dengan wacana seni moden Malaysia.

Kata Kunci: *Peribahasa Melayu, seni visual Malaysia, Jalaini Abu Hassan, Gurindam Jiwa, teori Terry Barrett.*

ABSTRACT

As a repository of traditional knowledge, Malay proverbs are seen as the wisdom of ancient societies. Malay proverbs serve as cultural symbols of philosophy, moral ideals, and outlooks on life for the Malay community. Although this research is currently limited to academic discourse, incorporating the use of Malay proverbs into visual art can create the potential to connect oral traditions with contemporary aesthetics. Gurindam Jiwa *(Indian Summer)*, a mixed media canvas painting by Jalaini Abu Hassan from 2000, is a powerful illustration of how Malay proverbs can be transformed into visual art. Terry Barrett's theoretical framework, which includes components of explanation, interpretation, and evaluation, will be used in this study to discover and investigate how Malay proverbs have been incorporated into visual art. Formal analysis of artworks is the primary focus of the qualitative method, supplemented by exhibition catalogues, critical writing, and contextual references. The results of the study show that Jalaini's artworks combine symbolic floral patterns with deep cultural metaphors, all conveyed through the expressive use of color and texture to evoke personal and community memories. This painting is not only visually appealing, but also emphasises the need to use proverbial imagery to preserve culture, strengthen Malay identity, and connect traditional values with modern Malaysian art discourse.

Keywords: Malay proverbs, Malaysian visual arts, Jalaini Abu Hassan, Gurindam Jiwa, Terry Barrett's theory

1 PENGENALAN

Istilah "seni" berasal daripada perkataan Latin *ars* yang bermaksud seni, kemahiran atau kraf. Dalam bahasa Yunani pula, istilah *techne poesies* bukan sahaja merujuk kepada seni halus, tetapi juga kepada pemilikan kemahiran tertentu, keupayaan untuk menghasilkan sesuatu, serta hasil ciptaan itu sendiri (Zachary Isrow, 2017). Seni juga merupakan medium yang mampu menyampaikan makna dan perasaan mendalam melalui bentuk, warna, dan simbolisme. Memahami makna seni bukan sahaja membolehkan kita menikmati karya seni dengan lebih mendalam, tetapi juga memberi peluang untuk merenung nilai, identiti, dan pengalaman hidup yang terkandung di dalamnya. Seni dianggap sebagai sebahagian penting daripada aktiviti manusia, iaitu gabungan aktiviti mental dan fizikal di mana penciptaan serta ekspresi memainkan peranan yang signifikan.

Penggunaan peribahasa Melayu merupakan salah satu unsur budaya yang paling kaya dan sering dimasukkan ke dalam seni visual di Malaysia. Peribahasa yang diwariskan secara lisan sejak berabad-abad ini tertanam kukuh dalam kebijaksanaan tempatan, tradisi, dan ajaran moral. Ia mencerminkan pandangan dunia masyarakat Melayu dan berfungsi sebagai alat linguistik serta falsafah. Peribahasa Melayu menawarkan makna yang mendalam, menghubungkan tradisi lisan dengan budaya visual, membolehkan seniman memelihara warisan tradisi sambil membincangkan isu kontemporari apabila ia dijadikan ilham dalam berkarya.

Kajian ini memberi tumpuan kepada kepelbagaian medium dan interpretasi peribahasa Melayu dalam karya-karya Jalaini Abu Hassan. Objektif kajian ini adalah untuk mengenal pasti peribahasa Melayu dalam karya seni, mengkategorikan artis yang menggunakan peribahasa Melayu, dan menganalisis peribahasa Melayu dalam konteks budaya dan tradisi Melayu menggunakan pendekatan umum. Kajian ini menggunakan kaedah kualitatif melalui analisis visual dan kajian dokumen, dengan memberi fokus kepada karya terpilih Jalaini Abu Hassan yang mengandungi peribahasa Melayu, khususnya karya yang berunsurkan motif flora dan fauna. Dapatan kajian menunjukkan keupayaan Jalaini Abu Hassan mengintegrasikan pelbagai pendekatan sambil menyerap nilai budaya dan makna falsafah daripada peribahasa Melayu. Kajian ini menyumbang kepada pemahaman tentang peranan kebijaksanaan tradisional dalam memperkayakan seni kontemporari Malaysia.

2 PENULISAN

Walaupun banyak penulisan mengenai seni Malaysia, peribahasa Melayu, dan warisan budaya, kajian ini berusaha mengumpulkan serta meneliti maklumat mengenai subjek tersebut daripada pelbagai sumber termasuk buku, penulisan akademik, dan tradisi lisan yang diwariskan turun-temurun. Kajian ini menumpukan kepada penerokaan hubungan antara kepelbagaian teknik cetakan dan interpretasi peribahasa Melayu dalam karya-karya Juhari Said. Tujuannya adalah untuk menghimpunkan pengetahuan tersebut dan mempersembahkannya secara kreatif sebagai sumbangan terhadap pemahaman seni visual Malaysia.

2.1 Biografi Terry Barrett

Terry Michael Barrett ialah Profesor Emeritus di Ohio State University dan seorang pengkritik seni serta pendidik seni dari Amerika. Sumbangannya sangat besar dalam membentuk bidang pendidikan seni, estetika, dan kritikan seni. Seni kontemporari kini lebih difahami hasil daripada pengaruh beliau. Antara penerbitannya yang berpengaruh termasuk Why Is That Art? Interpreting Art (2002) dan Criticizing Art (1999). Menurut teori kritikan seni Terry Barrett, sesuatu karya seni membuka ruang untuk pelbagai tafsiran yang munasabah. Beliau menegaskan bahawa makna seni dibentuk melalui latar belakang, emosi, pengalaman, dan perspektif budaya penonton, dan bukannya bersifat tetap. Kerangka ini menjauhkan diri daripada penilaian tunggal, malah membuka ruang dialogik dalam menilai seni.

Kritikan kontekstual mengajak penonton berfikir tentang karya seni berdasarkan konteks sejarah, sosial, dan budaya serta niat pengkarya kerana pendekatan Barrett berasaskan idea tersebut. Menurut beliau, penonton turut terlibat secara aktif dalam interpretasi, dan tafsiran mereka dianggap sah serta penting untuk memahami sesuatu karya seni. Kajian ini meneliti interpretasi visual oleh artis Malaysia terhadap peribahasa Melayu dengan menggunakan teori Terry Barrett. Ingatan kolektif dan kebijaksanaan budaya memberi pengaruh terhadap makna pelbagai lapis yang terkandung dalam peribahasa, seiring dengan penekanan Barrett terhadap konteks dan penglibatan peribadi.

2.2 Teori Kritikan Seni oleh Terry Barrett

Terry Michael Barrett merupakan pengkritik seni dari Amerika dan pernah berkhidmat sebagai profesor pendidikan seni di Universiti North Texas serta Profesor Emeritus di Universiti Ohio State. Beliau menghasilkan banyak buku, bab dalam antologi, dan artikel berkaitan seni kontemporari, kritikan seni, dan estetika. Dalam teori Barrett, terdapat tiga langkah utama iaitu deskripsi, interpretasi, dan penilaian. Seperti teori kritikan Edmund Feldman, teori Barrett juga popular dan digunakan secara meluas dalam pelbagai bidang seni termasuk seni visual, muzik, dan kesusasteraan.

Menurut Barrett, makna seni tidak hanya bergantung kepada karya itu sendiri, tetapi juga pada proses interaksi antara artis dan karya, serta tafsiran penonton. Beliau menekankan bahawa konteks sangat penting dalam memahami dan menghargai seni. Latar belakang artis, konteks sosial dan budaya di mana karya dihasilkan, serta pengalaman dan tafsiran individu penonton perlu dipertimbangkan bagi mencapai kefahaman yang lebih menyeluruh terhadap karya seni.

Selain itu, Barrett berpendapat bahawa seni merupakan medium yang menghubungkan artis dan penonton dalam mewujudkan interaksi dialog yang lebih mendalam dan bermakna. Beliau turut membangunkan beberapa langkah mudah dalam menganalisis karya seni melalui teori ini.

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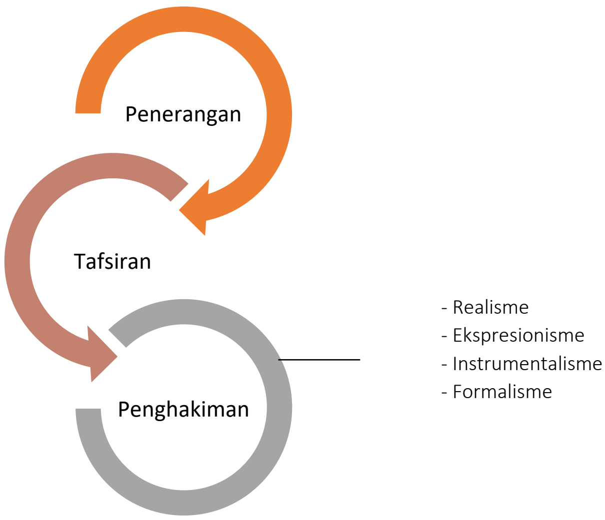

Rajah 1 Teori Kritikan Seni oleh Terry Barrett
(Sumber: Pengarang, 2023)

Dalam teori kritikan seni yang diperkenalkan oleh Terry Barrett, terdapat tiga langkah utama yang menjadi panduan dalam memahami karya seni, iaitu deskripsi, interpretasi, dan penilaian. Pada peringkat pertama, iaitu deskripsi, penekanan diberikan kepada usaha mengenal pasti serta merekod segala maklumat asas yang terdapat pada sesebuah karya. Hal ini meliputi butiran seperti nama artis, judul karya, bahan, teknik, tarikh penghasilan, dan subjek yang digambarkan. Selain itu, aspek medium atau bahan yang digunakan oleh artis turut diambil kira kerana ia mencerminkan cara sesuatu bentuk dihasilkan. Dalam proses ini, pengkritik juga meneliti elemen formal seperti garisan, bentuk, warna, tekstur, cahaya, ruang, serta prinsip seni seperti imbangan, irama, dan penekanan yang menyusun keseluruhan komposisi karya.

Langkah kedua ialah interpretasi, iaitu proses memahami maksud dan tujuan karya seni. Menurut Barrett (2002), interpretasi tidak sekadar memberi tafsiran kosong, tetapi merupakan hujah yang berasas serta meyakinkan tentang mesej yang ingin disampaikan oleh artis. Proses ini membincangkan makna sama ada tersurat atau tersirat, serta menyingkap tema yang mendasari karya. Interpretasi juga sering dipengaruhi oleh latar belakang, pengalaman, kepercayaan, dan pengetahuan seseorang pengkritik. Oleh itu, tiada satu tafsiran yang dianggap mutlak benar; sebaliknya, tafsiran yang baik ialah yang mampu membuka ruang pemahaman baru, bernas, serta memberi penjelasan mendalam tentang karya seni.

Akhir sekali, proses kritikan seni menurut Barrett ditutup dengan penilaian. Pada tahap ini, pengkritik membuat keputusan tentang nilai dan kualiti karya seni dengan merujuk kepada teori estetik tertentu. Empat kriteria utama sering digunakan, iaitu formalisme, realisme, ekspresionisme, dan instrumentalisme. Formalisme menekankan keindahan bentuk, warna, dan komposisi; realisme pula menilai sejauh mana karya menggambarkan realiti kehidupan; ekspresionisme memberi tumpuan kepada emosi dan ekspresi artis; manakala instrumentalisme melihat kepada peranan sosial, moral, atau politik yang dibawa oleh karya seni.

Secara keseluruhannya, teori Terry Barrett memberikan satu kerangka komprehensif untuk memahami karya seni secara lebih menyeluruh. Melalui deskripsi, interpretasi, dan penilaian, pengkritik dapat menilai bukan sahaja aspek formal dan estetik, tetapi juga mesej, emosi, dan konteks budaya yang terkandung dalam karya. Dengan itu, seni dapat diapresiasi secara lebih mendalam sebagai cerminan hubungan antara manusia, budaya, dan masyarakat.

2.3 Peribahasa Melayu

Peribahasa Melayu merupakan warisan lisan yang sarat dengan makna mendalam dan kebijaksanaan tradisional. Ia lahir daripada pengalaman hidup masyarakat Melayu yang banyak dipengaruhi oleh pemerhatian terhadap alam, hubungan sosial, dan nilai moral yang dipegang sejak turun-temurun. Peribahasa sering digunakan sebagai medium pengajaran, sindiran, teguran mahupun nasihat, sekali gus berfungsi sebagai alat komunikasi berlapis makna dalam masyarakat.

Menurut Mohd Ridzuan Md. Nasir (2021), peribahasa ialah bahasa kiasan yang terdiri daripada pepatah, simpulan bahasa, perbilangan dan perumpamaan yang bertujuan menyampaikan maksud tertentu. Sifatnya yang ringkas namun sarat makna menjadikannya mudah diingati serta terus hidup dalam tradisi lisan dan tulisan masyarakat Melayu. Humphreys J. L. (1914) pula melihat peribahasa sebagai ungkapan lama yang sudah sebati dengan kehidupan, mengandungi kebenaran praktikal yang diperoleh daripada pengalaman bersama. Definisi ini seiring dengan Kamus Dewan Edisi Keempat (2005) yang menegaskan peribahasa sebagai bahasa kiasan yang terbentuk daripada susunan kata tertentu dengan maksud tersendiri, padat tetapi penuh hikmah.

Zaitul Azma Zainon Hamzah dan Ahmad Fuad Mat Hassan (2011) menegaskan bahawa peribahasa Melayu bukan sahaja cerminan falsafah hidup generasi terdahulu, tetapi juga berfungsi sebagai panduan sosial dan moral. Ia menggambarkan cara berfikir masyarakat yang menitikberatkan keseimbangan antara manusia dengan alam, pentingnya nilai persaudaraan, serta keutamaan menjaga maruah dan kehormatan diri. Oleh itu, peribahasa Melayu wajar dilihat sebagai warisan budaya yang kaya dan relevan dalam konteks kontemporari.

Kritikan kontekstual mengajak penonton berfikir tentang karya seni berdasarkan konteks sejarah, sosial, dan budaya serta niat pengkarya kerana pendekatan Barrett berasaskan idea tersebut. Menurut beliau, penonton turut terlibat secara aktif dalam interpretasi, dan tafsiran mereka dianggap sah serta penting untuk memahami sesuatu karya seni. Kajian ini meneliti interpretasi visual oleh artis Malaysia terhadap peribahasa Melayu dengan menggunakan teori Terry Barrett. Ingatan kolektif dan kebijaksanaan budaya memberi pengaruh terhadap makna pelbagai lapis yang terkandung dalam peribahasa, seiring dengan penekanan Barrett terhadap konteks dan penglibatan peribadi.

2.4 Hubungan Seni dan Budaya Melayu

Menurut Dewan Bahasa dan Pustaka (DBP), seni ditakrifkan sebagai hasil ciptaan seperti puisi, lukisan atau muzik yang terbit daripada bakat dan kreativiti. Haziyah Hussin, Salmah Abu Mansor, Rahilah Omar, Hapsah Ismail, dan Aminuddin Hassan (2009) menyatakan bahawa seni yang dihasilkan oleh masyarakat Melayu merupakan alat budaya yang dikenali sebagai kelengkapan budaya. Ku Zam Zam (1984), seperti yang dipetik dalam kajian Haziyah, Salmah, Rahilah, Hapsah dan Aminuddin (2009), turut menegaskan bahawa seni mempunyai hubungan rapat dengan budaya kerana ia merupakan sebahagian daripada budaya itu sendiri.

Istilah seni itu sendiri berasal daripada perkataan Latin ars yang membawa maksud kebolehan atau kemahiran untuk mencipta sesuatu secara sedar sehingga mampu menghasilkan bentuk visual (Read, 1959, dipetik dalam kajian Issarezal, Muhamad Rozali, Nur Muhammad Amin Hashim Amir, Hamidi dan Zahirah, 2023). Oleh itu, seni difahami sebagai usaha mencipta bentuk yang indah dan menyenangkan (Sidi Gazalba, 1977, dalam kajian sama). Keupayaan ini membentuk hubungan mendalam antara karya seni dengan penghayatnya.

Dalam konteks Melayu, seni dan budaya tidak dapat dipisahkan kerana kedua-duanya saling berkait rapat. Seni bukan hanya dianggap sebagai ekspresi estetik, tetapi turut berfungsi sebagai medium untuk memelihara, mengekalkan dan menyampaikan nilai budaya, kepercayaan serta pandangan hidup masyarakat. Karya seni visual seperti lukisan, cetakan, ukiran kayu, batik dan tekstil lazimnya mengandungi unsur tradisional Melayu, termasuk kosmologi serta penggunaan peribahasa, pantun, dan motif budaya simbolik. Melalui karya-karya seni ini, nilai teras Melayu seperti kesopanan, kesederhanaan, keseimbangan dengan alam, serta kepatuhan kepada tradisi diperkukuhkan dan diabadikan dalam bentuk visual. Sebagai contoh, peribahasa Melayu sering menjadi inspirasi kepada seniman untuk menyingkap tema berkaitan tingkah laku manusia, hubungan sosial dan pengajaran moral.

Dalam konteks ini, seni ini bukan sahaja memperindah kehidupan seharian, malah berperanan sebagai wahana pendidikan budaya yang berkesan. Teknik dan medium yang digunakan dalam seni Melayu seperti cetakan kayu serta ukiran tradisional turut dapat mencerminkan nilai kesabaran, ketekunan, dan penghormatan terhadap alam. Unsur-unsur ini mampu membuktikan bahawa seni Melayu bukan sekadar penciptaan objek estetik, tetapi merupakan manifestasi cara hidup dan pandangan dunia masyarakat Melayu.

Secara keseluruhannya, hubungan antara seni dan budaya Melayu adalah hubungan yang saling melengkapi antaranya seni berfungsi memelihara, mempersembahkan, serta memperkasa budaya Melayu, manakala pula budaya dapat memberikan makna, isi dan identiti kepada seni.

2.5 Kajian Seni Visual Kontemporari Malaysia

Dalam perkembangan seni visual moden, ramai pelukis Malaysia memanfaatkan elemen tradisi seperti peribahasa, motif flora dan fauna, serta nilai budaya sebagai sumber inspirasi. Hal ini selari dengan pandangan Muliyadi Mahamood (2001) yang menegaskan bahawa seni kontemporari Malaysia berkembang dengan menggabungkan unsur moden dan tradisi sebagai usaha mencari identiti kebangsaan. Seniman-seniman kontemporari berusaha menghubungkan seni moden dengan akar budaya agar wujud kesinambungan antara tradisi dan realiti semasa.

Antara pelukis penting ialah Jalaini Abu Hassan, yang terkenal dengan karya bersifat eksperimental, sarat simbol, dan sering menggambarkan pergelutan identiti serta budaya Melayu dalam konteks moden. Menurut Redza Piyadasa (1993), Jalaini merupakan antara pelukis yang berjaya mengolah simbol-simbol tradisi ke dalam bahasa visual baharu tanpa mengabaikan isu sosial. Karyanya tidak hanya menekankan aspek visual, tetapi juga mengetengahkan persoalan sosial, budaya, dan sejarah yang dekat dengan masyarakat.

Dalam karya Gurindam Jiwa *(Indian Summer)* misalnya, Jalaini menggabungkan pendekatan ekspresif dengan pengaruh budaya tempatan yang kaya. Pandangan ini turut disokong oleh Amir Zainorin (2010), yang menyatakan bahawa karya seni kontemporari Malaysia sering menjadikan budaya setempat sebagai asas ekspresi walaupun bentuknya kelihatan moden dan eksperimental. Analisis terhadap karya ini membolehkan kita memahami bagaimana peribahasa dan nilai tradisional dapat diterjemahkan ke dalam bentuk seni kontemporari yang

3 METODOLOGI

Kajian ini menggunakan pendekatan kualitatif yang berasaskan kepada tiga aspek teori Terry Barrett, iaitu deskripsi, interpretasi dan pertimbangan. Terutamanya dalam menentukan bagaimana peribahasa Melayu dan ungkapan tradisional diterjemahkan ke dalam bentuk visual kreatif, pendekatan ini sesuai digunakan dalam kajian seni kerana ia menyediakan analisis menyeluruh terhadap ciri-ciri visual, makna simbolik, serta nilai artistik sesebuah karya. Satu karya seni telah dianalisis bagi menunjukkan bagaimana teori Barrett dapat diaplikasikan untuk memahami mesej simbolik dan refleksi budaya yang berpaksikan tradisi Melayu. Melalui pendekatan ini juga, dapat diperhatikan dengan lebih dekat bagaimana elemen-elemen kreatif seperti bentuk, warna, komposisi dan imej digunakan untuk menyampaikan nilai budaya, prinsip moral dan komentar sosial.

Karya seni yang dipilih dianalisis dengan menggunakan reka bentuk analitik deskriptif. Teori Terry Barrett dipilih kerana sifatnya yang adaptif, terbuka dan holistik, yang membolehkan tafsiran dibuat bukan sahaja melalui aspek formal, tetapi juga dalam konteks sosial, budaya dan pengalaman penonton. Hal ini amat relevan dalam menganalisis lukisan yang berlandaskan peribahasa dan ungkapan tradisional Melayu, yang sarat dengan nilai serta makna tersirat. Karya seni yang dipilih dalam kajian ini ialah Gurindam Jiwa *(Indian Summer)* oleh Jalaini Abu Hassan. Karya ini dipilih kerana ia mengintegrasikan objek budaya seharian, motif flora, serta terdapat elemen teks "Gurindam Jiwa" sebagai representasi simbolik yang menyampaikan konsep moral, identiti dan kesinambungan budaya. Ia juga memperlihatkan bagaimana nilai tradisional dapat ditafsir semula dalam bahasa seni kontemporari. Karya ini dipilih berdasarkan kekuatan intelektualnya, persembahan visual yang unik, serta keupayaannya mengekspresikan inti pati tradisi Melayu melalui naratif visual yang berkesan.

Jadual 1 Teori Terry Barrett

Bil	Aspek	Terry Barrett
1.	Penerangan	Mengenal pasti isi pelajaran, medium dan bentuk karya seni
2.	Tafsiran	Tafsiran yang munasabah berkaitan dengan karya seni. Pengkritik datang ke karya seni dengan sejarah, pengetahuan, kepercayaan dan berat sebelah yang berlaku, sepatutnya dan mesti mempengaruhi cara mereka melihatnya.
3.	Penghakiman	Teori estetik digunakan untuk menilai karya seni, dengan empat idea estetik yang boleh digunakan pada kebanyakan karya visual seperti realisme, ekspresionisme, instrumentalisme dan formalisme.

(Sumber: Pengarang, 2024)

4 DAPATAN KAJIAN

4.1 Analisis Karya Seni Kajian Seni Visual Kontemporari Malaysia

Kajian ini secara khususnya meneliti ke dalam karya seni oleh Jalaini Abu Hassan yang berjudul Gurindam Jiwa *(Indian Summer)* 2000, yang diinspirasikan daripada penggunaan peribahasa Melayu, bagi menilai sejauh mana teori Terry Barrett diaplikasikan dalam konteks seni visual Malaysia. Karya ini dipilih kerana ia memperlihatkan bagaimana teknik campuran dalam seni lukis mampu mengubah peribahasa Melayu yang sarat dengan nilai budaya Melayu kepada representasi visual yang kompleks dan bermakna.

Kajian ini menggunakan kerangka analisis Terry Barrett yang merangkumi aspek deskripsi, interpretasi, dan penghakiman. Selain itu, ia juga bertujuan untuk menentukan bagaimana komponen formal karya berinteraksi dengan kandungan makna budaya, serta sejauh mana pendekatan teori tersebut berjaya menyingkap lapisan estetik dan naratif dalam seni visual Malaysia.

Rajah 2 Gurindam Jiwa *(Indian Summer)*, 2000,
Media campuran atas kanvas, 122 cm x 122 cm
(Sumber: Pengarang, 2023, Persetujuan Hak Cipta: Dibenarkan untuk Diterbitkan)

Karya berjudul Gurindam Jiwa *(Indian Summer)* yang diterbitkan pada 2000 oleh Jalaini Abu Hassan menggunakan media campuran atas kanvas berukuran 122cm x 122cm. Ia menampilkan objek-objek harian seperti cawan, mangkuk, pasu, bubu, kotak, serta motif inai India dan corak mangga. Tulisan "Gurindam Jiwa", "Indian Summer" dan peribahasa Melayu serkap jarang digunakan sebagai simbol metafora untuk menyampaikan mesej moral, identiti dan kesinambungan budaya. Dari segi elemen seni, karya ini menonjolkan bentuk geometri dan organik, dengan warna utama coklat, kuning, oren, putih, biru, hitam, dan merah. Warna kuning di tengah berfungsi sebagai titik fokus, manakala garis dan tekstur pelbagai lapisan memberi kedalaman visual. Objek latar depan jelas, manakala latar belakang lebih kabur, mewujudkan ruang dan dimensi. Prinsip kesatuan dicapai melalui pengulangan warna dan bentuk, diimbangi dengan kontras antara warna terang dan gelap.

Dari segi tafsiran, karya ini mencerminkan gabungan tradisi dan kontemporari dalam ruang visual yang kompleks. Gurindam Jiwa merujuk kepada karya klasik Melayu yang sarat dengan nilai budaya dan spiritual, manakala *Indian Summer* melambangkan keterbukaan kepada semua lapisan masyarakat. Peribahasa Melayu serkap jarang diadaptasi sebagai naratif visual yang menyentuh soal memahami tradisi yang semakin dilupakan, serta nasihat dalam menjaga hubungan sosial. Simbol-simbol seperti sangkar burung kosong, bunga emas, kaca, dan motif seperti sotong melambangkan memori, warisan budaya, serta kerinduan terhadap tradisi yang semakin pudar. Sangkar kosong merujuk kepada jiwa yang terperangkap atau kehilangan identiti dalam arus moden. Bunga emas menggambarkan keindahan budaya Melayu, manakala motif ala batik melambangkan seni halus yang diwarisi. Tulisan Gurindam Jiwa pula menekankan nilai moral dan falsafah hidup.

Dari aspek penilaian, karya ini boleh dianalisis melalui empat kriteria iaitu formalisme, realisme, ekspresionisme dan instrumentalisme. Dari sudut formalisme, susunan objek yang bertindih, penggunaan warna kontras serta garisan kasar memberi kesan visual yang dinamik. Dari aspek realisme, walaupun gaya cenderung abstrak, objek seperti sangkar burung, bunga emas, dan cawan tetap dikenali serta dekat dengan kehidupan masyarakat Melayu. Dalam pendekatan ekspresionisme, gabungan warna gelap dan terang menggambarkan emosi resah, rindu, dan kesunyian akibat perubahan budaya moden. Dari perspektif instrumentalisme pula, karya ini berperanan sebagai kritikan sosial terhadap masyarakat Melayu yang semakin kehilangan identiti akibat arus pemodenan, namun masih berpegang pada warisan tradisi.

Secara keseluruhannya, Jalaini Abu Hassan berjaya mengangkat peribahasa Melayu "serkap jarang" ke dalam naratif visual kontemporari yang kaya dengan simbolisme. Gabungan objek tradisi dan teknik moden ini menzahirkan mesej mendalam tentang akar budaya, memori, serta jiwa manusia yang berdepan dengan perubahan zaman atau mengikut peredaran zaman.

5 RUMUSAN

Secara keseluruhannya, karya Gurindam Jiwa *(Indian Summer)* menampilkan kepelbagaian simbol dan metafora yang bukan sahaja mengangkat nilai budaya serta tradisi Melayu, tetapi juga menghubungkannya dengan pengalaman moden dan silang budaya, sekali gus memberikan makna yang lebih mendalam terhadap isu identiti, warisan, serta nilai kehidupan masyarakat. Dapatan daripada analisis karya ini menunjukkan bahawa simbol yang digunakan berfungsi sebagai medium untuk menyampaikan mesej tentang pentingnya menjaga kelestarian budaya, di samping menekankan aspek nostalgia, moral, dan spiritual yang terkandung dalam kehidupan masyarakat. Hal ini membuktikan bahawa seni visual tidak hanya menjadi medan ekspresi estetik, tetapi juga wadah intelektual dan budaya yang dapat memperlihatkan kesinambungan tradisi dalam konteks kontemporari.

Jadual 2 Ringkasan tafsiran

Bil	Simbol dan metafora	Tafsiran
1.	Gurindam Jiwa	Karya klasik Melayu yang menekankan nilai budaya, moral, dan spiritual.
2.	*Indian Summer*	Keterbukaan kepada "segala lapisan masyarakat", juga merujuk kepada pertembungan budaya Melayu dan India.
3.	Serkap jarang	Secara literal bermaksud membuat tuduhan tanpa bukti, tetapi dalam konteks karya ini ia menjadi simbol usaha memahami dan mengekalkan tradisi yang kian pudar.
4.	Sangkar burung kosong	Jiwa terperangkap, rasa kehilangan, atau identiti yang semakin hilang.
5.	Bunga emas	Keindahan, kekayaan budaya Melayu, nilai nostalgia.
6.	Barang kaca	Kehidupan harian dan memori domestik.
7.	Motif pusaran seperti sotong / batik	Warisan seni tradisi yang diwarisi turun-temurun.

(Sumber: Pengarang, 2024)

Keseluruhannya, Jalaini mengingatkan masyarakat agar tidak terus melupakan akar budaya dalam arus globalisasi lebih-lebih lagi kita sebagai masyarakat Melayu.

Jadual 3 Ringkasan penghakiman

Bil	Penghakiman	Tafsiran
1.	Formalisme	Susunan objek bertindih, warna kontras, garisan kasar dan tekstur memberi kesan dinamik.
2.	Realisme	Walaupun karya bercorak abstrak, objek seperti sangkar, cawan, bunga emas dan motif tradisi masih dikenali.
3.	Ekspresionisme	Warna gelap dan terang menggambarkan emosi resah, rindu, dan kesunyian dalam perubahan budaya moden.
4.	Instrumentalisme	Karya sebagai kritikan sosial, menunjukkan masyarakat Melayu kian kehilangan identiti akibat arus moden, namun masih ada harapan dalam warisan tradisi.

(Sumber: Pengarang, 2024)

Kesimpulannya, Jalaini telah mengangkat ungkapan peribahasa Melayu iaitu "serkap jarang" ke dalam naratif visual kontemporari yang penuh dengan symbol. Ia sekaligus menggabungkan unsur tradisi dan moden untuk menyampaikan mesej tentang akar budaya, memori, dan jiwa manusia.

6 KESIMPULAN

Analisis terhadap karya Gurindam Jiwa (Indian Summer) oleh Jalaini Abu Hassan memperlihatkan bagaimana peribahasa Melayu dapat ditafsir dan diterjemahkan semula melalui bahasa visual kontemporari, namun masih mengekalkan hubungan dengan identiti budaya. Dengan menggunakan kerangka Terry Barrett yang merangkumi aspek deskripsi, interpretasi dan penilaian, kajian ini mendapati bahawa karya tersebut bukan sekadar mempersembahkan bentuk visual, tetapi turut mengandungi lapisan makna yang berakar daripada kearifan tempatan dan tradisi lisan masyarakat Melayu. Penggabungan motif flora, objek budaya harian, serta elemen teks seperti Gurindam Jiwa menonjolkan usaha artis dalam mengekalkan kesinambungan budaya sambil menyesuaikannya dengan ekspresi seni moden.

Dapatan kajian menunjukkan bahawa Indian Summer berjaya menterjemahkan nilai-nilai abstrak dalam peribahasa Melayu kepada bentuk estetik yang nyata, sekali gus mampu berinteraksi dengan khalayak tradisional dan kontemporari. Karya ini mencerminkan kebolehan peribahasa sebagai wahana yang membawa nilai moral, memori kolektif, dan identiti dalam naratif visual.

Namun demikian, kajian ini menyedari bahawa penggunaan teori kritik seni Barat seperti Terry Barrett masih mempunyai keterbatasan dalam konteks seni Asia Tenggara. Justeru, kajian lanjutan dicadangkan agar memberi fokus kepada pendekatan tempatan dengan menerapkan konsep adat (undang-undang atau amalan tradisional) dan ilmu (pengetahuan tradisional) dalam kritikan seni. Selain itu, penyelidikan masa hadapan juga boleh membandingkan peribahasa Melayu dengan bentuk ungkapan tradisional lain di rantau ini, seperti peribahasa Indonesia atau suphasit Thai, bagi menilai bagaimana kebijaksanaan lisan dapat diterjemahkan dalam seni visual. Melalui pendekatan ini, teori Terry Barret dapat diperkaya dengan sudut pandang serantau, sekaligus mengukuhkan peranan seni sebagai jambatan antara tradisi dan kemodenan.

PENGHARGAAN

Penulis ingin merakamkan penghargaan kepada mana-mana individua tau organisasi yang terlibat secara langsung atau tidak langsung di dalam kajian ini.

PEMBIAYAAN

Kajian ini tidak dibiayai oleh geran penyelidikan dari mana-mana pihak.

SUMBANGAN PENULIS

Penulis artikel ini menyumbang dalam pencarian data, kajian literatur, kaedah dan penelitian, serta penulisan manuskrip secara sama-rata.

KONFLIK KEPENTINGAN

Penulis mengistiharkan bahawa kajian ini tiada konflik kepentingan berkenaan dengan penenyelidikan dan penerbitan.

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Beyond Convention: Xun Huisheng's Innovations in Qingyi and Huadan Performance Aesthetics

Zhu LingHui[1], Mumtaz Begum Aboo Backer[2]
[1,2]School of The Arts, Universiti Sains Malaysia, Main Campus, Minden, 11800 Penang, Malaysia

zhulinghui2022@gmail.com[1], *mumzie@usm.my[2]
***Corresponding author**

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ABSTRACT

This paper examines the distinctive performance style of Xun Huisheng (1900–1968), one of the "Four Great Dan" of Peking Opera, with a specific focus on his revolutionary approach to the Huadan (vivacious female) role type. Utilising textual analysis of primary sources from the Republican era, including newspaper reviews, performance records, and critical essays from periodicals such as Shen Bao and The Theatre Monthly, this study deconstructs Xun's innovations in vocal delivery, physical movement, and character portrayal. It argues that Xun systematically integrated expressive elements from regional theatre forms, particularly Bangzi opera, to forge a performance aesthetic characterised by naturalism, psychological depth, and nuanced emotional expression. The findings reveal that Xun's artistic reforms not only expanded the expressive capacity of the huadan repertoire but also embodied a significant paradigm shift within Peking Opera during its early 20th-century modernisation. This research offers a new perspective on the evolution of performance aesthetics in Chinese traditional theatre and underscores Xun Huisheng's profound influence on gender representation and stage practice.

Keywords: *Xun Huisheng, Peking Opera Theatre, Huadan, Chinese Performance Arts, Gender and Performance*

1 INTRODUCTION

The first half of the twentieth century was a particularly glorious era in the development of Peking Opera, during which it reached its artistic peak, especially in the Republican period (1912–1949) (Ye, 1994; Zhong, 2023). This was a time when the art of performance was refined to its highest level through the contributions of outstanding artists known collectively as the Four Great Dan. These four—Mei Lanfang (1894–1961), Cheng Yanqiu (1904–1958), Xun Huisheng (1899–1968), and Shang Xiaoyun (1900–1976)—were male performers celebrated for their portrayals of female roles (*dan*) (Ma et al., 2019). Each represented a distinctive artistic school, and together they elevated the *dan* performance system to an unprecedented level of sophistication and expressiveness (Luo, 2012).

The early twentieth century in China was also a time of profound social change and cultural renewal. Peking Opera, as the nation's dominant theatrical form, stood at a critical intersection between preserving traditional aesthetics and embracing modernisation (Hu, 1995). Within this historical context, the Four Great Dan not only defined the artistic standards of the era but also embodied the cultural negotiations of a society in transition. Their performances reflected the tension between the old and the new, the classical and the modern. Among them, Xun Huisheng distinguished himself through his innovative interpretation of the *huadan* role type, bringing fresh vitality, realism, and emotional depth to the portrayal of female characters (Liu, 2013). His artistic innovation became a vital force in the broader reform and modernisation of Peking Opera.

Compared to Mei Lanfang's elegance and grandeur, Cheng Yanqiu's profound subtlety, and Shang Xiayun's vigorous clarity, Xun Huisheng's artistic path was both distinctive and groundbreaking. Among the Four Great Dan, the other three mainly specialised in *qingyi* roles—refined and dignified female characters—while Xun Huisheng (1900–1968) stood out for his focus on the *huadan* role type. Xun was an outstanding master of Peking Opera who founded the Xun School Art System and played a significant role in the reform of Peking Opera (Zhu, 2005). Rather than confining himself to the dignified and elegant (*duānzhuāng diǎnyǎ*) archetype traditionally esteemed by the *qingyi* role type, he shifted his artistic focus to the *huadan*—a role type typically portraying lively young women or clever maidservants (Wang, 2021). Through his refined interpretations of *huadan* characters, Xun vividly depicted women's distinctive temperament and inner emotions, earning him the title of "the King of *Huadan*" (Li, 2010). His contributions went far beyond technical mastery: he boldly integrated the lively rhythm, realistic expression, and regional flavor of theatres such as Hebei *Bangzi* opera into the highly codified system of Peking Opera, forming a new artistic language that was both graceful and authentic. Many of the plays he created or adapted have continued to be performed to this day (He, 2016), attesting to his enduring influence. Instead of relying on the sometimes exaggerated or stylised conventions of the traditional *huadan*, Xun infused his performances with captivating vitality, expressive naturalness, and emotional sincerity that resonated deeply with the image of the "New Woman" emerging in Republican-era urban culture. His artistic practice was therefore not merely an innovation in performance technique but also a subtle cultural intervention that reflected and responded to the social transformations of his time. This orientation also resonates with Confucian thought, which values order and harmony, yet does not imply blind submission to authority or acceptance of the status quo (Wang et al., 2025).

Despite his achievements, Xun Huisheng has not received commensurate attention in overseas academia, where research still largely focuses on Mei Lanfang. In view of this, this study aims to fill this gap. It is grounded in first-hand historical sources from the Republican period (1920s-1940s), primarily theatre reviews and critical essays from newspapers and periodicals, and seeks to answer the following core questions:

(i) What are the specific characteristics of Xun Huisheng's *huadan* performance art across the four dimensions of singing, speech, acting, and combat?
(ii) In what key aspects did his artistic innovations break through the stylised norms of traditional Peking Opera?
(iii) How was his performance style received by contemporary critics, and what influence has it had on later Peking Opera?

By exploring these questions, this paper strives to restore Xun Huisheng's historical profile as a theatrical reformer and, through this specific case, reveal the complexity and diverse paths of Peking Opera's modern transformation. It argues that Xun Huisheng's synthesis of regional folk traditions with metropolitan Peking Opera created a new, hybrid aesthetic that was both authentically Chinese and strikingly modern, ultimately expanding the emotional and social vocabulary of the stage.

2 LITERATURE REVIEW

Research on the "Four Great Dan" has accumulated considerable results in both Chinese and foreign academia, but the focus is unevenly distributed. In English-language scholarship, Joshua Goldstein's *Drama Kings: Players and Publics in the Re-creation of Peking Opera, 1870–1937* (2007) provides an excellent socio-historical analysis of Peking Opera's modernisation but uses Mei Lanfang as its primary case study, inevitably casting the others in a supporting role. However, in comparing the "Four Great Dan", it notes that Xun Huisheng retained and mastered the so-called "*qiao*" (high-platform wooden shoes) technique and discusses his very extensive repertoire—over 300 plays, including several "signature plays" covering tragedy, comedy, martial plays, and adaptations from regional operas—thus demonstrating Xun's performative energy in themes of "ordinary people's lives". Yet, it does not present a complete and systematic picture of Xun Huisheng's performance art.

Research in the Chinese-speaking world shows deeper attention to Xun Huisheng. For instance, Qin Huasheng (2001) and Wang Shengmin (2021) have clearly identified the characteristics of Xun's absorption of *Bangzi* opera elements. Wu Yifan (2022) analysed Xun Huisheng's singing style. However, some studies still have two shortcomings: firstly, an over-reliance on secondary accounts or general observations rather than being rigorously grounded in the immediate, first-hand critical responses of his era; secondly, often remaining at the level of generalised descriptions of artistic features, failing to fully situate them within the specific socio-cultural context of the Republican period, thus weakening the cultural critical significance of his innovations.

The contribution of this study lies in its methodological focus. It strives to return to the historical scene, using immediate theatre reviews from *Shen Bao* and *Ta Kung Pao* and professional debates from *The Theatre Monthly* as the main analytical texts. This approach is methodologically justified by the unique nature of the Republican-era media landscape. The Republican period in China witnessed the rapid development of print media, wherein newspapers and magazines played a crucial role in disseminating and popularising Peking Opera (Yeh, 2008). The performances of artists like Xun Huisheng became frequent subjects of critical reviews by scholars and audiences. These discussions not only reflected public engagement but also actively contributed to the artistic development of the genre (Wang, 2014; Shan, 2021). As mass communication materials, these periodical reviews are especially valuable for examining cultural change and artistic trends within a specific historical context (Merriam & Tisdell, 2016). Consequently, the Republican era was selected as the focus of this study, as its surviving documentary materials preserve authentic, contemporaneous records of artistic practice, providing an objective and historically grounded foundation for analysis (Xu & Xu, 2007; Fu, 2019).

These historical materials not only record the specific details of Xun's art but also vividly preserve the audience reactions and critical dialogues of the time, providing an irreplaceable perspective for understanding how "Xun School" art was perceived, accepted, and debated by his contemporaries, thereby allowing for a more three-dimensional and historical assessment of the substance and impact of his artistic innovation.

3 RESEARCH METHODOLOGY

3.1 Research Method

This study adopts a qualitative textual analysis approach to examine Xun Huisheng's performance innovations within their historical and cultural contexts. Textual analysis enables a close reading of primary theatrical reviews, critical essays, and performance records from the Republican era, focusing not only on explicit descriptions of artistic technique but also on the underlying aesthetic values and ideological positions embedded in these texts. This approach is particularly appropriate for traditional theatre studies, where performance practices are often documented indirectly through contemporaneous writings rather than audiovisual recordings.

Through this method, the paper systematically identifies key artistic innovations in Xun's practice—across singing, speech, movement, and role-type versatility—and interprets them in light of broader cultural discourses and aesthetic transformations of the early twentieth century.

3.2 Data Collection

The analysis is based on primary historical materials drawn from major Republican-era newspapers and specialised theatre periodicals, housed in the National Library of China (Beijing) and the Shanghai Library.

Newspapers: Reviews and cultural supplements from publications such as *Shen Bao* and *Ta Kung Pao* provide insights into the perspectives of mainstream intellectuals and urban audiences.

Theatre Periodicals: Journals such as *The Theatre Monthly* and *Banyue Xiju* offer in-depth professional commentary and debates within the theatrical community.

These sources serve three key functions:

(i) Documenting technical innovations in performance (e.g., vocal style, speech patterns, staging).
(ii) Recording audience and critical reception, thereby revealing contemporary aesthetic expectations.
(iii) Providing evidence of artistic debates, which illuminate the ideological stakes of Xun's reforms.

These archives offer a wealth of material, including performance announcements, detailed reviews that describe specific vocal and physical techniques, audience testimonials, and transcripts of critical debates between traditionalists and modernists.

3.3 Theoretical Framework

The analysis is informed by two complementary frameworks:

3.3.1 The Internal Aesthetic System of Peking Opera

The Four Skills (Sì Gōng): Peking Opera, as a major branch of traditional Chinese theatre, inherits and refines the internal aesthetic principles that have long shaped Chinese performing arts. Traditional theatre in China is a comprehensive art form that combines literature, music, dance, visual arts, martial arts, acrobatics, and character portrayal (Huang, 2002; Xing et al., 2024). Its mode of expression is rooted in the synthesis of *chang, nian, zuo, da* (singing, acting, speaking, and combat), which are performed within a stylised stage setting to depict historical or contemporary life and evoke a refined sense of beauty (Ding, 2009).

Drawing on the traditional taxonomy of *chang, nian, zuo, da* and the role-type conventions of *huadan* and *qingyi*, this framework provides a precise technical reference system. It allows the paper to situate Xun's artistic practices in relation to inherited conventions—clarifying whether specific gestures, vocal choices, or speech patterns represent continuities or deliberate transgressions.

3.3.2 Cultural Sociological Perspective

Situated within the socio-cultural milieu of Republican urban China, this framework examines Xun's artistic choices as cultural strategies that both responded to and shaped broader trends—such as the rise of the "New Woman," vernacular modernity, and shifting audience tastes. His vernacularised speech, live painting performances, and reimagined female characters are interpreted as interventions in the negotiation between tradition and modernity.

By combining these frameworks, the study moves beyond descriptive performance analysis to a critical interpretation of Xun Huisheng as both an innovator within the operatic system and an active agent in cultural modernisation. These theoretical lenses guide the analysis presented in Section 4, where each artistic innovation is examined for both its formal characteristics and its broader aesthetic-cultural implications.

4 FINDINGS AND DISCUSSION

Through the methodological approach outlined above, this study systematically identifies key artistic innovations in Xun's practice—across singing, speech, movement, and role-type versatility. The following sections present these findings and interpret them in light of the broader cultural discourses and aesthetic transformations of the early twentieth century.

4.1 Vocal Innovation: Fusion of *Bangzi* and *Pihuang*

Xun Huisheng's vocal artistry represents the foundation of the "Xun School" style. He creatively fused the passionate, melodically florid, and rhythmically flexible vocal characteristics of Hebei *Bangzi* (a regional opera known for its high-pitched and expressive style) with the more structured and refined *pihuang* musical system of Peking Opera. This synthesis forged a distinctive aesthetic of "softness concealing strength, grace and brightness" (*róu zhōng dài gāng, wǎnyuē tòuliàng*).

Timbre and Technique. Departing from the shrill, piercing falsetto conventionally used by *huadan* performers, Xun developed a sweet, charming, and mellifluous tone by skilfully blending falsetto and true voice. Technically, he was a master of subtle tremolos, portamento (sliding between notes), and intricate ornamentation. His signature technique of concluding phrases with a delicate nasal resonance (*bíyīn shōu qiāng*) added a unique, lingering charm that felt both spontaneous and deeply emotive.

Emotional Expression and Audience Impact. This vocal style was not merely ornamental but served as a powerful instrument for psychological characterisation and emotional storytelling. Its profound impact on audiences is vividly documented in contemporary reviews. For instance, an article titled "On Xun Huisheng" in *Tianjin Yishi Bao* (1936) explicitly praised his singing in *The Phoenix Hairpin (Chaitou Feng)* as "touching and moving". The author provided a compelling anecdote: "last winter at the Guotai Theatre during the performance of *The Phoenix Hairpin*, at the scene of 'death separation', those who shed tears of sympathy were not few, some could not bear the sorrow and left before the end, this shows how his acting was." This firsthand account demonstrates the ability of his vocal style to create an immersive tragic atmosphere and elicit strong empathetic responses. Beyond tragedy, Xun demonstrated remarkable versatility. Whether conveying the cheerful playfulness of Hongniang or the profound grief and indignation of Du Shiniang, he could aptly articulate the required emotions through subtle yet masterful changes in vocal colour and delivery.

This nuanced and emotionally resonant approach, underpinned by the innovative fusion of *Bangzi* and *pihuang*, significantly enhanced the expressive capacity of the *huadan* role. It moved the character type beyond mere vivacity or coquetry toward a more serious and psychologically complex dramatic expression, thereby redefining its artistic potential.

4.2 Cultural Cultivation: Intersections of Visual and Performing Arts

Beyond performance technique, Xun's achievements were grounded in a deliberate cultivation of cultural literacy, particularly in painting and calligraphy. Contemporary sources (*Shanghai Pictoria*l, 1927; *Li Yuan Gong Bao*, 1930; *Beijing Pictorial*, 1931; *Yi Shi Bao*, 1933) document his formal study under established masters and the high demand for his artworks.

This proficiency found striking theatrical expression in his 1926 production *Danqing Yin*, in which Xun pioneered "live painting" on stage. Rather than serving as mere decoration, the act of painting was integrated dramaturgically, recalibrating the relationship between performer, medium, and theatrical space. By painting plum blossoms, bamboo, or calligraphy before the audience, he simultaneously heightened authenticity and expanded theatrical expressivity. As *Xi Bao* (1939) observed, this practice became widely emulated, inaugurating a new performative convention.

Contemporary media framed this innovation as a hallmark of Xun's artistry, effectively positioning him as a multidisciplinary cultural producer and blurring the boundaries between fine and performing arts.

4.3 Vernacular Speech and Expressive Naturalness

Xun's most radical departure from tradition occurred in the domain of spoken delivery (nian). While retaining the structure of jingbai and yunbai, he developed a hybrid xiebai style characterised by colloquial exclamatory particles ("a," "ya," "yo") and childlike intonations. This created an unprecedented psychological immediacy, rendering his portrayals of young female characters strikingly lifelike and emotionally transparent.

Influenced by the emerging spoken drama (*huaju*), this vernacularisation responded to modern urban audiences' shifting aesthetic expectations. By embedding natural speech patterns within the operatic framework, Xun challenged the stylised distance of traditional performance and repositioned huadan speech as a vehicle for character interiority, rather than as formulaic ornamentation.

4.4 Physical Embodiment: The Expressive Body

Xun Huisheng's physical artistry (*zuo*) was widely celebrated for its refinement and emotional precision. Contemporary critics often described his stage presence as "mesmerising," praising his rare ability to *"sing and act with equal brilliance."* His movements were marked by suppleness and restraint— *"lithe and graceful" (ē'nuó)*—and his eyes were consistently noted as his most expressive instrument. Through subtle shifts in gaze and delicate facial expressions, he could convey an entire emotional spectrum, from gentle shyness to sharp intelligence and deep sorrow.

This sensitivity to detail reflected Xun's deep psychological insight into his characters. Every gesture, glance, and motion appeared carefully designed yet never mechanical, combining technical mastery with genuine emotional experience. His performances revealed an extraordinary balance between external stylisation and internal truth—a fusion that elevated his *huadan* portrayals beyond conventional formula.

A key feature of his performance technique was his mastery of *caiqiao*—performing while wearing high-platform wooden shoes—a physically demanding practice that endowed his movement with both historical authenticity and aesthetic delicacy (Cheng, 1959). Yet, Xun went further by cleansing the *huadan* repertoire of exaggerated or overtly suggestive gestures that had once characterised the role type. Instead, he favoured gestures rooted in everyday observation: a fleeting glance, a subtle turn of the wrist, or a graceful inclination of the body that vividly conveyed individuality and emotion. His artistic aim, as many critics observed, was to "portray the disposition and character of the figures in the plays in a positive and uplifting light," transforming *huadan* from coquettish caricatures into believable, multidimensional women.

This artistic transformation was perhaps most evident in his celebrated portrayal of Hongniang (*The Little Maid Named Hongniang*). Reviews, such as that in *Ta Kung Pao* (1935), emphasised how Xun's finely tuned gestures—quick glances, nimble hand movements, and spirited posture—brought to life a witty, lively, and emotionally complex young maid. His performance conveyed not only Hongniang's humour and intelligence but also her warmth and moral courage, allowing audiences to perceive her as a psychologically complete and socially resonant figure rather than a mere supporting comic role.

In this sense, Xun's artistry represented a conscious reorientation of female representation on the Peking Opera stage—from conventionally stylised types to emotionally authentic and intellectually nuanced characters. His *embodied technique* thus redefined the expressive potential of *huadan* performance, integrating aesthetic grace with human depth and setting a new benchmark for female characterisation in Peking Opera.

4.5 Transcending Role-Type Boundaries

A defining hallmark of Xun Huisheng's artistry was his remarkable versatility across role types, often performing dual or even contrasting roles within a single production. This ability to transcend the rigid *hangdang* (role-type) system not only showcased his extraordinary technical mastery but also challenged the traditional boundaries of gender and characterisation in Peking Opera.

In *Fan Jiang Guan*, for example, Xun first appeared as Fan Lihua, a *daomadan* (martial female) in armor, displaying heroic grandeur through highly stylised combat movements. He then reemerged as Xue Jinlian, a *huadan* (vivacious young woman), capturing youthful playfulness and charm with delicate gestures and expressive glances. In *Da Ying Jie Lie*, he initially portrayed Chen Xiuying, a witty teahouse girl (*huadan*), before cross-dressing as the *wuxiaosheng* (young martial male) Wang Fugang—a vivid embodiment of heroic masculinity rarely attempted by *dan* actors. Likewise, in *Xun Guan Niang*, he fused the elegance of a *guimendan* (dignified young lady) with the athletic vigor of a *wudan* (martial female), presenting a character both intelligent and courageous as she broke through enemy lines.

Moreover, Xun was celebrated for his "dual-role performance in one play" (*yì xì shuāng jué*), in which he successively portrayed two entirely different female characters. Notable examples include *Hong Lou Er You*, where he alternated between the resolute and fierce Third Sister You and the fragile, tragic Second Sister You, and *Kan Yu Chuan*, in which he contrasted the dignified Yu Suqiu with the lively Han Yujie.

Contemporary reviews—including *Shuntian Shibao* (1926), *Xinwen Bao Benbu Fukan* (1926), and *The Theatre Monthly* (1931)—praised his exceptional command of both literary and martial techniques. Critics emphasised that his solid foundation in martial arts endowed his performances with remarkable agility and rhythm, while his refined acting captured subtle shifts of personality and emotion. Through these transformations, Xun not only displayed unparalleled artistic breadth but also questioned the restrictive hierarchies of the *hangdang* system, expanding the dramaturgical and expressive possibilities of Peking Opera.

4.6 Character Reinterpretation and Modern Female Agency

Xun's innovations in voice, speech, movement, and role versatility culminated in the reconfiguration of female stage characters. His portrayals ranged from lively and interesting young girls (*Hongniang*), gentle and sentimental daughters (*Huo Xiaoyu*), and quick-witted and courageous heroic women (*Xun Guanniang*) to tragic but resilient figures (*Du Shiniang, Honglou Er You)*. Across these roles, he foregrounded agency, intelligence, and emotional depth—qualities aligned with the Republican-era "New Woman" discourse.

This transformation was not merely aesthetic. It intersected with contemporary social movements that advocated for marital freedom and gender equality, enabling his performances to serve as subtle cultural interventions. Urban female audiences found in his characters both emotional resonance and models of modern subjectivity.

Furthermore, Xun Huisheng enjoyed particularly strong popularity among female audiences—including urban students, housewives, and professional women. This popularity stemmed from his ability to embody vibrant, authentic, and occasionally defiant young women whose independence and wit challenged conventional femininity. His attention to realistic stage details—such as naturalistic makeup, hairstyles, and costume design—further enhanced this connection, reflecting the aesthetic sensibilities and evolving self-awareness of modern women in the Republican era. Through these performances, Xun became more than a theatrical innovator; he emerged as a cultural icon whose artistic image symbolised a new form of female consciousness and social participation.

4.7 Critical Reception: Aesthetic Tensions and Modernity

Xun's artistic reforms provoked sharply divergent critical responses, reflecting the aesthetic and ideological tensions that characterised the Republican period. Progressive intellectuals praised his "new performance of old plays" (*jiù xì xīn yǎn*), as well as the vivid sense of everyday life and human insight expressed in his private repertoire, celebrating these as creative renewals of Peking Opera traditions. Traditionalists, however, decried his style as "too lively," "unrestrained," or even "lacking refinement," arguing that his approach blurred the boundaries of established stage convention.

In reality, Xun consciously purified the *huadan* repertoire by removing the coarse and erotic gestures of earlier performance traditions. He transformed them into movements of grace, humour, and vivid realism, thereby elevating the artistic value of *huadan* roles. His plays often depicted the joys and sorrows of ordinary women—stories of love, betrayal, and resilience drawn from everyday life. This realism, however, also became the reason some conservative critics labelled his art as "popular" rather than "refined". Their criticism did not imply moral vulgarity but revealed a deeper cultural divide: Xun's art appealed to the urban public, in contrast to the elite elegance associated with contemporaries like Mei Lanfang, who specialised in divine or aristocratic heroines.

Thus, the debates surrounding Xun's artistry illuminate how the modernisation of Peking Opera involved not merely technical reform but also a redefinition of aesthetic values—between the refined and the popular, the traditional and the modern. Positioned at the heart of these tensions, Xun Huisheng played a pivotal role in reshaping the aesthetic sensibility of modern Chinese theatre.

5 CONCLUSION AND IMPLICATIONS

Xun Huisheng's legacy is that of a transformative artist who redefined the boundaries of his tradition. By masterfully synthesising the raw emotional power of *Bangzi* opera with the sophisticated codification of Peking Opera, he created a performance style that was both deeply rooted and strikingly innovative. His work demonstrated that modernisation was not merely a matter of adopting some Western forms (like spoken drama) but could be achieved through the intelligent and creative recombination of indigenous Chinese traditions.

His innovations in vocal delivery, vernacular speech, and psychologically motivated movement moved the *huadan* role from the margins of comic relief to the centre of serious artistic expression. More importantly, his characterisations offered a new vision of femininity on the Chinese stage—one that was active, intelligent, complex, and profoundly relatable to the changing society of the Republican era. He didn't just perform roles; he embodied the spirit of a new age.

For subsequent research, two avenues are particularly promising. First, a comparative study of Xun Huisheng and Mei Lanfang's interpretations of similar roles (e.g., tragic heroines) would illuminate the diverse paths modernisation could take. Second, tracing the lineage of the "Xun School" (Xunpai) and its influence on contemporary female performers of *huadan* roles would reveal the enduring impact of his techniques in a performance context where the gender of the performer now often aligns with the gender of the role.

Finally, tracing the lineage of the "Xun School" (*Xunpai*) and its influence on contemporary female performers of *huadan* roles would reveal how his legacy continues to shape the expressive vocabulary of Peking Opera, especially in an era when gender alignment between performer and role has become the norm. However, the accelerating process of modernisation presents growing challenges to the preservation and transmission of traditional performing arts (Deng & Hassan, 2024). In this context, fostering cultural awareness and adaptability has become essential to sustaining artistic heritage in a changing society (Yi et al., 2024).

This study, through its reliance on primary historical sources, underscores the value of contemporary criticism as a lens for understanding artistic innovation. It provides a methodological framework for analysing how performance styles are constructed, contested, and ultimately canonised, offering a model that can be applied to the study of other revolutionary artists across global theatrical traditions.

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The first author conducted the study and collected all research materials, while the second author, as the supervisor, conceptualised the research idea and provided continuous guidance and critical revisions throughout the writing process.

CONFLICT OF INTEREST

The author declares no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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Section: Original Article

A Heideggerian Conceptual Framework of Temporality and Visual Strategy in TikTok: Past, Present, and Future in Digital Engagement

***Zahir Alauddin Abd Hamid[1], Mohd Hisham Johari[2], Noor Ashraf Noor Othman[3]**
[1]*Visual Communication, Faculty of Art and Design, Universiti Teknologi MARA (UiTM), Kampus Puncak Alam, 42300, Puncak Alam, Malaysia*
[2]*Creative Game Design, Faculty of Art and Design, Universiti Teknologi MARA (UiTM), Kampus Puncak Alam, 42300, Puncak Alam, Malaysia*
[3]*Design Technology, Faculty of Art and Design, Universiti Teknologi MARA (UiTM), Kampus Shah Alam, 40450, Shah Alam, Malaysia*

*zahir_alauddin@uitm.edu.my[1], hishamjohari@uitm.edu.my[2], noora567@uitm.edu.my[3]
***Corresponding author**

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ABSTRACT

In essence, the rise of TikTok is a temporal phenomenon governed by an algorithmic logic that prioritises instantaneous relevance over static social links. While traditional research attributes virality to technology or psychology. This research argues that a philosophical approach to time is essential for understanding digital participation. By examining Martin Heidegger's existential phenomenology of ecstatic temporality, which encompasses past (Gewesen), present (Gegenwart), and future (Zukunft), this article introduces novel theoretical insights for analyzing video content strategies on TikTok. On the surface, this method appears as a diagnosis that reveals TikTok creators (and the platform's algorithm) produce content with time in mind rather than merely making abstract judgments about it. This practice challenges conventional wisdom about determining the "best time to post" content, suggesting that successful material resonates with how real people genuinely experience and navigate time—the past, present, and future. This synthesis of philosophy and digital media studies presents a critical tool for comprehending engagement. It offers both theoretical advancements and practical strategies for content creation in an era characterised by algorithmic temporality.

Keywords: *Temporality, Martin Heidegger, TikTok, algorithm, digital engagement, visual strategy, social media, philosophy of time*

1 INTRODUCTION

TikTok, in fact, has been a significant cultural force as well as a digital platform. It was an incredibly new product, each element meticulously crafted on a whimsical and seemingly absurd algorithm that resembles a cosmic art feedback loop (Salzman, 2022). Only immediately relevant and appropriate content is rewarded, while content that lacks value and doesn't align with the algorithm's preferences at the time receives minimal attention, effectively marginalising it (Bhandari & Bimo, 2022). Unlike previous iterations, TikTok's algorithm on the popular For You Page (FYP) prioritises immediate realtime bi-popular engagement (Bhandari & Bimo, 2022) over social connections and follower numbers (Ling et al., 2021).

TikTok algorithms operate on their own time scales. This shift mirrors the broader digital experience, which will eventually become the norm. Simply sharing an article or picture is no longer sufficient; onemust now carefully consider both the timing of posting and the subsequent tone of comments. The constant refreshment and fleeting nature of information further disrupts its flow (Limbachiya, 2025). Surprisingly, despite the widespread discussion about the “best times to post,” time has often been a rather superficial factor in academic research. The day and hour are simply when you schedule something, not necessarily what you’re interested in. Berger’s (2013) STEPPS model, the leading analytic model of viral content, restricts time as a central didactic principle (Matikainen 2015). This is particularly relevant for TikTok, which operates on an algorithm that prioritises “temporal immediacy” (Baumann et al., 2025). Ironically, while practitioners debate the “best time to post,” the academic literature tends to treat time as almost trivial—a scheduling issue rather than a fundamental one. Prominent approaches to understanding virality, such as Berger’s (2013) STEPPS model, emphasise social currency, emotion, and practical value as key mediating mechanisms. However, there has been little interest in time as a fundamental structuring philosophical principle (Matikainen, 2015). This gap is especially pronounced for TikTok, where the algorithm operates based on a kind of “temporal immediacy” (Baumann et al., 2025). One content creator expresses frustration, stating, “My content doesn’t receive as much engagement as everyone else’s, even though I post the same stuff.” This frustration often stems from misconceptions about the role of time (Johncarson, 2023).

This paper argues that to comprehend digital engagement on platforms like TikTok, we must reimagine time. Beyond chronological ordering, I propose that time is an existential and strategic medium. To support this, I draw on Martin Heidegger’s thoughts. In “Being and Time” (1927/1996), Heidegger asserts that there’s no a priori access to temporality as the horizon of Dasein. We exist in time, not of it, and our individual identity emerges from the ceaseless flow between our pasts, present (our differences), and futures that propel us forward. Consequently, this paper poses the question: What insights can a Heideggerian philosophy of temporality provide about TikTok’s strategies of visual culture production and the logic of algorithmic engagement? I propose an alternative framework that integrates Heidegger’s threefold temporality with the visual and algorithmic machinations of the platform. From this perspective, I’ll explore how successful content creators intuitively or deliberately grasp “framing time” through visual narratives of memory (past), immediacy (present), and aspiration/anticipation (future). This approach challenges reductionist, plan-oriented advice and offers a more nuanced, philosophically grounded explanation for the appeal of digitally mediated now.

2 LITERATURE REVIEW

2.1 The Philosophy of Time: From Chronos to Kairos

Two Greek concepts of time, Chronos (the quantitative, linear kind) and Kairos (the qualitative, opportune moment), have dominated philosophical engagement with it. Most contemporary digital analyses have dealt with Chronos—the analytics of time, duration, and posting schedules—and not considered Kairos as a principle for creative strategy (Esposito 2017). The work of Heidegger itself is a coming to terms with time as something other than mere chronology. Time: Heidegger argues that the truth of Being is the transcendental horizon (or condition) for human temporality. Our existence is primordially directed towards the future (“ahead-of-it-self”), although it remains always already thrown (being-already-in) and acting within a past (being-with-alongside) and present (Heidegger, 1996). This felicitous coincidence is more a range than it is a chain, no matter how often the story is told, and less of a sequence than an infrastructure of care and possibility. Later phenomenologists, including Husserl (1991) and Bergson (1991), also developed the idea of time as lived experience (durée): a continuous river of self-awareness incapable of being reduced to measurement. Those kinds of philosophical underpinnings are an antidote to the metric-driven mindset that you see so much in social media analysis.

2.2 Algorithmic Temporality and Platform Logic

Social media platforms today construct unique ‘temporal architectures’ (Miyazaki, 2020). Instagram and Facebook, for instance, have long employed a chronological feed that reinforces linear time.

However, TikTok represents a transition towards "algorithmic temporality," where predictive analytics and real-time user interaction govern platform time (Bishop, 2023). Its FYP algorithm functions as a temporal gatekeeper, selectively allowing content that elicits immediate engagement (likes, shares, watch time) within a limited critical window (Lupinacci, 2024). Consequently, content that fails to generate this instant reaction is easily overshadowed, regardless of its quality (Bhandari & Bimo, 2022). This phenomenon creates an atmosphere of 'ephemeral opportunitisation' (Alessandro Caliandro et al., 2024), where the success lies in capturing the fleeting nature of the algorithmic moment. As Vera and Ghosh (2025) observe, the FYP serves as a "temporal space" that is continuously refreshed based on up-to-the-minute engagement metrics.

2.3 Virality, Engagement, and the Gap in Temporal Analysis

There is a lot of research on virality and engagement. The work of Berger (2013) on the STEPPS model identifies significant factors such as social currency and emotion. Quantitative research frequently associates virality with specific content attributes such as emotion, surprise, and practical value (Berger & Milkman, 2012). Studies specifically examining behavior on TikTok commonly mention trending audio (Ling et al., 2021; Zhou, 2023), duet/stitch features, video formats (e.g., POV), and the perceived authenticity of the creator.

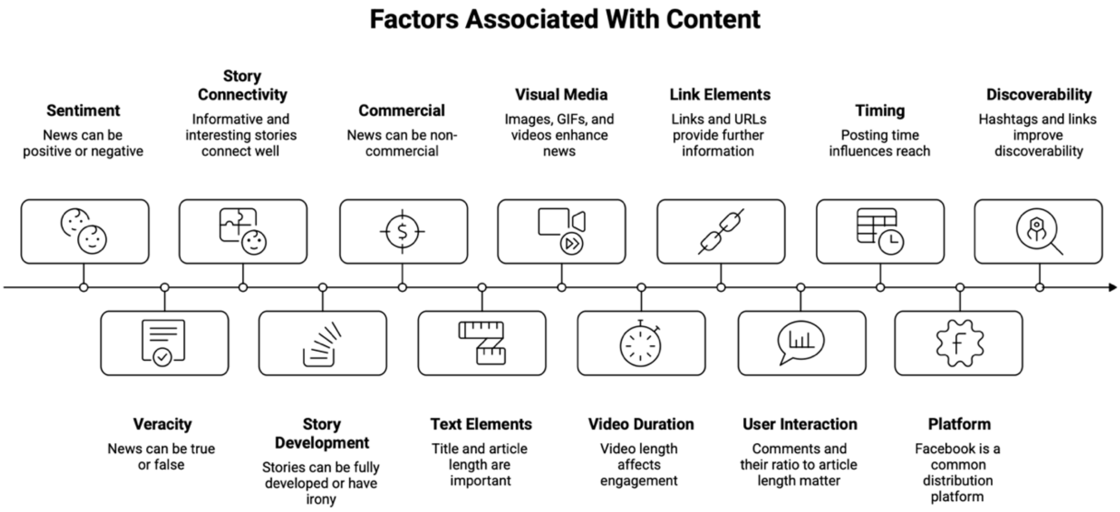

Figure 1 *Factors Associated with Content*

However, a significant gap persists. Systematic reviews, including the one conducted by Noor and Kamal (2020) on 35 studies examining online virality (Figure 1), indicate that time largely becomes treated as a secondary technical variable ("posting time"). Rarity as a narrative form, as a phenomenological experience, or as a creative strategy. Studies that consider TikTok as a real-time logic also evolve, viewing time as a constraint rather than a resource for the creator (Baumann et al., 2025). This lacuna highlights that the use of Heideggerian phenomenology—which makes time experience central to human understanding—to study digital content is something new.

Some scholars have begun interpreting Heidegger's thought in relation to technology, ofte drawing on his later concept of the "enframing" (Gestell) of modern technology (Heidegger, 1977). owever, fewer scholars have directly connected his early work on temporality with the practices of ocial media. A few exceptions include studies that have explored the concept of "presencing" oneself nline (Munn, 2020) or even the temporal rhythms of digital labor (Gillings, 2021). This paper ontributes to this ongoing conversation by analyzing Heidegger's ideas through the specific visual ogics and algorithmic affordances of a large social platform.

3 METHODOLOGY

The research method employed will be qualitative interpretation. This approach is appropriate for studies that concentrate on meaning, experience, and philosophical concepts (Harper and Thompson, 2012). Unlike statistical generalisability, the objective is to attain a profound comprehension through a multi-method design that encompasses three types of data, i.e. content analysis, interview, and philosophical interpretation.

3.1 Content Analysis of High-Engagement TikTok Videos

A purposeful sample of 30 to 50 Malaysian TikTok videos will be collected. Good and high engagement, or viral videos (views of 10,000 are clearly good, 100,000 indicate strong engagement, and those exceeding 500,000 to 1 million have a likes-to-views ratio greater than 10%), will be selected and labeled as “Good/High” and “viral.” A qualitative visual and narratological analysis will be conducted, with a specific focus on explicit and implicit temporal strategies. These strategies will then be compared with various open-coding categories that emerged from the Heideggerian framework, such as “invocation of the past,” “seizing the present trend,” and “future-oriented narrative.”

3.2 In-depth Phenomenological Interviews

Method: Semi-structured interviews will be conducted with eight to ten TikTok content creators in Malaysia who are actively producing good and viral content. These interviews, lasting between 45 and 60 minutes, will delve into three key aspects: (a) the artists’ intuitive grasp of “timing” and the algorithm, (b) their creative process for framing narratives, and (c) their perceptions of how past, present, and future-oriented thinking influences their work. The transcribed interviews will be analyzed inductively.

3.3 Philosophical Interpretation

Heidegger’s philosophical framework will be intricately interwoven with empirical observations from content analysis and interviews. This interpretative endeavor aims to construct a comprehensive understanding of how existential temporality manifests in TikTok as a practical and strategic domain This concept is significant because it explains how the dimension of time shape’s identity, progress, and human interactions with the world. This approach aligns with the study’s objective, which investigate how time (temporality) functions as a visual strategy in fostering engagement and virality of visua content on TikTok. Heidegger’s notion of time (temporality) establishes a robust theoretical framework that contributes to comprehending the multifaceted role of time, not only as a technical constraint in social media (such as posting time, duration of visual content, or view rate), but also as a visual strategy that has proven effective in creating visually appealing content capable of achieving high visibility rates on social media platforms.

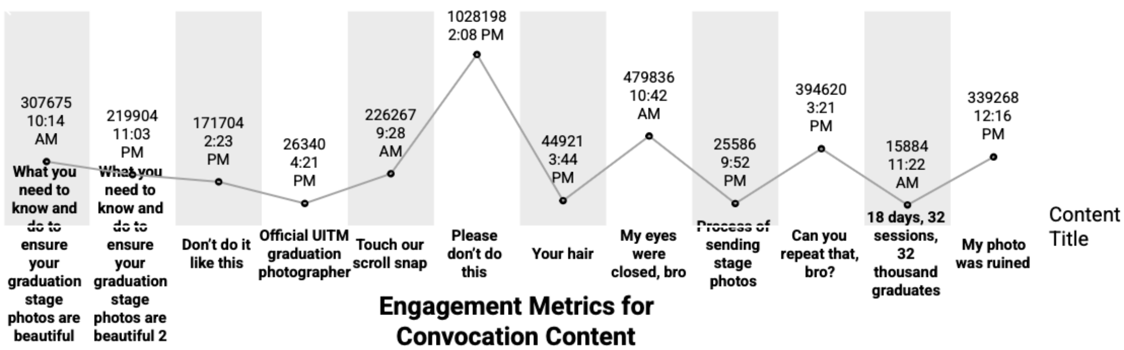

Figure 2 *Engagement Metrics for UiTM Convocation Content (Source: Sir Zahir TikTok)*

Figure 2 serves as part of the supporting case study and features a self-researcher's experiment posting convocation-related content. This data is significant in my understanding of how virality can be achieved not by relying on "golden hours," but rather by reaching its temporal relevance (convocation) at a specific time (Alauddin et al., 2025). I'm currently experimenting with the concept of time to engage viewers in the present day who are engaged in conversations. This indirect approach also reaches viewers who have experienced similar convocations in the past, allowing them to share their stories and experiences. Ultimately, the content produced also reaches students who are currently studying and eagerly anticipate their turn to participate in a convocation in the future. These students gain inspiration and envision their future aspirations. The data collected from this self-examination demonstrates that the three methodologies introduced in this study can provide evidence that the conceptual framework presented can contribute to the development of innovative visual strategies that effectively capture and maintain viewer attention, ultimately leading to high levels of engagement.

4 DISCUSSION

4.1 Debunking the "Golden Hour": Temporality vs. Chronology

Empirically, the data in Figure 2 is a strong counterpoint to simplistic advice that suggests doin things in a specific order. At various times, such as 10:14 AM, 11:03 PM, and 2:23 PM, researcher ideos offering advice on convocation suddenly went viral. These instances appeared to be random. A ideo uploaded at 2:08 PM on Wednesday garnered over a million views, despite being outside of any ideal times" recommended by social media guides (as shown in Figure 2). This aligns with the model resented here. It wasn't that this content was "trending" at 1 p.m., but rather that its virality was riggered temporally (in relation to the current context of convocation season), rather than hronologically (an artifact specific to a particular time slot on an individual's timeline). The algorithm xhibited a preference for content that was "present-at-hand" to a wide audience at the time, regardless f the clock time. This supports Heidegger's concept of two times: a planned time and a time that holds meaning.

4.1 The Creator as "Dasein": Temporal Awareness in Practice

Successful creators often possess an intuitive, even embodied, sense of temporal strategic action, like what Heidegger referred to as ecstatic temporality. They actively monitor the "FYP pulse" to anticipate upcoming trends. Furthermore, creators intentionally evoke nostalgia. People instantly connect with nostalgic sounds from their childhood. It's not just passive consumption; it's an emotional experience that fosters a sense of shared memory. This approach utilises the past to create a connection with the audience. Several writers discussed the concept of serial content. They planned Part 1 with the intention of having a clear concept for Part 2, encouraging viewers to return and anticipate the next installment. This forward-thinking narrative invites users to engage in their own future-oriented thinking.

4.3 The Algorithm as Temporal Architect

In my analysis, I demonstrate that the TikTok algorithm functions not only as a filter but also as a user temporality architect. When genuine spontaneity gained value, it incentivised content that could disrupt the user's experience most effectively. However, by personalising feeds based on past interactions, it intertwines individual and collective histories with the present moment. (Furthermore, the site's endless suggested videos subtly guide us toward a future of limitless browsing possibilities. Consequently, the FYP materialises a distorted yet potent version of ecstatic time, where ecstatic times are optimised for extended engagement and devotion to the platform.

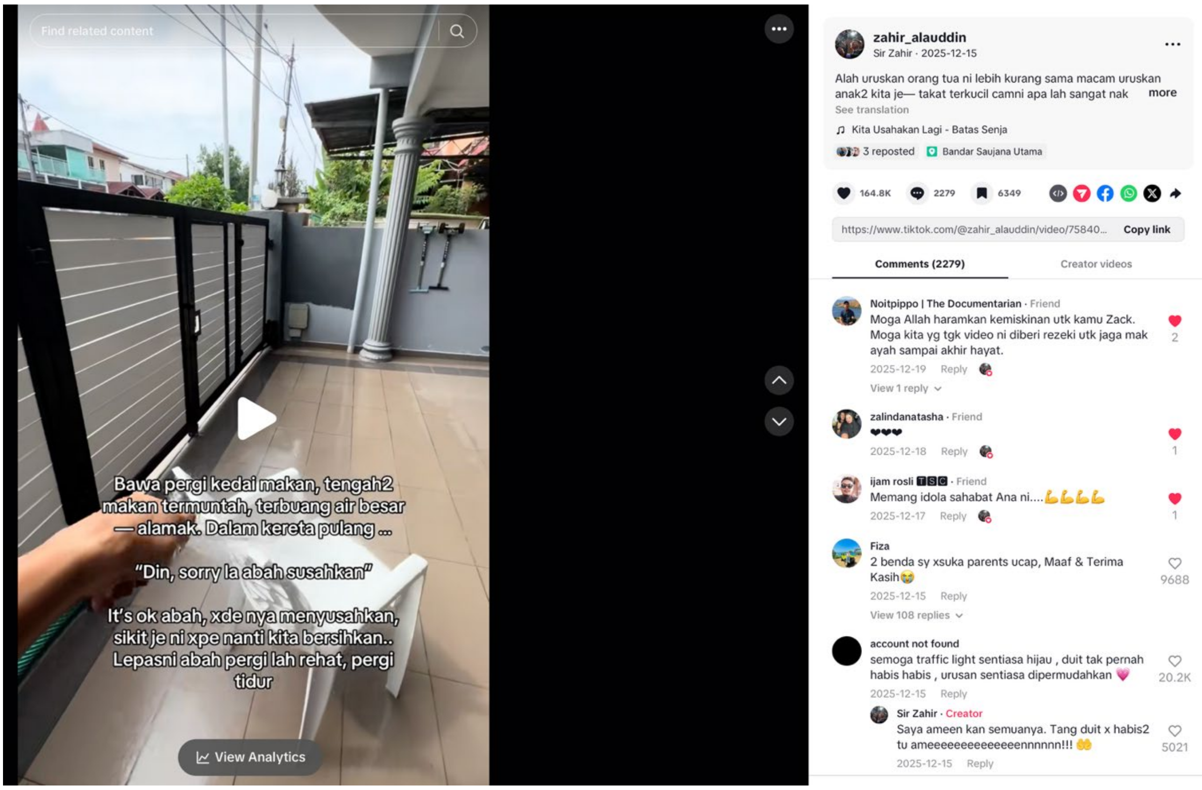

Figure 3 *It's Just a Small Matter*
(Source: Sir Zahir TikTok)

For example, content about the challenges of managing a father produced by me on TikTok using the nickname Sir Zahir (Figure 3), which is an experiment to see the integration of past (Gewesen), present (Gegenwart), and future (Zukunf), was judged to be successful. In this content, I share a story about my father, who suddenly defected and vomited when we took him out for breakfast at the restaurant. But I managed to clean and get him ready from the start, helping him put on clean and comfortable clothes before he fell asleep. This content was shared on December 15, 2025, and has already received 1.3 million views. It has 165,000 likes, 2,279 comments, 9,132 shares, and 6,349 saves. This video touches the sad feelings of all viewers because it reminds them of their fathers.

Figure 4 *Example comments from It's Just a Small Matter content*
(Source: Sir Zahir TikTok)

For example, Ezzate Hatta commented, *"He reminds me of my late mom. Once they fell out of the stoma bag of my mother's soul on the way to the toilet. At the time, I didn't want to be in a situation where I had to deal with my own feelings of guilt. People don't even ask to trouble their children."* This shows that the audience has experienced the same situation in the past. Another example is Afe_Rafe's comment, *"I also experienced the same thing; We must be prepared; Pampers clothes must be worn. Supplies, as we do with small children. Ready with bag powder and complete clothing wipes. May Allah protect us who take care of the elderly".* This shows that he is experiencing the same situation of taking care of the elderly (present). Finally, Hanani commented, *"I hope I am strong and will not complain when I take care of my elderly like you, brother."* This shows the determination and planning that this audience will prepare in the future (Zukunf).

4.4 Conceptual Framework: A Heideggerian Model for TikTok Engagement

To bridge the gap between philosophical temporality and digital practice, I propose the following conceptual framework (see Figure 3). The model illustrates the process of TikTokers' engagement, characterised by a dynamic interaction between Heidegger's ecstatic temporality, mediated by the algorithm (system), and executed as a visual strategy. The primary argument of this article is that captivating TikTok content embodies a synthesised temporality derived from Heideggerian phenomenology. I employ a didactic or intuitive approach to construct stories that simultaneously evoke the past (Gewesen) through nostalgic aesthetics, memetic formats, or personal archival footage. These elements serve as mechanisms to establish a foundational sense of shared identity and belonging. Simultaneously, the content seizes the present (Gegenwart) by positioning itself within trending audio, participatory challenges, and real-time interactive hooks.

I strategically place these elements at the top to capture users' attention and satisfy the algorithm's insatiable hunger for engagement. Furthermore, the content projects towards the future (Zukunft) by integrating aspirational visuals into serialised storytelling and goal-oriented teasers. These elements invite viewers to invest in an ongoing story world and envision themselves anew. This triadic temporal architecture transforms passive consumption into a gradual form of followership and encourages favor from algorithms. This mimetic imitation of the user's existential in-time mode-of-being instigates a continuous feedback loop between lived experience, curated content, and platform logic.

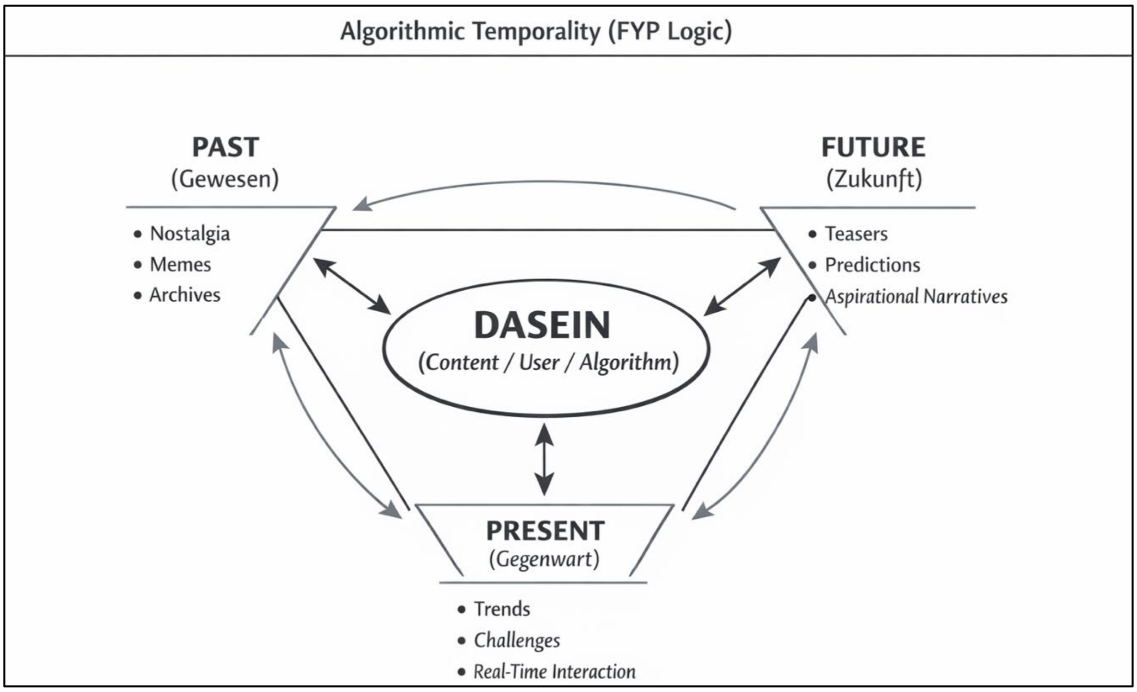

Figure 5 *A Heideggerian Conceptual Framework of Algorithmic Temporality (FYP Logic)*

Heidegger argues that humans experience time (temporality) to comprehend existence (Being). He asserts that the understanding of time is intrinsically linked to human existence (Dasein) (Martin Heidegger, 1996). This aligns with Islamic thought as well. In Islamic thought, humans are creatures who exist and are placed within time. As previously discussed, humans exist and live in relation to the past (memory, history, heritage, etc.), the present (what is happening and being done by humans), and the future (expectations, possibilities, planning). These elements collectively form the concept of human existence (Dasein) in time (temporality). (Martin Heidegger, 1996). When we consider human existence as temporal, we recognise that time is not an objective entity but rather a horizon that enables humans to understand themselves and their world. As Heidegger famously stated in his masterpiece, Sein Un Zeit (Being and Time, 1927), time (temporality) serves as the ontological foundation of existence. (Martin Heidegger, 1996).

5 CONCLUSION

This paper contends that comprehending digital engagement, particularly on platforms like TikTok that are temporal and reflective, necessitates a philosophical shift in our understanding of time. Drawing on Martin Heidegger's existential phenomenology of time and analyses of digital media, i propose a theoretical perspective that challenges the limited view of time as a linear progression. TikTok time is not a linear timeline but a dynamic field of strategic possibilities. It encompasses the "past" as a reservoir of living memory and nostalgia, the "present" as a fleeting moment of algorithmic capture and trendy opportunities, and the "future" as a sequenced horizon of expectations facilitated by serial storytelling and aspirational prospects. The platform's algorithm acts as a filter, favoring content that aligns with this temporal field.

The case study material effectively dispels the myth of the "golden hour," demonstrating that virality is more a matter of timing (Kairos) than strict adherence to a fixed schedule (Chronos). This chapter bridges Continental philosophy and digital media studies, providing a robust and anti-technocentric framework for analyzing platforms' logics and engagements centered around human experiences of time. The proposed framework offers strategic tools for content creators, marketers, and educators. It advises seeking the optimal posting time, cultivating temporal dexterity, auditing current trends (present), accessing cultural memory (past), and engaging users with narratives that encourage ongoing participation (future).

The study, a conceptual and qualitative exploration, focused solely on Malaysian TikTok from a single philosophical perspective. In the future, I believe it would be intriguing to quantitatively verify the association between multi-temporal content features and engagement metrics. To enhance the model, cross-platform trends like Instagram Reels and YouTube Shorts should be compared. Crucially, research must address the ethical implications of this "algorithmic temporality." The constant pursuit of an ever-present now harms creator well-being and cultural memory and erodes our collective sense of time.

In an era where everything is algorithmically shaped, it is not merely an academic luxury but an urgent necessity to reclaim a time philosophy. By acknowledging, as Heidegger emphasised, our fundamental temporal nature, we can become more discerning and proactive in our interactions with the digital (and non-digital) worlds through which time now transitions into the future.

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ARTICLE CONTRIBUTION TO RELATED FIELD OF STUDY

The author was responsible for the conceptualisation and design of the study, including the integration of Heidegger's ecstatic temporality into the digital media framework. The author performed the qualitative data collection through semi-structured interviews and content analysis. Furthermore, the author conducted the self-researcher experiment (the 'Sir Zahir' case study) to empirically validate the triadic temporal strategy of past (*Gewesen*), present (*Gegenwart*), and future (*Zukunft*). The author also wrote, reviewed, and approved the final manuscript.

AUTHOR CONTRIBUTION

Each author contributes equally in this research.

CONFLICT OF INTERESTS

The authors would like to declare that there are no conflicts of interests in this research.

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Pelancongan Gastronomi Di Malaysia: Perkembangan, Konsep Dan Implikasi Terhadap Ekonomi Dan Budaya

Gastronomic Tourism in Malaysia: Developments, Concepts, and Implications for Economy and Culture

***Haslinda Md. Nazri[1], Noor Aileen Ibrahim[2]**
[1]Jabatan Seramik, Fakulti Seni Lukis dan Seni Reka, Universiti Teknologi Mara, Cawangan Perak, Kampus Seri Iskandar, 32610 Seri Iskandar, Perak Malaysia
[2]Academic of Language Studies, Universiti Teknologi MARA, Cawangan Perak, Kampus Seri Iskandar, 32610 Seri Iskandar, Perak, Malaysia

*hasli550@uitm.edu.my[1], nooraileen@uitm.edu.my[2]
***Corresponding author**

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ABSTRAK

Pelancongan gastronomi telah berevolusi daripada sekadar aktiviti pemakanan kepada bentuk pelancongan pengalaman yang menggabungkan interaksi kulinari, warisan budaya, dan identiti setempat. Kajian ini bertujuan menilai evolusi sektor gastronomi di Malaysia dengan memfokuskan kepada peranan inisiatif strategik kerajaan dan implikasinya terhadap ekonomi nasional. Menggunakan kaedah analisis literatur sistematis dan sintesis data sekunder, dapatan kajian menunjukkan bahawa subsektor makanan dan minuman kini merupakan pemacu kritikal yang menyumbang 16.3% kepada industri pelancongan negara. Program berimpak tinggi seperti Malaysia Kitchen dan pengiktirafan Kuching sebagai Bandar Raya Kreatif UNESCO telah memperkukuh kedudukan Malaysia sebagai destinasi global yang kompetitif. Kajian ini merumuskan satu kerangka pembangunan holistik yang mengintegrasikan inovasi kulinari, kelestarian sumber, dan transformasi digital. Implikasi kajian mencadangkan bahawa sinergi antara teknologi dan pemeliharaan warisan adalah kunci kepada pertumbuhan pelancongan mampan di peringkat nasional dan antarabangsa.

Kata Kunci: *Pelancongan Gastronomi, Malaysia, Makanan Tempatan, Pengalaman Pelancong, Inovasi Kulinari.*

ABSTRACT

Gastronomic tourism has evolved from mere food consumption into a form of experiential tourism that integrates culinary interaction, cultural heritage, and local identity. This study aims to evaluate the evolution of Malaysia's gastronomy sector, focusing on the role of strategic government initiatives and their implications for the national economy. Utilizing systematic literature analysis and secondary data synthesis, the findings reveal that the food and beverage subsector is now a critical driver, contributing 16.3% to the country's tourism industry. High-impact programs such as Malaysia Kitchen and the recognition of Kuching as a UNESCO Creative City of Gastronomy have strengthened Malaysia's position as a competitive global destination. This study formulates a holistic development framework that integrates culinary innovation, resource sustainability, and digital transformation. The implications of the study suggest that the synergy between technology and heritage preservation is the key to sustainable tourism growth at both national and international levels.

Keywords: Gastronomic Tourism, Malaysia, Local Cuisine, Tourist Experience, Cultural Innovation

1 PENGENALAN

Pelancongan gastronomi merujuk kepada pengalaman pelancong yang menekankan interaksi dengan makanan, tradisi kulinari, dan budaya setempat (Hall & Sharples, 2003; Csoban & Konyves, 2015). Gastronomi bukan sekadar pemakanan, tetapi juga kajian tentang hubungan antara makanan, budaya, sejarah, dan pengalaman manusia (Mulcahy, 2019). Ia merangkumi proses penyediaan makanan, teknik memasak, seni persembahan, serta pengalaman sosial dan estetika. Dalam konteks pelancongan, makanan berperanan sebagai tarikan utama yang tidak hanya memenuhi keperluan asas tetapi juga memperkayakan pengalaman budaya pelancong, membolehkan mereka memahami adat, warisan kulinari, gaya hidup masyarakat tempatan, serta nilai-nilai sosial yang terkandung dalam aktiviti penyediaan dan pengambilan makanan (Tan et al., 2014).

Sektor gastronomi di Malaysia berpotensi menyumbang secara signifikan kepada pembangunan ekonomi bandar dan negara, melalui restoran, hotel, pasar, perkhidmatan katering, dan promosi makanan antarabangsa (Siti Noraishah Dollah@Abdullah et al., 2012). Kepelbagaian budaya, warisan kulinari yang unik, dan masyarakat yang mesra menjadikan Malaysia destinasi gastronomi utama di Asia Tenggara (Habibah, 2011). Dengan gabungan masakan Melayu, Cina, India, dan etnik pribumi, pengalaman gastronomi di Malaysia menawarkan variasi rasa, teknik memasak yang berbeza, dan ritual budaya yang autentik.

Selain itu, pelancongan gastronomi turut memainkan peranan penting dalam mempromosikan produk tempatan, memelihara tradisi kulinari, serta meningkatkan kesedaran terhadap kelestarian sumber makanan. Pelancong tidak hanya mencuba hidangan, tetapi juga mengalami proses pembuatan makanan tradisional, menyertai festival atau bengkel memasak, serta berinteraksi dengan komuniti setempat. Dengan cara ini, pelancongan gastronomi bukan sahaja menyokong pertumbuhan ekonomi tetapi juga memupuk penghargaan terhadap budaya dan sejarah makanan.

Kajian ini bertujuan meneliti perkembangan gastronomi di Malaysia, menilai konsep pelancongan gastronomi dari perspektif ekonomi, budaya, sosial, dan pengalaman pelancong, serta menyoroti implikasinya terhadap pembangunan destinasi, strategi pemasaran, kepuasan pelancong, inovasi kulinari, dan kelestarian industri makanan tempatan. Penekanan diberikan kepada kepentingan pembangunan pengalaman gastronomi yang autentik, kolaborasi antara kerajaan, komuniti, dan sektor swasta, serta pengintegrasian teknologi dan media sosial dalam promosi pelancongan gastronomi bagi memastikan Malaysia terus menjadi destinasi yang kompetitif di peringkat global.

2 KAJIAN LITERATUR

2.1 Definisi dan Konsep Gastronomi

Gastronomi merujuk kepada kajian makanan, budaya, dan amalan pengambilan serta kenikmatan makanan (Brillat-Savarin, 1994; Santich, 1996; Mulcahy, 2019). Ia bukan sekadar pemenuhan keperluan asas manusia, tetapi juga suatu bentuk seni yang menghubungkan aspek sejarah, tradisi, budaya, dan estetika. Richards (2002) menyatakan bahawa gastronomi telah berkembang menjadi industri global yang mempengaruhi pelancongan, menjadikan makanan sebagai pengalaman yang tidak dapat dilupakan. Dalam konteks pelancongan, gastronomi memainkan peranan penting sebagai alat untuk memperkenalkan budaya setempat, memupuk interaksi sosial antara pelancong dan komuniti, serta memperkaya pengalaman sensori pelancong melalui citarasa, aroma, dan penyediaan makanan.

Peralihan daripada ekonomi berasaskan perkhidmatan kepada ekonomi berasaskan pengalaman telah menekankan peranan makanan dalam penciptaan pengalaman pelancong yang autentik dan berkesan (Pine & Gilmore, 1999). Tahap pengalaman gastronomi bergantung kepada persepsi pelancong terhadap makanan tempatan, sama ada sebagai motivasi utama atau pengalaman sokongan dalam aktiviti pelancongan (Yuan, 2015). Kajian terdahulu menekankan bahawa pengalaman gastronomi bukan sahaja terhad kepada penyediaan dan pengambilan makanan, tetapi juga merangkumi estetika persembahan, sejarah makanan, tradisi kulinari, interaksi sosial, dan konteks budaya yang menyertainya (Santich, 1996; Brillat-Savarin, 1994).

Selain itu, gastronomi turut memberi peluang kepada pelancong untuk memahami nilai sosial dan ekonomi makanan, mempelajari teknik memasak tradisional, serta mengalami festival dan aktiviti kulinari yang mencerminkan identiti budaya tempatan. Perpaduan antara pengetahuan sejarah, pengalaman sensor, dan interaksi komuniti menjadikan gastronomi sebagai elemen penting dalam pembangunan destinasi pelancongan yang berdaya saing dan mampu menarik pelancong dari pelbagai latar belakang budaya dan negara.

2.2 Pelancongan Gastronomi

Pelancongan gastronomi ditakrifkan sebagai keinginan pelancong untuk meneroka, mengalami, dan menikmati makanan di destinasi tertentu (Hall & Sharples, 2003; Okumus & McKercher, 2007). Elemen utama pelancongan gastronomi termasuk budaya, pendidikan, hiburan, dan pengalaman sensori, yang kesemuanya mempengaruhi kepuasan pelancong serta minat mereka untuk melawat kembali destinasi tersebut (Roozbeh, 2013; Sengel, 2015; Ellis et al., 2018). Kajian oleh Hjalager dan Richards (2002) menunjukkan bahawa pelancongan gastronomi bukan sahaja memberi impak ekonomi melalui perbelanjaan pelancong di restoran, pasar, dan kafe, tetapi juga memperkukuh pengiktirafan produk tempatan dan identiti budaya.

Pemilihan makanan bukan sahaja menjadi faktor motivasi pelancong, tetapi juga merupakan sebahagian daripada identiti budaya destinasi, di mana hidangan tempatan mencerminkan sejarah, tradisi, dan keunikan budaya masyarakat setempat (Pilcher, 2006; Zahari et al., 2009; Everett & Aitchison, 2008). Populariti pelancongan gastronomi semakin meningkat berdasarkan keinginan pelancong untuk mencuba pengalaman baharu (neofilia makanan), di mana 53% pelancong senggang dikategorikan sebagai pelancong makanan menurut World Food Travel Association (2016). Kajian oleh Kivela dan Crotts (2006) menekankan bahawa pengalaman gastronomi yang berjaya menggabungkan elemen interaktif, pendidikan tentang sejarah makanan, dan penyertaan dalam festival atau bengkel masakan, dapat meningkatkan kepuasan dan daya tarikan destinasi.

Fenomena ini menekankan kepentingan pembangunan pengalaman gastronomi yang unik, autentik, dan selaras dengan budaya tempatan, agar pelancong bukan sahaja menikmati makanan tetapi juga memahami konteks sosial, ekonomi, dan sejarah makanan tersebut. Strategi pemasaran gastronomi yang efektif melibatkan promosi melalui media digital, pengalaman interaktif, serta kolaborasi dengan komuniti tempatan untuk mengekalkan keaslian dan warisan kulinari (Chang & Yuan, 2011; Ellis et al., 2018).

2.3 Perkembangan Gastronomi di Malaysia

Pelancongan gastronomi di Malaysia bukan sekadar aktiviti pemakanan, malah merupakan satu bentuk pelancongan pengalaman yang menekankan interaksi antara pelancong dengan makanan tempatan, tradisi kulinari, dan budaya setempat. Menurut kajian yang diterbitkan dalam Idealogy Journal, sektor ini merangkumi pengalaman budaya yang luas, termasuk sejarah makanan serta seni penyediaan dan persembahan hidangan yang unikKerajaan Malaysia dan agensi seperti MATRADE serta Tourism Malaysia memainkan peranan penting dalam mempromosikan makanan tempatan sebagai daya tarikan pelancong.

Program seperti *Malaysia Kitchen* (2006) dan kempen *Trak Makanan Malaysia* di New York bukan sahaja memperkenalkan masakan Malaysia di peringkat antarabangsa tetapi juga memperkukuh identiti budaya dan kepelbagaian etnik negara kepada komuniti global. Selain itu, penerbitan risalah gastronomi seperti "*SeeEatFood Trail*" yang menyenaraikan restoran makanan laut di Sabah dan Labuan direka untuk menarik pelancong dengan menonjolkan keunikan makanan laut serantau.

Di peringkat domestik, acara seperti *Citrawarna Keluarga Malaysia 2022* mempamerkan budaya dan gastronomi melalui pameran makanan, persembahan kraf, dan festival muzik di Sarawak, yang turut mengiktiraf Kuching sebagai Bandar Raya Kreatif UNESCO dalam kategori gastronomi. Kepelbagaian masakan Malaysia iaitu gabungan budaya Melayu, Cina, India, dan etnik lain menjadikan pengalaman gastronomi ini tarikan unik bagi pelancong asing dan domestik. Kajian terdahulu menunjukkan bahawa promosi makanan tempatan meningkatkan identiti destinasi dan memberi nilai tambah kepada ekonomi melalui peningkatan pengalaman pelancong dan perbelanjaan dalam sektor makanan dan minuman (Artinah et al., 2010; Correia et al., 2008).

Penyelidikan terkini mengenai kelestarian pelancongan gastronomi di Malaysia menekankan bahawa penggunaan bahan tempatan dan bermusim, pemeliharaan tradisi makanan, serta kerjasama antara pemegang taruh adalah faktor utama dalam pembangunan gastronomi mampan. Amalan ini bukan sahaja melindungi warisan makanan tetapi juga memperkukuh ekonomi komuniti melalui peluang pekerjaan, latihan, dan penglibatan komuniti dalam aktiviti pelancongan. Statistik industri pelancongan Malaysia terkini menunjukkan bahawa subsektor makanan dan minuman menyumbang sekitar 16.3% daripada keseluruhan industri pelancongan pada 2024, menekankan peranan penting gastronomi dalam pemulihan dan pertumbuhan pelancongan pasca-pandemik.

Secara keseluruhan, kolaborasi antara kerajaan, agensi promosi, komuniti tempatan, dan sektor swasta memacu pertumbuhan pelancongan gastronomi Malaysia, sambil memastikan ia memberi impak positif terhadap identiti budaya, ekonomi komuniti, dan pengalaman pelancong secara menyeluruh.

3 IMPLIKASI TERHADAP EKONOMI DAN BUDAYA

Pembangunan sektor pelancongan gastronomi di Malaysia memberikan impak yang signifikan merentasi dimensi ekonomi nasional dan pemeliharaan warisan budaya. Berdasarkan dapatan yang diterbitkan dalam Idealogy Journal (2026),Pelancongan gastronomi menyumbang kepada pembangunan ekonomi melalui pelbagai sektor termasuk makanan dan minuman, perkhidmatan restoran, hotel, serta pemasaran antarabangsa. Menurut Akaun Satelit Pelancongan 2024, industri pelancongan Malaysia menjana sebanyak RM291.9 bilion dan menyumbang 15.1 % kepada Keluaran Dalam Negara Kasar (KDNK) pada tahun 2024, di mana subsektor makanan dan minuman menyumbang sekitar 16.3 % daripada nilai keseluruhan sektor pelancongan — satu indikator penting peranan makanan dalam ekonomi pelancongan tempatan.

Selain itu, data menunjukkan bahawa perbelanjaan pelancongan inbound di Malaysia meningkat sebanyak 41.1 % pada 2024, dengan pertumbuhan pesat dalam aktiviti membeli-belah dan makanan & minuman, memperkukuh kedudukan subsektor makanan sebagai pendorong utama dalam pemulihan pascapandemik. Pelancongan domestik juga mencatat perkembangan positif, dengan pertumbuhan perbelanjaan keseluruhan lebih 25 %, menunjukkan bahawa pelancongan berbasis makanan menarik bukan sahaja pelancong antarabangsa tetapi juga domestik.

Gastronomi turut memperkukuh identiti budaya dan mempromosikan produk tempatan berkualiti tinggi, selari dengan dapatan Sirse (2014) yang menunjukkan hubungan positif antara promosi makanan tempatan dan pembangunan pelancongan destinasi. Kajian terdahulu juga menekankan bahawa destinasi yang menekankan pengalaman gastronomi mampu menarik pelancong dengan tahap pengulangan lawatan yang tinggi, memberi impak positif kepada pendapatan tempatan dan penciptaan peluang pekerjaan dalam sektor perkhidmatan, industri makanan, dan hospitaliti.

Pengalaman gastronomi meningkatkan kesedaran pelancong terhadap budaya dan gaya hidup komuniti setempat serta menyokong pembangunan pelancongan mampan melalui penggunaan hasil tanaman dan produk tempatan secara bertanggungjawab (Tannahill, 2002; Pilcher, 2006). Interaksi sosial yang terjalin melalui aktiviti kulinari seperti lawatan ke pasar tradisional, bengkel memasak, dan festival makanan tempatan turut memperkukuh pemahaman budaya dan membentuk persepsi positif terhadap destinasi, yang menjadi asas penting dalam strategi pemasaran pelancongan gastronomi masa kini.

4 PERBINCANGAN

Pelancongan gastronomi di Malaysia berkembang melalui gabungan beberapa faktor strategik yang saling berkaitan, termasuk inisiatif kerajaan, promosi antarabangsa, kepelbagaian budaya tempatan, dan kerjasama dengan sektor swasta (Hall & Sharples, 2003; Richards, 2002). Usaha kerajaan melalui agensi seperti MATRADE dan Tourism Malaysia, termasuk program *Malaysia Kitchen* (2006) dan *Trak Makanan Malaysia*, telah memperkenalkan masakan tempatan ke pentas global, meningkatkan visibiliti makanan Malaysia sebagai salah satu tarikan pelancongan utama (Siti Noraishah Dollah@Abdullah et al., 2012; Habibah, 2011).

Masakan Malaysia bukan sahaja memenuhi cita rasa pelancong, tetapi juga berfungsi sebagai simbol identiti budaya dan integrasi etnik. Kepelbagaian hidangan, termasuk masakan Melayu, Cina, India, dan pribumi, mencerminkan sejarah sosial, tradisi, dan kreativiti kulinari negara. Fenomena ini memperkukuh identiti destinasi dan memberikan pengalaman autentik yang bukan sahaja menekankan aspek rasa, tetapi juga estetika, ritual, dan naratif budaya yang berkaitan dengan makanan (Sirse, 2014; Mulcahy, 2019).

Pendekatan pembangunan berteraskan pengalaman (*experience economy*) menjadikan gastronomi sebagai instrumen pengalaman pelancong yang utama, di mana makanan bukan sahaja menjadi motivasi lawatan tetapi juga sebahagian daripada pengalaman sosio-budaya yang holistik (Pine & Gilmore, 1999; Yuan, 2015). Aktiviti seperti lawatan pasar tradisional, bengkel memasak, festival makanan, dan demonstrasi kulinari tempatan memberi pelancong peluang untuk mengalami proses pembuatan makanan secara langsung, mempelajari sejarah makanan, dan memahami gaya hidup masyarakat setempat. Keterlibatan ini meningkatkan kepuasan pelancong, menggalakkan lawatan berulang, dan menyumbang kepada pertumbuhan ekonomi tempatan melalui perbelanjaan langsung di restoran, hotel, dan pasaran produk tempatan (Correia et al., 2008; Artinah et al., 2010).

Cabaran utama dalam pembangunan pelancongan gastronomi termasuk kelestarian sumber makanan, inovasi kulinari, dan penglibatan komuniti tempatan. Kelestarian sumber merangkumi penggunaan bahan tempatan, teknik pertanian lestari, dan pengurusan sisa makanan dalam operasi pelancongan gastronomi (HRMARS, 2021). Inovasi kulinari diperlukan untuk menyesuaikan masakan tradisional dengan citarasa pelancong antarabangsa tanpa menjejaskan keaslian budaya (Kivela & Crotts, 2006). Selain itu, penglibatan komuniti setempat dalam perancangan dan pelaksanaan aktiviti gastronomi dapat meningkatkan pemilikan sosial dan memastikan pengalaman yang ditawarkan bersifat autentik serta berterusan (Ellis et al., 2018).

Integrasi teknologi dan digitalisasi dalam promosi makanan, termasuk pemasaran melalui media sosial, platform tempahan restoran, dan aplikasi panduan gastronomi, turut menyumbang kepada peningkatan capaian pelancong dan visibiliti global (Chang & Yuan, 2011). Ia juga membolehkan pengumpulan maklum balas pelancong secara real-time, memperbaiki mutu pengalaman, dan merangsang inovasi dalam sektor gastronomi.

Dengan penerapan dasar ekonomi pengalaman, gastronomi bukan sahaja berfungsi sebagai medium promosi budaya tetapi juga sebagai strategi pembangunan destinasi yang mampan. Ia meningkatkan daya saing destinasi, memperkukuh ekonomi komuniti tempatan, dan menyokong pembangunan pelancongan bersepadu yang menekankan kelestarian budaya, ekonomi, dan alam sekitar (Tannahill, 2002; Pilcher, 2006).

Secara keseluruhannya, pembangunan pelancongan gastronomi di Malaysia memerlukan pendekatan holistik yang menggabungkan dasar kerajaan, kerjasama komuniti, inovasi kulinari, kelestarian sumber, dan digitalisasi. Kajian masa depan boleh memberi tumpuan kepada penilaian pengalaman pelancong secara kualitatif, analisis peranan media sosial dalam promosi gastronomi, dan model pembangunan gastronomi mampan yang bersepadu dengan strategi pelancongan budaya dan ekonomi tempatan.

5 KESIMPULAN

Pelancongan gastronomi telah menjadi komponen penting dalam pembangunan pelancongan Malaysia, di mana ia bukan sekadar menyediakan pengalaman pemakanan, tetapi juga berfungsi sebagai medium untuk pemeliharaan budaya, pengukuhan identiti negara, dan pembangunan ekonomi tempatan (Hall & Sharples, 2003; Richards, 2002). Kepelbagaian etnik dan budaya Malaysia menjadikan pengalaman gastronomi unik dan autentik, di mana pelancong berpeluang memahami sejarah, tradisi, dan gaya hidup komuniti setempat melalui masakan Melayu, Cina, India, dan etnik pribumi (Sirse, 2014; Mulcahy, 2019). Interaksi ini bukan sahaja meningkatkan kesedaran budaya tetapi juga memperkukuh persepsi positif pelancong terhadap destinasi, yang seterusnya mendorong lawatan berulang dan peningkatan perbelanjaan pelancong (Artinah, Nizan, & Nizam, 2010; Correia et al., 2008).

Strategi pembangunan gastronomi perlu menekankan pendekatan berasaskan pengalaman, dengan aktiviti interaktif seperti bengkel memasak, lawatan pasar tradisional, demonstrasi kulinari, dan festival makanan. Pendekatan ini menekankan bukan sahaja rasa dan estetika makanan, tetapi juga naratif budaya, ritual, dan sejarah makanan, sekaligus memberikan pengalaman holistik yang meningkatkan kepuasan pelancong (Pine & Gilmore, 1999; Yuan, 2015). Selain itu, inovasi kulinari dan pengintegrasian teknologi digital dalam pemasaran, termasuk media sosial, aplikasi panduan gastronomi, dan platform tempahan dalam talian, memperluas capaian pelancong global dan memperkukuh daya saing destinasi Malaysia di peringkat antarabangsa (Chang & Yuan, 2011).

Kelestarian menjadi aspek kritikal dalam pembangunan gastronomi. Penggunaan bahan tempatan, amalan pertanian lestari, dan pemeliharaan resipi tradisional bukan sahaja menyokong pembangunan pelancongan mampan, tetapi juga meningkatkan nilai sosial dan ekonomi komuniti tempatan (HRMARS, 2021; Tannahill, 2002). Kolaborasi antara kerajaan, komuniti, dan sektor swasta memastikan pembangunan gastronomi inklusif, bersepadu, dan memberikan manfaat ekonomi serta sosial yang meluas (Ellis, Park, Kim, & Yeoman, 2018; Sirse, 2014).

Pelancongan gastronomi juga membuka peluang untuk pendidikan budaya, promosi produk tempatan, dan kesedaran terhadap kelestarian makanan. Ia berperanan dalam memupuk kesedaran terhadap amalan makanan lestari, menyokong ekonomi tempatan melalui penggunaan bahan tempatan, dan memperkukuh identiti destinasi melalui pengalaman kulinari autentik. Statistik terkini menunjukkan peningkatan signifikan dalam perbelanjaan pelancong terhadap pengalaman makanan di Malaysia, yang menekankan potensi gastronomi sebagai pemacu pertumbuhan ekonomi dan pembangunan destinasi (Tourism Malaysia, 2024; National Accounts Statistics, 2025).

Untuk meningkatkan impak akademik dan praktikal, kajian masa depan disyorkan menumpukan kepada: (1) penilaian pengalaman pelancong secara kualitatif dan kuantitatif, (2) analisis impak ekonomi, sosial, dan budaya gastronomi terhadap komuniti setempat, dan (3) pembangunan model gastronomi mampan yang mengintegrasikan inovasi, teknologi, promosi global, dan kelestarian sumber. Pendekatan holistik ini akan memastikan Malaysia terus mengekalkan kedudukan sebagai destinasi gastronomi utama di peringkat global, sambil menyokong pembangunan ekonomi, budaya, dan sosial komuniti tempatan secara mampan (Ellis et al., 2018; World Food Travel Association, 2016).

Secara keseluruhannya, pelancongan gastronomi bukan sahaja menyumbang kepada pertumbuhan ekonomi dan pengalaman pelancong yang unik, tetapi juga berperanan sebagai strategi pembangunan bersepadu yang mempromosikan budaya, inovasi, kelestarian, dan kolaborasi pemegang taruh, menjadikannya salah satu komponen utama dalam memperkukuh daya saing Malaysia sebagai destinasi pelancongan bertaraf antarabangsa.

6 CADANGAN PENYELIDIKAN MASA DEPAN

Kajian masa depan dalam pelancongan gastronomi di Malaysia perlu menumpukan kepada beberapa aspek kritikal bagi memastikan pembangunan sektor ini bersifat mampan, berdaya saing, dan memberi impak yang meluas. Pertama, kajian empirikal terhadap kepuasan pelancong gastronomi adalah penting untuk memahami faktor-faktor motivasi, pengalaman interaktif, dan persepsi terhadap makanan tempatan. Penggunaan instrumen kuantitatif dan kualitatif, termasuk soal selidik, temubual mendalam, dan analisis pengalaman melalui observasi, boleh memberikan data tepat bagi menilai sejauh mana pengalaman gastronomi memenuhi jangkaan pelancong serta mempengaruhi niat lawatan berulang (Yuan, 2015; Ellis et al., 2018).

Kedua, analisis impak ekonomi dan sosial promosi makanan tempatan perlu dilaksanakan secara sistematik. Ini termasuk pengukuran nilai tambah ekonomi daripada lawatan gastronomi, perbelanjaan pelancong di restoran, hotel, dan pasar tempatan, serta impak kepada penciptaan pekerjaan dan pembangunan komuniti. Pendekatan ini juga boleh menilai keberkesanan program promosi seperti *Malaysia Kitchen* dan *Citrawarna Keluarga Malaysia* dalam meningkatkan daya tarikan destinasi dan pertumbuhan ekonomi tempatan (Tourism Malaysia, 2024; National Accounts Statistics, 2025).

Ketiga, penyelidikan mengenai integrasi teknologi, media sosial, dan promosi antarabangsa adalah kritikal. Kajian masa depan boleh menilai bagaimana digitalisasi, pemasaran berasaskan platform media sosial, dan aplikasi panduan gastronomi memberi kesan kepada pengalaman pelancong, penglibatan komuniti, dan capaian pasaran global. Penekanan terhadap data, analitik perilaku pelancong, dan penilaian *real-time* boleh membantu pihak pengurusan destinasi merancang strategi gastronomi yang lebih berkesan, responsif, dan inovatif (Chang & Yuan, 2011; Ellis et al., 2018).

Selain itu, kajian lanjut mengenai pengaruh gastronomi terhadap pembangunan komuniti, budaya tempatan, dan kelestarian sumber perlu diberikan perhatian. Ini termasuk menilai bagaimana pembangunan gastronomi dapat memupuk pemilikan sosial, melestarikan resipi tradisional, dan meningkatkan kesedaran terhadap pertanian lestari serta penggunaan bahan tempatan. Penyelidikan ini juga dapat menilai peranan gastronomi dalam memperkukuh identiti budaya Malaysia serta menggalakkan pembangunan destinasi yang inklusif dan bersepadu (HRMARS, 2021; Tannahill, 2002).

Akhirnya, kajian masa depan perlu menumpukan kepada pembangunan model pembangunan gastronomi bersepadu, yang menggabungkan aspek ekonomi pengalaman, inovasi kulinari, kelestarian, promosi global, dan penglibatan komuniti. Model ini bukan sahaja akan meningkatkan daya saing Malaysia sebagai destinasi gastronomi utama di peringkat global, tetapi juga memastikan sektor ini berkembang secara mampan dari segi ekonomi, sosial, dan budaya (Ellis et al., 2018; World Food Travel Association, 2016).

Dengan pendekatan penyelidikan yang holistik dan interdisiplin, kajian masa hadapan berpotensi menghasilkan penemuan pasaran dan akademik yang lebih mendalam, yang dapat membimbing pembuat dasar, penggiat industri, dan komuniti tempatan dalam merancang strategi gastronomi berimpak tinggi dan lestari. Penyelidikan ini boleh menumpukan kepada analisis kepuasan pelancong gastronomi, penilaian keberkesanan program pembangunan gastronomi, serta pengaruh gastronomi terhadap pembangunan komuniti, pemeliharaan budaya tempatan, dan kelestarian sumber.

Selain itu, kajian masa hadapan boleh mengkaji integrasi teknologi digital, media sosial, dan strategi pemasaran antarabangsa dalam mempromosikan pengalaman gastronomi. Pendekatan berasaskan bukti ini mampu meningkatkan pengalaman pelancong, memperkukuh daya saing destinasi, dan memacu pertumbuhan pelancongan mampan yang menyeluruh di peringkat nasional dan global.

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AUTHOR CONTRIBUTIONS

All authors played equal contributions towards the production of this paper, including the conceptualization of the study, literature review, data analysis, manuscript writing, and revision for intellectual content. All authors have read and approved the final version of the manuscript and agree to be accountable for all aspects of the work.

CONFLICT OF INTEREST

The author declares that there is no potential conflict of interest regarding the research, authorship, and/or publication of this article. All aspects of the study, including data collection, analysis, interpretation, and presentation of findings, were conducted independently and objectively, without any financial, personal, or professional relationships that could have influenced the outcomes or conclusions of this research.

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Research on the Optimisation of Order-Splitting Model for Small and Medium-sized Custom Furniture Enterprises: An Empirical Analysis Based on In-depth Interviews

Cai Xifeng[1], *S'harin Mokhtar[2], Siti Salwa Isa[3]
[1,2,3]College of Creative Arts, Universiti Teknologi MARA, Shah Alam, Malaysia
[1]College of Art and Design, Guangdong Eco-Engineering Polytechnic, Guangdong, China

hncaixf88@gmail.com[1], *sharin2066@uitm.edu.my[2], sitisalwa@uitm.edu.my[3]
***Corresponding author**

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ABSTRACT

This study focuses on the models and processes of order splitting in six small and medium-sized custom furniture companies in China. Through a literature review to identify the shortcomings of existing research and in-depth interviews with six small and medium-sized custom furniture companies, this paper analyses the main pain points and optimisation paths of the order splitting process. The study found that small and medium-sized enterprises have problems with order processing, such as insufficient information technology, a lack of standardised modules, and inefficient cross-departmental collaboration. These problems, to varying degrees, have led to a poor customer experience, resulting in a negative overall reputation for the industry and a high rate of customer complaints, which in turn have affected the industry's overall development. Based on the results of qualitative and visual analysis, this paper proposes practical suggestions for improving the order splitting model. This study not only fills the theoretical gaps in the production and management of the custom furniture industry but also provides empirical evidence for improving the customer experience and operational efficiency of enterprises.

Keywords: *Customised furniture, Split order model, Small and medium-sized enterprises, Process optimisation, Customer experience.*

1 INTRODUCTION

1.1 Research Background

In recent years, China's custom furniture industry has experienced rapid growth, driven by growing consumer demand for personalised, functional, and lifestyle-oriented home solutions(Institute, 2023). Unlike traditional mass production, custom furniture requires companies to respond to individual customer needs through flexible design, efficient manufacturing, and precise delivery systems (Xu, 2020). Within this context, order splitting has become a key operational component (Figure 1).

Large enterprises in China's furniture industry have benefited from significant investments in information systems, standardised modules, and digital platforms. These capabilities have enabled them to adopt relatively mature order splitting models, ensuring efficiency and reducing error rates (Xiong, 2020a). In contrast, small and medium-sized enterprises (SMEs), which comprise a large portion of China's furniture industry, typically have limited capital, weak IT infrastructure, and constrained human capital (Xie, 2019). Consequently, order splitting practices among SMEs vary, varying in their reliance on manual labour, semi-digital processes, and partial standardisation. Differences in order splitting models among SMEs are not merely technical issues; they also have profound implications for production efficiency, delivery time, error reduction, and customer satisfaction (Liang, 2021).

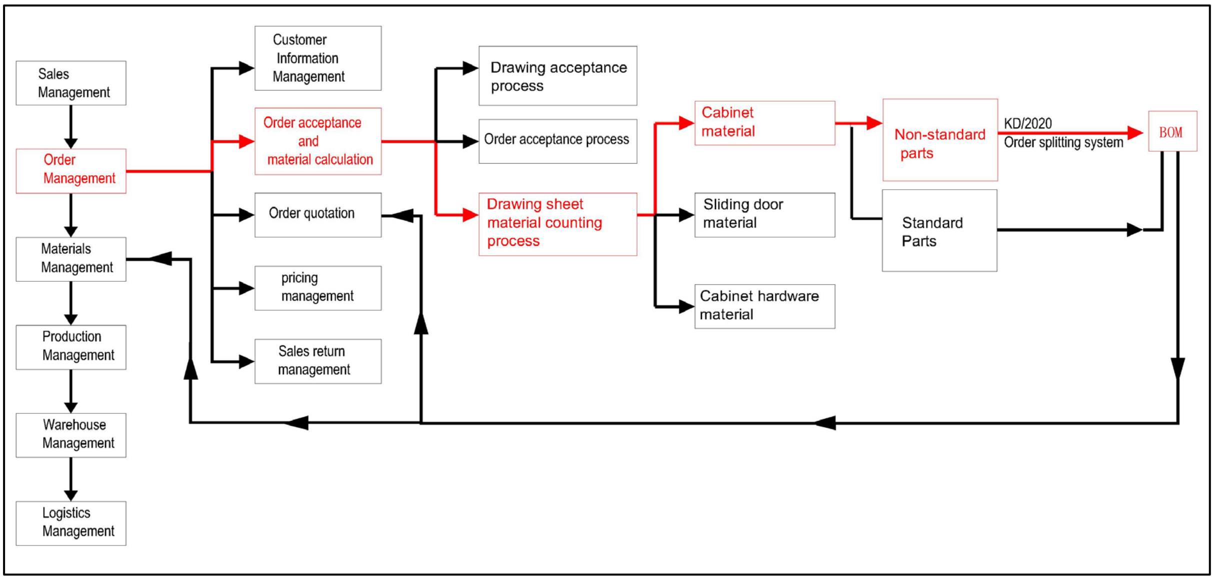

Figure 1 Order splitting process of the panel furniture production process
(Source: Cai, 2025, Copyright Consent: Permissible to Publish)

1.2 Problem Statement

While the custom furniture industry has garnered increasing scholarly attention, most research still focuses on the digital transformation of large enterprises or advanced manufacturing systems (Yao, 2018). In contrast, the operational practices of Chinese SMEs remain underexplored. This gap is problematic because SMEs face unique challenges that cannot be simply addressed by downsizing solutions developed for large enterprises. In practice, SMEs often encounter the following difficulties:

1. The volume of orders is substantial, resulting in a significant workload for order splitting

Large-scale personalised custom production has become a key model for furniture production. However, current personalised custom production suffers from high product batch sizes, and a large number of orders still rely on manual management and integration, including order splitting and quotation processing (Qin, 2023). Order splitting software uses various algorithms and rules to generate bill of materials files, which contain information such as panel size, material, quantity, texture, edge banding information, model code, process routing, packaging planning, and panel weight (Wang, 2024). As can be seen, after a production order is split, the amount of data required increases exponentially, resulting in a staggering workload.

2. The Order Module and Splitting Structure are Complex

In custom furniture production, the batch-based market is becoming increasingly refined, with an increasing demand for small-batch, high-variety, and time-sensitive goods. This, coupled with increasing uncertainty in customer demand, has led to an increase in the total number of items in customer orders, while demand for individual items has decreased (Wang, 2012).

Custom furniture companies offer products that cover nearly every space in a home, with a wide variety of module sizes and types. Design software includes a vast library of modules, some pre-configured and some allowing designers to freely create, providing designers with more options when designing for clients (Xie, 2021). Consequently, the order module is complex, and the splitting structure is even more complex. 3. The numerous order types and the data related to order splitting are complex.

Due to the complex and diverse order modules and high degree of personalisation for custom furniture, each successful customer order for custom furniture is uploaded to the order splitting system. The factory's process department uses order splitting software to break down each cabinet or piece of furniture into individual panels, calculate the hardware types and quantities, restore the processing information for each panel, and calculate the specifications and quantities of raw materials such as edge banding. This software then compares these with established processing rules, identifying designs that don't conform to these rules and implementing design corrections and improvements (Liu, 2021).

Production orders involve numerous uncertainties, such as type, quantity, style, and delivery date. These factors, influenced by the demand for personalised products, result in a complex and diverse structure for customised home furnishing products, resulting in complex order splitting data and a high risk of errors and omissions (Xiong, 2020b). Custom panel furniture customer demands are trending toward personalisation, diversification, small batches, and a wide variety of products. The ability to quickly split production orders and generate a bill of materials (BOM) tailored to the individual needs of panel furniture customers is crucial for providing timely product quotes, shortening delivery times, and rapidly responding to customer orders, thereby improving the company's information technology capabilities and core market competitiveness (Zhou, 2015).

These issues lead to inefficiencies, reducing the competitiveness of small and medium-sized enterprises (SMEs) and limiting their ability to meet customers' growing expectations for speed, precision, and personalisation. From an academic perspective, this also reflects a research gap: while order splitting has been recognised as a key determinant of mass customisation performance (Liu, 2021), there is a lack of understanding of the differences in SMEs' approaches, the specific challenges they face, and how to optimise their practices within resource constraints.

1.3 Research Questions

Based on the above background and problem statement, this study intends to explore the order splitting model adopted by small and medium-sized custom furniture enterprises in China. This study aims to answer the following questions:

1. What are the main characteristics of the order splitting model adopted by small and medium-sized enterprises in China's custom furniture industry?
2. How can we develop a more effective order splitting model to improve the customer experience of small and medium-sized custom furniture enterprises in China?

2 LITERATURE REVIEW

2.1 Order Splitting Models of Small and Medium-Sized Custom Furniture Enterprises in China

In recent years, China's custom furniture industry has developed rapidly. In particular, with the diversification and personalisation of consumer demand, small and medium-sized enterprises have become a vital component of the industry (Xu, 2020). Against this backdrop, the order splitting model has gradually become a key factor in whether enterprises can efficiently fulfil orders and maintain market competitiveness.

2.1.1 Basic Definition and Characteristics of the Order-Splitting Model

The order splitting model refers to the process by which an enterprise converts a customer order into an executable production task, including analysing the design plan, generating a bill of materials (BOM), allocating processing steps, and integrating with information systems (Guo, 2018). Large enterprises typically rely on information platforms and modular design to implement a relatively standardised order splitting model; however, small and medium-sized enterprises, due to resource constraints, often adopt a manual or semi-information-based model (Ning, 2022).

2.1.2 Classification of Order Splitting Models in SMEs

Existing research indicates that Chinese SMEs primarily employ the following types of order splitting models:

1. Manual Experience-Based: Relying on the personal experience of designers and craftsmen to split orders, this process is flexible but prone to errors.
2. Semi-Informatisation-Based: Using some design software or ERP modules for assistance, but with low system integration and information silos (Hui, 2019);
3. Modularisation/Standardisation-Oriented: Attempting to introduce standard modules into some products, but overall coverage is limited;
4. Platform-Based Collaboration-Based (a minority of enterprises): Integrating design, production, and management through the use of cloud platforms or digital tools, but penetration is low (Ma et al., 2021).

2.1.3 Current Status and Challenges of Order Splitting Models in SMEs

Overall, the order splitting model used by SMEs is still in its exploratory stage, with a significant gap compared to large enterprises. Its main characteristics include:

1. Process diversity, the models adopted by different enterprises vary greatly, and there is a lack of unified standards (Cai et al., 2024).
2. Insufficient level of informatisation, most small and medium-sized enterprises still remain at a low level of informatisation, resulting in low efficiency (Li, 2018).
3. Strong dependence on manpower: over-reliance on the experience of key employees and lack of replicable processes (Cai et al., 2024);

In summary, small and medium-sized custom furniture enterprises have the typical characteristics of "diversity, low informatisation, and experience dependence" in the order splitting model, which provides a background for subsequent research on their process pain points and optimisation strategies (Ying et al., 2025).

2.2 Pain points of the order splitting process

Although the order splitting model is crucial to the operational efficiency and customer satisfaction of custom furniture enterprises, in actual operation, especially in small and medium-sized enterprises, there are many pain points in the order splitting process. Among them, the most critical ones are the following:

2.2.1 Poor information transmission, Insufficient standardisation

The lack of a unified information platform between the design, production, and order management departments leads to data transmission relying on manual or local software, forming "information islands". This poor communication increases the error rate and rework costs (Hui, 2019). Small and medium-sized enterprises generally lack standardised order splitting processes and operating specifications. Different designers have different plans, which makes it difficult to split similar orders when splitting, making it difficult to achieve economies of scale (Ying, 2019).

2.2.2 Insufficient technology and system support

Many small and medium-sized enterprises do not have the conditions to apply ERP, MES, and other systems, or only use some of their functions, resulting in the inability to share and update information in real time (Ma et al., 2021). The lack of technology further amplifies the inefficiency and uncertainty of manual operations.

2.2.3 Risk of human dependence and knowledge loss

The order splitting process of small and medium-sized enterprises is highly dependent on experienced employees. Once the core personnel leave, it may lead to process interruption or a significant decrease in efficiency (Qian, 2023).

3 METHODOLOGIES

This chapter will explain the methodology and research design used in this study. The research methods primarily consist of a literature review and in-depth interviews. The former serves to build a theoretical and practical foundation for the research, while the latter serves to empirically explore the differences and pain points of order splitting models among China's small and medium-sized custom furniture companies.

3.1 Literature Review

The purpose of this literature review is to systematically review the current state of research on order splitting models in the custom furniture industry and identify research gaps and practical challenges faced by small and medium-sized enterprises in this field.

The topic focuses on order splitting models for small and medium-sized custom furniture companies, covering aspects such as order management, process optimisation, information system applications, and customer experience. Literature was sourced from domestic and international academic databases, including CNKI, Web of Science, and Google Scholar. Both Chinese and English literature were included to ensure a seamless integration of theory and practice.

The research process began with identifying search keywords such as "custom furniture," "order splitting model," and "order splitting process." The timeframe was set to focus on key research findings from 2010 to date, encompassing custom furniture, order splitting, or small and medium-sized enterprise management processes.

3.1.1 There are three main methods for literature analysis

1. Theme classification: such as "model characteristics", "process pain points", "informatisation and digital application", and "optimisation and innovation";
2. Difference comparison: comparing the order splitting models of six small and medium-sized enterprises;
3. Research gap identification: clarifying the shortcomings of research on order splitting in small and medium-sized enterprises, and providing entry points for subsequent empirical research.

3.1.2 Output results

1. Sorting out the characteristics and limitations of the order splitting model of small and medium-sized enterprises;
2. Summarising the focus and differences of domestic and foreign research;
3. Identifying research gaps and providing theoretical support for interview design. The main process of literature research is shown in Figure 2.

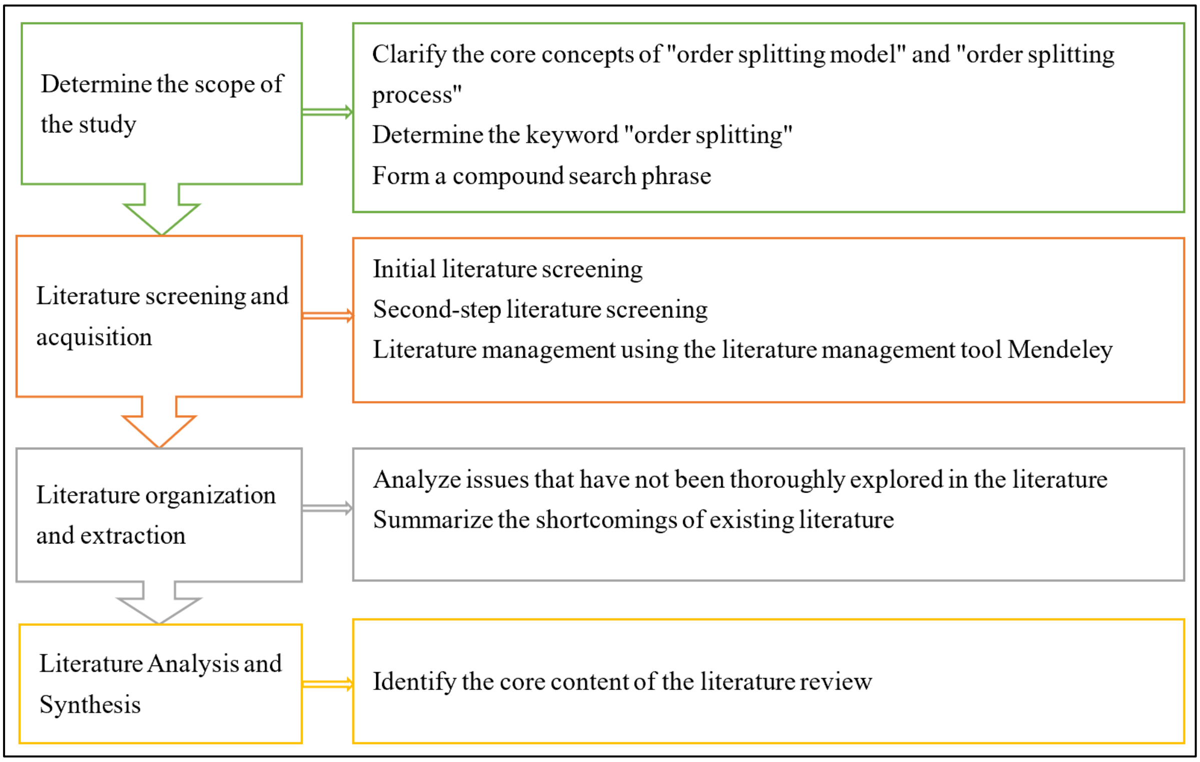

Figure 2 The main process of literature research
(Source: Cai, 2025, Copyright Consent: Permissible to Publish)

3.2 Deep-in Interview

3.2.1 Research Preliminary Preparation

The research objective was to obtain first-hand data from small and medium-sized custom furniture companies through in-depth interviews, gaining a deeper understanding of their actual practices, pain points, and optimisation needs in the order splitting process.

The research subjects were six small and medium-sized custom furniture companies (three medium-sized and three small). Interviewees included personnel from the design, production, and order management departments.

Interview Type: Semi-structured, in-depth interviews.

Interview Outline: Focused on four core themes:

Theme 1: The company's existing order splitting model and operational procedures; Theme 2: The main pain points and challenges in the order splitting process; Theme 3: The application of information systems and digital tools in order splitting; Theme 4: Needs and suggestions for optimising the order splitting process. Specific interview questions were as follows:

1. What is your company's order splitting model and process?
2. Are there standardised design modules?
3. Are there design specifications to support the order splitting process?
4. What percentage of order splitting is automated? What are the main challenges faced?
5. What are the advantages of your company's order splitting process?
6. What are the most common errors or challenges encountered in the order splitting process?
7. What mistakes lead to customer complaints or affect customer satisfaction?
8. How can we improve the customer experience?
9. What areas do you think can be improved in your company's current order splitting process?
10. What suggestions do you have for upgrading the order splitting software?

11. To your knowledge, are there any advanced order splitting models in the industry that are worth learning from? Which companies are using them? How do they split orders?

12. What do you think are the most critical areas for improvement in optimising the order splitting process across the industry? (For example, automation, data integration, intelligent algorithms, management collaboration, etc.)

3.2.2 Data Collection and Processing

We interviewed one to three individuals from each company, with the number of interviewers determined by the company's contract splitting model. If all questions could be answered by one person, we interviewed only one person. If multiple interviews were necessary, we conducted additional interviews. The interviews were audio-recorded and transcribed. The data was anonymised to ensure research ethics compliance.

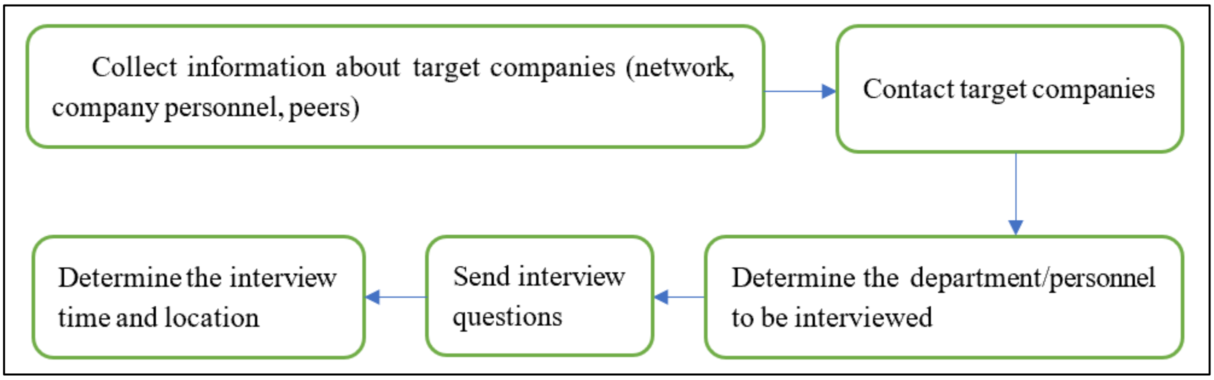

Figure 3 Confirmation process for interviewing company personnel
(Source: Cai, 2025, Copyright Consent: Permissible to Publish)

Table 1 Interview Company Information Form (Cai,2025)

Scale	Interview date	Company	Interviewer/ Department	Annual output value
Medium-sized enterprises	May 7, 2025	Kefan Home Furnishing Co., Ltd. (Hereafter referred to as Kefan)	Mo Fujian/Demolition Department	600
	April 8, 2025	Guangdong Saier Risheng Home Technology Co., Ltd. (Hereafter referred to as Saier)	Zhou Wenming/ Production Department	300
	June 17, 2025	Guangzhou Yadan Cabinet Industry Co., Ltd (Hereafter referred to as Yadan)	Liu Bin/Process Technology Center	200
Small-sized enterprises	May 19, 2025	Royal Home Furnishing Holdings Limited (Hereafter referred to as Royal)	Mr. Cai/Order Management Department	99
	May 27, 2025	Guangzhou Weiyi Home Furnishing Co., Ltd. (Hereafter referred to as Weiyi)	Chen Jian/ Production Department	8
	April 25, 2025	Meilijia Decoration Engineering Co., Ltd (Hereafter referred to as Meilijia)	Mo Jiachun/ Order Management Department	4

Note: Medium-sized enterprises are those with an annual output value of 100-1000 million, and small enterprises are those with an annual output value of less than 100 million. The annual output value unit in the table is million RMB.

3.2.3 Data Analysis Methods

(1) Coding and Classification

NVivo software was used to openly code the interview texts to form nodes and themes.

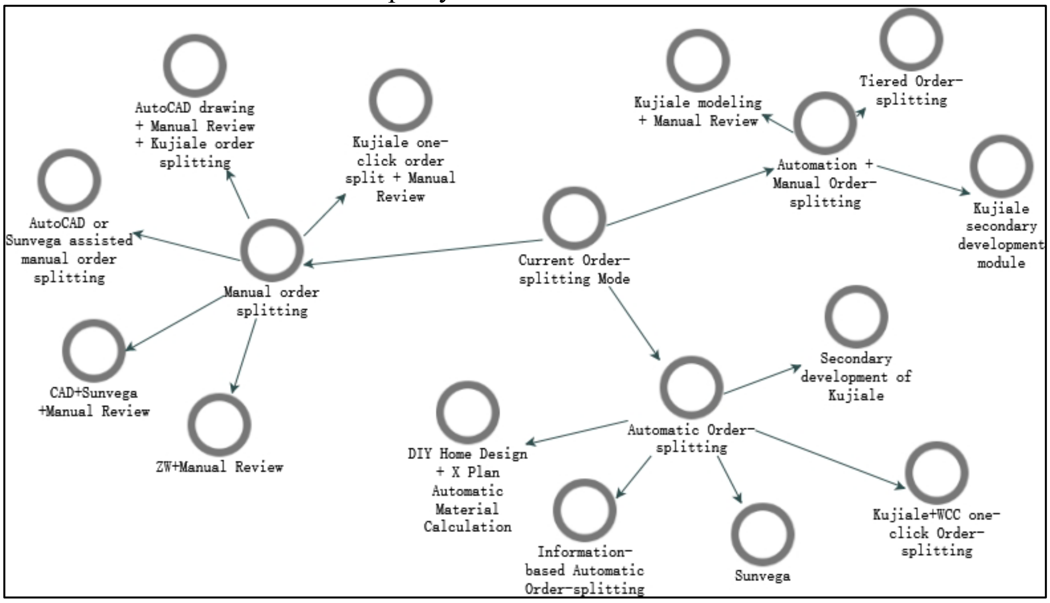

Figure 4 Current order-splitting mode node relationship diagram
(Source: Cai, 2025, Copyright Consent: Permissible to Publish)

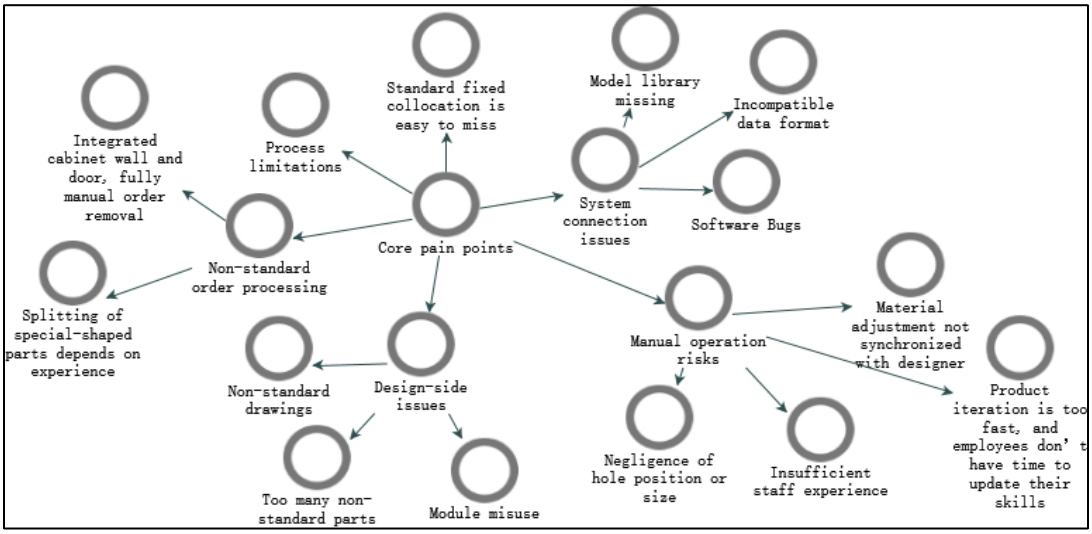

Figure 5 Relationship diagram of the core pain points of order-splitting
(Source: Cai, 2025, Copyright Consent: Permissible to Publish)

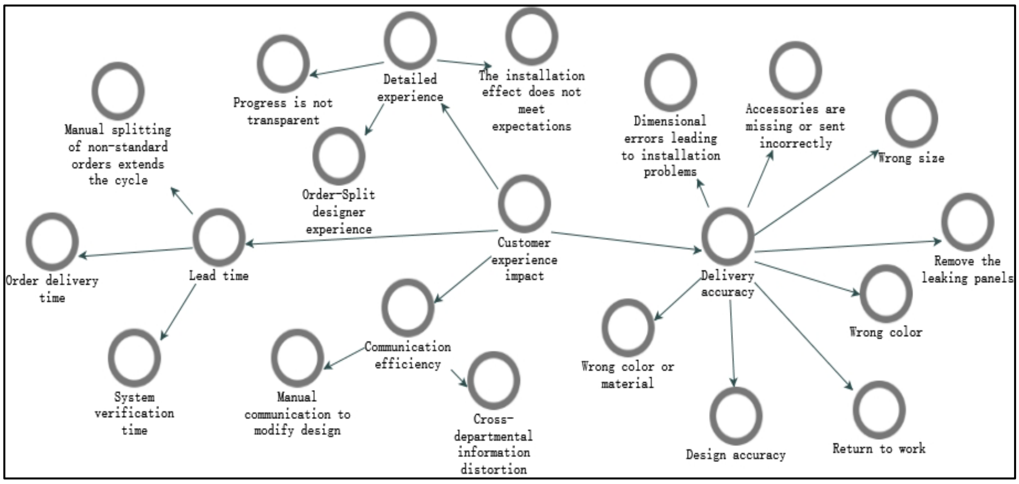

Figure 6 Customer experience impact node relationship diagram
(Source: Cai, 2025, Copyright Consent: Permissible to Publish)

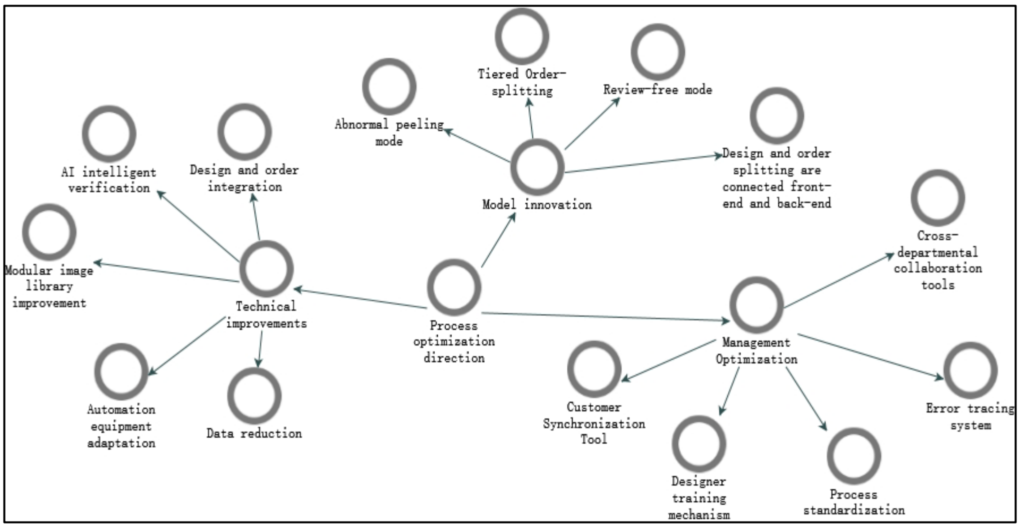

Figure 7 Optimisation direction of the order-splitting process
(Source: Cai, 2025, Copyright Consent: Permissible to Publish)

(2) Comparative Analysis

Establish a comparison table of the order splitting processes of the six companies (e.g., model characteristics, informationisation level, and pain points); Conduct a horizontal comparison of different companies.

Table 2 Comparison of automated order splitting rates among various enterprises

Scale	Company	Automatic order splitting rate (%)	Annual output value （million）
Medium-sized enterprises	Kefan	90.0(Cabinet)	600
	Saier	55.0(C-level)	300
	Yadan	95.0	200
Small-sized enterprises	Royal	95.0	99
	Weiyi	75.0	4
	Meilijia	0.0	8

(3) The main pain points of each enterprise

Table 3 Summary table of major bottlenecks and problem types of each enterprise

Scale	Company	Main bottlenecks and problem types	Core manifestations of the problem
Medium-sized enterprises	Kefan	System Technology: Integrated cabinet, wall, and door systems lack automation modules. Manual Operation: Designer turnover leading to order errors and miscommunication. Process Management: Rapid product iterations and lagging employee skills integration.	Complex orders (integration) rely entirely on manual labour; personnel stability affects process stability.
	Saier	System technology: Complex shapes (arcs/bends) cannot be automated; underlying logic limitations in the order splitting software (module re-enablement required). Manual operation: Excessive manual intervention leads to occasional errors.	The equipment processing capacity does not match the design requirements; the manual process under the hierarchical order splitting model becomes an efficiency and quality bottleneck.
	Yadan	System Technology: Software functionality lacks differentiation, making it difficult to meet non-standard requirements. External Environment: Industry competition (over appearance/materials) has led to a surge in non-standard orders. Manual Operation: Non-standard orders rely heavily on the experience of order splitters.	Market demand conflicts with system standardisation capabilities; the system completely fails in extreme customisation scenarios.
Small-sized enterprises	Royal	System technology: Insufficient software stability (occasional data loss); non-standard orders require manual CAD splitting. Manual operation: Designers lose hole location data when assembling designs.	Insufficient system robustness; non-standard front-end design breaks the system's verification capabilities
	Weiyi	System Technology: No standardised modules or design specifications; no system integration (data transfer is entirely manual); Manual Operation: Inconsistent drawing annotations; varying designer experience leads to inconsistent results. Process Management: No error tracking or optimisation mechanisms.	Complete reliance on manual experience, no system support; no standardised process, poor consistency of results
	Meilijia	System Technology: Special models/processes cannot be automatically split; the module library does not cover all product categories. Process Management: Customer proposals are repeatedly revised, increasing the workload of splitting orders.	Basic software functions cannot meet personalised needs; insufficient front-end communication leads to repeated back-end processes.

(4) Visual analysis

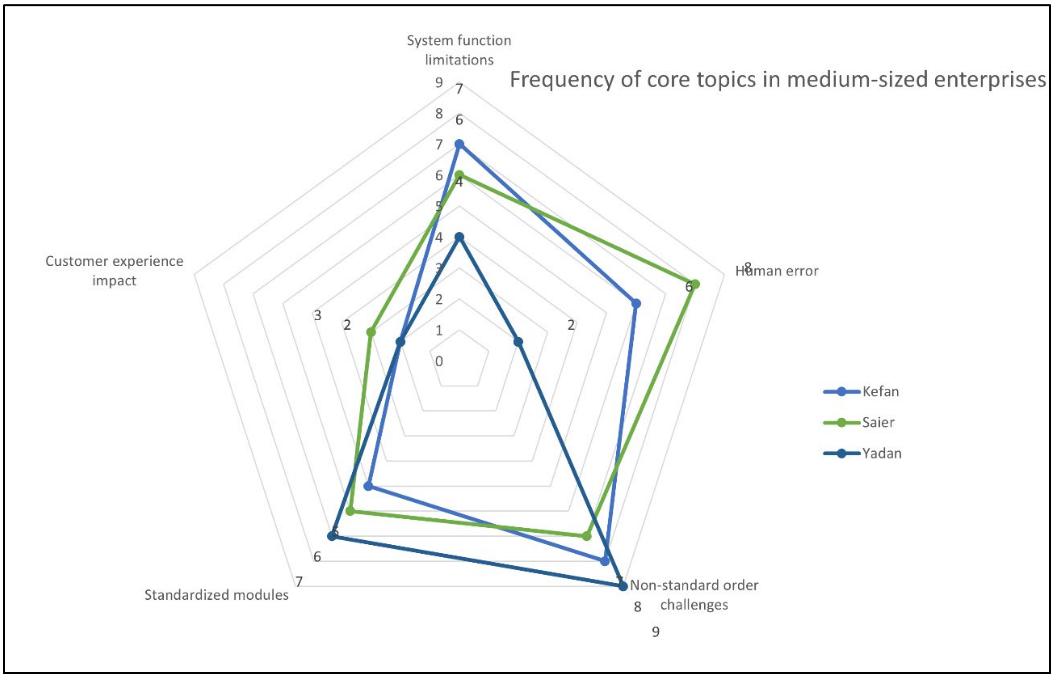

Figure 8 Frequency of core topics in medium-sized enterprises
(Source: Cai, 2025, Copyright Consent: Permissible to Publish)

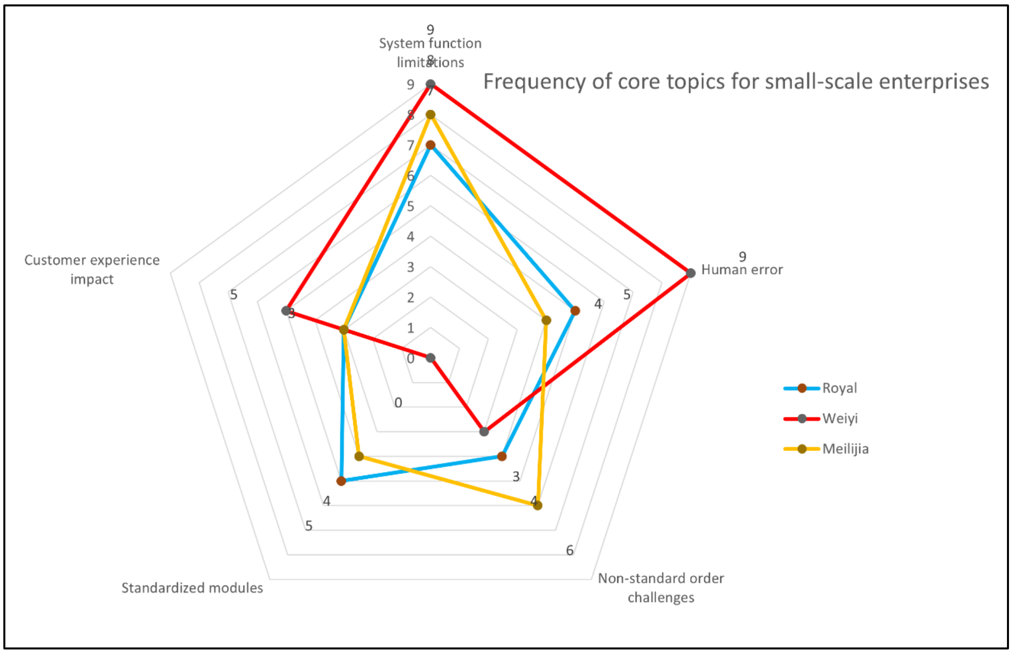

Figure 9 Frequency of core topics for small-scale enterprises
(Source: Cai, 2025, Copyright Consent: Permissible to Publish)

(5) Output

Differences in order splitting models among the six companies

Company	Core features of the order splitting model	Special processes/technical applications	Typical pain points
Kefan	The cabinet automation rate is 90%, but the cabinet wall and door integration orders are all manually split, and personnel turnover can easily lead to fluctuations in error rates.	There is no particularly outstanding special technology application, and complex orders are mainly processed manually.	Complex orders (cabinet wall door integration) drag down overall efficiency, and staff turnover affects quality and stability.
Saier	Adopting "A/B/C graded order splitting", the automation rate of grade C is 55%, and the splitting rate of grade A (10-15%) is fully manual, which is prone to occasional errors.	Hierarchical order splitting mode, adapting to orders of different complexity	Manual processes (A-level orders) become a quality shortcoming, making errors difficult to control.
Yadan	The automation rate is 95%, standard orders are error-free, and non-standard orders are handled by relying on the experience of senior employees. The internal competition in the industry has led to a surge in non-standard orders.	Standardised modules cover a wide range and are highly efficient in responding to standard orders.	The industry's internal competition has led to a surge in non-standard orders, which rely on manual processing and affect overall efficiency.
Royal	The automated order splitting rate is 95%, and details (such as hardware accessories) need to be manually reviewed. The system interface is connected to improve the efficiency of the entire process.	Highly dependent on the OMS system and 3D home model library	Designers tend to lose hole position data when assembling shapes, resulting in an inability to assemble on-site
Weiyi	Purely manual order splitting, 0% automation rate, no standardised process, and inconsistent order splitting results with the design	High degree of design freedom to meet extreme customisation needs	No standardised process, low efficiency and quality, poor consistency of results
Meilijia	The automation rate of Coolhome is 75%. Special shapes require manual CAD splitting. Special shapes and customer plans often need to be changed, which is inefficient.	Flexible adaptation of multiple software (Coolhome, CAD) to cope with special shapes	Repeated customer proposals lead to low efficiency, and insufficient software functions limit the efficiency of complex modelling processing.

The six companies face three common pain points in the order splitting model: First, the processing of non-standard orders generally relies on manual labour. Whether it is Kefan's cabinet wall door integration order, Saier Risheng's A-level high-difficulty order, or the non-standard needs of Yadan, Royal, and Meilijia, manual intervention is required at key links, which not only reduces order splitting efficiency but also increases the risk of errors due to the uncertainty of manual judgment (such as Royal The second issue is an imbalance between standardisation capabilities and customisation needs.

Companies with a solid foundation for standardisation (such as Yadan and Royal) face customisation demands that transcend module boundaries, but the advantages of standardisation are lost, forcing them to switch to manual processing. Companies lacking standardisation (such as Weiyi) face inconsistent order splitting results due to a lack of unified processes, making it difficult to ensure efficiency and quality. Third, personnel factors significantly impact order splitting quality. Kefan's error rate fluctuates due to staff turnover, while Yadan relies on experienced employees to handle non-standard orders. Royal, Saier Risheng, and Meilijia are also limited by staff operating standards and experience. Even with a high degree of automation, they cannot completely avoid problems caused by human operations. Personnel capabilities and stability have become common obstacles to order-splitting quality.

The six companies have different focuses on the personalised problems of their order splitting models: while the cabinet automation rate of Kefan reaches 90%, integrated cabinet, wall and door orders need to be handled entirely manually, and personnel turnover easily causes fluctuations in error rates, and complex orders reduce overall efficiency; Saier Risheng adopts "A/B/C graded order splitting", but errors in grade A fully manual orders are very sporadic, and the manual link becomes a quality shortcoming; although Yada has a high automation rate for standard orders, the industry's internal competition has led to a surge in non-standard orders, and reliance on manual processing affects overall efficiency; Royal is highly dependent on the system, but there is a problem that designers easily lose hole position data when assembling shapes, resulting in the inability to assemble on site; Weiyi uses pure manual splitting without standardised processes, and the splitting results are inconsistent, with both efficiency and quality low; some orders of Meilijia rely on Coolhome's automated splitting, but special shapes require manual CAD processing, and customer plans are repeatedly revised. Insufficient software functions also limit the efficiency of complex shape processing.

4 FINDING AND DISCUSSION

4.1 Interview results

Table 1 Comparison of pain points in the order splitting process for six small and medium-sized enterprises

Company	Informatisation level	Standardised modules	Error rate	Collaboration efficiency
Kefan	High	Yes	Medium	Medium
Saier	Medium	Yes	Medium	Medium
Yadan	High	Yes	Low	High
Royal	High	Yes	Low	High
Weiyi	Medium	No	High	Low
Meilijia	Low	Yes	High	Low

4.2 Comparison with literature

This study's findings echo the perspective of "modularisation and information system synergy" proposed by Liu Weixin (Liu, 2022). Furthermore, the study found that the challenge facing SMEs lies in a lack of resources to advance informatisation, which aligns with Shen Jianhong (Shen, 2010)description of the predicament faced by SMEs in the manufacturing sector. Thus, the optimal approach should emphasise the introduction of low-cost informatisation tools and the gradual development of standardised modules to adapt to the realities of SMEs.

5 CONCLUSIONS

Through in-depth interviews and comparative analysis, this study summarises three major problems faced by small and medium-sized custom furniture companies in the order splitting model:

1. Inadequate information systems lead to low process efficiency.
2. Lack of standardised modules makes task splitting complex.
3. Low efficiency of cross-departmental collaboration and impaired customer experience.

To address these issues, the study proposes:

1. Gradually introduce information systems;
2. Build a modular design database;
3. Optimise cross-departmental communication mechanisms.

The theoretical contribution of this paper is to enrich the research on the order splitting model of customised furniture for small and medium-sized enterprises; its practical significance is to provide enterprises with an operational improvement path. Future research can further combine large-sample questionnaires with case tracking to verify the universality of the research conclusions.

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AUTHOR CONTRIBUTIONS

Cai Xifeng, as the main author, played a role in data search, analysis, and writing, while S'harin Mokhtar, as the second author, acted as a supervisor, and Siti Salwa, as the third author, acted as a co-supervisor.

CONFLICT OF INTEREST

The author declares no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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Section: Original Article

RELICS: Digital Preservation of the Malacca Sultanate's Historical Events Through Animated Narratives

Nur Muhd Hidayat Khan Sakhir Sultan[1], *Mohd Firdaus Mohd Herrow[2], Marsya Hussairilamjan[3], Danial Safiy Sujud[4], Nurzuhayra Filzah Mohammad Abdul Jalil[5]

[1,3,4,5]*Department of Information Technology, Centre for Diploma Studies, Universiti Tun Hussein Onn Malaysia, Pagoh Higher Education Hub, Johor, Malaysia*
[2]*Faculty of Art and Design, Universiti Teknologi MARA Selangor Branch, Puncak Alam Campus, Malaysia*

muhdhidayat404@gmail.com[1], *firdausherrow@uitm.edu.my[2], marsyahussairil@gmail.com[3], danialsafiy2004@gmail.com[4], zuearkzuhayra@gmail.com[5]
***Corresponding author**

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ABSTRACT

Preservation of cultural heritage is crucial amidst globalization and modernization as part of the efforts to protect national identity and historical understanding for future generations. This study addresses the declining awareness of the Malacca Sultanate's historical currency, particularly among youth, by creating a 2D edutainment animation about the Malacca Sultanate's Golden Dinar. The data were gathered through a semi-structured interview with a numismatic expert and a questionnaire survey involving high school students, with the aim of creating an animation that aligns well with teenagers' preferences. The results indicated a strong interest in anime and action genres, validating the animations' effectiveness in making historical content engaging. The animation also successfully captured the youth's interest, proving to be a powerful tool for digital preservation and education. The blending of education with entertainment is thus proven as a promising approach to enhance the understanding and appreciation of history and cultural heritage, particularly among youth.

Keywords: *Cultural Heritage, Digital Preservation, Animation, Artifact, Numismatic, History*

1 INTRODUCTION

Cultural heritage refers to tangible and intangible aspects, such as history, traditions, beliefs, values, and artifacts, that are passed down through generations and symbolize the collective memories and values of a society (Petronela, 2016). As the world moves toward rapid globalization and modernization, the preservation of cultural heritage is crucial to protect historical and traditional elements for future generations (Wong, 2022). Such preservation effort also extends to historical events as these significant occurrences in the past have had a lasting impact on societies, cultures, or nations, adding to the development of national identity.

One of the important aspects of Malaysia's cultural heritage is the Malacca Empire's old currency, known as the Golden Dinar (*Dinar Emas*). However, knowledge about this currency is fading, especially among youths. This primarily owes to the fact that despite rapid evolution within the local educational system, the teaching methods for history remain relatively unchanged. Since students of the current era, often referred to as Digital Natives, are highly receptive to technological integration in education (Prensky, 2010), there is a potential to incorporate animation as an alternative learning medium to make historical content more stimulating and memorable. Subsequently, engaging students in historical topics through technology, particularly animation, can enhance their understanding and interest in cultural heritage.

Therefore, this study explores the use of 2D edutainment animation as a digital preservation method to educate high school students about the Malacca Sultanate's historical currency. It aims to achieve three primary objectives: (1) to investigate the authenticity and unique attributes of Malacca's historical currency, (2) to design a 2D edutainment animation that educates the target audience about Malacca's currency history, and (3) to evaluate the effectiveness of the animated content in enhancing the target audience's understanding about the importance of preserving Malacca's currency history. Developing the 2D edutainment animation content by blending education with entertainment and focusing on the Malacca Sultanate's historical currency has significant educational and economic implications. By presenting historical information in an engaging manner, the project aims to spark the youth's interest in cultural heritage, thus promoting historical awareness and appreciation. It also contributes to economic growth by integrating educational content with cultural tourism, potentially attracting tourists and boosting the tourism sector. Finally, the animated content showcases the historical significance of the Golden Dinar and the rich cultural heritage of the Malacca Sultanate, creating a compelling narrative that can draw local and international interests and foster a deeper connection with Malaysia's cultural legacy.

2 LITERATURE REVIEW

2.1 Culture & Heritage

Culture represents the enduring attitudes, behaviors, ideas, and traditions shared by a large group of people, which are transcended from one generation to the next. As a collective treasure of humanity, cultural heritage serves as an essential source of knowledge that must be preserved. It includes physical artifacts and living traditions, such as history, practices, values, architecture, and folklore. These heritages are inherited from past generations and maintained in the present, ultimately benefiting future generations by connecting members of society (Wong, 2022). Thus, preservation strategies and global awareness are vital to protect this vulnerable legacy from threats like environmental changes and rapid globalization.

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) defines cultural heritage as encompassing tangible and intangible categories, both playing a crucial role in identifying races and shaping national images (Petronela, 2016). Tangible cultural heritage refers to physical objects that can be seen and touched on land and underwater, such as coins, paintings, sites, and monuments (Suaib et al., 2020). This heritage is valuable and must be preserved to serve as a testament to past achievements, lifestyles, and values. Examples of tangible heritage in Malaysia include the Historic Cities of the Straits of Malacca, the National Monument, and the Golden Dinar of the Malacca Sultanate.

The discussion on culture and heritage can never steer away from the term 'artifacts', which was derived from the Latin word "*arte factus*" meaning "made by human skill or craft" to describe objects from the past that were modified by people, thus holding cultural and historical significance. These include numismatic items, tools, pottery, weapons, jewelry, and clothing that offer unique perspectives on human history, traditions, and beliefs (Tribe, 2023). Numismatic (originating from the French word "*numismatiques*") refers to the study or collection of currency, including coins, tokens, paper money, and medals. These items provide insights into economic, social, and cultural history through their production and use. Numismatists, or coin graders, collect, analyze, and assess the quality of these items to determine their historical significance, rarity, and value. Their expertise helps maintain the integrity and appreciation of numismatic collections worldwide, ensuring that these cultural artifacts are preserved for future generations (Investopedia, 2024).

2.2 Digital Preservation in Malaysia

Digital preservation is the act of keeping digital files safe and usable so that they do not fade with time. While digitalization has aided the preservation of valuable records and cultural materials, necessary actions must be taken to ensure these digital files remain accessible. Therefore, scholars have highlighted that preservation is not just technical but also social, since what is stored shapes how people remember the past (Mohd Herrow & Azraai, 2023).

In Malaysia, the effort to preserve culture through digital means has slowly grown. Museums and research centers are beginning to scan and store objects so that they can be shared with wider groups. An important step is the involvement with the Asia-Europe Museum Network (ASEMUS), where the Virtual Collection of Asian Masterpieces was introduced. Through this platform, Malaysian collections sit next to works from across Asia and Europe, giving access to material that would normally remain in storage. The collaboration highlights how computer graphics and media science have been used to make heritage visible in ways that physical visits cannot provide (Isa et al., 2018).

The main goal of such collaboration is not only to save the past in a digital vault, but to let people interact with it. Aside from allowing ordinary users to browse collections online, the Virtual Collection of Asian Masterpieces enables schools and universities to gain materials for teaching and for researchers to compare items across countries. This opens up culture, which was once locked inside a building, to anyone with a connection. By joining such global projects, Malaysia also establishes cultural diplomacy with other Asian countries since sharing heritage becomes a means to build ties and to show identity beyond borders. In practice, digital preservation is both a safeguard and a bridge: it keeps memory alive and at the same time creates new paths for people to connect with it.

2.3 Animation as a Teaching Aid

Animation is the method of creating moving pictures from still images. The technique is not new; it has been around for centuries in different forms. Initially, animation was thought mainly as entertainment, but over time, people began to see how it could also explain ideas or tell stories that are difficult to show in real life (Singh Kanda et al., 2018). The strength of animation lies in its ability to move between playfulness and depth. It can make abstract ideas visible, stir emotion, and turn something complex into something that feels simple. This quality is useful particularly in education and heritage work. Instead of reading about history, students can watch animated scenes and gain a sense of place or atmosphere. Rizalman et al. (2024) pointed out that when the design of animated characters reflects local ethnic traits such as physical forms, facial details, or clothing styles, the result is more than visual appeal it grounds the story in a culture, thus giving both excitement and recognition to the viewer.

To date, the use of animation as a practical teaching tool has begun to take place across many fields. Teachers use it because it attracts attention, and learners respond to it because it is easier to follow. Complex material can be simplified into steps, shown with moving images, and supported by voice or sound. This combination of sight and hearing holds the learners' focus, making study less heavy and more approachable (Singh Kanda et al., 2018). The value lies not only in simplifying lessons but also in giving learners a sense of engagement. Ultimately, education becomes more than a transfer of facts; it is an experience that mixes knowledge with curiosity.

2.4 Golden Dinar of the Malacca Sultanate

In the early days of the Malacca Sultanate, merchants utilized gold dust, silver bars, and tin blocks for transactions. The arrival of Arab and Indian Muslim traders introduced gold dinars and tin pitis from *Pasai*. It later influenced the first official coins of Malacca, believed to have been issued during Sultan Muzaffar Shah's reign (1445-1449) (Shaw et al., 1970). These coins were made from tin and possibly gold and featured Arabic scripts engraving the sultan's name and title. However, no evidence of gold coins from the Malacca Sultanate has been found, despite references to gold usage in their legal texts, *"Hukum Kanun Melaka"* and *"Undang-Undang Laut Melaka",* raising questions about their fate (Bank Negara Malaysia, 2005).

It is speculated that the gold coins were confiscated and destroyed during the Portuguese invasion of Malacca in 1511 to assert dominance. The Portuguese likely melted the coins and minted them into their own currency before distributing them around Malacca City. The golden dinar is considered a valuable but lost artifact of Malaysia, representing a significant part of local cultural heritage. Therefore, preserving their history is crucial for the collective memory of future generations.

2.5 Past Related Research on Digital Cultural Storytelling

Table 1 Previous research on interactive digital cultural storytelling

Product	Description	Advantages	Disadvantages
Interactive Motion Comic: The Fang King (*Raja Bersiong*) (Nor Farizah et al., 2018)	A new way of folklore storytelling using Interactive Motion Comic	The motion comic includes special effects, sound, dubbing, and multiple story endings, utilizing Microsoft's Kinect Motion Control to enhance interactivity.	Limited plotlines that reduce engagement and replay value.
VR-Heritage: Chinese Cultural Heritage in the Digital Age (Jianwei Zhang & Lala Zuo, 2024)	A database developed by Peking University's Experimental Teaching Center for Virtual Reality and Simulation in Archaeology in 2017 to document all valuable cultural heritage sites in China.	The product offers virtual trips for students to explore sites with immersive VR experiences and high-quality 3D images.	Unable to fully capture the materiality of cultural sites.
Animated film: Upin & Ipin: Keris Siamang Tunggal (Les' Copaque Production, 2019)	The film was developed by Les' Copaque Production and tells the adventure of a pair of twins and their friends in the fantastical kingdom of Inderaloka, where they must save the kingdom from an evil king named Raja Bersiong.	The film portrays several classic characters from Malaysia and the Malay folklore.	The film only portrays a small portion of the entire Malaysia and Malay folklore.

Table 1 lists a number of three past studies related to digital storytelling, focusing on interactive narrative design, virtual reality heritage preservation and animated folklore adaptations. The Interactive Motion Comic project of "The Fang King (*Raja Bersiong*)" introduces a new way of storytelling for folklore through the use of special effects, sound, dubbing, and multiple story endings, all enhanced by Microsoft's Kinect Motion Control for greater interactivity. However, the project faces challenges, including limited plotlines that reduce engagement and replay value, which must be addressed to fully realize its potential in preserving and promoting traditional folklore.

Meanwhile, the VR-Heritage: Chinese Cultural Heritage in the Digital Age database was developed by Peking University's Experimental Teaching Center for Virtual Reality and Simulation in Archaeology in 2017. The aim is to preserve their cultural heritage by documenting all valuable cultural heritage sites throughout China. It offers virtual trips for students, enabling them to explore these sites with immersive VR experiences and high-quality 3D images. However, it is unable to fully capture the materiality of the cultural sites.

Finally, the animated film "Upin & Ipin: Keris Siamang Tunggal" was produced by Les' Copaque Production to preserve elements of Malaysia's cultural heritage through its engaging and entertaining storyline. It tells the adventure of a pair of twins and their friends in the fantastical kingdom of Inderaloka, where they must save the kingdom from an evil king named Raja Bersiong. The film portrays several classic characters from Malaysia and Malay folklore, though it only covers a small portion of the entire folklore throughout its duration.

3 METHODOLOGY

This research employed both qualitative and quantitative approaches to design an educational 2D animation focusing on the Golden Dinar of the Malacca Sultanate. Data regarding the history of the dinars were gathered by conducting interviews with numismatic experts and administering questionnaires with the target audience to understand their preferences of the final product.

3.1 Interview

A semi-structured interview uses a guide of open-ended questions and allows follow-up prompts when new ideas appear. The format suits expert knowledge because it keeps a clear direction while leaving room for clarification and detail. In this project, a semi-structured interview was conducted with Mr. Dickson Niew Cheng Kok, the 2nd Vice President of the Malaysia Numismatic Society. The conversation focused on the Golden Dinar of the Malacca Sultanate. Among the topics discussed were the historical background, authenticity, identifying features, and the context explaining why the coin is regarded as long lost. The aim was to gather reliable information that could support the script and visual choices for an educational 2D animation.

Content analysis was then applied to analyze the interview data. All statements were grouped into recurring themes to determine important points. Common themes included chronology of the dinar, traits used to verify authenticity, distinctive visual attributes, circulation and function, and factors linked to disappearance. Key quotations were noted to anchor each theme and claims that were uncertain or anecdotal were marked for cautious treatment in the final narrative. Taken together, the interview and the coding process produced a verified outline of the story and a set of concrete details that could guide terminology, scene structure, and on-screen labels while staying close to the historical record.

3.2 Questionnaire

A questionnaire often contains open- or close-ended questions to gather information from targeted respondents. In this project, two (2) questionnaires were prepared. The first questionnaire focused on the respondents' demographics and preferences for 2D edutainment animation content, such as genre, art style, character design, and backgrounds, while the second questionnaire aimed to evaluate the effectiveness of educating the audience about the history of Malacca's currency. Both questionnaires used a close-ended survey method and were conducted online via Google Forms. The data were analyzed using descriptive analysis, or descriptive statistics, which involved summarizing and organizing the data for easy understanding and interpretation using statistical tools.

4 FINDINGS

4.1 Interview Findings

The semi-structured interview with Mr. Dickson Niew Cheng Kok provides valuable knowledge and insights into the history of the long-lost Golden Dinar of the Malacca Sultanate. According to the expert, limited sources have documented or confirmed the existence of the golden dinar to date, but several articles and books suggest that it existed during the Malacca Sultanate's reign. Before addressing the specific questions, Mr. Dickson offered a brief yet detailed explanation of the Malacca Sultanate's history and its downfall, allowing the authors to grasp the core aspects of this historical period. The authors proceeded to ask questions related to the objectives of understanding the currency's authenticity and unique attributes.

Table 2 Question and Answer with Mr. Dickson Niew Cheng Kok

Questions	Answers
Who is the founder of the Malacca currency?	• Sultan Muzaffar Shah (1445 – 1459), who was heavily inspired by the Pasai Kingdom coinage.
What uniqueness distinguishes the Malacca currency from others?	• The engraved Khat Arabic script on both sides of the currency. • It had the name of the Sultan in charge and his title.
What happened to the Malacca Sultanate's currency?	• They were confiscated and melted down by the Portuguese during the 1511 invasion to demonstrate their domination over Malacca City.
How many types of currency originated from the Malacca Sultanate?	• Gold dinars and pitis

The results in Table 1 indicate that the Malacca Sultanate produced two forms of currency, namely the gold dinar and the pitis. The earliest development of this currency system is closely linked to the reign of Sultan Muzaffar Shah (1445–1459), who drew significant inspiration from the established coinage of the Pasai Kingdom. This influence can be traced back to 1414, when Parameswara, the first ruler of Malacca, strengthened political and cultural ties with Pasai through marriage and his subsequent conversion to Islam. The alliance encouraged an influx of Muslim merchants and scholars who crossed the Straits to Malacca, bringing with them economic practices and the tradition of Pasai-style coinage. It was within this context of growing Islamic influence and regional trade expansion that Sultan Muzaffar Shah issued the earliest local coins, marking a pivotal step in Malacca's economic and administrative development (Shaw et al., 1970).

A distinctive feature of the Malaccan currency was the use of engraved Khat Arabic script, which conveyed both spiritual identity and political authority. The inscriptions typically included the Sultan's name and title, reflecting the integration of Islamic aesthetics into statecraft and material culture. However, the lifespan of these coins was abruptly disrupted following the Portuguese conquest of Malacca in 1511 under Afonso de Albuquerque. During this invasion, the Portuguese confiscated and melted down large quantities of the Sultanate's currency in an effort to symbolically erase Malacca's sovereignty and assert their own control over the city. The melted metals were subsequently repurposed into a new Portuguese-issued currency, marking a significant shift in the economic landscape and contributing to the rarity of surviving Malaccan coins today.

4.2 Results of Animation Design Theme

A total of 195 respondents aged 13 to 17 years old participated in the survey through Google Forms. The data were used to develop animations based on teenagers' preferences, including 2D animation art style, character design, and background design.

Figures 1 (a) and 1 (b) explore whether the fusion of action and futuristic themes makes the animation more interesting. Figure 1 (a) shows that 90.3% of the respondents were interested in action genres. Meanwhile, Figure 1 (b) illustrates that 91.8% of them agreed that the combination of action genre and futuristic theme was interesting.

Figure 1 (a) Respondents' interest in action genre for the animation theme.

Figure 1 (b) Respondents' opinion on combining action and futuristic themes in animation.

Figure 2 investigates the art style that the audience finds most appealing for the animation. The results show that most respondents preferred anime (61%) and adult cartoons (50.8%), while others preferred children's cartoons (21%) and anthropomorphic (9.7%). Such insights are useful for developing an animation that meets the eye and preferences of the audience.

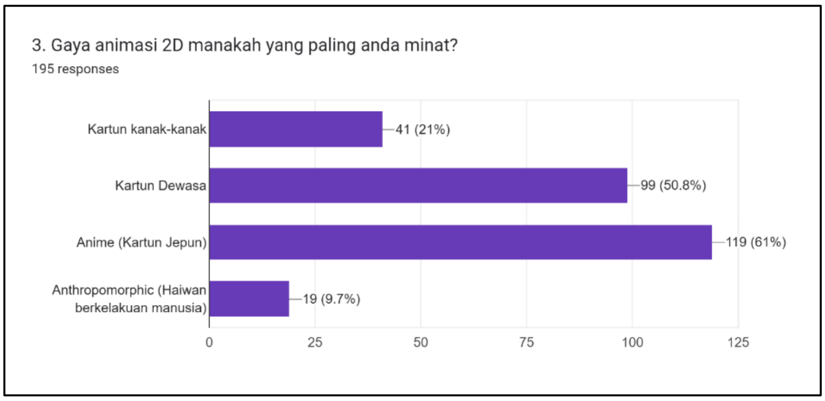

Figure 2 Respondents' preferred art style for animation design.

4.3 Results of Evaluating the Animation's Effectiveness

The second questionnaire was distributed to gather feedback from the audience about the animation's effectiveness in educating them regarding the importance of preserving the Malacca Sultanate's Golden Dinar. A total of 53 respondents aged 13 to 17 years old took part in the survey through Google Forms. The data were analyzed to evaluate the animation's suitability as a preservation medium and its effectiveness in imparting knowledge about the history of the Malacca Sultanate's Golden Dinar.

Figures 3 (a) and 3 (b) evaluate the animation's suitability as a preservation medium of history. The results in Figure 3 (a) show that 84.9% of the respondents believed that 2D animation is a suitable medium for conservation and protection. Meanwhile, Figure 3 (b) denotes that 86.8% of them agreed that the use of 2D animation makes history preservation more interesting.

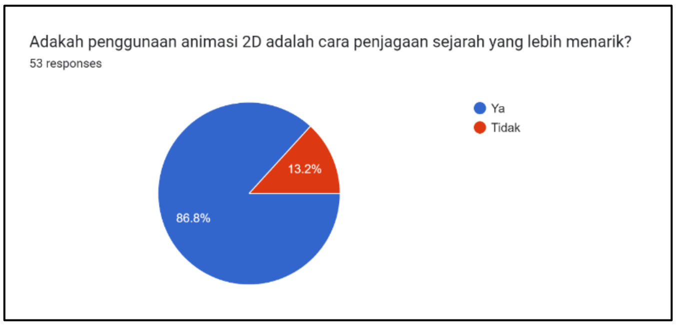

Figure 3 (a) Respondents' perception of 2D animation as a suitable medium for cultural heritage preservation.

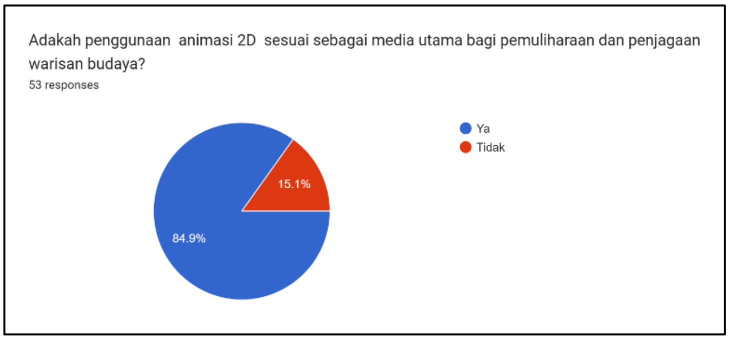

Figure 3 (b) Respondents' agreement that 2D animation makes historical preservation more interesting.

Figures 4 (a) and 4 (b) entail the effectiveness of using animation to impart knowledge about the history of the Malacca Sultanate's Golden Dinar. The results in Figure 4 (a) reveal that 92.5% of the respondents acknowledged and appreciated the Golden Dinar of the Malacca Sultanate after watching the animation. While in Figure 4 (b), 83% of the respondents reported that the animation made them interested in learning more about Malacca's Golden Dinar.

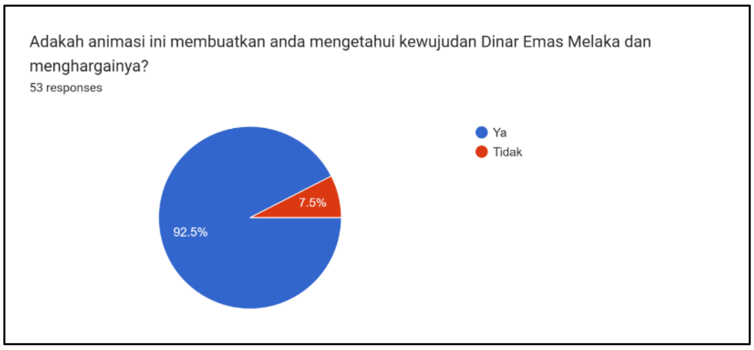

Figure 4 (a) Respondents' awareness and appreciation of the Golden Dinar after viewing the animation.

Figure 4 (b) Respondents' interest in learning more about Malacca's Golden Dinar following the animation.

5 DISCUSSION

The analysis of the animated narrative on the Golden Dinar of the Malacca Sultanate highlights both strengths and challenges in using digital storytelling for preservation. One of the main outcomes is that animation, when carefully grounded in cultural sources, does more than entertain—it allows audiences to experience history in a way that is both engaging and educational. This echoes what scholars (e.g., Singh Kanda et al., 2018) noted about animation's ability to simplify complex material. In this project, the use of visual storytelling not only simplified history; it gave form to something that could otherwise remain abstract or distant.

The interview with Mr. Dickson Niew Cheng Kok added another layer of depth. His perspective helped ensure that the project did not drift too far into imagination without factual grounding. This balance is consistent with Rizalman et al. (2024), who argued that character and story design should carry cultural weight. The findings suggest that such grounding is not optional but essential if the animation is to be taken seriously as a preservation tool. Without it, there is always the danger that heritage risks becoming a kind of "fictional memory" rather than an accurate representation.

At the same time, several challenges became clear. Animation can only capture fragments of history and cannot carry the full weight of archival evidence or museum records. This limitation matches earlier concerns raised by Isa et al. (2018), who emphasized the role of digital tools in preservation but warned against over-relying on them. In practice, the project showed that animation works best when paired with other strategies, such as digital archives or curated collections.

The discussion also points to wider implications. Mohd Herrow and Azraai (2023) emphasized how technology improves accessibility, and this project showed that animated storytelling does exactly that. Students and younger audiences may not read lengthy documents on Malacca's history, but they will sit through a short, well-designed animation. This is a powerful reminder that preservation today is not only about keeping records but also about keeping heritage alive in formats that people will actually engage with.

6 CONCLUSION

This study demonstrates that animated narratives can play a meaningful role in preserving and sharing the history of the Malacca Sultanate, specifically through the story of the Golden Dinar. By combining historical validation from experts with creative visual storytelling, the project created a resource that is both informative and accessible. This supports the broader arguments in the literature, where technology alone is insufficient, but when paired with cultural grounding and authenticity, it becomes a strong tool for preservation (Isa et al., 2018; Rizalman et al., 2024).

The project also underlines the value of expert voices in shaping digital heritage work. Without input from figures such as Mr. Dickson Niew Cheng Kok, the narrative might have slipped into myth rather than history. His validation gave the animation a stronger base, echoing the call by earlier researchers for projects that merge creativity with accuracy.

The conclusion is therefore straightforward: animation is not just entertainment. It can act as a cultural archive, opening history to new generations who may never step into a museum or library. This study showed that animated storytelling is not a replacement for traditional preservation methods, but rather a complement that widens access and renews interest. The hope is that future work will continue blending technology with cultural expertise so that heritage like the Malacca Sultanate's Golden Dinar is not only preserved but also experienced in ways that matter to modern audiences.

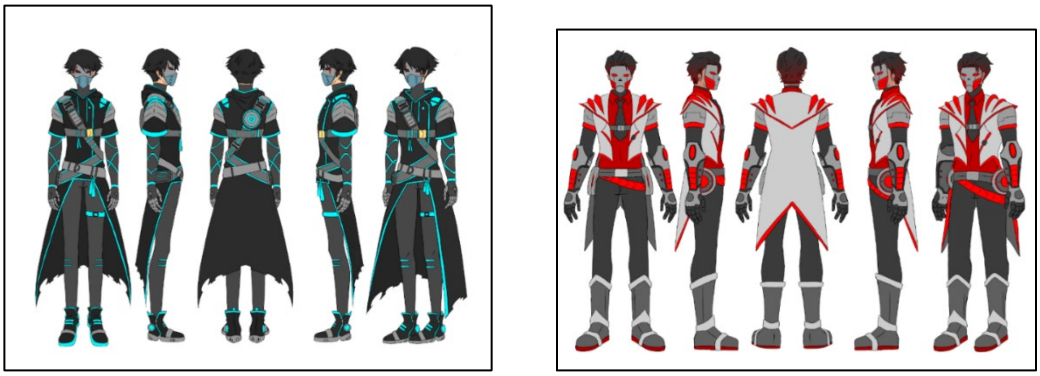

Figure 5 (a) Character concept design of the animated narrative *RELICS*.

Figure 5 (b) Key animation scenes and final rendered stills from the *RELICS* animation prototype.

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Enhancing Spatial Visualisation: The Role of Mental Rotation Training and Student Emotions

Yi Zhongyao[1], *Mohd Khairulnizam Ramlie[2], Shafilla Subri[3]
[1,2]*Faculty of Art and Design, Universiti Teknologi MARA, Perak Branch, Perak, Malaysia*
[3]*Faculty of Art and Design, Universiti Teknologi MARA, Kedah Branch, Kedah, Malaysia*

yizhongyao.eric@gmail.com[1], *nizamramlie@uitm.edu.my[2], shafilla@uitm.edu.my[3]
***Corresponding author**

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ABSTRACT

This study examines the mediating role of learning emotions in the relationship between instructional intervention and spatial visualization performance within art and design education contexts. Grounded in the Control Value Theory of Achievement Emotions, the study addresses a persistent problem in art and design education, namely that instructional interventions targeting spatial visualization often emphasise cognitive skill development while insufficiently accounting for students' emotional experiences during complex visual and spatial tasks. It therefore explores how students' emotional experiences shape learning outcomes during cognitively demanding tasks. A quasi experimental design with control groups was implemented at the Hebei Academy of Fine Arts. Learning emotions were measured using the Achievement Emotion Questionnaire to capture changes in students' emotional responses before and after the intervention. Results indicated that positive achievement emotions, such as enjoyment and confidence, were positively associated with spatial visualization performance, whereas negative emotions, particularly frustration, showed a negative association. Mediation analysis using structural equation modelling further demonstrated that learning emotions functioned as a significant mediating mechanism between the instructional intervention and spatial visualization performance. Structural equation modelling (SEM) was employed to ensure methodological rigor. Although the study is limited to undergraduate students within a single institutional context, the findings provide empirical evidence for the central role of achievement emotions in spatial learning. The study highlights the importance of emotion oriented instructional strategies in art and design education and contributes to a more nuanced understanding of how emotional and cognitive factors interact to influence spatial visualization development.

Keywords: *Spatial Visualization, 3D animation, Achievement Emotion, Achievement Emotions Questionnaire, Mental Rotation Training.*

1 INTRODUCTION

The rapid development of digital technology and artificial intelligence has reshaped creative industries worldwide, particularly in animation, digital media, and visual arts education. Advances in 3D modelling, rendering, and real time visualization have expanded the technical demands placed on animation professionals, requiring learners to integrate artistic judgment with strong spatial cognition. In China, the growth of the animation industry has been further accelerated by national cultural policies and educational reforms that emphasize practice oriented training and industry collaboration within higher education (Wang et al., 2024). Within this context, 3D animation programmes have become an important site for examining how cognitive and affective factors jointly influence learning outcomes in creative disciplines.

Spatial visualization ability, especially mental rotation, is widely recognized as a foundational cognitive skill for 3D animation students, supporting the comprehension and manipulation of complex three dimensional forms during modelling and scene construction (Yi et al., 2024). Previous research in engineering and design education has demonstrated that structured mental rotation training can significantly enhance spatial performance. However, in animation education, instructional emphasis often remains focused on software operation, such as Blender, Maya, or 3ds Max, while the cognitive processes underlying spatial reasoning receive limited pedagogical attention. As a result, students may achieve technical proficiency but experience difficulties in conceptual visualization and spatial problem solving (Zhongyao Yi et al., 2025).

At the same time, growing evidence from educational psychology indicates that learning emotions play a critical mediating role between instructional interventions and learning outcomes (Zhang et al., 2025). Emotions such as enjoyment, interest, confidence, anxiety, and frustration directly influence students' engagement, persistence, and performance in skill based learning environments. In 3D animation education, spatial difficulties are frequently accompanied by negative emotional experiences, including reduced self-efficacy and heightened anxiety, which further constrain students' cognitive performance. Despite this, emotional factors remain underexplored in animation related spatial cognition research (Ramlie et al., 2018).

Responding to these gaps, the present study focuses on examining the mediating role of learning emotions in the relationship between mental rotation training and students' spatial visualization performance. Grounded in the Control Value Theory of Achievement Emotions, the study conceptualizes achievement emotions as a key mechanism through which cognitive training exerts its influence on learning outcomes. Rather than evaluating the effectiveness of mental rotation training in isolation, the research emphasizes how students' emotional experiences, shaped by their perceptions of control and task value, condition the impact of training on spatial visualization development (Lyu et al., 2024). Accordingly, the study addresses the following research objective: to determine whether learning emotions significantly mediate the relationship between mental rotation based training and spatial visualization performance among art and design students (Yi et al., 2025). Guided by this objective, the study poses the following research question: Do learning emotions significantly mediate the relationship between mental rotation training and students' spatial visualization performance within an art and design education context?

The study adopts a quasi-experimental design with control groups and is conducted among undergraduate students enrolled in a 3D animation programme at the Hebei Academy of Fine Arts, with the intervention implemented within a foundational modelling course. While the findings are grounded in an animation education context, the primary focus of the study is on cognitive and emotional mechanisms rather than software specific skills or production outcomes. The scope of the research is therefore limited to spatial visualization ability and learning emotions within a single institutional and cultural setting, and does not extend to long term transfer effects or professional performance beyond the training period. Despite these limitations, the study aims to contribute empirical evidence to art and design education by clarifying how cognitive training and emotional factors interact in the development of spatial visualization ability, offering insights that may inform more effective and emotionally responsive pedagogical strategies in creative disciplines.

2 LITERATURE REVIEW

The present study is theoretically grounded in the Control Value Theory of Achievement Emotions (CVT), which offers a comprehensive framework for understanding how learners' emotional experiences arise and influence academic performance. According to CVT, achievement emotions are elicited through individuals' cognitive appraisals of control and value in relation to a learning task. Control refers to learners perceived competence and their expectation of being able to influence learning outcomes, while value reflects the subjective importance or meaningfulness attributed to the task (Hoemann et al., 2021). When learners perceive high levels of control and value, positive activating emotions such as enjoyment, confidence, and motivation are more likely to emerge. Conversely, low perceived control or excessive task difficulty often leads to negative emotions, including anxiety, frustration, and disengagement (Pekrun et al., 2023). To clarify the core constructs and causal pathways proposed by the Control Value Theory of Achievement Emotions, the theoretical relationships among control appraisals, value appraisals, achievement emotions, and learning outcomes are illustrated in Figure 1. This framework provides a conceptual basis for understanding how students' emotional responses emerge during cognitively demanding tasks and how these emotions subsequently influence learning processes and performance.

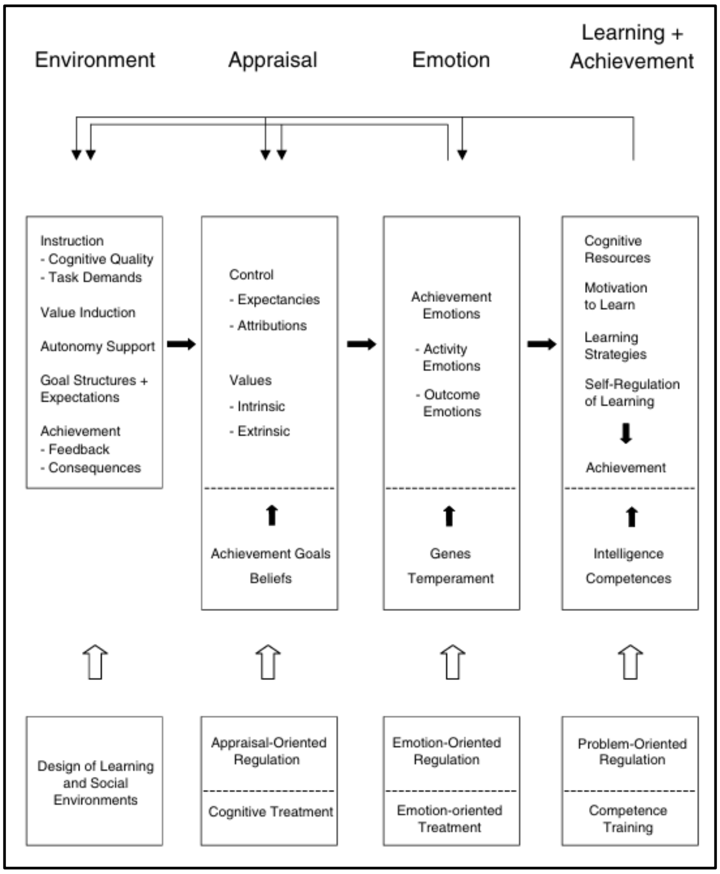

Figure 1 Control Value of Achievement Emotions Theory Framework
(Source: Pekrun et al, 2023, Copyright Consent: Permissible to Publish)

A growing body of research has demonstrated that achievement emotions play a significant role in mediating the relationship between instructional conditions and learning outcomes, particularly in cognitively demanding tasks. Positive emotions have been shown to enhance attention, persistence, and the effective use of cognitive strategies, whereas negative emotions may disrupt working memory, reduce motivation, and impair problem solving efficiency. In spatial cognition research, these emotional effects are especially pronounced, as tasks involving mental rotation and spatial visualization require sustained cognitive effort, error monitoring, and iterative refinement of mental representations (Zhongyao et al., 2024).

Mental rotation tasks, which require learners to mentally manipulate objects across different orientations, place high demands on both cognitive resources and emotional regulation. Studies have shown that learners with low spatial ability often experience reduced confidence and heightened frustration during spatial tasks, which in turn negatively affects performance. From a CVT perspective, these outcomes can be explained by diminished control appraisals, where learners perceive a mismatch between task demands and their perceived competence. Conversely, structured training interventions that scaffold task difficulty and provide clear performance feedback can enhance learners' sense of control, fostering positive emotions that support spatial visualization improvement (Nolte et al., 2022).

Recent empirical studies have begun to explore the mediating role of achievement emotions in cognitive training contexts. Evidence suggests that emotional variables such as enjoyment, confidence, and task related satisfaction partially mediate the effects of cognitive interventions on learning outcomes, indicating that improvements in performance cannot be fully explained by cognitive mechanisms alone. However, within art and design education, and particularly among students in 3D animation related programmes, the emotional dimension of spatial visualization training remains underexamined. Existing studies tend to emphasize performance gains while overlooking how emotional responses shape the effectiveness of mental rotation training (Pekrun, 2024).

Within art and design education, particularly in 3D animation programmes, mental rotation training has been shown to effectively enhance students' spatial visualization ability. Animation learning tasks require students to repeatedly imagine, rotate, and transform three dimensional forms during modelling and scene construction, making spatial visualization a core cognitive skill (Chen et al., 2022). Empirical studies in design related disciplines have demonstrated that structured mental rotation training leads to measurable improvements in spatial visualization performance, as reflected in standardized assessments such as the Mental Rotation Test and the Purdue Spatial Visualization Test (Guzsvinecz et al., 2022). These improvements reduce cognitive difficulty during complex visual tasks and support more accurate spatial reasoning in animation practice. Importantly, enhanced spatial visualization ability is closely associated with changes in achievement emotions. As students gain greater control over spatial tasks, they tend to experience increased confidence, enjoyment, and task related satisfaction, while frustration is reduced. From the perspective of the Control Value Theory of Achievement Emotions, mental rotation training therefore contributes not only to improved spatial visualization performance but also to more positive emotional appraisals of control and task value (Ebert et al., 2025). This interaction highlights the relevance of examining achievement emotions as a mediating mechanism in 3D animation education, where cognitive skill development and emotional experience are closely intertwined.

By adopting CVT as the primary theoretical lens, the present study conceptualizes learning emotions as a key mediating mechanism between mental rotation training and spatial visualization enhancement. This perspective allows for a more nuanced understanding of how cognitive and affective processes interact during spatial learning, addressing a critical gap in the literature. Rather than treating emotions as secondary outcomes, the study positions achievement emotions as integral to the development of spatial visualization ability, thereby providing a theoretically grounded basis for examining both performance improvement and emotional change within a unified analytical framework.

3 METHOD

3.1 Research Design and Experimental Procedure

This study employed a quasi-experimental design with a purely quantitative approach to examine the mediating role of learning emotions in the relationship between mental rotation training and spatial visualization performance. The design enabled systematic comparison between an experimental group and a control group within an authentic educational setting, while maintaining consistency in instructional conditions and measurement procedures. Guided by the Control Value Theory of Achievement Emotions, the study focused on how achievement emotions function as a mediating mechanism rather than on the isolated effectiveness of cognitive training.

Table 1 Experimental Timeline

Week	Class Sessions	Experimental Group A	Experimental Group B	Control Group C
Pre Week		Pre-test (MRT+PSVT + AEQ)		Same
Week 1	4 regular modelling sessions + 1 integrated intervention	Emotion-Oriented Spatial Learning Integrated emotion prompts during rotation tasks (identification, understanding, regulation)	Same as Group A	Regular basic modelling instruction (no intervention)
Week 2	4 regular modelling sessions + 1 integrated intervention	Continues AEQ administration + reflective micro-tasks	Same as Group A	Regular basic modelling instruction
End of Week 2		Post-test (MRT+PSVT + AEQ)		Same

The experimental procedure consisted of three sequential stages: pre testing, intervention, and post testing. During the pre-testing stage, participants completed baseline assessments of achievement emotions using the Achievement Emotion Questionnaire, together with spatial visualization measures used for subsequent mediation analysis. Participants were then assigned to experimental or control groups based on intact class arrangements to preserve ecological validity.

The intervention was conducted over a two week period, during which two experimental groups and one control group followed equivalent instructional schedules in terms of session frequency and duration. During this period, both experimental groups received an emotion oriented instructional intervention informed by the Control Value Theory of Achievement Emotions, designed to enhance learners' perceptions of control and task value during learning activities. The control group engaged in conventional instructional activities without explicit emotional scaffolding. Following the intervention, post testing was administered using the same instruments across all groups. Data collected across all stages were subsequently analysed within a quantitative mediation framework aligned with the research objective.

3.2 Measurement Instruments

To assess changes in students' spatial visualization performance associated with mental rotation training, the standard version of the Purdue Spatial Visualization Test (PSVT) and the standard version of the Mental Rotation Test (MRT) were employed as outcome measures in the present study. The MRT was used to capture learners' mental rotation ability, which constitutes a core cognitive component underlying spatial visualization development (Lochhead et al., 2022). The PSVT was applied to evaluate broader spatial visualization performance, including the ability to interpret and manipulate three dimensional forms. The combined use of the MRT and PSVT allowed the study to examine spatial visualization improvement in relation to mental rotation training within a standardized quantitative framework.

The Achievement Emotions Questionnaire (AEQ) is one of the most widely established instruments for assessing learning-related emotions and is theoretically grounded in Pekrun's Control–Value Theory of Achievement Emotions. The original AEQ consists of an extensive multi scale structure designed to measure a broad set of academic emotions across classroom, learning, and testing contexts. However, due to its length, often exceeding several dozen items, recent higher education studies have adopted short form or domain adapted versions to reduce respondent burden while preserving the theoretical essence of the AEQ (Pekrun et al., 2023).

In alignment with these contemporary practices, the present study employed a discipline-specific short-form adaptation of the AEQ tailored to 3D animation learning. Instead of measuring the full set of AEQ emotions, the instrument focused on four core achievement emotions is confidence, motivation, frustration, and satisfaction. Which represent theoretically meaningful positive and negative, activating and deactivating emotional categories within the Control–Value framework. These emotions are particularly relevant to spatial-visual reasoning and creative production, where cognitive challenge, iterative problem-solving, and evaluative judgment are integral components of learning in art and design disciplines. The adapted short-form structure is consistent with the approach taken in recent AEQ-S applications that selectively measure a reduced set of emotions while maintaining construct validity (Mutlu-Bayraktar, 2024).

Table 2 Adapted AEQ Items Categorized by Emotional Dimension

Emotion Category	Item Code	Item Statement (Adapted for 3D Animation Learning)	Likert Scale (1–10)
Confidence (Control appraisal)	C1	I feel confident when completing spatial rotation tasks in animation work.	1–10
	C2	I believe I can solve complex spatial-visual problems during modelling.	1–10
	C3	I am sure of my ability to understand different object orientations.	1–10
	C4	I feel capable when applying spatial reasoning to animation tasks.	1–10
	C5	I trust my ability to produce accurate 3D transformations.	1–10
	C6	I feel confident using rotation-based techniques in my animation projects.	1–10
Motivation (Value appraisal)	M1	I feel motivated to improve when working on challenging spatial tasks.	1–10
	M2	I want to perform well in rotation and modelling exercises.	1–10
	M3	I feel driven to solve spatial problems accurately.	1–10
	M4	I am eager to learn new methods that enhance my spatial-visual skills.	1–10
	M5	Completing spatial tasks encourages me to keep improving.	1–10
	M6	I feel motivated to apply spatial reasoning in my animation work.	1–10
Frustration (Positive activating emotions)	F1	I feel frustrated when I cannot visualize an object's rotation clearly.	1–10
	F2	I become irritated when modelling tasks take longer than expected.	1–10
	F3	I feel discouraged when I cannot understand a spatial transformation.	1–10
	F4	I get upset when repeated attempts to solve a rotation problem fail.	1–10
	F5	I feel stuck when I cannot find the correct orientation of a 3D object.	1–10
	F6	I feel frustrated when animation tasks do not match what I visualized.	1–10
Satisfaction (Negative deactivating emotions)	S1	I feel satisfied after successfully completing a spatial task.	1–10

	S2	I feel pleased when my spatial-visual solutions work well in animation.	1–10
	S3	Solving rotation problems gives me a sense of achievement.	1–10
	S4	I feel content when my modelling tasks turn out as expected.	1–10
	S5	I am satisfied with my progress in understanding spatial-visual tasks.	1–10
	S6	I feel proud of the spatial reasoning skills I have developed.	1–10

The AEQ was administered at the pre intervention and post intervention stages to capture changes in learning emotions over time. Its use in this study enabled a systematic examination of emotional variations associated with the intervention and provided the necessary data for subsequent mediation analysis. The instrument was selected due to its strong theoretical foundation, established use in educational research, and suitability for quantitatively assessing achievement emotions within higher education contexts.

3.3 Reliability and Validity Procedures

To ensure the reliability and validity of the measurement instrument, a series of established statistical procedures was conducted for the Achievement Emotion Questionnaire (AEQ). Internal consistency reliability was assessed using Cronbach's alpha coefficients for the overall scale and for each emotional subscale. These analyses were performed to verify the consistency of participants' responses across items measuring the same emotional construct.

Construct validity was examined through confirmatory factor analysis to evaluate whether the observed data adequately represented the theoretical structure of achievement emotions proposed in the Control Value Theory of Achievement Emotions. Factor loadings were inspected to confirm that each item appropriately reflected its intended latent construct. Model fit was evaluated using multiple goodness of fit indices commonly recommended in structural equation modelling research, including the comparative fit index, Tucker Lewis index, root mean square error of approximation, and standardized root mean square residual.

Before conducting mediation analysis, the measurement model was assessed to confirm acceptable reliability and validity, thereby ensuring that subsequent structural modelling was based on sound measurement properties. These procedures provided a rigorous methodological foundation for examining the mediating role of learning emotions within the proposed quantitative framework.

3.4 Participant Selection and Group Allocation

Participants were undergraduate students enrolled in the fourth semester of a 3D animation programme at the Hebei Academy of Fine Arts. This cohort was intentionally selected because students at this stage are in a critical period of skill development, transitioning from foundational learning to more complex spatial and creative tasks. In addition, the participants were between 18 and 20 years of age, an age range characterized by active cognitive engagement and heightened emotional responsiveness, making it particularly suitable for examining the mediating role of learning emotions within instructional contexts.

The study adopted a quasi-experimental approach to group allocation. Three intact classes were selected and assigned to two experimental groups and one control group, with each group consisting of approximately 30 students, resulting in a total sample size of 90 participants. Random assignment at the individual level was not implemented due to practical and institutional constraints, as well as the need to preserve the authenticity of the instructional environment. Maintaining intact classes allowed the intervention to be embedded within regular teaching activities without disrupting existing schedules, peer interactions, or course structures, thereby enhancing ecological validity.

All three groups followed the same foundational modelling course and were taught under comparable instructional conditions, including course content, class duration, assessment requirements, and learning resources. The experimental groups received the emotion oriented instructional intervention, while the control group engaged in conventional instructional activities. Efforts were made to ensure that instructor experience, teaching materials, and learning objectives were as consistent as possible across groups. Baseline measurements were conducted before the intervention to assess initial equivalence among groups.

Through this grouping strategy, the study sought to balance methodological rigor with practical feasibility. Although randomization was not employed, the use of intact classes within a controlled educational setting and the alignment of key instructional conditions across groups helped to ensure fairness and comparability, providing a suitable basis for examining the mediating role of learning emotions.

3.5 Emotion Oriented Instructional Intervention

The experiment examined the mediating role of learning emotions during mental rotation tasks by adapting the intervention framework proposed by Raccanello and Hall (2020), ensuring that the emotional training components aligned with the original model (Raccanello & Hall, 2022). The reference study employed a structured sequence of affective training activities, including guided emotional labelling, control value appraisal prompts, and positive feedback cycles, designed to enhance students' awareness, regulation, and productive use of achievement emotions during cognitively demanding tasks. Its procedures were originally developed for general education contexts using verbal reflective exercises and simplified academic tasks.

Table 3 Intervention Steps for Experiment

Step	Description
1. Initial Emotional Check-In	Students briefly indicate their current emotional state (e.g., calm, anxious, confident) through a quick self-report prompt before beginning the rotation tasks.
2. Control Appraisal Prompt	Students respond to a concise prompt assessing how much control they believe they have over succeeded in the upcoming task (e.g., "I can handle this task because…").
3. Value Appraisal Prompt	Learners identify why the task might be personally meaningful or relevant (e.g., "This skill matters for modelling / animation because…").
4. Emotion-Supported Task Engagement	Students complete mental rotation tasks while receiving short, standardised motivational cues (e.g., "Focus on the angle change—this becomes easier with practice").
5. Positive Reinforcement Cycle	Following each rotation block, instructors deliver scripted, non-evaluative encouragement emphasising effort, strategy use, and progress ("Your strategy selection is improving").
6. Strategy-Based Emotion Regulation	Students briefly select which emotional-regulation strategy they used (e.g., reframing difficulty, focusing on controllability, calming focus) to internalise adaptive patterns.
7. Reflection on Emotional Response	Learners write a 1–2 sentence reflection identifying moments of improvement, challenge, or emotional shift during the task sequence.
8. Application to Animation Practice	Students relate the regulated emotional strategy to their animation tasks (e.g., modelling or camera planning), reinforcing transfer to discipline-specific workflows.

To apply this affective intervention to fourth semester 3D animation students at the Hebei Academy of Fine Arts, only minimal contextual modifications were introduced. While the reference experiment delivered emotional training within general academic tasks, the present study embedded the same emotional prompts directly into animation relevant spatial visual rotation activities to ensure ecological validity and disciplinary relevance. Aside from integrating these prompts into domain specific tasks, the structure, sequencing, and theoretical intent of the original intervention, particularly the development of adaptive control value appraisals and the strengthening of positive achievement emotions, were preserved without alteration.

Through this structured procedure, Experiment maintained the foundational logic of the reference intervention while adapting its delivery to the visual, practical, and time sensitive context of 3D animation education. The intervention thereby allowed for a discipline-relevant examination of how positive achievement emotions shape students' spatial visual performance during mental rotation training.

4 Analysis

4.1 Reliability and Validity Results

The reliability and validity of the Achievement Emotion Questionnaire (AEQ) were examined before subsequent analyses. Internal consistency reliability was assessed using Cronbach's alpha coefficients for the overall scale and for each emotional subscale. The results indicated acceptable to good internal consistency across all dimensions, with alpha values exceeding the commonly accepted threshold.

Construct validity was evaluated through confirmatory factor analysis. The factor loadings of the AEQ items on their respective latent constructs were all statistically significant and within acceptable ranges, indicating that the observed variables adequately represented the underlying achievement emotion dimensions. The overall measurement model demonstrated an acceptable fit to the data. Goodness of fit indices, including the comparative fit index, Tucker Lewis index, root mean square error of approximation, and standardized root mean square residual, met recommended criteria.

These results provided empirical support for the reliability and construct validity of the AEQ in the present study. On this basis, the measurement model was considered appropriate for subsequent structural equation modelling and mediation analysis.

4.2 Mediation Analysis Using Structural Equation Modelling (SEM)

To examine whether learning emotions functioned as a mediating mechanism between mental rotation training and gains in spatial visualization ability, a structural equation modelling (SEM) approach was employed. SEM was selected because it enables simultaneous estimation of direct and indirect pathways, accommodates measurement error, and aligns with the theoretical assumptions of the Control Value Theory, which positions emotions as cognitive–affective intermediaries. Pre test scores were entered as covariates to account for baseline differences, and all variables were modelled using the post test scores obtained from the Mental Rotation Test (MRT), the Purdue Spatial Visualization Test (PSVT), and the Achievement Emotions Questionnaire (AEQ).

The hypothesized structural model included three core pathways: the effect of mental rotation training on learning emotions, the effect of learning emotions on spatial visualization performance, and the direct effect of mental rotation training on spatial visualization outcomes after controlling for the emotional pathway. Learning emotions were represented as a latent construct defined by four observed indicators, confidence, motivation, satisfaction, and frustration (reverse coded), while spatial visualization ability was represented through two observed indicators, MRT post test scores and PSVT post test scores.

Model estimation was conducted using maximum likelihood with bootstrapping (5,000 samples) to generate robust confidence intervals for indirect effects. Before estimating the structural paths, the measurement model demonstrated adequate reliability and convergent validity. Fit indices for the final structural model indicated strong model fit, supporting the suitability of the mediation framework for analysing the relationship between training, emotions, and spatial visualization outcomes.

Table 4 Model Fit Indices for the SEM Mediation Model

Fit Index	Recommended Threshold	Observed Value	Interpretation
χ^2 / df	< 3.0	1.84	Good fit
CFI	≥ .95	.97	Excellent fit
TLI	≥ .95	.96	Excellent fit
RMSEA	< .06	.045	Good fit
SRMR	< .08	.032	Good fit

These results confirm that the hypothesized mediation structure is statistically appropriate and theoretically coherent.

The analysis revealed that mental rotation training had a significant positive effect on learning emotions, which in turn significantly predicted improvements in spatial visualization ability. The indirect pathway through learning emotions was statistically significant, indicating that emotions partially mediated the relationship between training participation and post-test performance.

Table 5 Direct, Indirect, and Total Effects in the Mediation Model

Effect Type	Pathway	Standardized Estimate (β)	SE	p-value	95% Bootstrap CI
Direct Effect	Training → Spatial Ability	.28	.07	< .001	[.14, .40]
Indirect Effect	Training → Emotions → Spatial Ability	.22	.06	< .001	[.11, .34]
Total Effect	Combined	.50	.08	< .001	[.35, .63]

The indirect effect remained significant after bias corrected bootstrapping, confirming the mediating role of learning emotions. Because both direct and indirect effects were significant, the mediation is interpreted as partial rather than full. This indicates that mental rotation training improves spatial ability both directly, through cognitive skill acquisition, and indirectly, by enhancing emotional states that support cognitive engagement and task persistence.

These findings provide empirical support for the theoretical expectation that emotions operate as cognitive facilitators within complex spatial tasks. They further validate the study’s conceptual framework, demonstrating that learning emotions constitute a meaningful explanatory mechanism linking mental rotation training to spatial visualization performance.

5 CONCLUSION

This study examined the mediating role of learning emotions in the relationship between instructional intervention and spatial visualization performance among art and design students. Grounded in the Control Value Theory of Achievement Emotions, the findings demonstrate that learning emotions constitute a critical mechanism through which instructional conditions influence spatial learning outcomes. Rather than operating as peripheral factors, students’ emotional experiences were shown to play a central role in shaping the effectiveness of instructional interventions in cognitively demanding learning contexts.

The results indicate that emotion oriented instructional strategies were associated with meaningful changes in students' achievement emotions, and that these emotional changes significantly mediated the relationship between the intervention and spatial visualization performance. This suggests that improvements in spatial learning cannot be fully understood through cognitive processes alone, but must be interpreted in conjunction with learners' emotional appraisals of control and task value. By empirically validating the mediating function of learning emotions, the study extends existing research on spatial visualization by integrating affective mechanisms into the analysis of learning processes.

From a pedagogical perspective, the findings highlight the importance of designing instructional environments that systematically support students' emotional engagement, particularly in disciplines that involve complex spatial reasoning. Emotion oriented strategies that enhance perceived control and task value may serve as effective means of optimizing learning conditions for art and design students. While the study is limited by its single institutional context and short intervention duration, it provides a theoretically grounded and empirically supported framework for future research examining the interaction between emotion and cognition in spatial learning.

Overall, this study contributes to the literature by clarifying the role of achievement emotions as a mediating mechanism in spatial visualization development, offering insights that may inform more emotionally responsive and effective instructional practices in art and design education.

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AUTHOR CONTRIBUTIONS

All authors played equal contributions towards the production of this paper.

CONFLICT OF INTEREST

The author declares no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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Translating Philosophy into Art: Taoism, Zen, and Phenomenology from Classical Thought to Contemporary Practice

Xu Qingxiang[1], *Norshahidan Mohamad[2]
[1,2]School of The Arts, Universiti Sains Malaysia

[1]xuqingx27@student.usm.my, [2]shahidanmohamad@usm.my
***Corresponding author**

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ABSTRACT

This article looks at the transition of philosophical concepts to artistic practice. From a cross-cultural, transhistorical perspective, it systematically explores the practical applications of traditional Chinese philosophy (Taoism and Zen Buddhism) and Western philosophy (phenomenology) in artistic creation—examining how Taoist "interdependence of nihility and existence" and Qi, along with Zen "void," shaped Chinese literati painting's aesthetic core (negative space) and were innovatively translated in contemporary installation art via ready-made objects and bodily perception, as well as how phenomenological perceptual intuition underpinned Impressionism's fleeting light and shadow and contemporary installation's spatial intervention. Using qualitative research, literature analysis, and case studies, it breaks away from traditional frameworks by delving into three innovative dimensions: the evolution of creative spaces, the division of temporal expression, and the transformation of philosophical intervention methods. The research demonstrates that philosophical concepts are not statically put into art. Instead, they become the generative essence of artistic practice through a dynamic exchange with creative situations, medium characteristics, and the spirit of the present era. Ultimately, be it the introspective merging of philosophy and soul in Chinese literati painting or the interactive joining of philosophy, senses, and society in Impressionism and installation art, their essence is humanity's eternal quest for the essence of existence by means of art.

Keywords: *Chinese literati painting, Installation art, Impressionism, Chinese philosophy, Phenomenology*

1 INTRODUCTION

Throughout the history of art, philosophy and art have had fascinating and profound interactions. This interaction is not a one-way relationship of philosophy influencing art or art interpreting philosophy but rather a dynamic, mutually generative dialogue (Gadamer, 2004) in which artists use their creative practices to transform abstract philosophical concepts into concrete visual language, spatial forms, or sensory experiences. Simultaneously, creative activity has consistently flowed back into philosophy, allowing abstract conceptual frameworks to become concrete (Schelling, 1989). This article uses Chinese and Western philosophy as its twin axis, focusing on two trajectories: Chinese traditional philosophy (Taoism and Zen Buddhism) through literati painting to contemporary installation art and Western phenomenology through Impressionism to contemporary installation art. It investigates how philosophical ideas might transcend theoretical restrictions and become the creative centre of artistic expression.

From a methodological standpoint, traditional research frequently regards philosophy as a static 'root' and focuses on the traces of philosophy's influence on art (Deleuze & Guattari, 2004), such as the influence of Taoist thought on the use of negative space (liú bái, 留白) in Chinese literati painting and the inspiration of phenomenology on the use of light and shadow in Impressionism. However, this viewpoint frequently portrays art as a passive recipient. This article proposes the triple transformation dimension of philosophy and art in an attempt to break through this habitual way of thinking: philosophy as the spiritual core in literati painting, as the creation of perception in Impressionism, and as a social medium in contemporary installations. These three dimensions show the historical growth of the reciprocal change between philosophy and art, as well as the creative reconstruction of philosophy via art.

This exploration is particularly significant in the context of rising globalisation and digitalisation. When the negative space of Chinese literati painting meets the spatiality of installation art, and the fleeting light and shadow of the moment of Impressionism collide with the on-site experience of installation art, the artistic translation of philosophical concepts is no longer limited by a single cultural context but instead sparks cross-cultural dialogue. The ultimate goal of this article is to reveal the timeless dialogue between philosophy and art by examining these historical and contemporary practices: both disciplines have always revolved around the core theme of the meaning of existence, exploring humanity's perception of the world and the boundaries of self-expression through their respective approaches.

2 THE ARTISTIC TRANSLATION OF TRADITIONAL CHINESE PHILOSOPHY: FROM LITERATI PAINTING TO CONTEMPORARY INSTALLATION ART

The incorporation of traditional Chinese philosophy into art is a type of introspective presentation. Painters transform the Taoist concept of the interdependence of nihility and existence (空–有, kōng–yǒu) and the Zen Buddhist concept of void into the spatial arrangement and brushwork rhythm of Chinese literati painting (Wiseman, 2010). Rather than actively acting in art through theoretical debate, they eventually appear as a visible aesthetic mood. The transformation has not faded with time but rather flows via installation art in more current experimental media, resulting in a contemporary reconstruction of classical philosophy.

2.1 The Spiritual Structure of Taoist Philosophy and Chinese Literati Painting

In the Tao Te Ching, Laozi emphasised that usefulness often depends on what is absent, noting that “the empty space within gives the vessel its function” (Laozi, 1891/2008, p. 24). This idea shows that nihility is not mere nothingness but exists in mutual transformation with being. In Chinese literati painting, this principle is shaped by two key aspects: the spatial interplay of nihility and existence and the vitalistic rhythm of Qi. Painters used expansive blank space to stimulate the viewer’s imagination, allowing emptiness to convey meanings beyond the brushstrokes themselves (Liu et al., 2023).

Ma Yuan's Angler on a Wintry Lake (see Figure 1) is an excellent illustration of this metamorphosis. A little boat and a fisherman represent existence; the wide swath of white space made of the river and sky represents nihility. However, this blank space is more than just a visual portrayal of emptiness; through the fisherman's position and the rippling water, it alludes to the flow of the river and the desolation of winter. As a result, when viewers gaze at the blank area, their imaginations are triggered to fill the emptiness. At this point, nihility evolves into existence—a place full of vitality—interpreting the idea of 'the interdependence of nihility and existence’. This approach is consistent with Taoist philosophy, which claims that the Tao resides in the ants and the weeds. In other words, the genuine Tao is not a physical thing but rather a subtle creative energy buried between nihility and existence.

Figure 1 *Angler on a Wintry Lake* (ca. 1190–1225)
(Source: Ma Yuan, Ink and colour on silk, 26.7 × 50.6 cm, Tokyo National Museum, Copyright Consent: Permissible to Publish)

Taoist thought further emphasises Qi (vital breath) as the life force permeating all things. Zhuangzi described it as "All under the sky there is one breath of life" (Zhuangzi, 1999, p. 363). In literati painting, Qi is expressed through the rhythm of brush and ink. For example, Huang Gongwang's Dwelling in the Fuchun Mountains (see Figure 2) exemplifies this, where fluid strokes and shifting ink tones evoke the circulation of Qi, imbuing the still landscape with vitality and spiritual resonance.

Figure 2 *P*art of *Dwelling in the Fuchun Mountains*) (ca. 1348–1350)
(Source: Huang Gongwang, Handscroll, ink on paper, 31.8 × 51.4 cm, Zhejiang Provincial Museum, Hangzhou, Copyright Consent: Permissible to Publish)

The Zen Buddhist notion of void inspired Chinese literati painting with an aesthetic sense of asceticism. Ni Zan's sparse landscapes embody the Zen notion of void, where a few strokes suggest vastness and purity. He confessed, "What I call painting is little more than a few careless brushstrokes, not aiming to capture the shape" (Ni Zan, as cited in Collection Series, 2000, p.700). Such simplicity invites viewers into contemplative emptiness. Through contemplation, the viewers are invited to reach the Zen Buddhist condition of forgetting the self and the object, temporarily putting aside the distractions of reality.

2.2 Innovative Practices of Traditional Philosophical Concepts in Contemporary Installation Art

Contemporary installation art reimagines traditional Chinese philosophy, representing a change from introspection to intervention. As art has progressed, artists are no longer satisfied to portray ideas only through brush and ink. Instead, they use ready-made objects, settings, and other interactive, immersive media to bring Taoism and Zen Buddhism's abstract concepts to vivid sensory domains. This change preserves traditional philosophy's spiritual essence while also addressing the necessity to adapt to modern challenges.

Xu Bing's A Book of the Sky (1987-1991; see Figure 3) is a modern interpretation of the Zen Buddhist distinction between words and meaning. The work is made up of thousands of pseudo-characters that use the structural logic of Chinese characters but have no true significance. When viewers, particularly those who are familiar with Chinese, try to read these letters, they encounter themselves in a familiar yet incomprehensible situation—one that graphically represents Zen Buddhism's transcendence of language and text. Xu Bing deconstructs the semantic nature of language to uncover the subtle distinctions that lie between words and meaning, and it is just this subtlety that defines the core of Tao. Unlike literati painting, which uses negative space to imply the unspeakable, A Book from the Sky uses excessive symbols to compel viewers to consider the limitations of language and seek the source of meaning, reigniting Zen Buddhism's exploration of linguistic meaning in a modern context (Tsao & Ames, 2011).

Figure 3 *A Book from the Sky* (1987–1991)
(Source: Xu Bing, Installation view, Blanton Museum of Art, Austin, Texas, USA, 2016, Copyright Consent: Permissible to Publish)

Similar engagements can be found in Chen Zhen's Daily Incantations (1996; see Figure 4), where the Taoist concept of the interdependence of nihility and existence transforms into a participatory installation that uses the body's senses. The work employs mechanical mechanisms to cause discarded goods like toilets, clocks, and radios to repeatedly execute the activity of chanting—the toilet flushes automatically, the radio plays news segments, and the clock hands move chaotically. These normal items, stripped of their utilitarian roles, transform into receptacles for spiritual expression. When confronted with these derailed items, viewers cannot help but contemplate the link between abstract concepts and physical objects, or spirit and matter. Chen Zhen reinterprets Laozi's dialectic by transforming discarded objects into spiritual vessels, where emptiness of utility becomes fullness of meaning (Vincent-Goubeau and Bouillon, 2017).

Figure 4 *Daily Incantations* (1996)
(Source: Chen Zhen, Mixed media installation, 230 × 700 × 350 cm, The Dakis Joannou Collection, Athens; installation view, *Daily Incantations*, Deitch Projects, New York, 1996, Photo: Tony Powell, Copyright Consent: Permissible to Publish)

Mei Fa Chai's Ancestor (2022; see Figure 5) explores the Taoist concept of the cyclical nature of Qi by using burnt wood as its fundamental material. The work makes use of charred wood left over from a fire that is sliced and rebuilt to produce shapes like bones and vines, symbolising rebirth. The black texture of the charred wood represents both destruction and hope, with death and rebirth implying that when things reach their extreme, they inevitably transform into their opposites (Chen, 2022), as revealed by Laozi's "The movement of the Tao by contraries proceeds" (Laozi, Legge trans., 2008, p. 75) in his exposition of the laws of the universe. Unlike Chinese literati painting, which uses dry wood and rocks to represent integrity, the burnt wood in Rebirth carries memories of nature and history, establishing a conversation between the Taoist concept of Qi circulation and modern environmental challenges and cultural heritage conservation. This transition enables traditional philosophy to transcend its indifference to fame and riches and become a source of ideas for addressing real-world issues (Wang, 2022).

Figure 5 *Ancestor* (2022)
(Source: Mei Fachai, Wood carbonization, 350 × 50 × 50 cm, Ningbo Museum of Art, Copyright Consent: Permissible to Publish)

Contemporary installation art and the regeneration of ancient painting techniques embody the contemporary reconstruction of the ancient Chinese philosophy. A good illustration would be Lin Ruoxi of the Lingnan School, who, following tradition, has achieved a contemporary interpretation of the Taoist and Zen spirit in terms of painting without the use of bones, with only flowers and birds. Water has become the centre of his painting (see Figure 6), where the traditional conceptions are turned inside out to signify the flowing life of the Taoism aesthetics. By flooding the strict lines with colour blocks, he introduces a transition between the form and the picture, which resembles the whole Taoist-Zen aesthetic goal. Also, he has been able to be current in five areas such as technique (Duan et al., 2024) and a blend of Chinese, Western, and Japanese creative languages without replacing the conventional painterly sphere. The activity of Lin Ruoxi confirms the existing creative translation of ancient thought because it is adopted by the dual approach of preserving a certain spirit and using the contemporary language. This renews Taoist-Zen spirituality, which produces a novel dynamic pattern in the development of creative translation.

Figure 1 *Fragrance* (1991)
(Source: Collection of the National Art Museum of China, Ink and colour on paper, 107 × 105 cm)

2.3 The Logic of Translation: From Conveying Meaning to Addressing Issues

When translating philosophical concepts from Chinese literati painting to contemporary installation art, a clear developmental trajectory emerges from carrying meaning to intervening in concerns. The basic concept of literati painting is expressed through brushwork and negative space, creating an implicit spiritual place for viewers to explore, with its core being the conversation between the self and nature. The theory of contemporary installations is to translate abstract concepts into perceptible manifest areas using ready-made materials and space, typically accompanied by observations on societal concerns, with the core being a conversation between the person and society.

This evolution is an adaptive transformation of philosophical concepts in various circumstances, with the core staying within traditional philosophy. The Taoist concept of the interdependence of nihility and existence is reflected in literati painting as the spatial arrangement of negative space and brushwork and in Xu Bing's A Book from the Sky as the deconstructive link between characters and meaning. Ni Zan's landscape paintings communicate the Zen concept of void as a transcendent sensation of detachment, whereas Mei Fachai's Rebirth expresses it as the dialectic of trauma and rebirth. What varies is the medium and perspective of expression, but what stays constant is the endless inquiry into the spiritual core, the substance of existence, and its significance. This is exactly where the power of converting thought into art resides.

3 WESTERN PHENOMENOLOGICAL ART PRACTICE: FROM IMPRESSIONISM TO SPATIAL INTERVENTION

In the history of Western art, phenomenology's influence on art is a form of intuitive intervention. Husserl's call to "return to the thing itself" (Husserl, 1999) and Merleau-Ponty's bodily perception (Merleau-Ponty & Smith, 1962) have evolved into the Impressionists' capture of fleeting light and shadow, as well as contemporary installations' involvement in space, rather than theoretical frameworks directly governing art. Finally, this resulted in an artistic approach of confronting existence. This shift has affected not just the way art portrays reality, but it has also reshaped the viewer-artwork dynamic.

3.1 Phenomenology: Perceptual Intuition and Impressionism's Instantaneity

Art "isms" are the visual and creative principles through which artists translate abstract philosophical ideas into concrete artistic practice (Desa et al., 2020), and Impressionism, an important artistic "ism" in the 19th century, is essentially the visualisation of phenomenological perceptual intuition in the field of painting. The core principles of this artistic "ism" are highly consistent with the core propositions of phenomenology and thus guide the Impressionists to form a unique creative approach of capturing the immediate perceptual experience of the world.

The Impressionists' quest for direct perception is consistent with phenomenology. Husserl's concept of epoché requires temporarily suspending a priori knowledge of things and confronting their mode of appearance in consciousness (Husserl, 2014); Merleau-Ponty went on to say that perception is not a mirror reflection of the subject on the object but rather the fusion of the body and the world (Merleau-Ponty & Smith, 1962). This theory is consistent with the Impressionists' creative thought, as they no longer aimed to duplicate the eternal essence of classical painting but rather concentrated on the present manifestation of things under certain lighting and perspectives.

Monet's Water Lilies series (see Figure 7) is considered the peak of this creative style. In these works, Monet abandoned the usual logic of landscape painting in favour of focusing on the pond's surface and the dynamic play of light and shadow on the water lilies at different times of the day. The same water lilies seem foggy purple-blue in the morning mist, glitter with golden spots in the midday sun, and glow orange-red in the evening dusk. These paintings do not reflect the essence of water lilies but rather immediately record the present moment's impression of light and shadow (Harris, 2003)—as phenomenology underlines, existence is perception. Monet reportedly observed, “Landscapes have no meaning in themselves; their appearance changes from moment to moment” (Van Dyke, 2019). According to Merleau-Ponty (1962), perception is a conversation between the body and the environment. This sensitivity to atmosphere and light is one of them.

Figure 6 *The Water Lilies – Setting Sun* (1920–1926)
(Source: Claude Monet, Oil on canvas, 200 × 600 cm, Musée de l’Orangerie, Paris, Google Art Project, Copyright Consent: Permissible to Publish)

Other Impressionists explored related concerns. Renoir's figure paintings are an artistic expression of the phenomenological premise of the primacy of physical perception (Merleau-Ponty & Smith, 1962). Renoir avoided comprehensive portrayals of the figures' facial features and outlines in the Dance at Le Moulin de la Galette (1876; see Figure 8), instead capturing the play of light and shadow on skin and clothing with light brushstrokes and brilliant colours. Sunlight flows through the foliage, producing dancing spots of light on the dancers. These patches of light mix smoothly with their skin and skirt hems, no longer existing only for their purpose, but also as a vital part of the perceptual experience (Richman-Abdou, 2020). When viewers enjoy a picture, they are drawn to the warmth of the sun and the vibrancy of the dance, rather than the identity of the characters depicted. Phenomenology's basic perception is precisely the sensory experience that precedes cognition. The sunlight, air, and colours in Renoir's paintings essentially constitute a perceptual field where the body and the environment merge.

Figure 7 *Dance at Le Moulin de la Galette* (1876)
(Source: Pierre-Auguste Renoir, Oil on canvas, 131 × 175 cm, Musée d'Orsay, Paris, Google Art Project, Copyright Consent: Permissible to Publish)

Degas's Dancers series (see Figure 9) investigates phenomenology's dynamic perception. Unlike Monet and Renoir, who focused on static light and shadow, Degas used blurred shapes and overlapping brushstrokes to represent the transient positions of dancers in motion. These stances are not static acts but rather transitional positions between about to happen and just accomplished, which coincides with phenomenology's description of the fluid character of perception—the view of objects is constantly in the process of becoming rather than completely completed (Husserl, 1997). Degas' purposeful blurring of the dancers' feet and hands maintains the raw vitality of perception, recognising that dynamic perception cannot be properly recorded.

Figure 8 *Three Dancers Preparing for Class* (after 1878)
(Source: Edgar Degas, Oil on canvas, 32 × 46 cm, The Metropolitan Museum of Art, New York, Google Art Project, Copyright Consent: Permissible to Publish)

3.2 The Extension of The Phenomenology of Perception in Contemporary Installation Art

Phenomenology has transcended painting's two-dimensional restrictions in contemporary installation art, extending bodily perception into three-dimensional interactive environments. Artists no longer confine themselves to reproducing perception on a two-dimensional canvas but instead construct perceptual fields that allow viewers to immerse themselves, giving the phenomenological concept that the body is the place where the world is perceived a more direct form of expression (Merleau-Ponty & Smith, 1962).

Leandro Erlich's Swimming Pool (1999; see Figure 10) presents Merleau-Ponty's idea of embodied perception, which holds that the viewer's experience is determined by their bodily position and movement inside the environment (Merleau-Ponty & Smith, 1962). The work splits the area into two sections by a clear glass panel: above the glass is what looks to be the real surface of a swimming pool, while below is a corridor through which viewers can travel. When viewers enter the corridor, they see ripples and reflections on the water's surface, as well as light spots projected onto the pathway as if they were underwater; nevertheless, when they reach out to touch it, all they feel is icy glass. From above, viewers may discern ghostly silhouettes in the empty pool (Liu, 2021). This contrast between visual truth and tactile lie stimulates the viewer's physical experience while also challenging them to consider how to decide the presence of reality and significance. This question directly refers to Husserl's claim that phenomenon is essence, which states that the existence of objects is not independent of observation but is formed via the expression of perception (Husserl, 1999). Swimming Pool, unlike Impressionism, which captures light and shadow to perceive reality, deconstructs the viewer's cognitive boundaries through spatial design, transforming the viewer from an observer to a participant in perception. This completes the transition from reproduction to participation in the creation of meaning (Duchamp & Peterson, 1975).


Figure 9 *Swimming Pool* (1999) (Source: Leandro Erlich, 21st Century Museum of Contemporary Art, Kanazawa, Japan, https://www.leandroerlich.art, Copyright Consent: Permissible to Publish)

Donald Judd's works, on the other hand, emphasise the phenomenological "self-explanatory nature of objects". While artists frequently focus on the notion of Specific Objects; Judd rejects the symbolic character of conventional sculpture by using industrial materials. In Untitled (Stack) (1967; see Figure 11), twelve cubes of galvanised iron are put on the wall in a neat-by-breaking pattern. The cubes' spacing is precisely calibrated, which makes the viewer feel a physical sense of breakage (Judd, 1975). The artist eliminates cultural symbols and emotional projections, leaving just the existence of objects to provide significance. It also mirrors Merleau-Ponty's ambiguity of objects—the existence of objects is given meaning by human experience while retaining their transcendence. The encounter between viewers and objects reshapes the essence of existence, hidden by ordinary cognition, and reveals the transcendence of objects themselves.

Figure 10 *Untitled (Stack)* (1967) (Source: Donald Judd, Lacquer on galvanized iron, 10 units each 15.2 × 68.6 × 61 cm, installed with 15.2 cm intervals, The Museum of Modern Art, New York, Copyright Consent: Permissible to Publish)

James Turrell's light and shadow creations take phenomenology's pure perception to an extreme. In his *Skyspace 1* (1990; see Figure 12), he manipulates space and light to create a realm where only light and colour exist. When the viewer enters the space, they progressively lose their traditional perspective of time and space and instead experience a highly concentrated visual sensory condition (Spector, (n.d.)). This unique perceptual shift is phenomenologically consistent with Husserl's epoché theoretical paradigm, resulting in transcendent cognitive detachment from experience. Turrell was reminded of a tangible light - palpable light - and he created the conditions for perceiving light. These conditions are fundamentally beyond ordinary perception, allowing viewers to experience the pure consciousness defined by phenomenology through their interaction with light. Unlike the Impressionists, who strove to depict natural light, Terrell's artificial light more fully removes object interference, erasing the boundaries between subject and object and serving as a medium for the conversation between perception and existence (Artsy Editorial, 2013).

Figure 11 *Skyspace I* (1990) (Source: James Turrell, Aperture cut into plaster wall with tinted glass and fluorescent light, 287.7 × 287.7 × 287.7 cm, Solomon R. Guggenheim Museum, New York, Copyright Consent: Permissible to Publish)

3.3 The Logic of Translation: From Perceptual Recording to Perceptual Construction

The transition of phenomenology from Impressionism to contemporary installation art marks a shift from perceptual recording to perceptual construction. Impressionism captures the natural expression of seen phenomena through colour and brushstrokes, with its core being passive reception; contemporary installation art develops perceptual fields accessible to involvement through space and materials, with its core being active creation. This progression demonstrates that existence is not only acknowledged, but also manifested via perception.

Monet's *Water Lilies* and Terrel's *Skyspace 1* are diametrically opposed: the former sees external light while the latter activates internal perception, and the former's viewers are bystanders while the latter's viewers are participants. Nonetheless, both exemplify the essential ethos of phenomenology: observing the present moment as it unfolds and challenging past recognition. This mentality ensures that the translation of phenomenology in contemporary art, with its various media, stays attentive to the authenticity of existence.

4 METHODOLOGY

This study used a qualitative, interpretive approach at the intersection of art history and philosophy, focusing on how ideas are translated into artistic practice. The methods included literature analysis, case studies, and cross-cultural comparison. Key philosophical texts—such as Laozi's Tao Te Ching (Legge, 2008), Zhuangzi's writings (Legge, 2015), Zen Buddhist reflections (Feng, 1948), Husserl's Ideas I (2014) and The Idea of Phenomenology (1999), and Merleau-Ponty's Phenomenology of Perception (Merleau-Ponty & Smith, 1962)—were studied alongside art-historical research (Snyder, 2019; Tsao & Ames, 2011). Case studies were chosen to show how concepts move from philosophy into visual practice, based on their connection to philosophical themes, their use of different media, and their historical importance. The analysis was structured around three dimensions: creative space, temporal expression, and modes of intervention.

The research was framed by philosophical hermeneutics and art semiotics. Gadamer's hermeneutics (Regan, 2012) supports the view that the meaning of philosophy in art emerges through dialogue between past and present. Semiotic analysis, drawing on Barthes (Yan & Ming, 2015), was used to understand how artistic forms act as symbols of philosophical meaning. Two limitations were noted. First, case selection was partly subjective, even though care was taken to choose representative works (Baxter & Jack, 2008). Second, cross-cultural comparison might risk oversimplification, since Chinese and Western traditions arise from different contexts. These risks were managed through careful contextualisation and interpretive balance.

5 CROSS-DIMENSIONAL COMPARISON: CONTEXTUAL DIFFERENCES AND COMMONALITIES IN PHILOSOPHICAL TRANSFORMATION

In different cultural contexts, creative translations of Chinese and Western philosophy share a similar pursuit of transcendent existence. By comparing the three dimensions of creative space, temporal expression, and philosophical intervention methods, one can better understand the differences and similarities between Chinese and Western expressions, as well as the underlying logic of philosophical concept translation through art.

5.1 Philosophical Metaphors in Creative Spaces

The differing locations of artistic creation essentially reflect different philosophical readings of the universe. Chinese literati painting creates introspective spaces such as study rooms and pavilions, aligning with Taoist philosophy's cognitive path of seeking the way inward. Impressionism's creative spaces are outdoor natural settings, embodying phenomenology's experiential philosophy of confronting the present moment. Contemporary installation art actively creates public areas where the virtual and real worlds intersect, breaking down the barriers between subject and object and symbolising philosophy's transition from contemplation to intervention.

The study room in Chinese literati painting represents a microcosm of cosmic order. Ni Zan's Qingbi Pavilion is a spiritual environment made up of old zithers, scriptures, and brush and ink. The painter translates his perceptions from nature into brush and ink, cleansing the mind to perceive the Tao (Collection Series, 2000). This introspective method echoes earlier Taoist and Zen ideals, where inner spaces foster spiritual openness. As Laozi wrote, “Without going outside his door, one understands all under heaven” (Tao Te Ching, Legge, 2008 ch. 47). Literati studios thus became microcosms of the cosmos, bridging inward reflection and universal order.

The Impressionists' natural scene is an expansive area that dissolves into the subject while embracing the moment. Monet sought to break free from the constraints of the studio by practising phenomenology's deconstruction of subject-centredness in the process of confronting nature's present manifestation—only by merging the body with nature can one escape the shackles of a priori cognition and attain pure perception (Merleau-Ponty & Smith, 1962). The light and hues of the natural world, with their unpredictable and changeable properties, constitute the assurance of perceptual authenticity.

Contemporary installations employ public places (such as urban installations) as a means of philosophical intervention in society. Xu Bing's A Book from the Sky has been shown in public areas all around the world, utilising pseudo-characters to create a cross-cultural interaction environment. The choice of space reflects the union of the Taoist idea ‘the world belongs to all’ and phenomenological intersubjectivity—philosophy is no more a personal spiritual practice but rather a platform for public discourse. Chen Zhen's Prayer Wheel - Money Makes the Mare Go (Chinese Slang) (1997) uses a gigantic prayer wheel to address significant concerns for society, investigating the relationship between material existence and spiritual endeavour.

5.2 The Philosophical Basis of Temporal Expressions

Different manifestations of temporality in different cultural contexts reflect distinct philosophical understandings of continuity of existence. Chinese literati painting seeks eternity by reflecting the Taoist concept of Qi; Impressionism captures transience, which implies a phenomenological, present-oriented view of time; and contemporary installations present reorganisation of fragments, a postmodern philosophical deconstruction of the linearity of time.

The eternality of literati art affirms the cycle of time. Huang Gongwang spent three years painting Dwelling in the Fuchun Mountains, combining elements of spring, summer, autumn, and winter into his brushwork. The image represents the cyclical nature of the seasons and the passage of time, rather than a precise point. This condensation of time is consistent with the Taoist cosmology of Qi circulation, allowing viewers to experience the endless movement of time and nature inside the static image.

Impressionism's transience stems from its unwavering belief in the immediacy of time. Monet painted the same scene many times—not to create a complete perception but to capture the light, shadow, and colour of this instant moment. This fragmented recording is consistent with phenomenology's understanding of temporal awareness, which holds that time is not a linear, continuous totality but rather a fluid process made up of multiple presents (Husserl, 1997). Each painting displays previous impressions while also containing future visual possibilities. Impressionist paintings therefore crystallise time, maintaining perception's raw energy.

The reorganisation of fragments from contemporary installations disrupts the linear and cyclical character of time, resulting in a multidimensional temporal and spatial realm. Chen Zhen's Le Bureau de Change（1996-2004; see Figure 13) converted a public toilet in Shanghai from the 1980s into a bank counter and placed financial tools, such as a money-counting machine and a safe deposit box, in it. The sounds of the toilet flushing and the money counting machine were played at the same time, establishing a conversation between various periods and locations, allowing multiple cultures to collide, and highlighting the ludicrous link between material trade and bodily necessities (Vincent-Goubeau and Bouillon, 2017). The approach is based on Taoist conceptions of spacetime perception and incorporates phenomenological theories that time is a fabrication of perception. Finally, it examines the alienation of time in the globalised period by deconstructing materiality and finding the real state of existence inside fractured time.

Figure 12 *Le Bureau de Change (Detail)* (1996–2004) (Source: Chen Zhen, Courtesy of Galleria Continua, San Gimignano / Beijing / Les Moulins; photo provided by Rockbund Art Museum, Copyright Consent: Permissible to Publish)

5.3 The Evolution of Philosophical Intervention Methods

Philosophy's effect on art, from the implicit spiritual core to the explicit sensory medium to public social concerns, reflects the historical development of art's role. In Chinese literati painting, philosophy is the invisible framework of artistic conception; in impressionism, it is the visible principle of perception; and in contemporary installation art, it is a tool for social dialogue.

The philosophical intervention in literati art is implicit. Wang Wei's "poetry in painting, painting in poetry" includes the Taoist concept of harmony between heaven and man via landscape design and brushstroke rhythm. The artist enables viewers to experience the concept while admiring the painting - a feeling that transcends words and reaches the spiritual level, finally attaining the embodiment of Tao.

Impressionism's philosophical involvement is manifest. Philosophy becomes the methodology that guides creativity, and artists' discussions and emphasis on perception and light are essentially artistic declarations of phenomenological intuition. The jumping hues and flowing brushstrokes convey the perception-first creative ethos straight to viewers.

The philosophical intervention of contemporary installations is public. Xu Bing's Where Does the Dust Itself Collect? (2004; see Figure 14) employed dust from the 9/11 attacks to spell out the Zen verse, "As there is nothing from the first, where does the dust itself collect?" across the gallery floor (Xu, n.d.). The work reflects on the themes of war and disaster by exploring Taoist concepts of 'nihility' and Zen notions of 'void'. Entering the space, viewers encounter not only the metaphysical depth of philosophy but also the trauma of lived history, as philosophy becomes a bridge between personal experience and communal memory.

Figure 13 *Where Does the Dust Itself Collect?* (2004) (Source: Xu Bing, Material: dust. Retrieved from https://www.xubing.com, Copyright Consent: Permissible to Publish)

The democratisation of philosophy can also be accomplished with the help of the visual constructions of abstract geometrical forms in the form of the modern public sculpture of Southeast Asia. One of the examples is Ramlan Abdullah, a Malaysian artist, who interprets abstract ideas like cosmic equilibrium and spatiotemporal movement in the visual language of mass-produced sculpture through mathematical calculations and geometric reasoning based on cosmology expressed in tubular lines and movable objects (Mohammad et al., 2022). His writings would not possess the figurative text or symbols and therefore rely on a rigidly formal language to make cosmological concepts intelligible to people with different cultural backgrounds. The given form of interaction breaks both language and cultural barriers, which means that the popularisation of philosophical ideas achieved a significant level of development. It illustrates the increase in philosophical participation in media and cultural situations.

5.4 Commonality in Differences: The Eternal Quest for The Essence of Existence

Although artistic translations of Chinese and Western philosophy vary in terms of place, time, and form of intervention, they all address the subject of the essence of existence. Chinese literati painting investigates the interplay of nihility and existence via negative space; Impressionism captures present perception through light and shadow; and modern installation art develops the connectivity between subject and world through interaction. Regardless of the media or philosophical resources used, art continues on its journey to discover the essence of existence and the authenticity of life through perceptual methods.

6 CONCLUSION

Looking through the history of creative translation in Chinese and Western philosophy, it may reach a fundamental conclusion: philosophical conceptions are the generative core of artistic creation and an infinite source of inspiration for art, rather than simply external contributions to artistic production. This core has endless vitality, capable of sustaining spiritual depth while constantly merging into other cultures, times, and mediums, resulting in reconstruction in different artistic forms.

From the negative space of Chinese literati painting to the void of contemporary installation art, and from the light and shadow of Impressionism to the embodied nature of installation art, the artistic translation of philosophical concepts reveals three distinct pathways. On the spiritual level, it serves as a vehicle for the individual's inner spirit to participate in discourse with the universe (such as the Qi generated by brushwork and negative space in literati painting). On the sensory dimension, it acts as a link between the body and the outside world (such as embodied perception in Impressionist paintings). On the social dimension, it serves as a conduit for public discourse (such as the juxtaposition of various temporal-spatial and cultural elements in contemporary installations). These three routes have not been lost in the passage of time, nor have they been isolated in their distinct growth. Instead, they have intermingled to establish a complex network of connections between philosophy and art, allowing philosophy to engage with art on a more profound level.

As technology progresses and multiculturalism spreads, creative translations of philosophical concepts will become increasingly diverse. Regardless of how forms and media evolve, the core of philosophy's intervention in art remains basically an attempt by humans to observe the universe and investigate the meaning of existence. This attempt combines a deep grasp of traditional philosophy with a sympathetic approach to social challenges. Only then can philosophy genuinely become the soul of art, and art may take the shape of philosophy's perceptual embodiment. The two are linked, similar to the Taoist concept of the interdependence of nihility and existence, continuously stretching the limits of human experience of the world and increasing the horizons of human cognition.

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Navigating On-Site Challenges Strategies for Success in Interior Design Project

Mohd Firdaus Tugiman[1], Yulyta Kodrat Prasetyaningsih[2], Nur Maizura Ahmad Noorhani[3], Arniatul Aiza Mustapha[4]
[1,3,4]Fakulti Alam Bina, Universiti Teknologi MARA, Puncak Alam, Selangor, Malaysia
[2] Faculty of Visual Arts and Design, Institut Seni Indonesia Yogyakarta, Yogyakarta, Indonesia

[1]firdaustugiman@uitm.edu.my, [2]yulyta_kodrat@isi.ac.id, [3]nmaizura@uitm.edu.my, [4]arnia836@uitm.edu.my
***Corresponding author**

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ABSTRACT
Interior design construction projects operate under tight spatial, technical, and aesthetic constraints, yet empirical evidence on the root drivers of on-site failures remains limited. This study identifies the dominant challenges affecting interior project delivery and the strategies practitioners rely on to manage them. Using a qualitative design, 26 experienced professionals were purposively selected for non-structured interviews, and responses were thematically coded. Seventeen problem categories emerged, with communication failures (n=13), cash-flow constraints (n=11), and poor project execution (n=11) constituting the most pervasive risks. Thirteen solution themes were identified, led by stringent site monitoring (n=14), structured communication protocols (n=11), and rigorous cost planning (n=11). The findings underscore the need for integrated management systems that strengthen coordination, financial governance, and execution control in interior construction.

Keywords: *Interior design project, Issues at site during construction stage and solutions*

1 INTRODUCTION

The interior design industry is primarily driven by the role of the interior designer, a multifaceted and demanding profession that blends creativity with technical expertise to design aesthetically pleasing and functional indoor environments. Ultimately, work aims to enhance the quality of life for users (Manjunath, 2024). Construction sites, particularly those involving interior projects, present a unique set of challenges that can significantly impact the successful completion of a project. These challenges range from logistical issues and time constraints to quality control and stakeholder management. In the dynamic environment of an interior construction project, where precise details and high standards of finish are paramount, the margin for error is slim. Problems can arise at any stage, whether in the planning, execution, or final inspection phases, often leading to delays, increased costs, and dissatisfaction among stakeholders. Yusoff (2024) emphasised that delays in interior design construction projects in Malaysia are largely caused by logistical complexities, stringent time constraints, and frequent design changes, resulting in significant schedule overruns and increased costs in both private and public sectors. By leveraging visual hierarchy and strategic layouts, designers utilise typography and imagery to address specific client needs. This approach facilitates the effective communication of complex information across diverse media, ensuring clarity and alignment among various construction stakeholders (Amirul et al., 2024).

On the other hand, Jasmani (2016) agreed that one of the core issues faced in interior construction projects is the coordination of various trades and subcontractors. Unlike external construction projects, interior works demand meticulous attention to detail and seamless integration of diverse elements such as carpentry, electrical, plumbing, and finishes. Besides that, Jasmani (2016) also underlined that interior design projects require meticulous coordination between consultants and contractors, thus without proper integration of multidisciplinary drawings and site supervision, efficiency suffers and both time and budget performance are negatively impacted. The interdependence of these trades means that a delay or error in one area can have a cascading effect on the entire project timeline. Additionally, site conditions can vary significantly, posing unforeseen challenges that require immediate and effective solutions.

According to Fakhrhoseini & Ariffin (2023), the significance of effective project management in overcoming construction site problems cannot be overstated and by implementing robust project management practices, project managers can reduce the likelihood of delays, manage costs effectively, and deliver a finished product that meets or exceeds client expectations. Therefore, understanding the common problems encountered on interior construction project during construction phase and the strategies project managers employ to address the problems is critical for the successful execution of these projects. Meanwhile, according to Rosman et al. (2025), construction teams rely heavily on face-to-face interaction and shared experience. By prioritising meetings, the industry demonstrates a core need for immediate collaboration to navigate project hurdles. These findings emphasise that maintaining effective communication is a critical factor for success during the construction process. Consequently, Ullah (2018) believed that the involvement of incompetent practitioners in the installation phase can directly lead to substandard execution. This lack of expertise not only complicates long-term maintenance but also results in inflated construction costs due to errors, rework, and the inefficiency of the installation process.

This paper aims to identify the problems encountered on construction sites for interior projects during the construction stage and to recognise solutions implemented by project managers to mitigate these issues.

1.1 Problems Encountered in Interior Design Projects During the Construction Phase

Interior design projects encompass the strategic planning, coordination, and execution of design elements within built environments to enhance both functionality and visual appeal. These projects extend far beyond surface-level decoration and require a thorough understanding of spatial organisation, material application, human behaviour, and compliance with safety and regulatory standards. Whether in residential, commercial, hospitality, or institutional settings, interior design demands a careful balance between artistic vision and technical precision to create spaces that are not only attractive but also practical, safe, and sustainable (Ahmad Noorhani et. al, 2024). Additionally, Rener et. al (2023) noted that interior designers often work in close collaboration with architects, engineers, and contractors to bring concepts to life while adhering to budgetary and time constraints.

The complexity of interior design projects largely arises from the involvement of multiple specialist trades working within confined and often occupied spaces. These elements must be carefully sequenced to prevent clashes and disruptions. According to Jasmani (2016), the lack of integration between consultant and contractor drawings is a recurring issue that leads to rework, cost escalation, and project delays. Similarly, Ahmad Noorhani (2024) emphasised that the dynamic nature of the construction environment, combined with rising client expectations for quality and customisation, places additional pressure on project managers to maintain precision and accountability. To address these challenges, Latupeirissa and Arrang (2024) highlighted the importance of early trade involvement, robust communication structures, and the adoption of digital tools to enable real-time coordination and effective decision-making.

Table 1 Problem at Site

Problem at Site	Descriptions	Literature Review
Communication & Coordination Issues	Poor communication and coordination among stakeholders cause misalignment of expectations, rework, delays, and cost overruns. Ineffective collaboration among trades (electricians, plumbers, carpenters) leads to clashes and double handling. Miscommunication between clients and designers due to lack of visualisation tools (2D drawings) results in misunderstanding of design intent. Hierarchical barriers and language differences further delay decision-making. Even with BIM, unclear data-sharing protocols reduce efficiency.	Gamil et al. (2019); Jones (2019); Yakub & Kamaruddin (2021); Hamid (2022); Ahmad (2023); Ardini & Wardina (2021); Abdullah (2023); Mustafa & Rahmat (2024)
Financial and Cash Flow Issues	Cost overruns result from underestimated budgets, scope changes, material price fluctuations, and poor procurement strategies. Cash flow problems, delayed payments, and reimbursement cycles disrupt progress, delay procurement, and strain financial resources.	Sharma & Sinha (2024); Okereke (2020)
Improper Project Execution	Inadequate planning, poor supervision, and weak resource coordination cause major project delays and cost overruns. Ineffective risk management and poor documentation result in double handling and disruption of workflow. Selection of incompetent or low-bid contractors worsens site inefficiency. Poor logistics, including late material delivery and access constraints, further hinder site progress.	Yusoff et al. (2024); Shah & Patil (2019); Abdullah & Yusoff (2024)
Design Issues	Design changes, incomplete or inaccurate drawings, and evolving client requirements lead to cost and time overruns. Miscommunication among designers and contractors results in errors and rework. Design discrepancies can increase costs by 5%–40% of the total project budget and compromise quality.	Ebekozien (2015); Shoar & Chileshe (2021); Aslam (2019)
Unforeseen Site Conditions	Unexpected conditions such as outdated systems, water damage, or hazardous materials (e.g., asbestos) discovered during renovation disrupt schedules and increase costs. Poor pre-construction assessments exacerbate these problems, requiring variation orders and design adjustments.	Azman (2010); Zainal (2022); Alaghbari (2007); Rahmat & Ali (2010)
Safety and Health Issues	Interior fit-out work in confined or occupied spaces exposes workers to dust, fumes, noise, and hazardous materials. Poor site segregation and handling procedures increase the risk of accidents and long-term health issues. Proper safety planning and risk management are essential.	Sulaiman (2019); Kamarudin (2021); Zainal (2022); Yusof (2017)
Client-Related Issues	Frequent client changes, indecisiveness, and unclear communication during construction cause rework, delays, and budget overruns. Emotional involvement in design outcomes often leads to last-minute modifications, disrupting workflows. Managing expectations and maintaining documentation are crucial.	Rahmat & Ali (2010); Zulhabri (2020); Kamaruzzaman (2018)

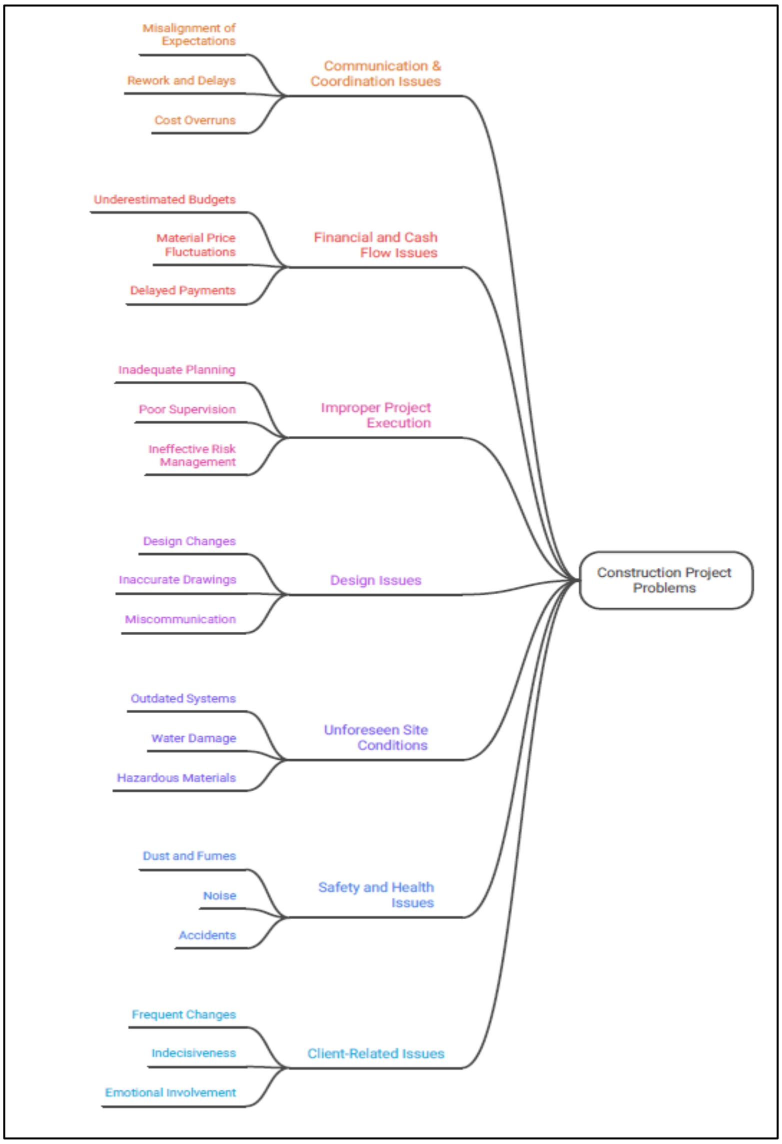

Figure 1 Problem at Site

1.2 Solutions to Problems in Interior Design Projects During the Construction Phase

In the context of interior projects during the construction stage, effective management is essential to navigating the complex challenges that arise. The execution of interior projects requires careful planning, clear communication, financial control, risk mitigation, and a strong emphasis on safety and environmental considerations. Throughout the construction phase, issues such as project delays, unforeseen costs, and safety risks are common. To overcome these, a comprehensive approach that addresses communication, financial stability, efficient project execution, and safety protocols is necessary.

Table 2 Solution for Problem at Site

Solution	Explanation	Author(s)
Communication & Coordination Management	Effective communication ensures clear information exchange, reduces misunderstandings, and aligns all stakeholders with project objectives. In interior construction, clear and timely communication prevents costly errors and delays while fostering collaboration. Establishing formal communication channels (meetings, emails, software) ensures efficient information flow among multiple stakeholders. Regular monitoring of these channels ensures consistent use and alignment with project goals. Continuous evaluation helps maintain communication effectiveness and supports timely decision-making throughout the project lifecycle.	Schwalbe (2015); Cohen (2017); Bercovitz & Mitchell (2020); Acker (2019); Todorovic (2015); Turner & Müller (2017); Laufer et al. (2020)
Financial and Cashflow Management	Effective financial and cashflow management ensures project continuity and stability. Using milestone-based payments, contingency budgets, and financial tools helps manage risks. Real-time budget monitoring anticipates shortfalls and stabilises cash flow. Proper staffing and budget allocation prevent inefficiencies and cost overruns. Progress payments maintain liquidity and ensure timely payments to contractors and suppliers. Accurate cost estimation and contingency planning prevent cost overruns and financial strain. Continuous cost tracking and adjustment maintain project control and financial health.	Lee & Tan (2023); Rahman & Aziz (2021); Molenaar et al. (2017); El-Sayegh (2019); Gido & Clements (2018); Walker (2020); Ingram & Seong (2020); Shrestha (2019); Turner (2018); Smith (2020)
Project Execution Management	Successful execution depends on competent contractor selection, clear contracts, and strong planning. Experienced contractors ensure timely and quality delivery. Comprehensive contracts clarify responsibilities, timelines, and deliverables, reducing disputes. A structured project management plan defines goals, resources, and monitoring strategies. Effective risk management identifies and mitigates issues such as material delays and design changes. Standardised documentation ensures consistency and transparency, supporting coordination and communication across stakeholders.	Turner (2018); Schwalbe (2015); Kerzner (2017); Gido & Clements (2018); Hillson (2016); Cleland & Ireland (2007)
Safety and Health Management	Managing health and safety in interior construction is critical, particularly during renovations involving hazardous materials such as asbestos or lead. Proper identification, removal, and disposal are necessary to avoid long-term health issues. Adequate ventilation, dust control, and noise management reduce risks to workers. Working in confined spaces requires training, use of mechanical aids, and strict access control. In live environments, safety planning and barriers protect occupants and workers. Implementing comprehensive safety procedures ensures a safe working environment.	Zainal (2022); Sulaiman (2019); Kamarudin (2021); Yusof (2017)
Managing Client-Related Issues	Clear communication and documentation from the project outset help manage client expectations and minimise disruptive changes. Realistic discussions about project timelines and budgets prevent misunderstandings. Detailed contracts define work scope, change request procedures, and related costs. Educating clients through visual tools or mock-ups improves understanding and reduces indecision. Consistent updates and engagement maintain alignment, minimise rework, and support smoother project delivery.	Rahmat & Ali (2010); Zulhabri (2020)

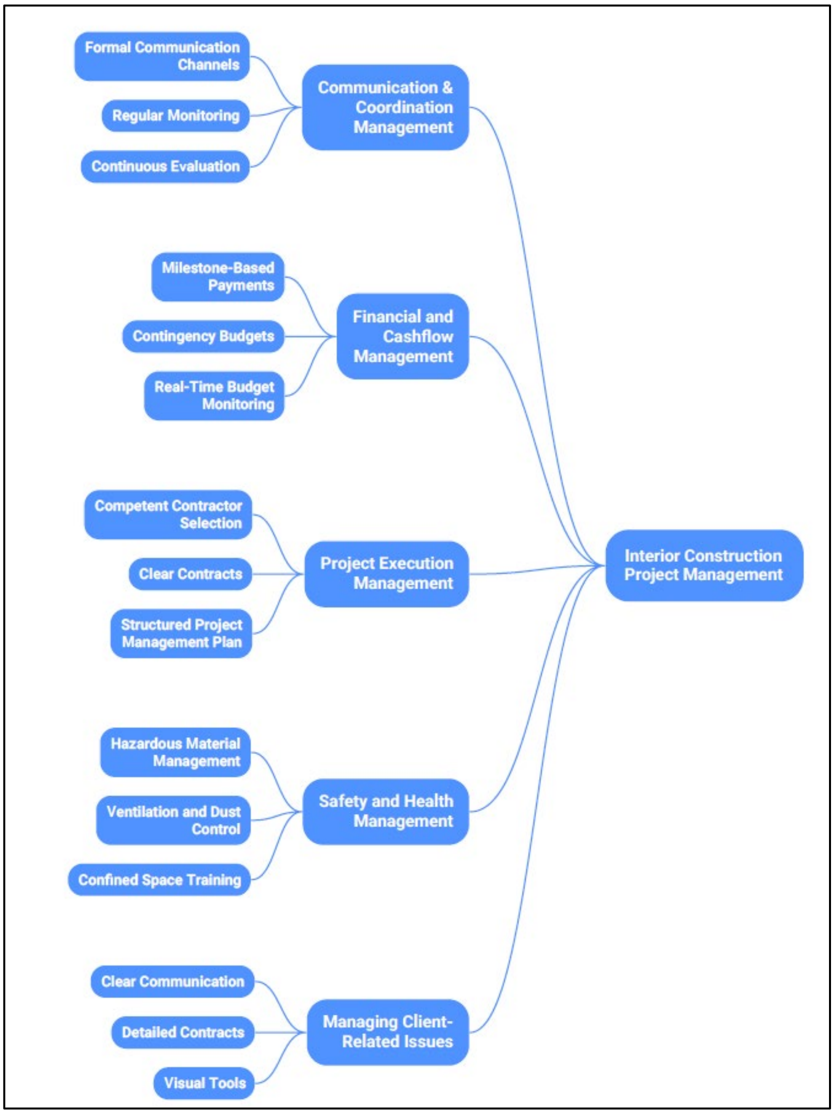

Figure 2 Solution for Problem at Site

2 RESEARCH METHODOLOGY

This study employs a qualitative research approach, combining a literature review and semi-structured interviews to examine common problems encountered during interior construction projects and the strategies used to address them. The methodology aims to obtain in-depth insights from professionals experienced in interior design and construction.

Respondents were selected purposefully using a purposive sampling method to ensure the respondents had relevant experience and expertise in managing interior construction projects. The selection focused on professionals directly involved in project management, design coordination, and site execution, including project managers, interior designers, contractors, and suppliers. This approach ensured that all participants could provide knowledgeable and practical perspectives on the challenges faced in interior construction.

2.1 Aims and Objectives

The aim of this study is to examine the key challenges faced in interior construction projects during the construction stage and to understand ways of project managers address these challenges through effective management strategies. To achieve this aim, the study focuses on two (2) main objectives. Firstly, to identify the problems commonly encountered at interior project sites during the construction stage, and secondly, to explore the solutions implemented by project managers to address and mitigate these issues.

2.2 Results and Discussion

This research adopts a qualitative approach and involves a total of twenty-six (26) respondents to identify the key challenges faced during the construction stage of interior projects and the solutions implemented by project managers. All respondents were purposefully selected based on their professional involvement in interior construction projects, including consultants, design and build (D&B) contractors, general contractors, and suppliers.

2.3 Results and Discussion

According to Table 3, a total of twenty-six (26) respondents participated in this study, representing various stakeholders involved in interior construction projects. The respondents were selected using a purposive sampling approach to ensure that only individuals with relevant experience and expertise in the field were included. Among the participants, design and build (D&B) contractors formed the largest group with 14 respondents (54%), followed by consultants with 9 respondents (35%), contractors with 2 respondents (8%), and suppliers with 1 respondent (3%).

This distribution reflects the dominant role of D&B contractors in interior construction projects, as they are typically responsible for both design coordination and project execution. The representation of consultants highlights the managerial and design perspectives within the industry, while the inclusion of contractors and suppliers provides additional insight into on-site implementation and material management. Collectively, this respondent composition offers a comprehensive view of the challenges encountered and the management strategies applied during the construction stage of interior projects.

Table 3 Background of Respondents

Stakeholders	Numbers	Designation
Consultant	9	Project Manager
D&B Contractor	14	
Contractor	2	
Supplier	1	
Total	**26**	

3 FINDINGS

3.1 Problems Encountered in Interior Design Projects During the Construction Phase

After gathering qualitative responses from 26 participants, a total of 69 problem statements were identified. Each problem mentioned by the respondents was listed, coded, and then grouped into broader categories based on themes from the literature review (LR). This step helped organise similar problems under common themes such as communication issue, budget and cash flow issue, improper project execution, incompetent contractor, and others.

Each response was reviewed and placed into the most suitable category according to its meaning. For example, statements like “poor communication” and “miscommunication between contractor and other parties” were grouped under Communication Issue, while “cash flow issue” and “payment delay by client” were placed under Budget and Cash Flow Issue.

In total, 17 problem categories were identified. The frequency for each category was then counted to find out which problems occurred most often. Results showed that communication issue was the most common problem (n=13), followed by budget and cash flow issue and improper project execution (n=11 each). This shows that most challenges faced by respondents are related to communication gaps, financial constraints, and poor project implementation.

Table 4 Frequency and Ranking of Problem Categories

No.	Problem Category	Frequency	Rank	Description / Notes
1	Communication issue	13	1	Issues involving poor communication, miscommunication, or coordination failure between project stakeholders.
2	Budget and cash flow issue	11	2	Financial constraints, payment delays, and poor cash flow management affecting project progress.
3	Improper project execution	11	2	Problems related to poor planning, poor site marking, workmanship, and inadequate project implementation.
4	Incompetent contractor	7	3	Unskilled or inexperienced contractors and site workers affecting project performance.
5	Safety and health issue	5	4	Concerns regarding worksite hazards, risks, and safety compliance.
6	Demanding client	3	5	Excessive client expectations, frequent changes, or unrealistic demands during project execution.
7	Time management	3	5	Delays and inability to adhere to project timelines and deadlines.
8	Design change	2	6	Modifications to design and client expectations during construction stage.
9	Lack of monitoring	2	6	Inadequate site supervision and tracking of project progress.
10	Logistic issue	2	6	Issues related to material delivery, transportation, and coordination of logistics.
11	Poor documentation	2	6	Incomplete or improper documentation and record-keeping at site.
12	Poor time management	2	6	Ineffective scheduling and planning of project timelines.

13	Unforeseen site condition	2	6	Unexpected ground or environmental conditions encountered during project.
14	Delay of product	1	7	Late delivery of materials or products from supplier.
15	Poor risk management	1	7	Inadequate assessment and mitigation of project-related risks.
16	Drawing and design issue	1	7	Errors or ambiguities in construction drawings and design details.
17	Quality control	1	7	Deficiencies in inspection or control of material and workmanship quality.
Total		**69**		

3.2 Solutions to Problems in Interior Design Projects During the Construction Phase

From the responses of 26 participants, a total of 65 solution statements were identified. Each solution was listed, coded, and grouped into broader categories to find common themes. This helped to summarise the key strategies suggested by respondents to overcome the problems faced in their projects.

The solutions were grouped into 13 main categories, including Proper Monitoring and Execution, Establish Communication Channel, Set up Rigorous Cost Estimation and Contingency Planning, and Award Competent Contractor. For example, solutions such as “carry out site visits regularly” and “monitoring to ensure project execution aligns with planning” were grouped under Proper Monitoring and Execution, while “establish clear communication channel” and “transparent communication among parties” were grouped under Establish Communication Channel.

Results showed that Proper Monitoring and Execution was the most common solution (n=14), followed by Establish Communication Channel and Set up Rigorous Cost Estimation and Contingency Planning (n=11 each). These findings show that respondents believe strong supervision, clear communication, and effective cost planning are the main ways to improve project performance and prevent similar issues in the future.

Table 5 Frequency and Ranking of Solutions to Problem in Interior Design Projects During the Construction Phase

Item No	Summary of Solution Category	Frequency	Rank	Description / Notes
1	Proper monitoring and execution	14	1	Emphasises the importance of continuous supervision, timely follow-up, and adherence to planned schedules to ensure project success.
2	Establish communication channel	11	2	Highlights the need for clear, transparent, and consistent communication among all project stakeholders to avoid misunderstandings.
3	Set up rigorous cost estimation and contingency planning	11	2	Suggests that early and realistic cost planning, along with emergency budgeting, helps manage financial uncertainties.
4	Award competent contractor	8	3	Recommends selecting qualified contractors with proven experience to improve project quality and efficiency.
5	Develop comprehensive project management plan	6	4	Stresses the need for a structured project plan covering objectives, timelines, responsibilities, and risk mitigation.
6	Effective communication	3	5	Encourages open and efficient information exchange among team members and departments.
7	Establish safety culture	3	5	Focuses on promoting safety awareness and consistent enforcement of safety protocols at the worksite.
8	Adequate staff and budget	2	6	Calls for sufficient manpower and funding to ensure smooth project execution without delays.

9	Comprehensive contract document	2	6	Suggests that clear and detailed contract documentation helps prevent disputes and aligns expectations.
10	Implement change management protocol	2	7	Advises structured handling of design or scope changes to reduce project disruptions.
11	Client to provide progress payment as per contract	1	8	Points to the importance of timely client payments to maintain project cash flow.
12	Develop comprehensive risk management	1	8	Encourages identifying potential risks early and preparing action plans for unforeseen events.
13	Set up standard documentation format	1	8	Proposes the establishment of uniform documentation procedures to ensure clarity and record accuracy.
Total		**65**		

4 CONCLUSIONS AND RECOMMENDATION

The findings from both the interviews and literature review revealed three main issues commonly faced during the construction stage of interior design projects are communication breakdowns (n=13), budget and cash flow issues (n=11), and poor project execution (n=11). These issues are still common in the industry and often interrelated. Poor communication between designers, contractors, and clients can lead to misunderstandings, delays, and design errors. At the same time, weak financial management and poor project supervision contribute to delays, rework, and reduced quality, as also highlighted in previous studies by Rahmat et al. (2023), Chan and Adabre (2019), and Li et al. (2022).

To overcome these challenges, the study suggests adopting a more integrated project management approach. This includes strengthening communication through structured protocols and regular coordination meetings, improving financial control through accurate cost estimation and timely payments, and enhancing monitoring through competent supervision. The use of digital project management tools such as BIM can further improve coordination and efficiency. Finally, engaging qualified contractors and encouraging continuous professional training are essential to ensure better project execution and long-term success.

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Towards a Holistic Framework for Academic Library Furniture Design: Integrating Aesthetic Experience, Functionality, and Pedagogy for 21st-Century Learning

Nurul Ain Haron[1], *S'harin Mokhtar[2], Natrina MP Toyong[2]
[1] *INTI Centre of Art and Design, INTI International College Subang*
[2]*Faculty of Art & Design, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, MALAYSIA*

[1]nurulain.haron@newinti.edu.my, [2]sharin2066@uitm.edu.my, [2]natrinatoy@uitm.edu.my
***sharin2066@uitm.edu.my**

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ABSTRACT

Academic libraries are evolving from quiet repositories of books into hybrid learning commons that foster collaboration, creativity, and digital fluency. Within this transformation, furniture is no longer passive equipment but a key mediator between body, technology, and space that shapes cognitive, emotional and social engagement that underpins 21st-century learning. Yet scholarship on libraries remains fragmented. Most studies examine either functionality (ergonomics, proxemics, spatial efficiency) or aesthetic experience (comfort, ambience, emotional appeal) and rarely integrate these perspectives with contemporary pedagogy. This paper proposes a holistic conceptual framework for academic library furniture design grounded in a Systematic Literature Review (SLR) of research across environmental psychology, higher-education studies, ergonomics, and design. Guided by PRISMA screening, the review identified recurring concepts such as sensory-motor engagement, neuroaesthetic valuation, universal design and digitally enhanced learning. The findings were synthesised into three interwoven theoretical domains. 1) Aesthetic Experience, which encompasses sensory-motor stimulation, emotional resonance, and cultural meaning-making; 2) Ergonomic and Environmental Design, by integrating proxemics, anthropometrics, universal accessibility, and technology infrastructure; 3) Learning Environment and Pedagogy, which aligns physical settings with constructivist, collaborative, and blended learning strategies. By bridging design, psychology, and education, the framework positions furniture as an aesthetic pedagogical interface and provides a robust platform for empirical testing through wellbeing metrics, collaborative behaviour analysis and digital engagement studies. It offers designers, educators and institutions a future ready for creating library environments that sustain and transform 21st-century learning.

Keywords: *Neuroaesthetic, Academic library, 21st century learning, Furniture design.*

1 INTRODUCTION

Academic libraries have entered an era of rapid transformation. Driven by the imperatives of 21st-century learning, digital fluency, critical thinking, collaboration, creativity, and lifelong adaptability the modern library is a hybrid learning commons, supporting project-based learning, interdisciplinary research, and virtual–physical integration. A key aspect of this transformation is rooted in the enhancement of digital literacy within academic libraries. Libraries have taken on a renewed mission during the pandemic, focusing on the importance of digital literacy as a means to equip students and faculty with the skills needed to navigate an increasingly digital world (Martzoukou, 2020). This advocacy for digital literacy ensures that library services not only provide access to information but also empower users to engage with and utilize that information critically. The integration of virtual and physical spaces in modern academic libraries ensures that they meet the demands of users, who require flexible access to digital resources and the collaborative atmosphere of in-person engagement. This hybrid model aligns with findings that stresses the significance of managing library services concerning user engagement and adaptability in the digital age (Akinola, 2022). By embracing a hybrid learning commons model, academic libraries position themselves as essential partners in fostering the educational objectives of the 21st century.

Furniture plays a pivotal role in this transition. It is not merely functional equipment; it mediates between body, technology, and built environment, shaping cognitive–emotional processes and enabling flexible, technology-enabled pedagogy. The conceptual transition towards student-centred learning environments is firmly linked to the integration of flexible furniture design. Learning environments enriched with adaptable furniture choices promote student engagement and autonomy, ultimately fostering a shift away from traditional teacher-centred models (Starkey et al., 2021). This shift encourages collaboration and active learning, effectively reshaping the educational experience and enhancing cognitive outcomes. Furthermore, furniture not only provides comfort but also supports diverse learning modalities, thereby facilitating a seamless integration of technology and physical space. (Shaleh et al., 2022). Moreover, the exploration of social interaction within learning environments points to the functionality of movable furniture as a means to enhance collaborative learning. Flexible furniture arrangements enable users to cultivate their social interactions, supporting a variety of participation modes and fostering a sense of community in learning spaces (Loo & Fan, 2023). This adaptability is essential for creating vibrant educational environments that promote teamwork and idea exchange. The aesthetic and spatial arrangements of furniture directly influence emotional responses and cognitive learning processes. A thoughtfully designed furniture can inspire creativity, motivate learners, and create an engaging learning atmosphere (Mahat et al., 2023). This illustrates the transformative potential of furniture beyond its mundane functionality, positioning it as a pivotal element in redefining educational spaces.

Yet, despite advances in smart furniture, reconfigurable layouts, and ubiquitous connectivity, research remains fragmented. Most studies emphasize either *functionality* (ergonomics, proxemics, spatial efficiency) or *aesthetic/experiential* qualities (comfort, ambience, emotional appeal). This paper addresses that gap by proposing a conceptual framework that integrates aesthetic experience with functional and pedagogical imperatives, aligning furniture design with the needs of future-ready learners.

2 LITERATURE REVIEW

2.1 Aesthetic Experience

Aesthetic experience in design is multidimensional, encompassing sensory–motor processes, emotional valuation, and knowledge-based interpretation. Neuroaesthetic studies suggest that sensation and perception are mediated by the motor system, allowing users to interact physically and cognitively with their environment (Chatterjee & Vartanian, 2014). The motor regions of the brain are active during both real and imagined actions, which suggests that anticipation of sensory feedback from the environment can occur even before physical action is taken (Pinheiro et al., 2020). This aligns with Chatterjee and Vartanian's concept that perceptual processes are heavily influenced by our physical interactions with our surroundings. Such anticipatory mechanisms enable individuals to have a richer engagement with their environments, confirming that the motor system mediates experiential processes. Voluntary actions are accompanied by predictions of sensory outcomes, indicating a predictive coding framework whereby the motor system prepares the brain to interpret sensory feedback during and after actions. This finding reinforces the notion that sensory experiences are enriched through active engagement with one's environment, which is essential in spaces such as libraries, where physical layout and user interactivity can significantly impact cognitive and emotional responses (Ody et al., 2023). Moreover, sensory interactions can be influenced by postural manipulations and that anticipatory motor activity is tied to expected sensory feedback outcomes (Christie et al., 2019); (Vercillo et al., 2018).

These findings closely relate to Chatterjee and Vartanian's argument that aesthetic experiences are mediated by a combination of sensory input and motor actions, suggesting that enhancing library spaces with consideration for users' physical interactions could lead to more engaging and beneficial learning environments. Emotional and reward systems shape how individuals “like” or “want” particular design features, linking furniture to psychological wellbeing (Magsamen et al., 2023). Evidence shows that the design of school furniture significantly affects users' satisfaction, well-being, and comfort levels. They emphasize that ergonomic furniture, particularly when designed with captivating colours and motifs, can foster a favourable learning environment (Manca et al., 2020). This finding aligns with the understanding that emotional responses to aesthetic elements in furniture are crucial for psychological comfort and overall well-being. In a behavioural context, social and cultural connections inherent in furniture design that significantly impact users' psychological well-being (Ukabi & Gürdallı, 2021). They argue that the design of furniture allows for cultural expression, fostering community and improving emotional satisfaction. This underscores how the emotional resonance with furniture design influences not just the individual but also collective well-being within public spaces. Moreover, the semantic and semiotic aspects of furniture design, suggesting that meanings attached to furniture shapes play a crucial role in consumer preferences (Lin et al., 2023). Their findings imply that the psychological impact of furniture extends beyond its physical use, tapping into deeper emotional fields and cultural significances that can greatly influence user interaction and satisfaction. Beyond immediate perception, meaning-making processes are influenced by cultural context, expert knowledge, and individual experiences (Siler, 2015). In library furniture, this suggests that materials, textures, and forms are not only seen or touched but also interpreted symbolically, contributing to identity and belonging.

In a 21st-century learning context, where motivation and wellbeing are key drivers of student success, *affective resonance* from materiality to colour becomes critical. The emotional aspects of learning environments, including the design and colour of furniture and spaces, play a critical role in student engagement and well-being. "Affectagogy," which reimagines pedagogy by emphasizing emotional engagement through the integration of emotional intelligence (EI) and social-emotional learning (SEL) within educational contexts (Chee, 2025). This emotional foundation can enhance student motivation and foster positive psychological outcomes, creating an environment conducive to learning. Moreover, research on the effects of colour on memory and emotion are explored, which provide evidence on how varying background colours can impact learning outcomes and overall student engagement, highlighting that colour plays a crucial role in enhancing the efficacy of learning materials (Cai & Wang, 2024). Finally, the emotional experiences of students as they transition to learning spaces have been documented, that underscores how the design of learning environments affects both the physical and emotional journeys of students, thereby impacting their engagement levels (Knight, 2025).

2.2 Temporal Dynamic Experience

Learning today is extended, asynchronous, and blended. Furniture must accommodate long-duration study, quick reconfiguration for group work, and evolving digital task (Wassiliwizky & Menninghaus, 2021). They articulate that aesthetic experiences are not static but evolve based on context and engagement. Aesthetic encounter unfolds through a series of stages that together contribute to an overall dynamic experience. Research indicates that individuals' perceptions shift during these stages as they engage with generative art, prompting evolving aesthetic valuations (Meng et al., 2025). This aligns well with the idea presented by Wassiliwizky and Menninghaus, emphasizing that aesthetic moments are not confined to a single instance but are experienced over time, significantly altering individuals' responses and feelings. Further expanding this discourse, neurodynamic processes underpin aesthetic engagement in creative arts therapies. Study shows that aesthetic experiences involve both affective and cognitive processes that are temporally structured, wherein emotional resonance develops through ongoing interactions within various contexts (Vaisvaser et al., 2024). This temporal depth of engagement supports the understanding that experiences unfold dynamically, fostering transformation as individuals respond to aesthetic stimuli. Other findings on temporal instability in aesthetic preferences found that objects show variability over time, indicating that aesthetic resonance is not static but fluctuates depending on the duration of exposure (Aleem & Grzywacz, 2025). Their findings contribute to the understanding of how repeated interactions with an object or environment affect individuals' emotional and aesthetic responses, reflecting the multifaceted nature of aesthetic experiences as they unfold. In a more philosophical exploration, the experience of time in relation to objects and processes, highlighting how our interactions with material objects are intrinsically temporal. The phenomenology of experiencing time can influence how we perceive and value aesthetic encounters, suggesting that the dimension of temporality is fundamental to our understanding of aesthetics (Shardlow, 2023). This perspective echoes Wassiliwizky and Menninghaus's assertion that cognitive and emotional engagements with spaces and objects evolve continuously.

In the library context, this implies that furniture design should anticipate long-term interactions, comfort during extended study sessions, adaptability across diverse activities, and evolving relationships with changing pedagogical practices. The importance of flexible furniture designs in student-centred learning environments which research advocates for furniture that supports active and collaborative learning, facilitating group work and enabling responsive teaching practices (Starkey et al., 2021). Such flexibility is critical in accommodating various pedagogical demands and fostering an engaging learning atmosphere. The ergonomic aspects of furniture design cannot be overlooked. A study discussing the need for adjustable classroom furniture to accommodate the diverse physical dimensions of students. They find that ergonomic considerations are pivotal in ensuring comfort during extended periods of study, which can improve focus and reduce discomfort (Ansari et al., 2018). This design approach is essential for enhancing physical well-being and enabling longer engagement with academic materials.

2.3 Proxemics and the Built Environment

The arrangement of furniture influences social distance, privacy, and collaboration. Flexible space is essential for active learning. Proxemics (Hall et al., 1968) and learning archetypes ("campfire," "cave," "watering hole") (D. Thornburg, 2004) highlight how furniture enables a spectrum from individual focus to collaborative innovation core competencies of 21st-century pedagogy. Work on proxemics, first introduced in 1966, fundamentally reshaped the understanding of personal space and its effects on communication and social interaction (Hall et al., 1968). Proxemics, as defined by Hall, refers to the study of how individuals use physical space in interpersonal interactions, encompassing various aspects of human behaviour in relation to spatial distance. Hall categorizes personal space into four main zones: intimate space (less than 1.5 feet), personal space (1.5 to 4 feet), social space (4 to 12 feet), and public space (more than 12 feet) (Scandolo & Fraichard, 2011). Each zone corresponds to different degrees of intimacy and familiarity among individuals, affecting social cues and interactions. Intimate space is reserved for close relationships, while public space is appropriate for interactions among strangers. This classification system has become foundational in the study of social interactions and environmental psychology.

Thornburg (2004) describes three primary metaphors that illustrate different contexts for learning as "campfire," "cave," and "watering hole." Each of these archetypes emphasizes unique facets of the learning experience and provides insights into the design of educational environments that foster deeper engagement and collaboration among learners. The "campfire" archetype symbolizes shared learning experiences that occur in a communal setting where knowledge is imparted through storytelling and discussion. This metaphor aligns well with current educational methodologies that prioritize collaborative learning. learning spaces modelled after the campfire metaphor enhance knowledge development through vivid imagery, creating vibrant interactions where learners are actively engaged in sharing ideas and experiences (Bodrick et al., 2025). Spaces designed for "campfire" interactions facilitate communal storytelling, which can foster a sense of community and shared purpose among learners, reflecting Thornburg's ideas on creating interconnected learning experiences. The "cave" represents a solitary and reflective space, emphasizing individual learning and introspection. This metaphor reflects the need for learners to engage deeply with their own thoughts and the material at hand. The cave archetype is vital for personalization and self-directed learning, allowing students to concentrate on their learning without distraction. Conversely, the "watering hole" serves as a gathering space that encourages informal discussions and collaborative exchanges. This metaphor embodies the principle of sharing knowledge in a more relaxed atmosphere, similar to how animals gather at a watering hole. It emphasizes the social aspect of learning where dialogue and peer interaction are paramount to the learning process. The interplay between these archetypes is particularly crucial in contemporary educational settings where flexibility is key. Thornburg's models facilitate the design of learning environments that incorporate elements of all three archetypes. Effective learning spaces today might include areas that encourage intimate group discussions (campfire), reflection zones (cave), and collaborative hubs (watering hole) that cater to diverse learning needs.

The design of flexible learning spaces is increasingly recognized as essential for supporting active learning strategies in contemporary educational settings. This flexibility enables varied degrees of collaboration and individual reflection, which are core competencies of 21st-century pedagogy. Integrating Hall's (1968) concepts of proxemics and Thornburg's (2004) learning archetypes "campfire," "cave," and "watering hole" provides a robust framework for understanding how furniture arrangements and spatial design impact learning outcomes. When physical spaces are designed to be flexible, they accommodate various pedagogical approaches that ranging from individual study (aligned with the "cave" archetype) to collaborative activities (resonating with the "watering hole" archetype) which in turn fosters autonomy and motivation among students (Kariippanon et al., 2020). further expand on the importance of flexible learning spaces, emphasizing that educators who have input regarding the configuration of these spaces can better tailor learning experiences to meet student needs (Round & Subban, 2023). This echoes Hall's concept of proxemics, where the arrangement of furniture can facilitate or hinder communication and interaction. In a broader context, balancing technology, pedagogy, and physical space are essential in higher education particularly post-pandemic (Rapanta et al., 2021). This indicates that flexible learning environments, which adapt to various teaching models, are crucial for keeping students engaged, echoing Hall's insights on proxemic dynamics in educational settings. flexible learning environments not only facilitate interaction but also contribute to positive educational outcomes by supporting varied learning approaches, connecting directly to Hall's proxemics and Thornburg's archetypes (Kariippanon et al., 2020). In conclusion, recent literature consistently supports the assertion that flexible learning spaces are vital to active learning. By effectively integrating Hall's proxemics and Thornburg's learning archetypes, educators can create environments that promote a spectrum of learning experiences, thus enhancing student engagement, collaboration, and ultimately improving educational outcomes.

2.4 Ergonomics and Human-Centred Design

The principles of anthropometry and ergonomics are crucial for designing environments, products, and systems that accommodate the physical characteristics and capabilities of users. Henry Dreyfuss, a pioneer in ergonomics, significantly impacted design practices through his emphasis on human factors and anthropometry. His principles revolve around creating designs that are functional, aesthetically pleasing, and suitable for the physical attributes of users. Dreyfuss's contributions are seminal in formulating ergonomic standards derived from anthropometric data, as elaborated in "The Measure of Man and Woman," which offers extensive anthropometric statistics for product design tailored to a varied demographic (Dreyfuss & R Tilley, 2002). This reference is vital for enabling design approaches that include human variability, rendering ergonomics an indispensable component of product development in industrial design (Буров, 2019). The use of Dreyfuss's principles in eco-ergonomic designs that emphasize human health and comfort while guaranteeing environmental sustainability. Effective workplace design can enhance safety and comfort, underscoring Dreyfuss's focus on harmonizing the physical workspace with human needs (Protasenko & Mygal, 2021). Pheasant & Haslegrave (2018) provide an in-depth examination of the interaction between human dimensions and ergonomic design. They express that successful ergonomic solutions can only be realized through the proper utilization of anthropometric data. Research highlights the evolving nature of anthropometric principles that require continuous updates to align with shifts in population demographics, health trends, and lifestyle modifications. This adaptability to changing anthropometric traits facilitates the creation of products and work environments that accurately address the requirements of users (Pheasant & Haslegrave, 2018).

The implementation of nudging algorithms to enhance student involvement, ergonomics has larger implications in designing spaces that are both physically accommodating and conducive to psychological engagement and interaction. By creating educational environments that prioritize cognitive ergonomics and physical comfort, schools can enhance interactive learning experiences (Brown et al., 2022). Environments must correspond with the anthropometric profiles of users to guarantee comfort and safety, applying this principle to educational contexts (Emir et al., 2022). The difficulties educational institutions have had in overseeing digital accessibility, especially during the pandemic. This underscores the imperative for a universal design strategy that integrates ergonomic principles to guarantee digital content accessibility for all users, regardless of ability (Lazar, 2021). Anthropometric and ergonomic principles remain vital, but must now integrate technology use, inclusive design, and universal accessibility to support diverse learners. In conclusion, current research highlights the critical importance of anthropometric and ergonomic theories in educational design, especially as learning settings integrate technology and universal accessibility standards. The integration of these ideas fosters inclusive environments that accommodate varied learners and enrich educational experiences.

2.5 Learning Environment and Pedagogy

The connections between physical environments and their impact on human behaviour and emotions has been thoroughly documented in the literature, particularly by (Rapoport, 1990) and (Norman, 2013). Both writers underscore the active role of settings in shaping experiences, engagement, and emotional responses, especially within educational and social contexts. In "Culture and Environment," Rapoport examines the impact of spatial configurations and environmental attributes on human behaviour and social interactions. He asserts that environments are not simply settings but dynamic entities that influence emotions and behaviours. Rapoport posits that cultural values significantly influence individual perceptions of space and the emotional reactions provoked by various environments (Grádaigh et al., 2021). He highlights that the design and organization of physical settings can foster or inhibit various forms of behaviour, such as collaboration, solitude, or interaction, thus underscoring the importance of understanding user needs in space design. Rapoport’s concept clearly correlates with research on how educators may optimize physical learning settings to improve student engagement and emotional well-being. His observations indicate that classrooms that support diverse teaching approaches and social interactions can markedly enhance educational performance.

In "The Design of Everyday Things," Norman extends the discussion of how physical environments impact human behaviour through the lens of usability and emotional design. The emotional response to products and spaces significantly influences user satisfaction and engagement. The significance of developing environments that fulfil physical requirements while also connecting with users emotionally (Norman, 2013). Well-structured workspaces can facilitate pleasant emotional experiences, promoting creativity and collaboration among individuals (Mynott et al., 2024). Norman's examination of "affordances" demonstrates how spatial design can imply particular functions, hence directing human behaviour and emotional reactions. The notion asserts that intrinsic characteristics of physical environments can provoke specific behaviours, which corresponds with the recognition that physical settings significantly influence user experiences and social interactions. Further studies support these foundations, demonstrating that observed behaviours and emotional expressions in various settings, including hospitality, can yield insights about how environments influence guest satisfaction and emotional responses (Kang, 2023). Similarly, other research explores how the integration of social and physical environments significantly shapes user outcomes based on emotional engagement. These findings reinforce the notions posited by Rapoport and Norman regarding the active role of physical environments in guiding human behaviours and emotional states (McEwan et al., 2022). In conclusion, both Rapoport (2008) and Norman (2013) provide valuable frameworks for understanding the impact of physical settings on behaviour and emotion. Their insights are critical for design disciplines that aim to create environments fostering positive, supportive, and engaging experiences for users, particularly in educational frameworks. Furniture thus becomes a pedagogical agent for flipped classrooms, maker-spaces, and collaborative digital studios.

Individual studies address aesthetics, ergonomics, and technology, they often do so in isolation Diverse educational formats impact civic participation, indicating that the nature of the educational environment can determine students' levels of engagement (McEwan et al., 2022). However, the research does not encompass how the design and emotional aspects of these environments might further influence student behaviours and attitudes. The absence of interdisciplinary approaches highlights broader institutional challenges, as the corporatization of educational environments may compromise holistic educational experiences by prioritizing financial outcomes over comprehensive and inclusive educational practices (Mynott et al., 2022). His critique underscores the pressing necessity for an understanding that acknowledges the interrelated aspects of aesthetics, ergonomics, and technology in the creation of effective learning environments. The current literature underscores an urgent necessity for a cohesive framework that amalgamates aesthetics, ergonomics, and technological innovations in instructional methodologies. Integrating these disciplines can improve learning settings, promoting increased emotional involvement, inclusivity, and overall educational effectiveness. Across these strands, research remains siloed, lacking an integrated framework that unites aesthetics, ergonomics, and the evolving 21st-century educational agenda.

3 THEORETICAL FRAMEWORK

The proposed framework rests on three interwoven domains that together capture the physical, psychological, and pedagogical dimensions of a 21st-century academic library. Rather than treating furniture as a neutral backdrop, the model positions it as an active medium of multisensory, cognitive, and technological engagement**,** shaping how learners perceive, feel, and interact with information and with each other. The physical aspect of academic libraries includes the design, layout, and technology used in these places. Modern academic libraries must be structured to facilitate a range of learning activities, promoting flexibility and adaptation to support multiple pedagogical methodologies (Onwusu-Ansah & Korkuvi, 2024). Libraries are progressively employing open spaces, collaborative work areas, and technology-enhanced environments to promote interaction and adaptable usage. These design features are essential since they affect the interaction between students, instructors, and information resources. The psychological dimension focuses on the emotional and cognitive engagement of users within the library space. Well-designed environments evoke positive emotions and encourage learning through better user experiences. The aesthetic attributes of library spaces such as lighting, colour, and layout significantly affect user satisfaction and motivation (Xie et al., 2020). Inviting and physically appealing spaces can cultivate a sense of belonging and promote extended stays, enhancing general well-being and academic achievement. The pedagogical dimension emphasizes the role of libraries as active learning environments that facilitate inquiry-based and student-centred learning. The changing dynamics of educational methodologies require a transition to a library ecosystem that fosters collaboration, exploration, and interactive learning (Onwusu-Ansah & Korkuvi, 2024). This encompasses providing access to resources that enable innovative practices and learning methodologies that align with 21st-century pedagogical frameworks.

The framework rests on three interwoven domains:

1. Aesthetic Experience – Sensory–motor, emotional, and cultural meaning-making.
2. Ergonomic & Environmental Design – Proxemics, anthropometrics, universal design, and technology integration.
3. Learning Environment & Pedagogy – Active, collaborative, digitally enhanced learning strategies.

3.1 Aesthetic Experience

Aesthetic experience goes beyond surface appearance to encompass sensory–motor stimulation, emotional resonance, and cultural meaning-making.

Sensory–motor: Texture, colour, proportion, and tactile feedback invite movement and bodily interaction, supporting comfort during long study sessions and micro-movements that reduce fatigue. Tactile and kinesthetics feedback in haptic technology illustrates that multimodal haptic feedback enhances interaction by improving surface perception and allowing users to more effectively differentiate between various textural variation (Ratschat et al., 2024). In designing learning environment, the relevance of tactile cues can significantly influence user performance, underscoring the importance of well-designed interactions that consider the integrative nature of sensory modalities. Educators can utilize this information to enhance learning environments that foster comfort via sensory engagement (Beyvers et al., 2022).

Emotional valuation: Neuroaesthetic research shows that positive emotional responses—pleasure, curiosity, a sense of calm will enhance attention and memory. Furniture that delights the senses can therefore elevate motivation and persistence. Perceptual learning is affected by sensory experiences, indicating that favourable emotional circumstances improve the efficacy of information processing and discrimination learning. By heightened emotional states can facilitate the encoding of experiences, underscoring the importance of sensory engagement in educational settings (Grádaigh et al., 2021). The relationship between emotional experiences and learning processes suggests that the incorporation of positive emotional stimuli, such as visually appealing designs, promotes long-term memory retention. The importance of aesthetics indicates that appealing designs might enhance student motivation and perseverance by fostering an emotionally engaged environment (Mynott et al., 2022) Examine the function of multimodal experiences in augmenting the educational environment Research indicates that incorporating varied sensory stimuli, including appealing textures and colours, enhances engagement and emotional connection to learning, hence resulting in superior educational experiences (Nakitare et al., 2020).

Cultural and symbolic layers: Material choices, local craft references, and visual narratives embed identity and belonging, helping students feel rooted in place even as they engage in global, digital learning. By interacting with local cultural references, students cultivate a deeper connection to their heritage, so augmenting their sense of belonging within the educational environment. This demonstrates how cultural artifacts can function as significant instruments for identity development and community establishment in educational environments (Boakye-Yiadom et al., 2024). The importance of students establishing linkages between cultural signs and symbols enables them to express their identities and experiences. Incorporating local traditions into educational procedures allows educators to foster students' emotional ties to learning surroundings, so improving their sense of belonging (Deroo et al., 2024).

In the 21st-century learning context, this domain ensures that design nurtures wellbeing, inclusivity, and cultural relevance, vital for diverse, international student populations. As education globalizes, educational environments must embody both local cultural settings and global innovation tendencies. By incorporating local craftsmanship and material selections, educational institutions can develop environments that reflect cultural identities and instil pride in students. The research promotes the creation of adaptable environments that cater to various learning styles and include culturally significant components, hence enhancing students' sense of belonging (Vezhbovska et al., 2024).

3.2 Ergonomic and Environmental Design

This domain integrates proxemics, anthropometrics, universal design, and technology infrastructure to guarantee physical comfort, accessibility, and digital readiness.

Proxemics: Furniture layout regulates personal space and collaboration zones, enabling smooth transitions between solitary focus, small-group dialogue, and large-scale teamwork. The significance of multipurpose furniture in educational settings, highlighting that versatile furniture can enable diverse workspace configurations. research indicates that flexible furniture layouts cater to different modes of interaction and can foster both individual and collaborative learning experiences, enhancing student engagement (Shaleh et al., 2022). A thorough review of flexible learning environments, emphasizing how particular furniture arrangements can enhance student mobility and educational results. Research shows that optimal spatial utilization involves not only furniture arrangement but also understanding of how proxemics affect student interactions and participation (Kariippanon et al., 2020). design preferences in educational furniture and note that adjusting layouts can enhance comfort and user experience in settings, emphasizing the need for designs that can cater to collaborative and individual tasks (Cui et al., 2024). The physical design of learning settings must promote user involvement by incorporating flexible designs that accommodate various learning styles. Research indicates that flexible learning environments might improve both comfort and productivity for students (Khan & Thilagam, 2021).

Anthropometrics & ergonomics**:** Adjustable heights, varied seating postures, and support for device use accommodate bodies of different sizes and abilities, reflecting universal design principles. The attributes of differentiated assignments that learning spaces design must accommodate varied learning preferences. This entails utilizing ergonomic furniture that caters to diverse learning styles and physical requirements, hence enhancing an inclusive educational environment (Özdemir & Işıksal-Bostan, 2021). The necessity for ergonomic considerations in learning space design to enhance effective teaching and learning results. The implementation of adaptable designs that accommodate various instructional methods and improve student engagement (Dong-qing & Chen, 2023). Employing adaptable furniture designs that provide adjustable heights and diverse seating postures enables educational settings to demonstrate universal design principles, fostering inclusivity and improving comfort for all students. This method not only accommodates varied learners but also cultivates a more efficient and enjoyable educational experience.

Technology integration**:** Embedded power access, cable management, and support for hybrid or virtual collaboration make furniture a platform for laptops, tablets, AR/VR tools, and future digital innovations. Supportive infrastructure, comprising adaptable furniture and technology-compatible environments, is vital for the effective integration of technology in educational contexts (Legesse et al., 2024). The connection between student privacy and technological integration in higher education shows that furniture arrangements can affect the efficacy of digital instruments while maintaining a balance between student interaction and privacy.(Blackmon & Major, 2023). Considering both physical and electronic ecosystems in educational environments, encompassing efficient furniture arrangements that facilitate digital instruments. This strategy seeks to establish an inclusive educational environment that accommodates diverse student requirements (Kalney, 2021).

Essential features include internal power access, cable management, and changeable furniture to accommodate various devices and improve the overall learning experience. By adopting these concepts, educators may establish environments that utilize technology while fostering inclusivity and accessibility for all students. Here, furniture is not static but a responsive environmental interface**,** adapting to the evolving technological and physical demands of 21st-century education.

3.3 Learning Environment and Pedagogy

The third domain situates furniture within the practices of active, collaborative, and digitally enhanced learning**.** Draws on constructivist and inquiry-based theories, recognising that knowledge is co-created through interaction. A causal-comparative study demonstrating the beneficial impact of inquiry-based learning on cognitive learning outcomes. The research synthesizes findings from 60 studies, demonstrating that an emphasis on inquiry considerably boosts student cognitive achievements, underlining the significance of active participation as a core principle of good educational practices

(Nugroho & Zulfiani, 2021). Asynchronous group learning and highlights how social interactions in learning environments shape educational outcomes. Results confirm the idea that inquiry-based approaches, emphasizing collaboration and involvement, augment the learning experience by facilitating peer-to-peer learning (Tuma & Aljazeeri, 2021). Challenges and approaches in assessing inquiry-based learning is defined by exploration and collaboration, enabling students to construct knowledge through active engagement in various contexts (Mao, 2023).

Flexible tables, writable surfaces, and mobile seating encourage peer-to-peer collaboration, rapid reconfiguration for project work, and seamless integration with digital platforms. Furniture becomes a pedagogical catalyst, supporting flipped classrooms, blended learning, maker activities, and informal peer mentoring—all hallmarks of 21st-century curricula.

3.4 Systematic Literature Review (SLR) Process for Framework Development

When combined, these domains form a holistic design lens**.** Aesthetic experience ensures emotional and cultural resonance; ergonomic and environmental design secures comfort, accessibility, and technological capacity; and learning-pedagogical considerations align the physical setting with contemporary teaching and learning strategies. Because the framework is derived from a transparent and replicable SLR**,** it offers not only conceptual clarity but also an evidence-based foundation for future empirical validation. Academic library furniture is thus recast as a dynamic ecosystem component simultaneously beautiful, functional, inclusive, and pedagogically intelligent capable of sustaining the creative, collaborative, and digitally mediated learning demanded by today's universities.

To ensure the framework is evidence-based and methodologically rigorous**,** a Systematic Literature Review (SLR) was carried out. The criteria for executing systematic literature reviews (SLRs) have become a fundamental aspect of research across multiple fields. Numerous established criteria exist that offer a systematic framework for systematic literature reviews, ensuring rigor and validity in the synthesis of study findings. Significant papers encompass the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) criteria and additional methodological frameworks that underscore clarity, transparency, and reproducibility in literature reviews.

PRISMA 2020, a revised systematic review reporting guideline. This thorough paper stresses SLR reporting openness and uniformity. The authors provide a checklist to help researchers follow best practices and improve systematic reviews across studies. They say PRISMA can be used for intervention, diagnostic, and observational systematic reviews (Page et al., 2021). The proposed process for framework development as in Table 1.

Table 1 Systematic Literature Review (SLR) Process for Framework Development

No	Stage	Purpose	Key Activities	Expected Outcome
1	Planning & Protocol Design	Establish scope and rigour	• Define research questions and objectives • Identify databases (Scopus, Web of Science, ERIC, ProQuest, Google Scholar) • Develop keywords, Boolean strings, and inclusion/exclusion criteria • Register or document review protocol	Transparent, replicable plan for the review
2	Comprehensive Search	Capture all relevant studies	• Execute searches across selected databases (2000–2024) • Export results to reference manager and remove duplicates	Comprehensive corpus of potentially relevant studies
3	Screening & Selection	Ensure relevance and quality	• Title/abstract screening using inclusion/exclusion criteria • Full-text review for methodological quality and direct relevance • Record flow using PRISMA diagram	Final set of high-quality studies
4	Data Extraction & Coding	Gather key evidence	• Extract bibliographic details, context, methods, and key findings • Apply thematic coding aligned with three domains: Aesthetic Experience, Ergonomic & Environmental Design, Learning Environment & Pedagogy	Structured database of coded evidence
	Synthesis & Integration	Identify patterns and gaps	• Compare coded data across domains • Map overlaps, contradictions, and research gaps • Relate findings to 21st-century learning needs (digital fluency, collaboration, inclusivity)	Integrated conceptual map linking aesthetics, functionality, and pedagogy
	Derivation of Guiding Principles	Translate theory to practice	• Distil evidence into five guiding principles: Aesthetic–Functional Nexus, Temporal Dynamics, Spatial Mediation, Pedagogical Anchoring, Holistic Integration	Evidence-based conceptual framework
	Expert Validation (Planned)	Strengthen credibility and applicability	• Delphi panels and interviews with designers, librarians, ergonomists, educators, and student representatives • Incorporate feedback for refinement	Validated framework ready for empirical testing and application

4 RESEARCH GAP AND CONCEPTUAL PREPOSITION

Despite rich work in each domain, no existing model integrates aesthetics, functionality, and 21st-century pedagogy, the literature on academic libraries reveals a persistent fragmentation. This siloed approach leaves a critical theoretical void: there is no integrated model that simultaneously embraces aesthetic resonance, physical usability, and the demands of 21st-century pedagogy including digital fluency, collaboration, and learner wellbeing. Integrating educational ideas into curriculum design is important. This research emphasises the need for conceptual frameworks that link theoretical viewpoints with practical applications to foster experiential learning (Kumar, 2025). The impact of aesthetic education-transformative learning models shows how aesthetic education can boost creativity and well-being, highlighting the fragmentation in current methods that fail to connect these key dimensions (Wu & He, 2021). This paper proposes that academic library furniture must function as an aesthetic–pedagogical interface, enabling digital collaboration, flexible learning modes, and wellbeing.

4.1 Contribution

4.1.1 Interdisciplinary Connection

The framework integrates perspectives from design theory, environmental and cognitive psychology, educational technology, and contemporary pedagogy. It offers a common lexicon and a framework of design principles that architects, interior designers, learning technologists, and educational researchers can utilize cooperatively, dismantling entrenched disciplinary barriers.

4.1.2 Reconfigured Agency

Furniture is reimagined as an engaged collaborator in the learning process. Its materiality, flexibility, and technical capabilities influence attention, govern proxemic interactions, and facilitate seamless transitions between physical and virtual collaboration essential skills in 21st-century education.

4.1.3 Investigative Platform

The model provides quantifiable constructs for forthcoming empirical research, including:

- Wellbeing measurements (physiological comfort, emotional responses, stress alleviation).
- Collaborative behaviours (frequency and quality of peer interactions across spatial contexts).
- Digital engagement patterns (the impact of technology integration in furniture on device utilization, hybrid participation, and information dissemination).

These constructs enable rigorous mixed-method investigations and evidence-based design innovations, ensuring that library furniture design remains responsive to evolving educational needs.

4.2 Conceptual Proposition

To address this gap, the paper advances the idea that academic library furniture must operate as an "aesthetic–pedagogical interface."

Furniture is conceived not just as an object for sitting or working, but as a dynamic platform that:

- Enables digital collaboration through embedded power, connectivity, and adaptable layouts.
- Supports flexible learning modes, from individual reflection to high-energy teamwork and hybrid on-site/online activities.
- Promotes wellbeing and inclusivity by stimulating the senses, reducing fatigue, and reflecting diverse cultural identities.

By fusing aesthetic pleasure, ergonomic intelligence, and pedagogical purpose, the framework redefines furniture as an active mediator of multisensory, cognitive, and technological engagement a cornerstone of future-ready library ecosystems.

5 CONCLUSIONS

It is no longer sufficient to evaluate academic library furniture based solely on how comfortable it is and how long it will last. It needs to encourage collaboration, support digital-age pedagogy, and foster mental and physical well-being. The framework that is presented in this paper provides a design lens that is ready for the future, and it brings form and function into harmony in order to create library environments that encourage, support, and transform learning in the twenty-first century.

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Analysing the Motion Graphic Principles Used in Microplastics Pollution Awareness Video

Taqiuddin Al-Husaini Azlani[1], Nabila Aimi Mohamed Ghazali[2], *Sharkawi Che Din[3]
[1,2,3]College of Creative Arts, Universiti Teknologi MARA, Selangor Branch, Puncak Alam Campus, Selangor, Malaysia

taqiuddinhusaini@gmail.com[1], nabilaaimi@uitm.edu.my[2], *sharkawi237@uitm.edu.my[3]
***Corresponding author**

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ABSTRACT
Public awareness of microplastic pollution in Malaysia remains low despite increasing scientific attention to its environmental and health impacts. Traditional live-action formats dominate local awareness efforts, underutilising the potential of motion graphics to enhance communication. This study aims to examine how motion graphic principles can improve the effectiveness of microplastic pollution awareness videos in engaging and educating audiences. Using Ge Song's (2016) framework of four motion graphic principles (logic, transformation, transition, and music), this study used a qualitative content analysis of seven selected awareness videos that primarily utilise motion graphics. Each video was evaluated on sub-elements such as message clarity, visual transformation, narrative flow, and emotional resonance using a structured 5-point Likert scale. Findings reveal that the logic principle was consistently applied across all videos, ensuring clear message delivery and well-structured narratives. Transformation and transition principles were moderately well utilized, particularly in videos targeting younger audiences or produced with higher-quality animation. Music, however, showed the most inconsistency, with several videos lacking emotional depth or relying on minimal sound design. In conclusion, while motion graphics demonstrate strong potential for simplifying complex information and increasing audience engagement, their application in Malaysian microplastic awareness videos remains uneven. This study suggests that a more balanced and integrated use of all four motion graphic principles could significantly enhance the impact of future environmental campaigns, bridging the gap between scientific information and public understanding.

Keywords: *Motion Graphic Principles, Microplastic pollution, Microplastic awareness video*

1 INTRODUCTION

The advent of digital communication has transformed the manner of communicating information. Motion graphics, which utilize animation, illustration, and type-based narrative, become powerful tools to convey complex ideas and capture people's attention. In Malaysia, motion graphics are increasingly being utilized in advertisements and music, reflecting the growing importance they are accorded in the creative sphere. For instance, a study of Malaysian sparkling drink commercials established that the employment of digital paint and motion graphics considerably enhanced brand recall and audience engagement (Zaifa Kamaruzaman et al., 2023).

In addition to its use in commerce, motion graphics also have potential in sustainability and environmental education. Zhao et al., (2024) demonstrated how creatively crafted visual media are. For instance, interactive animation can bridge the gap between public understanding and scientific knowledge through emotional connection and transparency. Yet in Malaysia, environmental campaigns remain largely dependent on live-action formats, instead of leveraging the potential for more intimacy provided by motion graphics (Zaifa Kamaruzaman et al., 2023; Khairulah et al., 2023). This study bridges that gap by studying microplastic pollution awareness videos, grounded on Ge Song's (2016) principles of motion graphic design: logic, transformation, transition, and music. This research evaluates the efficacy of such principles in enhancing public engagement and ecological literacy toward the overall discussion of effective visual communication in Malaysia's sustainability efforts.

1.1 Research Objective

The objective of this research was to analyse the usage of motion graphic principles in selected microplastic pollution awareness videos.

1.2 Problem Statement

Motion graphics are widely recognized for their ability to simplify complex information and enhance viewer engagement. However, their specific application in microplastic pollution awareness campaigns remains under-researched. Mahaliyana and Nugawela (2024) emphasize the significant gap between scientific research on microplastics and public awareness, highlighting the need for effective science communication strategies to bridge this divide.

In Malaysia, this issue is further worsened by the limited number of microplastic awareness videos, with most publicly available content originating from international sources (Praveena, 2024). In Malaysia, environmental awareness campaigns like microplastic pollution awareness mostly use live- action footage, with limited usage of motion graphics or animated elements. This underutilisation of motion graphics suggests a missed opportunity to enhance the effectiveness of environmental communication.

Motion graphics have the potential to simplify complex information and foster deeper emotional and cognitive connections with audiences. As highlighted by Mahaliyana and Nugawela (2024), there is a significant gap between scientific research on microplastics and public awareness, emphasizing the need for effective science communication strategies to bridge this divide. Furthermore, studies show that public understanding and attitudes toward plastic pollution in Malaysia still require strengthening, indicating a need for more engaging and educational content (Chin, Mahanta, & Nath, 2023).

2 LITERATURE REVIEW

This literature review highlights the increasing importance of motion graphics in digital communication, particularly for simplifying complex information through engaging visual storytelling. Motion graphics have been successfully applied in education, health communication, and marketing. However, their use in environmental awareness campaigns, especially within the Malaysian context remains limited. Despite growing concern over microplastic pollution, public awareness in Malaysia is still low. Most existing educational content often relies on international sources. Local awareness campaigns mostly use live-action formats, underutilising the potential of animated content to resonate emotionally and cognitively with audiences. To address this gap, this study adopts Ge Song’s (2016) four motion graphic principles (logic, transformation, transition, and music) as a framework to evaluate the effectiveness of microplastic awareness videos. These principles offer a valuable design guide for enhancing clarity, narrative flow, and emotional engagement in motion graphic-based environmental communication.

2.1 Motion Graphics in Digital Communication

Motion graphics have become a widely used tool in digital communication, especially for presenting complex information in a simple, engaging, and memorable way. Their ability to combine text, visuals, animation, and sound allows content creators to create powerful messages that attract attention and improve people's understanding. This approach has proven effective across many fields, including education, marketing, and health communication (Pereira, Figueiredo, & Silva, 2020; Ares, Barros, & Montero, 2021). With the increasing consumption of visual content online, motion graphics are now core to many awareness campaigns aimed at reaching audiences more effectively through visual storytelling (Scherer, Flemming, & Nowak, 2019).

2.2 Microplastic Pollution Awareness and the Malaysian Context

Microplastic pollution is tiny plastic particles that result from waste breakdown. It has become a major environmental issue, especially in countries with high plastic use and poor waste management systems like Malaysia (Jambeck et al., 2015). Although scientific research on the risks of microplastics is growing, public awareness remains low. Chee, Toh, and Ng (2021) report that many Malaysians have a limited understanding of how microplastics affect the environment and health. Mahaliyana and Nugawela (2024) emphasize a clear gap between research and public knowledge, calling for stronger communication strategies. Praveena (2024) adds that awareness videos produced in Malaysia are limited in number and often depend on content created by international sources. This highlights the urgent need for more localized, engaging educational content to improve microplastic literacy in the Malaysian public.

2.3 Motion Graphics in Environmental Awareness Campaigns

Motion graphics have strong potential for public communication, but their use in environmental campaigns especially in Malaysia is still limited. Most local awareness videos are live-action, with very few using animation or motion graphic techniques. This underuse of motion graphics represents a missed opportunity to present environmental messages in a way that resonates emotionally and cognitively with audiences (Yasa, Wibawa, & Pramayasa, 2024). Chin, Mahanta, and Nath (2023) found that public attitudes and behaviors toward plastic pollution in Malaysia are still weak, suggesting a need for better-designed educational content. Integrating motion graphics into awareness campaigns could enhance engagement and improve message retention, especially among youth who are more responsive to digital and visual formats.

2.4 Motion Graphic Principles by Ge Song

To assess the quality and effectiveness of motion graphics in awareness videos, this study adopts Ge Song’s (2016) four key motion graphic principles: logic, transformation, transition, and music. These principles serve as design guidelines to ensure the video flows smoothly, delivers a clear message, and creates an emotional impact. Logic refers to the structure and clarity of the narrative. Transformation describes how visual elements change to support the message. "Transition" refers to how scenes or elements shift; and "music" adds mood and emotional depth. When applied well, these principles improve viewer understanding and retention (Bock, Iyer, & Kendall, 2020; Song, 2016). However, few studies have explored how these principles are used in microplastic pollution awareness videos, making this an important area of research.

3 RESEARCH DESIGN

This study employed a qualitative research approach, utilising content analysis to examine the usage of motion graphic principles in selected microplastic pollution awareness videos. Content analysis is a systematic research method for making replicable and valid inferences from texts or other meaningful materials within their contexts (Krippendorff, 2013). It enables researchers to analyse the presence, meanings, and relationships of certain words, themes, or concepts within qualitative data. A sample of seven awareness videos focusing on microplastic pollution was selected for the analysis. The selection criteria emphasised videos that primarily employed motion graphics as their medium of communication. The analysis was guided by the Motion Graphic Principles framework developed by Song (2016), which encompasses four key principles: logic, transformation, transition, and music. These principles provide a structured method to assess the effectiveness and design of motion graphics in creating awareness about microplastic pollution.

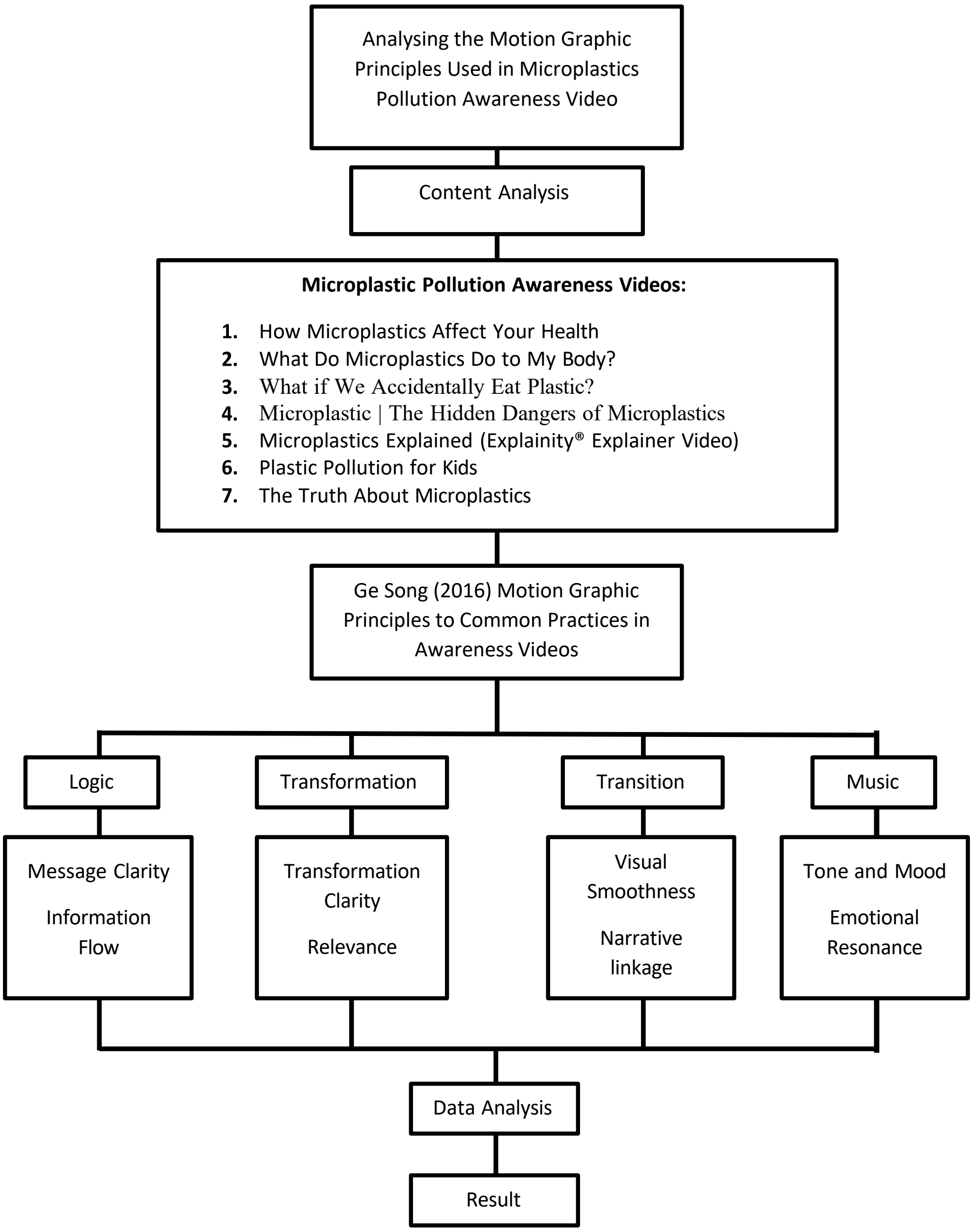
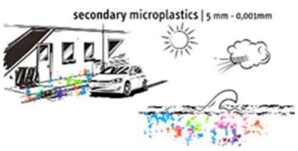


Figure 1 Ge Song's (2016) four key motion graphic principles, adopted for this study

4 SELECTION OF MICROPLASTIC POLLUTION AWARENESS VIDEO

Table 1 Selection Sample of Microplastic Pollution Awareness Video

	Title	Publisher	Platform / Date Published	Code	Justification
1.	How Microplastics Affect Your Health 	UN Environment Programme	Posted on YouTube November 15th 2019	MPAV1	Appears to use strong animation and infographic element
2.	What Do Microplastics Do to My Body? 	National Geographic	Posted on YouTube March 21st 2025	MPAV2	Produced by a reputable source with high production quality
3.	What if We Accidentally Eat Plastic? 	Dr. Binocs Show	Posted on YouTube July 9th 2024	MPAV3	Child-friendly educational format
4.	Microplastic | The Hidden Dangers of Microplastics 	The Planet Voice	Posted on YouTube June 7th 2024	MPAV4	Uses animated visual storytelling with voiceover
5.	Microplastics Explained (Explainity® Explainer Video) 	Explainity channel	Posted on YouTube March 18h 2019	MPAV5	Known for structured, whiteboard-style animations
6.	Plastic Pollution for Kids 	Errington House	Posted on YouTube Sept 20th 2023	Mpav6	Includes microplastics within broader pollution context
7.	The Truth About Microplastics 	CIIT College of Arts and Technology Philippines	Posted on YouTube Dec 22th 2021	MPAV7	Short animated video with infographic style

5 DATA ANALYSIS

A 5-point Likert scale (Likert, 1932) was used to evaluate the use of motion graphic principles in selected microplastic pollution awareness videos. Each sub-element such as message clarity or emotional resonance was rated from 1 (weak) to 5 (strong), with 3 indicating a moderate presence. A rating of 1 indicated a very poor application, where the element was either absent or highly ineffective in supporting the intended message. A score of 2 reflected a poor implementation, with minimal clarity or impact. A rating of 3 represented a fair application, suggesting moderate use with average coherence and effectiveness. A score of 4 denoted a good application, where the element was clearly presented and contributed meaningfully to the video's communication goals. Finally, a rating of 5 signified an excellent application, indicating a highly effective, impactful, and well-integrated use of the motion graphic principle that significantly enhanced audience engagement and message delivery. This method allowed for consistent, structured assessment of visual and auditory design elements for all videos.

Table 2 Analysis of motion graphic principles in Microplastic Pollution Awareness Video

	Microplastic Pollution Awareness Videos (Code)	Logic		Transformation		Transition		Music	
		Message Clarity (MC)	Informatio n Flow (IF)	Transformati on Clarity (TC)	Relevance (R)	Visual Smoothness (VS)	Narrative Linkage (NL)	Tone & Mood (TM)	Emotional Resonance (ER)
1	MPAV 1	5/5	5/5	4/5	4/5	5/5	5/5	4/5	3/5
2	MPAV 2	5/5	5/5	4/5	5/5.	5/5	5/5	4/5	3/5
3	MPAV 3	5/5.	5/5	4/5	5/5	5/5	5/5	4/5	3/5
4	MPAV 4	5/5	5/5	4/5	5/5	5/5	5/5	4/5	3/5
5	MPAV 5	5/5	5/5	3/5	4/5	3/5	3/5	2/5	2/2
6	MPAV 6	5/5	5/5	4/5	4/5	5/5	5/5	4/5	3/5
7	MPAV 7	5/5	5/5	4/5	5/5	5/5	5/5	4/5	4/5

6 RESULTS

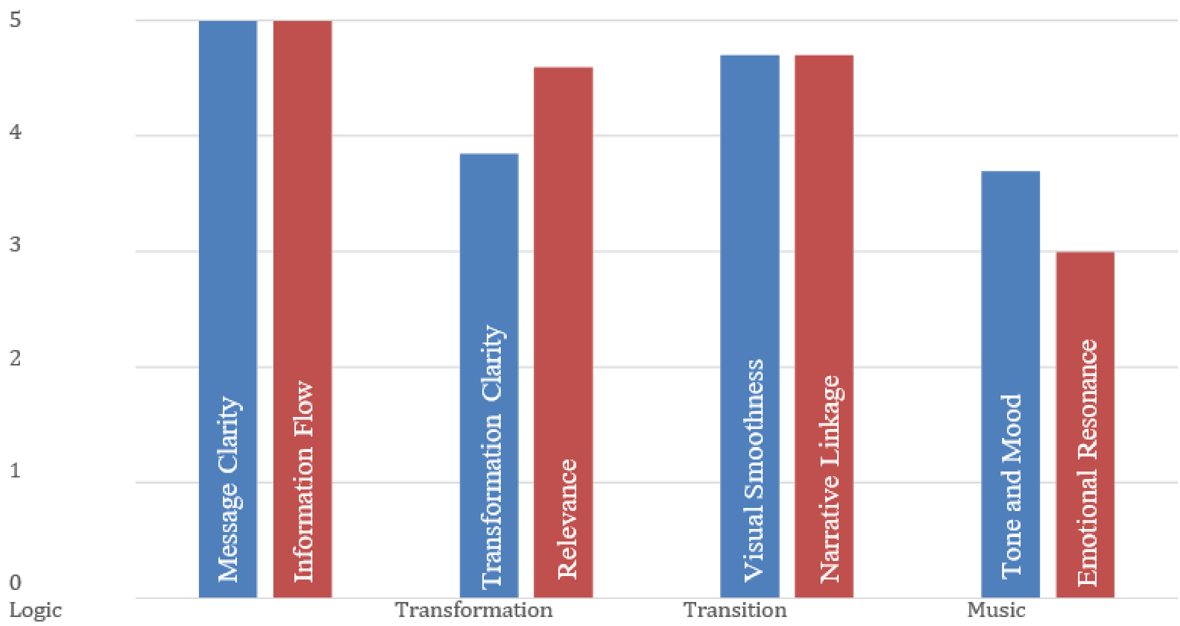


Figure 2 Result of analysis of motion graphic principles in Microplastic Pollution Awareness Video

7 FINDINGS

The analysis of all seven selected microplastic pollution awareness videos revealed a consistent application of the Logic principle, particularly in the areas of message clarity and information flow. All videos demonstrated a strong ability to convey complex environmental topics in a clear and accessible manner. Videos such as “How Microplastics Affect Your Health” and “The Truth About Microplastics” were especially effective in maintaining a focused narrative and organizing content in a logical sequence. On the Likert scale, the Logic principle was rated 5 (Very Good), reflecting its consistent strength across all samples.

In contrast, the application of Transformation varied more significantly across the samples. Videos targeting younger audiences, such as “What if We Accidentally Eat Plastic?” and “Plastic Pollution for Kids”, employed transformation effectively through character-driven storytelling and object-based animations, which enhanced visual engagement and content retention. However, videos like “Microplastics Explained” relied heavily on static whiteboard illustrations and minimal visual transitions, limiting the dynamic visual appeal. Therefore, the Transformation principle received a rating of 3 (Moderate), indicating an average level of application with noticeable room for improvement.

The Transition principle was generally well executed, with most videos incorporating smooth scene progressions and maintaining narrative coherence between segments. Strong examples include “National Geographic’s What Do Microplastics Do to My Body?” and “The Truth About Microplastics”, which demonstrated proficient use of editing techniques to maintain fluidity.

Nevertheless, simpler formats such as “Microplastics Explained” and “Plastic Pollution for Kids” delivered only basic transitions, lacking the sophistication observed in more polished productions. Thus, the Transition principle was assigned a rating of 4 (Good).

Lastly, Music emerged as the most unevenly applied principle. Child-oriented and advocacy-focused videos, including The Dr Binocs Show and The Planet Voice, used background scores effectively to set an appropriate emotional tone either playful or urgent. In contrast, more technical or minimalist videos, such as “Microplastics Explained”, either underutilized music or failed to leverage it for emotional impact. Even in more balanced productions like “The Truth About Microplastics”, music remained largely functional rather than emotionally compelling. Consequently, the Music principle was rated 2 (Poor), reflecting its limited and inconsistent contribution across the dataset.

In summary, the findings highlight a strong baseline in logical structure (rated 5), moderate execution of transitions (rated 4), uneven visual transformation (rated 3), and underdeveloped use of music (rated 2). Addressing these disparities could enhance both the persuasive power and educational impact of motion graphic videos, particularly in emerging awareness contexts like Malaysia, where such formats are still evolving.

8 CONCLUSION

This study concludes that while motion graphics are widely recognised for their potential to simplify complex topics and enhance viewer engagement, their application in microplastic pollution awareness videos remains uneven. The analysis of seven selected videos revealed that the principle of logic was consistently and effectively applied, enabling clear message delivery and structured information flow. However, the remaining principles which are transformation, transition, and music were applied with varying effectiveness. Transformation and transition were more successfully implemented in videos with higher production quality or those targeting younger audiences, while music was often underutilized, limiting emotional resonance. This supports the claim that motion graphics, though underused in Malaysian environmental communication, offer significant untapped potential. By adopting a more balanced approach that integrates all four motion graphic principles, future awareness campaigns can become more engaging, emotionally impactful, and educationally effective, helping to bridge the gap between scientific knowledge and public understanding of microplastic pollution.

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AUTHOR CONTRIBUTIONS

All authors played equal contributions towards the production of this paper.

CONFLICT OF INTEREST

There is no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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Section: Original Article

Identifying Features in Studio Lighting Tutorial Videos for Photography Education

Muhamad Adam Hanif Che Saad [1], Balqis Nabilah Ramanizan[2]
[1]*Faculty of Art and Design Universiti Teknologi MARA, Seri Iskandar Campus, Perak, Malaysia,*
[2]*School of AI Computing & Multimedia, Lincoln University College, Kelana Jaya, Selangor, Malaysia*

*adamhanif@uitm.edu.my[1]
***Corresponding author**

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ABSTRACT

The shift from print-based to time-based learning has been more intense in the modern era, accelerated particularly by the Covid-19 pandemic. Online and flexible modes of learning demanded an educational shift from the traditional printed word to electronic and online media. The purpose of this research is to identify key features used in studio lighting tutorial videos that enhance the learning experience of photography students. It focuses on how video tutorials can effectively deliver practical knowledge in photography.

A content analysis method was employed on 20 YouTube videos related to studio lighting tutorials. Nine critical features were identified which is typography and text, video duration, language, lighting condition, audio and narration, instructor presence, graphic elements, shot variety, and equipment demonstration. These features were consistently used across the most engaging and informative videos.

The findings suggest that a well structured visual content plays a crucial role in improving comprehension and attention among students, particularly in subjects requiring practical demonstration. The result serves as guidelines for educators and video creators to develop more effective instructional videos, especially in creative and visual fields such as photography.

Keywords: *Studio Lighting, Video tutorial, Photography Education, Content Analysis, Visual Learning*

1 INTRODUCTION

In recent years, especially during the COVID-19 pandemic, educational institutions have seen a significant shift from traditional print-based learning methods to time-based learning formats. This shift is particularly evident in creative and visual disciplines such as photography, where practical skills and visual demonstration are essential. Video tutorials have become an increasingly popular medium for delivering such knowledge. With platforms like YouTube offering free access to instructional videos, educators and learners alike have turned to this medium as a primary source of learning.

This study focuses on identifying the essential features found in effective studio lighting tutorial videos. As photography students require hands on skills in lighting setups, understanding how these features, this research aims to offer valuable insights for educators, video content creators and curriculum developers.

2 LITERATURE REVIEW

The use of video in education has been widely discussed across various disciplines. According to Carmicheal (2017), videos provide visual advantages that can expand access to practical demonstrations and allow for repeated viewing. The rise of self-learning among Generation Z also plays a role in the relevance of video based education. According to Seemiller and Grace (2017), Gen Z learners prefer flexible, technology driven learning experiences that allow autonomy and multimedia integration. Tutorial videos meet these expectations, especially when they include visually appealing elements, clear language and direct instruction interaction.

Sulaiman (2017) emphasised that YouTube tutorials are especially effective in photography education, where visual clarity and step by step guidance are crucial. Video tutorials can present abstract or complex ideas in a tangible, demonstrative format, making them ideal for skill-based learning courses such as studio lighting. These tutorials often incorporate layered explanations using demonstrations, animations and real-time applications, which enhance cognitive engagement and motivation. Fiorella and Mayer (2016) suggested that videos can facilitate generative learning by encouraging students to actively engage with content through visuals, narration and pacing.

Research also highlighted the importance of specific video design features. Guo (2014) found that shorter videos tend to maintain student attention better, particularly those under six minutes. Mayer's (2005) multimedia learning theory emphasises the synergy between visuals and spoken words to enhance retention. This principle is applicable in studio lighting tutorials, where combining on-screen lighting setups with verbal instructions can improve knowledge transfer. Other scholars have identified common best practices for instructional video design by using conversational tone (Clark * Mayer,2011), reducing cognitive overload through segmentation and showing real-life application of tools and techniques (Brame, 2016). These practices align with features commonly found in high-performing studio lighting videos.

In parallel to educational design, recent studies in visual communication particularly in tourism promotion, offer relevant insights. Nasruddin (2024) highlighted how motion graphics elements in projection mapping videos can significantly enhance tourist engagement by using vibrant colours, clear graphics and sound design. Although the context is agrotourism, the visual strategies applied are transferable to educational video content. Their study shows that integrating dynamic visuals such as typography, transitions and lighting helps sustain viewer interest and effectively deliver complex messages. Thus, integrating visual communication strategies from fields like agrotourism promotion into tutorial video design can enhance the effectiveness of educational media. Understanding how visual elements operate across disciplines allows creators to adopt a more holistic and impactful approach when producing photography instruction content.

Nine elements are frequently highlighted in the literature as key to effective tutorial videos. The elements are typography and text overlays, concise duration, clear language, proper lighting, quality audio, instructor presence, supportive graphics, varied camera shots, and visibility of equipment. Each of these components contributes uniquely to the overall learning experience. Together, these components not only support understanding and knowledge retention but also significantly increase student engagement and satisfaction (Fiorella & Mayer, 2016).

3 METHODOLOGIES

This study employed a qualitative method which is visual analysis approach. A total of 20 YouTube videos on studio lighting were selected using purposive sampling based relevance, popularity, and educational value. The analysis focused on identifying recurring features used across these videos.

3.1 Research Flow and Design Methodology

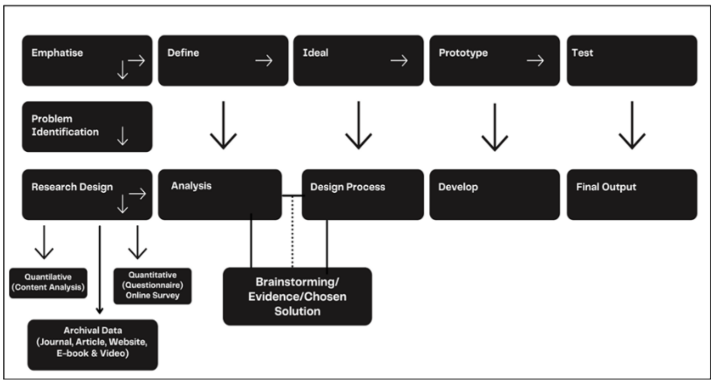

Figure 1 Framework of research methodology.

3.2 Data Analysis

Table 1 List of Video Information

No.	Video Title	Duration (Minutes)	Language	URL
1	How to setup light: Basic Portrait Light (Malaysia Version)	3.27	Malay	https://www.youtube.com/ watch?v=ym2-hH56ssw
2	How To Setup Light: Key, Fill, Rim and Background Lighting (Malaysia)	3:52	Malay	https://www.youtube.com/ watch?v=cc9CNsOfcEc
3	One Light Beauty Setup | Making the Most Out of a Single Studio Light	2:29	English	https://www.youtube.com/watch?v=TBK7jj8fYqo
4	How to Use One Light Overhead in Your Portrait Photography	2:13	English	https://www.youtube.com/watch?v=fs0OoW43Bj8
5	Three Ways to Use a One Light Photography Setup | Miguel Quiles | Sony Alpha Universe	3:36	English	https://www.youtube.com/watch?v=I4ofNcXESZc
6	5 Portrait Lighting Positions on Photography Sets	3:34	English	https://www.youtube.com/watch?v=d4ChaBrNtOM
7	Photography Tips-Quick Rembrandt Lighting Setup	3:15	English	https://www.youtube.com/watch?v=GxB5Z0NhMJQ
8	Beauty Photography - Two STUDIO LIGHT Setup | Studio Lighting for Beginners	2:54	English	https://www.youtube.com/watch?v=BH08pmCf5L0
9	7 Easy Portrait Lighting Setups in 70 Seconds	1:34	English	https://www.youtube.com/watch?v=_DvYegArI-c
10	3 Ways to Light Your Photography Background | Background Light Colour	2:25	English	https://www.youtube.com/watch?v=XgEBS7h3wc0
11	Three Point Lighting Basics for Photography/Video	3:48	English	https://www.youtube.com/watch?v=EBGuQZo0g94
12	TWO-LIGHT Portrait Setup | Cross Lighting	3:19	English	https://www.youtube.com/watch?v=4SqGcm9LSyA
13	Creating an Easy One Light Setup for Moody Portraits	3:31	English	https://www.youtube.com/watch?v=AIPMx7TW7I0
14	One Light B+W Portrait Behind the Scenes	3:18	English	https://www.youtube.com/watch?v=ix6qNdp4eEg
15	How to Shoot a simple One Light Portrait	2:12	English	https://www.youtube.com/watch?v=Id7qwCVV40I
16	Fashion Photography with One Light	2:24	English	https://www.youtube.com/watch?v=DDjPx1W3wzo

17	Episode 10 - 3 DIFFERENT Ways to use a Parabolic Softbox	3:55	English	https://www.youtube.com/watch?v=UdrHVA9nX3k
18	One Light Fashion Boudoir Photography	3:28	English	https://www.youtube.com/watch?v=81X2NAyILMc
19	One Light Portraits in 60sqf/5.5sqm | Shooting in Small Spaces	3:38	English	https://www.youtube.com/watch?v=LE0eQV6pbIs
20	How to create dramatic one-light portraits	1:57	English	https://www.youtube.com/watch?v=4-oZx9ysll4

Each video was reviewed multiple times to examine specific elements, A checklist was used to categorise observed features including text use, video duration, spoken language, lighting setup audio quality, presenter visibility, use of graphic camera angles, and equipment shown. The data were then synthesised to identify patterns and common practices.

4 FINDINGS

The video analysis from 20 YouTube videos revealed nine key features commonly used in effective studio lighting tutorial videos.

Table 2 Data of duration from 20 collected YouTube videos

Duration	Total
1:00 to 2 minutes	10%
2:00 to 4 minutes	90%

According to Table 2, 10% of videos are 1 to 2 minutes long, while 90% of videos are 2 to 4 minutes long. Based on the article "How Long Should an Instructional Video Be? And Why Does It Matter?" February 23,2021. The study, which was taken from https://www.boclips.com/blog/whats-the-optimum-lenght-for-an-instructional-video-andwhy-does-it-matter, found that the student engagement was highest for the shortest movies, which were between 0 and 3 minutes. Videos should not exceed six minutes in length in order to be as effective as possible. By dividing the learning material into digestible chunks that students can watch in a single sitting, shorter films help to prevent this. This increases the overall control that the student has over their learning.

Table 3 Data of language used from 20 collected YouTube videos

Language	Total
Malay	10%
English	90%

Table 4.2:

Based on an article from Sinar Harian titled "Ini sebab UiTM guna Bahasa Inggeris" by Ali (2019, November 29), UiTM students should have no trouble understanding video tutorials that are in English because they have learned theories in English during class. As can be seen from Table 3, 81.8% of videos are in English, while another 18.1% are in Malay. English is the most preferred language to learn about photography.

Table 4 Data of typography used from 20 collected YouTube videos.

Typography	Total
Sans Serif	100%
Serif	0%

According to Table 4, all pop-up text graphics in the video that provide further information are typeset in Sans Serif. Sans Serif fonts have crisp, clean endings, while serif fonts are more ornamental and have serifs protruding from the ends. These two styles have unique personalities and express quite different ideas. For this reason, it is essential to comprehend each style and choose a font that reflects the message the company wants to get across. Sans Serif fonts are clean, modern, and amiable. Sans Serif fonts are preferred by many for on-screen use because to their crisp, distinct lines. Users will find it easier to read text on a screen with crisp edges and clean lines. Sans Serif fonts give the appearance of relaxed, casual, amiable, and approachable. Sans Serif fonts are a popular choice because of these features. Rinaldi (2019, May 30).

Table 5 Data of talents used from 20 collected YouTube videos.

Talent	Total
2 Talents	95%
3 Talents	5%

From the Table 5, 95% of the videos featured two talents, one as a model and one as an instructor. While the three talents video have one talent as an instructor, one as a model and one as the instructor's assistant are the additional 5%. Because of the instructor's and the examples' educational influence, the effectiveness of the talent based film is that it encourages students to engage in generative learning activities while they watch it. The practice of urging students to mimic the instructor's behaviours while watching a video presentation is supported by some preliminary data. Mayer, (2020).

Table 6 Data of audio used from 20 collected YouTube videos.

Audio	Total
Instrumental music only	5%
Instrumental music and audible audio	95%

As can be seen from Table 6, 95% of the videos used instrumental music and audio, while 5% used just instrumental music. According to a study from the article "Five ways to increase the effectiveness of instructional video" (Mayer, 2020), videos in which the instructor speaks and performs demonstrations while facing the camera will draw in more viewers than videos with instrumental music alone.

Table 7 Data of Graphic Elements used from 20 collected YouTube videos.

Graphic Elements	Total
Pop-up Text	100%
Graphic Images	10%
Pop-up Window	20%
Supporting Images	85%
Motion Graphic	5%

According to Table 7, 85% of the videos also included supporting photographs to display the final product of the photo shoot, and 100% of the videos employed pop-up text graphics to provide the viewer with more information. Ten percent of the video employed graphic pictures to accompany their message, and only twenty percent of the video used the pop-up window graphic. Finally, just 5% of videos used motion graphic animation.

Table 8 Data of Lighting Condition used from 20 collected YouTube videos.

Lighting Condition	Total
Bright and Warm	25%
Bright and Cool	60%
Dark and Cool	20%

According to the Table 8, bright and cold mood and tone colours were used in 60% of the films, while bright and warm mood and tone colours were used in 25% of the video's content was shot in cool, gloomy lighting. The article "What Are Warm and Cool Colours and How Do They Make You Feel?" served as the inspiration. Olsen, Jacob (n.d.). According to this article, which was taken from https://www.color-meanings.com/warm-cool-colors/,cold colours eliminate the toxicity associated with these negative feelings.

Table 9 Data of Lighting Condition used from 20 collected YouTube videos.

Video Layout	Total
16:9	100%

According to Table 9, 100% of the video uses 16:9 layout which is the industry standard video layout to published in video in YouTube.

Table 10 Data of Lighting Condition used from 20 collected YouTube videos.

Video Composition	Total
Wide angle shot	95%
Medium shot	90%
Extreme Close-up shot	35%
Close-up shot	65%
Depth of field	25%

From the Table 10, wide angle shots are used in 95% of the videos. A broad perspective tells the viewer who is involved, where the action takes place, and when it happens. According to the article "What Is a Wide Shot in Film?, and How do directors use wide shots in filmmaking?" (2021, May 13), retrieved from https://www.masterclass.com/article/whatis-a-wide-shot-in-film-how-directors-use-wide-shots-in-filmmaking. Additionally, according to the article "Film 101: what is a Medium Shot," 90% of the videos employed a medium shot. "A Comprehensive Guide to Using A Medium Shot in Film." (2020, November 8). Taken from the article https://www.masterclass.com/articles/film-1010-what-is-a-medium-shot-understandingthe-essentials-of-using-a-medium-shot-in-film, the study finds that a medium shot, sometimes referred to as a mid-shot or waist shot, is a camera shot that shows an actor from the waist up in both cinema and television. A medium shot is intended to highlight the performer and their surroundings by giving them both an equal prominence on screen. Moving on to close up shot, 35% of videos utilised extreme close-up shots, while 65% of videos used close-up shots. In television and movies, close-up shots are a type of camera shot that gives a scene more emotion. In addition to giving the viewer a chance to notice subtleties in the subject's face that they may miss in a wide, long, or full shot, this enables the actor to establish a strong emotional bond with them. Last but not least, only 25% of their film made use depth of field, which might be used to get more respectably sharp shots in less time. A large depth of focus is another name for this, and some cinematographers would just call scenes with a large DOF "depth". This method is also known as deep focus.

These features align with the findings of previous studies and confirm their relevance in the context of photography education. A well designed tutorial videos not only convey technical knowledge but also foster a more immersive and engaging learning experience.

5 CONCLUSIONS

This study identified and confirmed seven critical features that contribute to the effectiveness of studio lighting tutorial videos. As photography education continues to evolve with digital tools, these findings can inform the development of higher quality educational videos. Educators and content creators are encouraged to incorporate these elements to enhance learning outcomes, especially in skill based disciplines.

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From Verbs to Validity: Developing the Wheel for Integrated Scaffolded Evaluation through CEFR and Bloom Linked Reference (WISE-CB)

***Amer Fawwaz Mohamad Yasid[1], Nurul Kamalia Yusuf[2], Raja Mayang Delima Mohd Beta[3]**

**Faculty of Administrative Science and Policy Studies, Universiti Teknologi MARA Cawangan Negeri Sembilan, Kampus Seremban*
Academy of Language Studies, Universiti Teknologi MARA Cawangan Negeri Sembilan, Kampus Seremban
Faculty of Business and Management, Universiti Teknologi MARA Cawangan Negeri Sembilan, Kampus Seremban

amerfawwaz@uitm.edu.my[1], nurulkamalia@uitm.edu.my[2], drmayang@uitm.edu.my[3]
***Corresponding Author**

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ABSTRACT

Bloom's Taxonomy (BT) has been an important part of designing assessments in higher education for a long time. It offers a coherent method for mapping assessment items to specific learning domains or different areas of learning. However, some lecturers continue to have difficulties in its successful application, frequently resulting in examinations that inadequately align with students' language preparedness or cognitive abilities. To tackle this problem, this study presents the Bloom's Taxonomy–CEFR Reference Kit (WISE-CB), a novel instrument aimed at improving the ability to assess and minimising discrepancies in exam development across higher education programs. The study utilised a qualitative content analysis, bolstered by an extensive literature survey, which incorporated educational taxonomies, lexical frameworks, and psycholinguistic components. The research design unfolded in five phases: (1) identification of BT verbs from foundational and contemporary sources; (2) integration of these verbs with CEFR vocabulary levels (A1–C2) to ensure linguistic appropriateness for diploma, undergraduate, and postgraduate learners; (3) evaluation of verb suitability using Cognitive Load Theory to balance working memory demands with task complexity; (4) expert classification and validation by instructional design and English Language Teaching specialists; and (5) development of the Reference Kit, visually represented as a wheel, to serve as a practical scaffold for lecturers in exam question design. The results show that connecting Bloom's cognitive domains with CEFR levels and cognitive load considerations in a systematic way is a new addition. The Reference Kit offers a proven, reproducible framework for higher education lecturers by placing assessment verbs within both cognitive and language dimensions. This invention improves assessment practices, encourages fair testing for students with different levels of skill, and pushes for new ways to instruction in higher education.

Keywords: *Bloom's Taxonomy, Higher Education Assessment, CEFR (Common European Framework of Reference), Cognitive Load Theory, Assessment Innovation*

1 INTRODUCTION

Continuous assessment is extensively utilised in higher education to monitor student learning throughout the semester. Nonetheless, the final examination persists as one of the most common and conventional methods of evaluation in universities globally. In Malaysia, final examinations are compulsory at public universities, including Universiti Teknologi MARA (UiTM), and are often conducted in written format, contingent upon the discipline and program. Formulating good exam questions needs both topic mastery and the ability to align questions with suitable levels of cognitive complexity. Bloom's Taxonomy, created by Benjamin Bloom, has been widely utilised as a framework for developing examination questions at both undergraduate and postgraduate levels. Despite its prevalent application, issues persist in guaranteeing that exam questions constantly correspond with the designated learning outcomes and students' actual competence levels. Research and internal evaluations reveal that certain lecturers have difficulties in the proper implementation of Bloom's Taxonomy, leading to questions that are either excessively linguistically challenging or misaligned with the designated cognitive domain. This challenge is exacerbated by insufficient training and the lack of systematic tools that link cognitive complexity with language accessibility (Sulaiman et al., 2025)

Current tools and frameworks have advanced in tackling this junction. The L-TRU framework, an adaptation of Schoenfeld's TRU framework, emphasises the interaction between cognitive demand and language support across five dimensions: Mathematical Richness, Cognitive Demand, Equitable Access, Agency, and Use of Student Contributions (Prediger & Neugebauer, 2020; Neugebauer & Prediger, 2022). L-TRU, albeit valuable, largely focusses on mathematics education and does not immediately apply to larger exam design methods across higher education fields. Research in foreign language teaching indicates that digital tools and cognitive methods can improve memory, attention, and motivation while alleviating cognitive load (Broda, 2025; Gennari, 2025; Abad-Castro, 2025). These findings emphasise the necessity of integrating assessment design with cognitive and language support, albeit they remain disjointed and specific to particular disciplines.

Neurolinguistic research substantiates that cognitive load directly affects language processing in the brain, with differing demands either enhancing or obstructing comprehension based on learner proficiency (Mofrad & Schiller, 2019; Kuhlen & Rahman, 2023). In practice, higher-order cognitive demands are frequently inadequately represented in English language instruction materials and assessments (Glušac et al., 2019; Xie, 2024), creating a disparity between theoretical insights and classroom realities. These studies collectively indicate that, despite the existence of frameworks and methodologies, there is no cohesive, practical, and scalable instrument that systematically integrates Bloom's Taxonomy, CEFR language levels, and cognitive load considerations for the design of assessments in higher education. This study fills the void by presenting the Bloom's Taxonomy–CEFR Reference Kit, a proven and practical instrument intended to assist higher education instructors in test formulation. The kit integrates Bloom's cognitive domains with CEFR vocabulary levels and Cognitive Load Theory, offering a structured, replicable framework for instructors to create exam questions that are cognitively demanding and linguistically comprehensible. This invention enhances assessment literacy, fosters equity for learners with diverse proficiency levels, and improves pedagogical methods in higher education.

1.1 Research Objective

1. To determine which verbs in Bloom's Taxonomy are acceptable for students' linguistic and cognitive levels by classifying them according to cognitive levels and matching them to CEFR competence bands (A1-C2).

2. To create and verify a Bloom's Taxonomy-CEFR Reference Kit that helps instructors at UiTM create test questions that strike a balance between cognitive load, vocabulary accessibility, and cognitive demand.

2 LITERATURE REVIEW

The design of assessments in higher education should go beyond the evaluation of learning outcomes. Assessment design should demand involvement of the learner's thought processes and flexibility. The combination of Bloom's Taxonomy, the CEFR, and CLT offers a rich basis for designing assessments that aim to meet the diverse needs of learners. This review brings together essential theories and contemporary studies (2020-2025) to illuminate their use, approaches, and consequences for equitable assessment practices.

2.1 Bloom's Taxonomy in Exam Design

Bloom's Taxonomy was created by Benjamin Bloom in 1956 and identifies the cognitive skills in levels that range from lower to higher order skills.

		THE KNOWLEDGE DIMENSION			
THE COGNITIVE PROCESS DIMENSION		Metacognitive	Procedural	Conceptual	Factual
	Remember	Recall	Recognise	List	Remember
	Understand	Predict	Clarify	Classify	Summarise
	Apply	Use	Carry Out	Provide	Respond
	Analyse	Deconstruct	Integrate	Differenciate	Select
	Evaluate	Reflect	Judge	Determine	Check
	Create	Create	Design	Assemble	Generate

Figure 1 The Revised Bloom's Taxonomy
Source: Adapted from Munzenmaier & Rubin, 2013, p. 22

The Revised Bloom's Taxonomy is more comprehensive to describe the levels of learning. This is because learning is classified into levels through two dimensions which are types of knowledge and cognitive process. According to Munzenmaier and Rubin (2013), the revision of the taxonomy is significant to reconsider the value of the taxonomy in the development of accountable programmes, the alignment of curriculums, and the design of assessments. Moreover, Munzenmaier and Rubin (2013) state that it is important to revise the original taxonomy based on new learning understanding and new instructional methods. Since the use of online instructional games has increasingly gained interest for learning, the Revised Bloom's Taxonomy is notably applicable for this new learning approach that takes place in the new learning environment which occurs virtually. Bloom's Taxonomy has been used in teaching and learning pedagogy for a long time, and has a diverse and extensive use in exam creation. More and more studies now illustrate its use in different fields.

2.2 Applications in Assessment Design

2.2.1 Question Design

Assessments in the Bloom's framework can range from the most basic cognitive processes of remembering to more complex one of creating (Pizà-Mir, 2022; Abdulrahman, 2023) (Abdulrahman, 2023; (Gani et al., 2022). Research shows that assessments that aim to test higher order thinking skills improve critical thinking and performance in academic work Abdulrahman, 2023.

2.2.2 Automated Tools

The creation and growth of technology have led to the availability of automated classification tools aimed at categorizing exam questions according to Bloom's taxonomy.

As an example, Gani et al. (2022) used machine learning techniques for classifying exam questions, which made the construction of exam papers at various cognitive levels more efficient. Though, the varying levels of experience and belief as to the effectiveness of the tools used raise barriers to the use of these tools (Baharuddin & Naufal, 2023). Evidence of Recent Research A systematic review by Pizà-Mir (2022) stated that assessments based on Bloom's Taxonomy proved to be more engaging and satisfying for students than traditional assessment methods. Reports also suggest that more refined assessments positively impact learning outcomes for students across various disciplines such as STEM and the humanities (Abdulrahman, 2023; Baharum et al., 2021, Zhongyao et al., 2024). Recent scholarly work has shed more light on the use of Bloom's Taxonomy for exam construction, highlighting its enhancement of cognitive activities and the overall learning outcomes. This section centres on assessing the most recent research from the last few years which has prepared ground-breaking findings on the practical application of Bloom's increases cognitive processes framework toward educational assessments. Effective Questioning Strategies Doðan et al. (2023) studied the processes whereby pre-service teachers of English Language Teaching (ELT) engage Bloom's Taxonomy and questioning at the same time.

The research showed that although most teachers recognized how crucial it was to include higher-order questioning, there was a great deal of variance in how it was incorporated in assessments. Bloom's concepts of effective questioning were employed during teacher training, which leads to the conclusion that in Bloom's framework should be incorporated in the pre-service training pedagogy as it could greatly improve the quality of instruction and the level of student engagement. This evidence further supports the need to utilize Bloom's Taxonomy in crafting assessments that foster the development of critical thinking Doğan et al (2023). Application in (Banda et al, 2023) investigated the use of Bloom's Taxonomy in the subdividing of the cognitive process development continuum among college level learners. The results showed how most educators attempted to use Bloom's taxonomy principles in describing the structure of the course and assessments and were quick to point lack of training as the chief reason. This research supports the need for training programs designed to teach educators Bloom's Taxonomy in order to extend its use to construct more effective learning activities and assessment activities, culminating in greater emphasis on evaluation of student learning outcomes (Banda et al, 2023).

3 LINGUISTIC ASPECTS OF BLOOM'S TAXONOMY AND BLENDED LEARNING

Pikhart and Klímová (2019) studied the use of linguistic components of Bloom's Taxonomy in blended learning. They discovered how as much as incorporating Bloom's terminology improved course design and improved student engagement, it was the systematic approach that really enhanced the course design. These results indicate that Bloom's pervasive taxonomy may provide closure and broaden the framework's impact on language, understanding and application, hence the value added by Bloom's Taxonomy to assessment design in current educational practices (Pikhart & Klímová, 2019). The impact on incorporating Cognitive Load Theory (CLT) on assessment tasks designed around Bloom's Taxonomy within microlearning modules was illustrated in (Lopez, 2024). The study emphasized that the cognitive level of the assessment tasks and the students' level of learning should be matched in order to achieve optimal retention and understanding. It was established in this research that through the application of CLT to Bloom's Taxonomy, there is an imbalance between cognitive load and cognitive objectives, hence the need to add reframed CLT and Bloom's Taxonomy as educational frameworks to the discourse on integrating cognitive theory with assessment design (Lopez, 2024).

Asma and Sarnou (2020) focused on the application of Cognitive Load Theory as an Instructional design framework and critiqued it to Bloom's Taxonomy to form an integrated assessment framework. It was emphasized that there is a need to understand the cognitive architecture of students in order to design assessments that do not bombard the learners, but rather, foster learning environments. The relationship between CLT and Bloom's Taxonomy further suggests grounding assessments in theoretical frameworks can be productive, particularly in relation to Bloom's Taxonomy, which continues to remain useful and versatile in use. Such frameworks are especially garnered towards assessments, and hence, educators, and especially, Bloom's Taxonomy, need to be equipped with such frameworks. This professional neglect, in addition to the lack of evidence of student-centered approaches as professional development, demonstrates improvement prospects. Integrating Bloom's Taxonomy with other frameworks, particularly CLT, opens new avenues for further development and refinement of learning assessments to foster and promote learner-centred outcomes and experiences.

3.1 CEFR in Language Proficiency Alignment

The CEFR offers an effective and comprehensive framework to assess and relate language proficiency in different contexts. Having been developed in the 1990s, it has gained a lot of prominence and recognition, especially as the need for a unified and standardized language assessment grows.

3.2 Assumption of Language Proficiency

3.2.1 Alignment of Assessments.

In developing language assessments, specific proficiency levels must be identified and aligned to the respective level on the CEFR since it is a mapped framework of language proficiency levels (blinded citations, 2024). The illustrative case of the role of CEFR framework in the rest of Marzaini and Yusoff (2022) in Malaysia clearly demonstrates the role of the framework in improving understanding and the implementation of the assessment of language proficiency by teachers (Marzaini & Yusoff, 2022).

3.2.2. Enhancing Outcomes of Learners.

Language acquisition and learner motivation has advanced due to the positive implementation of fully aligned CEFR assessments. Learners’ work and research clearly show that descriptors do serve to guide teachers in the production of appropriate assessments needed by the learner’s scaffolding assessment because of the proficiency levels identified (blinded citations, 2024).

3.3 Issues and Implications

Though positive, the implementation of CEFR still faces harsh criticism concerning its intricacies and the obstacles of consistent use. The difference in opinions that teachers have within a group, and miss out on achieving the correct assessment and evaluation on the learner, underscores the need to change the language on the topic to zealous nurturance of the underpinning professional aims.

3.4 Task Difficulty and Cognitive Load Theory

Managing the intricacy of the tasks to be done, within Cognitive Load Theory, is a fundamental aspect of learning that must be taken into serious consideration. Assessments should ensure appropriate levels of mental effort to encourage effective learning experiences (Sweller, 1988; Huang et al., 2024) (Mohammed & Omar, 2020) (Herrmann-Werner et al., 2023).

3.4.1 Balancing Cognitive Load in Assessments

3.4.1.1 Task Design

Effective assessment design requires careful attention to the cognitive load placed on students. Retention and comprehension are improved when the underlying cognitive load of an assessment is understood. Mohammed and Omar (2020) analyse the relationship between Bloom's

Taxonomy and cognitive load in exam question design and emphasize the importance of applying a 'moderate' approach relative to the learner's working memory (Mohammed & Omar, 2020).

3.4.1.2 Adaptive Learning

Huang et al. (2024) examine adaptive assessment techniques where the level of the task is altered during performance according to an analysis of the learner's current actions in real time. Targeted learning is likely to occur because cognitive overload is minimized and a more individualized assessment is provided (Herrmann-Werner et al., 2023).

Future research should seek to clarify the relationships between cognitive load elements, Bloom's taxonomy, and the CEFR framework. It is also the case that the mechanisms to implement this cognitive load management are particularly limited and require urgent attention.

3.5 Existing Tools: Strengths and Weaknesses

Several frameworks and tools designed in instruments to help educators pivot around Bloom's Taxonomy, CEFR, and CLT are Bloom's Wheels, the L-TRU model, and assessment tools with AI capabilities.

Bloom's Wheels. Bloom's Wheels are graphic tools that depict the various capabilities within the cognitive domain to assist teachers in setting assignments and tests that target specific levels within the domain. While their design is functional and informative, and their use saves time and effort, their rigid format is not able to account for the state of constant change that characterises the educational environment.

The L-TRU Framework incorporates Bloom's Taxonomy in language responsive teaching whereby it includes dimensions of fairness and equity, as well as student participation. While it has been claimed that it fosters equity, it is apparent that its use is designed with the expectation that teachers have undergone considerable training (Prediger & Neugebauer, 2020; Neugebauer & Prediger, 2022).

While these tools provide automated and, in most cases, scalable approaches to the evaluation of assessment instruments, their lack of clarity in proprietary algorithms lowers educators' acceptance of AI-generated suggestions. Most AI in education equity and inclusivity need to be addressed (Herrmann-Werner et al., 2023).

3.6 The Need for an Integrated Tool: The Wheel for Integrated Scaffolded Evaluation through CEFR and Bloom Linked Reference (WISE-CB)

Even with the successes that are represented in these tools and frameworks, there is a need for practicality and fully integrated and cohesive set of instruments for Bloom's Taxonomy, CEFR, and Cognitive Load Theory. The aforementioned The Wheel for Integrated Scaffolded Evaluation through CEFR and Bloom Linked Reference (WISE-CB) aims to encompass a wide range of resources for educators to develop assessments that are balanced cognitively, linguistically, and pedagogically appropriate. As a flexible reference tool, WISE-CB would assist educators in designing assessments that adequately meet the different complexities of learners and promote equitable assessment practices.

The interweaving of Bloom's Taxonomy, CEFR, and Cognitive Load Theory are pivotal in advancing the appreciation of assessment practices in higher education and in most paradigms, always remains a work in progress. Many tools exist to aid practitioners and educators but the absence of a unifying mechanism synthesizes and reframes their potential to positively affect the educational opportunities and advancements of learners. The Wheel for Integrated Scaffolded Evaluation through

CEFR and Bloom Linked Reference (WISE-CB) aims to offer educators a framework to develop assessments that are aimed at measuring learning effectively and equitably at every level of the learning process.

4 METHODOLOGIES

4.1 Research Design

The method of this study is based on a qualitative content analysis using a full literature review. This approach involves collecting and analysing data from academic publications such as online databases, reports, and other credible media sources to explore the previous research relevant to the study. This enables a systematic and in-depth examination of the linguistic features that cannot be adequately captured through a quantitative approach (Wildemuth, 2016, as cited in Mohd Farhan Abd Rahman et al., 2025). Specifically, the analysis focuses on identifying and classifying Bloom’s Taxonomy verbs according to CEFR levels and cognitive load. This method integrates educational taxonomies, lexical frames, and psycholinguistic theoretical constructs to support target vocabulary analysis that not only reflects cognitive complexity but also aligns with learners’ language proficiency levels.

4.1.1 Phase 1: Identification of Bloom’s Taxonomy Verbs

The initial framework (Bloom, 1956), its refinement (Anderson & Krathwohl, 2001), and later modifications in educational research (Krathwohl, 2002; Adams, 2015; Ramirez, 2016) were all included in the comprehensive evaluation of important and recent publications on Bloom's Taxonomy. Core action verbs that embody the six cognitive domains-Remember, Understand, Apply, Analyse, Evaluate, and Create-were extracted using this approach. To guarantee validity and consistency, each verb was recorded and cross-referenced across sources.

4.1.2 Phase 2: Integration with CEFR Vocabulary Levels

Combining CEFR Vocabulary Levels with Each of Bloom's verbs was compared to the Cambridge English Online Dictionary and CEFR wordlists in order to match them with the language proficiency of the learners. Verbs were grouped based on their lexical complexity in accordance with CEFR guidelines:

1. Degree (A1-B2);
2. Postgraduate (A1-C2);
3. Diploma (A1-B1).

This made sure that, according to the learners' stage of study, the suggested verbs were both linguistically accessible and mirrored cognitive levels. High-frequency verbs like list (A1), for instance, were mapped to the "Remember" domain, whereas more complicated verbs like synthesise (C1-C2) were allocated to the "Create" domain.

4.1.3 Phase 3: Cognitive Load Consideration

Verb matching with CEFR levels was assessed using the Cognitive Load Theory (Sweller, 1988; Paas & Ayres, 2014). To make sure that exercises do not exceed working memory capacity, verbs that need higher-order thinking (such as evaluate, hypothesise, and design) were evaluated against learners' expected proficiency. By guaranteeing a smooth transition from lower-order verbs that are suitable for beginning learners to higher-order verbs that are suitable for advanced learners, this step addresses intrinsic and extraneous load.

4.1.4 Phase 4: Classification and Verification

The identified verbs were categorised based on CEFR levels and Bloom's hierarchical domains. Subject-matter experts in instructional design and English Language Teaching (ELT) were consulted in order to conduct expert validation. The professionals evaluated the mapping's suitability, guaranteeing linguistic and educational accuracy.

4.1.5 Phase 5: Development of the Reference Kit

The last step was to combine the verified verbs into a Bloom's Taxonomy–CEFR Reference Kit, which was displayed graphically as a wheel. This tool is intended to:

1. Help instructors choose verbs that are both linguistically and pedagogically appropriate.
2. Provide helpful advice on how to create exam questions that strike a balance between learner proficiency and cognitive demand.
3. Act as a scaffold to lessen unnecessary mental strain while maintaining the emphasis on content engagement.

5 OUTCOMES

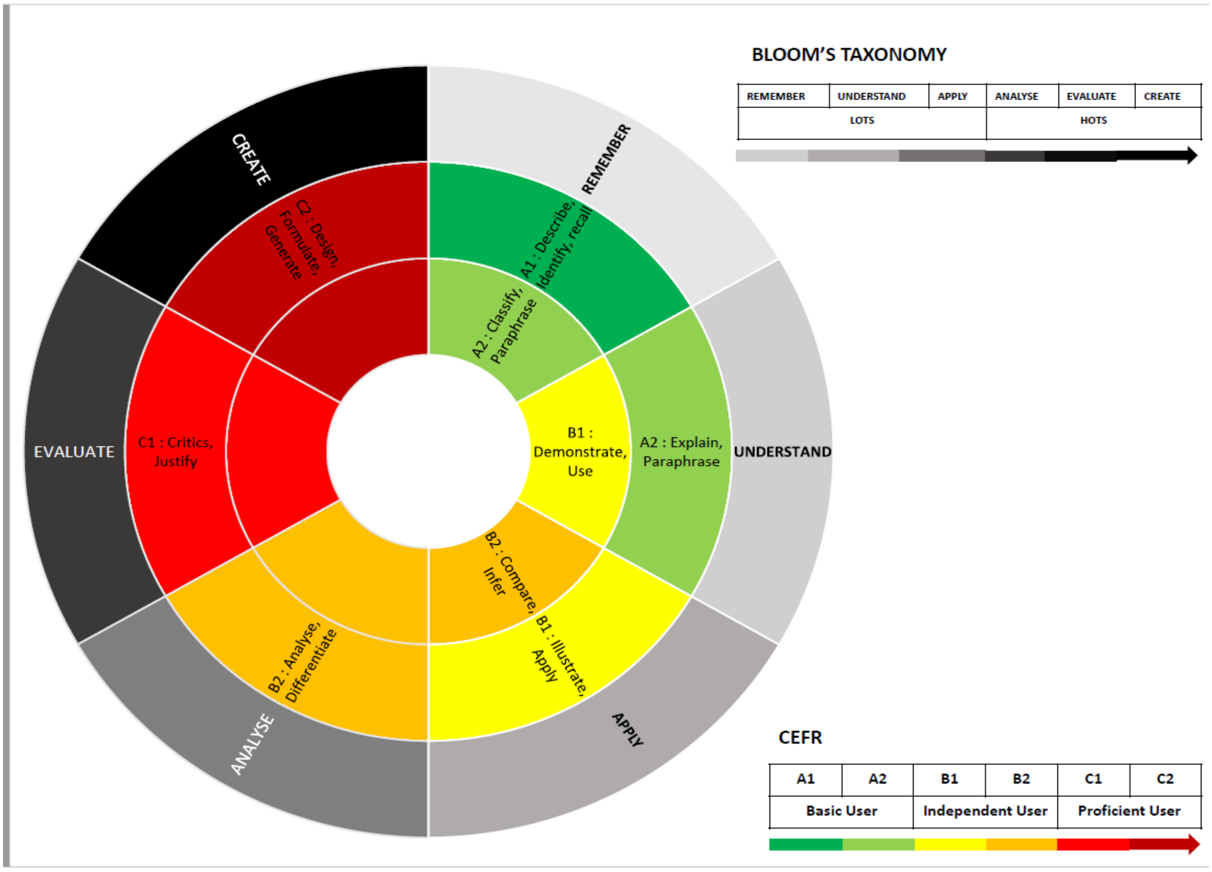

Figure 1 The Wheel for Integrated Scaffolded Evaluation through CEFR and Bloom Linked Reference (WISE-CB)
Source: Developed by the researcher (2025)

The results of this study provide evidence that Bloom's Taxonomy, CEFR, and Cognitive Load Theory all integrated into one and linked with a tool, creates a validated framework to enhance assessment literacy in higher education. The Wheel for Integrated Scaffolded Evaluation through CEFR and Bloom Linked Reference (WISE-CB) empowers lecturers in Bloom’s taxonomy to methodically choose action verbs and design exam questions that are linguistically easy and cognitively challenging. The wheel aligns CEFR proficiency levels with Bloom’s taxonomy so that in all stages–diploma, undergraduate, and postgraduate–learners are assessed through tasks that represent their actual language and cognitive readiness. This alignment mitigates exam expectation and student performance mismatches, thus contributing to the attainment of a fairer and equitable assessment.

WISE_CB’s practical significance is that it extends the innovative assessment design discourse in higher education. The tool implemented innovative frameworks approach to assessment design beyond single institutions and disciplines. The wheel, through expert validation and theoretical grounding, accentuates the need to incorporate linguistic and cognitive scaffolding to enhance learning. Thus, the study outlines the steps lecturers can follow to provide innovative quality assessments that encourage the students to engage in deeper learning while enabling the institutions to achieve their goals of inclusive and transparent evaluations.

6 CONCLUSIONS

The present research attests to the need for inclusion of the cognitive, linguistic, and instructional aspects when designing assessments for higher education. Bloom's Taxonomy has continued to serve as a foundation for assessing higher order thinking, although there has been a considerable gap in its use due to a disconnect between the language used in assessments and students’ language proficiency, as well as a lack of adequate cognitive load evaluation. The Wheel for Integrated Scaffolded Evaluation through CEFR and Bloom Linked Reference (WISE-CB) simultaneously fills these gaps, offering gap-bridging assessment frameworks for CEFR level aligned argumentation in an instructional and research context. By doing so, the present research articulates that WISE-CB enhances assessment literacy and fosters greater equity and inclusivity in assessment and framework use. Its ease of adaptation in and across programs and institutions positions it as an important framework to assess thinking at the higher instructional levels, while also reflecting the learners’ level of understanding. This research asserts that steady advancement in teaching and learning frameworks for the 21st century is attained by demonstrating that Bloom's cognitive levels, CEFR proficiency levels, and cognitive load theory remain interrelated, thus achieving an integrated framework for streamlined application.

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Amer Fawwaz bin Mohamad Yasid developed the Wheel for Integrated Scaffolded Evaluation through CEFR and Bloom Linked Reference (WISE-CB). Nurul Kamalia Yusuf developed the Structure of the articles including Literature Review, Methodology Section and Proofing of the articles. Raja Mayang Delima Mohamad Beta contributed on the idea toward the development of WISE-CB model.

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There was no conflict of interest.

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Analysing Call-to-Action (CTA) Design in Sign Language Content on Social Media in Malaysia

Nur Hanisah binti Rasif[1], Nabila Aimi binti Mohamed Ghazali[2], *Sharkawi Che Din[3]
College of Creative Arts, Universiti Teknologi MARA, Selangor Branch, Puncak Alam Campus, Selangor, Malaysia

[1]2023600536@student.uitm.edu.my, [2]nabilaaimi@uitm.edu.my, [3]sharkawi237@uitm.edu.my
***Corresponding author**

ABSTRACT

This study explores the effectiveness of Call to Action (CTA) design in Malaysian Sign Language (MSL) content on social media platforms, focusing on accessibility for the Deaf and hard-of-hearing (DHH) community. Many sign language campaigns in Malaysia still rely heavily on plain text-based CTAs, which limits their ability to engage DHH audiences effectively. In a digital era where social media plays a key role in education and public outreach, the absence of visually accessible CTAs presents a significant barrier to inclusion. To address this issue, this study employed a qualitative content analysis of ten purposively selected social media posts—five from TikTok and five from Instagram—featuring sign language content related to awareness and education. The analysis was guided by five core CTA principles: intuitiveness, aesthetic appeal, attention-grabbing features, low design friction, and clarity. The results revealed that posts with visually integrated CTAs, such as QR codes and direct phrases like "Register here" were more effective in prompting user action. TikTok posts demonstrated stronger engagement due to dynamic visual elements, while Instagram posts often lacked visual cues and emotional tone. Although most posts followed a clean visual structure, few utilized storytelling or motion graphics to improve clarity. The study concludes that incorporating intentional visual design in CTA elements can significantly enhance inclusivity and interaction, helping sign language content resonate more effectively with both DHH individuals and the public.

Keywords*:* *Call-to-action, Sign language, Social Media Content.*

1 INTRODUCTION

Call-to-Action (CTA) design plays a crucial role in digital engagement, guiding users to take specific actions, whether signing up, sharing content, or exploring further. Traditionally, CTAs rely on buttons, links, or visual prompts, but their effectiveness hinges on thoughtful design. Mejtoft et al. (2021) emphasize that the most successful CTAs are intuitive, transparent, and visually appealing, reducing friction while building trust. Research suggests that CTAs can also inspire deeper user engagement by enhancing social interaction and community participation, especially when paired with visually appealing content (Oltra et al., 2021). However, a critical gap remains in how these design principles are implemented in Malaysian sign language content, often failing to meet the expectations of the DHH community. Many CTAs targeting Deaf and hard-of-hearing (DHH) audiences still default to text-heavy formats, overlooking the visual communication needs central to this community.

An effective CTA does more than prompt action; it creates a seamless, inclusive experience. Research highlights five key traits of successful CTAs: intuitiveness, aesthetic appeal, attention-grabbing design, low design friction, and high explainability and honesty (Mejtoft et al., 2021). When applied to sign language content, these traits can help transform static campaigns into interactive and inclusive platforms. However, sign language content in Malaysia still often lacks these features. Studies show that many awareness efforts rely primarily on plain text, which limits their ability to engage and inform DHH audiences effectively (Ahmad Mustafa et al., 2023).

This challenge is further compounded by limited public understanding of Bahasa Isyarat Malaysia (BIM), the official sign language and natural means of communication for the Malaysian Deaf community (Sardi et al., 2022; Chong, 2018). In English-language contexts, BIM is often referred to as Malaysian Sign Language (MSL), both terms describe the same visual-gestural language and are used interchangeably in academic literature. Unlike spoken Malay, BIM/MSL has its own grammar, sentence structure, and linguistic rules, distinguishing it clearly from Kod Tangan Bahasa Malaysia (KTBM), which is a manually coded system created for classroom use (Chong, 2018). It follows the structure of the Malay language, using signs and fingerspelling to assist Deaf students in learning written Malay. However, KTBM lacks the natural fluency and expressive depth of BIM/MSL as used in everyday life (Sardi et al., 2022). Motion graphics and visual storytelling techniques have been shown to support comprehension among DHH learners (Musa, 2024), yet these strategies remain underutilized in CTA design. Without visually intuitive CTAs, social media campaigns risk alienating the very communities they aim to support. The deaf community's access to BIM in mass and social media remains limited, contributing to the lack of inclusive communication strategies (Chong, 2018).

In conclusion, rethinking CTA design through accessibility principles is vital for improving inclusion in sign language content on Malaysian social media. By adopting visually engaging, low-friction CTAs that align with the needs of DHH users, content creators can ensure that messages are not only seen but understood. To be truly effective, CTAs must be designed with the audience in mind, especially when that audience communicates visually.

2 LITERATURE REVIEWS

Call-to-Action (CTA) design plays a critical role in visual communication, especially on social media platforms such as Instagram and TikTok. It helps guide users toward actions like engaging with content, following accounts, or accessing linked resources. For sign language content, however, CTA design often lacks the visual clarity and accessibility needed to effectively reach Deaf and hard-of-hearing (DHH) users. This gap in visual accessibility echoes findings in education, where DHH learners face similar barriers due to limited access to materials in BIM (Ismalyza et al., 2024). Research highlights the importance of visual communication for DHH individuals (Musa, 2024), yet many CTAs in Malaysian sign language content rely heavily on plain text. Text-heavy communication fails to support DHH learners' preferences for visual materials and BIM-based explanation (Ismalyza et al., 2024). This mismatch between the communication mode of the content and the design of its CTAs poses a significant barrier to inclusive engagement, creating missed opportunities for awareness and community participation (Ismalyza et al., 2024).

In response to this gap, this study conducted a qualitative content analysis of 10 samples, 5 from TikTok and 5 from Instagram, that feature Malaysian Sign Language (MSL) content. The samples were examined using CTA design criteria proposed by Mejtoft et al. (2021), including intuitiveness, honesty and clarity, aesthetic appeal, attention-grabbing features, and appropriate design friction. The analysis identified trends across platforms: Instagram CTAs were generally static and text-dependent, often placed in captions or hashtags without visual prompts. In contrast, TikTok content showed more experimentation, using motion graphics and gestures to guide user actions. However, even in TikTok samples, there was a lack of consistency in design, with visual CTAs often poorly placed or not clearly linked to the intended action.

A review of the literature reveals both potential and limitations in current approaches. For example, Setyawan et al. (2024) found that motion graphics can significantly enhance comprehension among DHH users in educational settings. Similarly, Sardi et al. (2022) noted that the general public's limited knowledge of MSL contributes to communication gaps, suggesting that better-designed CTAs could help bridge this divide. Despite growing recognition of the value of accessible design, many content creators lack awareness or resources to implement inclusive CTA strategies effectively. A lack of formal training in sign language among educators reflects a broader gap in accessibility design; similarly, many digital content creators lack the resources or awareness to develop CTAs that accommodate DHH communication needs (Izuli et al., 2020, p. 21). This points to a broader challenge in digital inclusion: while some creators are beginning to adopt visual approaches, most still default to text-heavy methods, which fail to meet the needs of DHH audiences.

This study is grounded in visual communication theory and the CTA framework developed by Mejtoft et al. (2021), offering a structured lens through which to analyse digital sign language content. The qualitative method enables an in-depth exploration of how CTA elements are used, or neglected, on platforms that prioritize visual storytelling. By identifying design gaps and inconsistencies, the research aims to inform best practices that make CTAs more effective, intuitive, and inclusive for DHH users. This not only supports broader accessibility goals but also contributes to more engaging and equitable communication across Malaysian social media platforms.

2.1 Understanding Call-To-Action (CTA) Design

Call-to-Action (CTA) elements are strategic prompts used to guide user behaviour. They typically appear in the form of buttons, links, or visual cues and are used extensively in marketing, web interfaces, and multimedia communication. According to Mejtoft et al. (2021), effective CTAs share five main characteristics: intuitiveness, aesthetic appeal, attention-grabbing features, low design friction, and clarity. These components work in tandem to improve usability and encourage audience interaction without cognitive effort.

In digital media, particularly on social platforms, CTAs serve not only functional but also persuasive roles. They are crafted to trigger psychological responses such as curiosity or urgency. Despite these design strategies, CTAs in sign language content often remain text-heavy or poorly positioned, making them less effective for DHH users who rely on visual modes of communication. Clear CTA messages ensure that users understand the intended action and feel motivated to follow through, highlighting clarity as a key factor in conversion (Dindar, 2024). Although not focused on sign language, Ahmad Mustafa et al. (2023) emphasize that relying solely on text increases confusion and reduces clarity, highlighting the broader importance of integrating visual elements to improve communication effectiveness.

2.2 Understanding Call-To-Action (CTA) Design

Malaysian Sign Language (BIM/MSL) is the primary mode of communication within the Deaf community in Malaysia. Unlike written or spoken language, BIM/MSL is inherently visual and spatial, depending on hand shapes, movements, facial expressions, and body language. As such, the integration of text-based CTAs without visual synchronization often results in miscommunication or disengagement.

Studies have shown that sign language users process information differently compared to hearing individuals. Sardi et al. (2022) argue that limited public knowledge of BIM/MSL hinders the creation of inclusive content. Content creators unfamiliar with the visual-linguistic structure of BIM/MSL may overlook essential visual cues, leading to CTAs that are not aligned with the natural flow of sign language communication. Furthermore, the use of manually coded systems like KTBM in place of natural sign language can lead to confusion and reduce message clarity. These barriers not only affect comprehension but also diminish the effectiveness of outreach efforts and awareness campaigns.

2.3 Call-To-Action Implementation in Sign Language Content

One of the main challenges in designing CTAs for sign language media is the lack of integration between visual storytelling and interactive elements. While platforms like TikTok and Instagram have enabled broader access to sign language content, many CTAs are still placed in captions or end screens, separate from the main visual narrative. Ahmad Mustafa et al. (2023) noted that most content creators continue to use conventional CTA formats such as “link in bio” or plain text overlays, which may not be visually intuitive for BIM/MSL users focused on dynamic hand movements and expressions.

Furthermore, current design practices seldom include motion graphics or icons that are tailored to the visual processing styles of DHH audiences. This reflects broader findings that CTA elements with strong visuals and urgency can significantly increase impulsive interaction and click-through behaviour (Dindar, 2024). Mejtoft et al. (2021) suggest that for CTAs to be effective, they must minimize cognitive effort and enhance usability. However, in sign language videos, static or unsynchronized text CTAs can interrupt visual flow—especially when not designed to complement the signer’s movement or facial cues. This challenge is amplified when creators unknowingly treat BIM/MSL and KTBM as interchangeable systems, overlooking the need for fluid, visually engaging communication in Deaf-centred media.

3 RESEARCH METHODOLOGY

To explore the effectiveness of Call-to-Action (CTA) design in Malaysian sign language content, this study adopts a qualitative content analysis approach. Content analysis is well-suited for examining visual and communicative patterns within digital media, particularly when assessing user engagement and design features (Mejtoft et al., 2021). A total of 10 social media postings were purposively selected—five from TikTok and five from Instagram—reflecting their popularity among Malaysian users and their frequent use for public awareness and community outreach. The selected postings feature content presented in Malaysian Sign Language (BIM/MSL), covering themes such as education, health messaging, and social inclusion. Each sample was analysed using the CTA framework developed by Mejtoft et al. (2021), which includes five core design principles: intuitiveness, aesthetic appeal, attention-grabbing features, low design friction, and high explainability and honesty. These elements were chosen because they provide a comprehensive lens for evaluating both functional clarity and user-centred design. Postings were examined for how these elements were visually integrated, whether through text overlays, icons, motion graphics, or signer gestures, and how effectively they guided viewer attention and action. Special attention was given to the alignment between the signer’s visual cues and the placement of CTA elements, as misalignment may lead to confusion or disengagement, particularly for Deaf and hard-of-hearing (DHH) audiences. This method enables a detailed, contextualized understanding of how CTA strategies perform in real-world sign language content, highlighting both best practices and common shortcomings. By focusing on actual social media posts, this study not only addresses a critical gap in accessibility design but also aims to provide actionable insights for content creators seeking to improve inclusive engagement in Malaysia’s digital landscape.

4 RESEARCH DESIGN

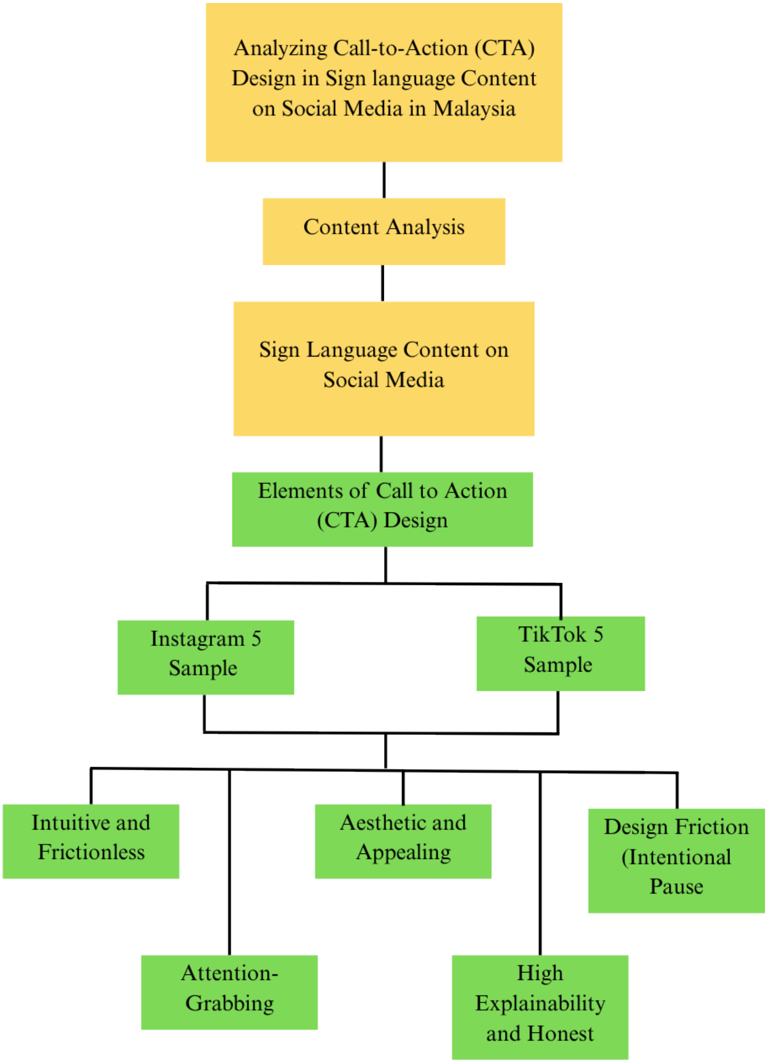

Figure 1 Research Process (Source: Mejtoft et al., 2021)

5 SELECTION OF SAMPLES

Ten social media posts from 2020 to 2025 were selected from Instagram and TikTok, focusing on Malaysian Sign Language awareness. Each was analysed for its call-to-action (CTA) effectiveness in promoting inclusive communication through visual design and engagement strategies.

Table 1 TikTok and Instagram Sampling Details

No	Post Title	Date Posted
1	 Post Owner: Pusat Aspirasi Anak Perak (PASAK)	14 November 2024
2	 Post Owner: amarupnm	30 April 2024
3	 Post Owner: Pusat Aspirasi Anak Perak (PASAK)	14 November 2024
4	 Post Owner: ivsa.kelantan	29 April 2024
5	 Post Owner: bimmfd	9 January 2024
6	 Post Owner: bp_sydney	19 June 2023

<table>
<tr><th>No</th><th>Post Title</th><th>Date Posted</th></tr>
<tr><td>7</td><td>


Post Owner: signon</td><td>3 May 2025</td></tr>
<tr><td>8</td><td>


Post Owner: psyhdept.help</td><td>17 October 2023</td></tr>
<tr><td>9</td><td>


Post Owner: Ilkbs.bpkb</td><td>16 January 2024</td></tr>
<tr><td>10</td><td>


Post Owner: Ques:internationaluniversity</td><td>30 October 2020</td></tr>
</table>

6 DATA ANALYSIS

		Elements of Call-to-Action (CTA) Design (Mejtoft et al., 2021)				
No	**Instagram/ TikTok Sample**	**Intuitive and Frictionless**	**Aesthetic and Appealing**	**Design Friction (Intentional Pause)**	**Attention - Grabbing**	**High Explainability and Honest**
1	 Post Owner: Pusat Aspirasi Anak Perak (PASAK)	The poster itself lacks direct instruction; users may not immediately know what to do just by viewing the visual. The caption (not shown here) provides direction.	Cartoon visuals and soft colours make the design friendly and culturally inclusive.	Moderate. Users may feel uncertain unless they read additional text, as there's no visible QR code or clickable element in the visual.	Strong. Bold red "FREE!!!" text draws attention quickly, especially effective on TikTok's fast-paced environment.	Relatively clear about what's being offered (a free class), but the absence of full action steps in the image reduces transparency.
2	 Post Owner: amarupnm	The visual includes clear headings and the phrase "Let's Learn Malaysian Sign Language," which gives a good hint of purpose. However, no clear instruction is visible on how to participate (e.g., no link, QR code, or action phrase). This limits its intuitiveness and ease of action.	The design uses professional visuals with good colour contrast and a modern layout. It looks credible and culturally relevant, which enhances its visual appeal.	Medium to high. Users are not told exactly what step to take next, which creates hesitation. Lack of direct CTA button or interaction introduces friction.	Moderate. The layout is clean, and the use of bold headers helps, but the post does not feature high-contrast CTA words ("FREE," "Join Now") that strongly pop out.	The goal of the program is stated, but there is little detail about what the user needs to do or what will happen if they take action. This limits its transparency.

No	Instagram/ TikTok Sample	Intuitive and Frictionless	Aesthetic and Appealing	Design Friction (Intentional Pause)	Attention - Grabbing	High Explainability and Honest
		Elements of Call-to-Action (CTA) Design (Mejtoft et al., 2021)				
3	 Post Owner: Pusat Aspirasi Anak Perak (PASAK)	The post mentions the program name and a registration deadline (“Tarikh tutup pendaftaran: 15 September”) which provides some directional clarity. However, it does not tell users *how* or *where* to register, which weakens the intuitiveness and ease of action.	The design is neat and uses neutral colour tones with formal typography. It appears professional but lacks elements that might emotionally engage younger audiences.	High friction. Users are likely left unsure of the next step — no QR code, no visible link, and no action word (e.g., “Register Now”) means extra effort is needed.	Low to moderate. The header is informative but not bold or colourful enough to stop users while scrolling. There is no striking design feature that draws instant focus.	The post is honest in stating the course name and deadline. However, due to the lack of “what to do next,” it falls short of full explainability.
4	 Post Owner: ivsa.kelantan	The poster includes clear event details (title, date, time) and has the instruction “Register Here” placed directly above a QR code. This makes the action easy to understand and frictionless, users know exactly what to do and where to do it.	The layout is clean, with a structured hierarchy, consistent fonts, and calm colour tones. While not bold or playful, it looks professional and reliable.	he inclusion of “Register Here” and a clearly placed QR code minimizes hesitation. The user doesn’t need to search or think, the action is clear and direct.	Moderate. The main text is bold and visible, but the overall design lacks high contrast or colour pops that might attract fast-scrolling users on platforms like TikTok.	The post transparently explains what the event is and when it happens. It avoids exaggerated claims. However, it could be more specific about the benefits of attending.

		Elements of Call-to-Action (CTA) Design (Mejtoft et al., 2021)				
No	**Instagram/ TikTok Sample**	**Intuitive and Frictionless**	**Aesthetic and Appealing**	**Design Friction (Intentional Pause)**	**Attention - Grabbing**	**High Explainability and Honest**
5	 Post Owner: bimmfd	The poster provides a contact number but does not explicitly state what action the user should take (“Call to register” or “WhatsApp for info”). Without that cue, the post is less intuitive and may leave users uncertain about what’s expected.	The design is clean and organized but quite formal and text heavy. It does not use colour, icons, or visuals that would enhance aesthetic appeal or emotional connection.	Moderate to high. Although a phone number is provided, the user must decide on their own how to interact (call, text, WhatsApp?) and what to say, this creates hesitation.	Low. The title is in bold, but there are no vivid colours, CTA phrases, or visual elements to catch the eye quickly in a social media context.	Moderate. The course name and contact number are honest, but the lack of clear instructions (“What do I do with this number?”) reduces overall explainability.
6	 Post Owner: bp_sydney	The poster contains full event details, but there is no clear instruction on what users should do next (register, contact). This reduces intuitiveness.	lean and balanced layout, but lacks colourful visuals or engaging elements. More formal than inviting.	Without a QR code, clickable link, or contact direction, users are left guessing what action to take, which increases friction	Moderate. The use of uppercase and bold fonts helps a little, but no standout visual or emotional trigger to stop scrolling.	The event is described accurately and honestly, but it lacks explanation of how to join or what to expect, so transparency is limited.
7	 Post Owner: #signon	The poster provides clear event details including venue address, which signals a face-to- face class. While no action is stated, the location info improves intuitiveness.	Clean and formal design, but text heavy. It communicates seriousness yet lacks warmth or engaging visuals.	Moderate. Users must likely reach out separately to register or confirm attendance, but knowing the location helps reduce some uncertainty.	Low to moderate. The header is bold, but no standout colours or phrases like “Join Us” or “Free Class” are used to grab attention.	High. The information is honest and specific, users know it’s a physical class and where it will be held, which adds clarity.

No	Instagram/ TikTok Sample	Elements of Call-to-Action (CTA) Design (Mejtoft et al., 2021) Intuitive and Frictionless	Aesthetic and Appealing	Design Friction (Intentional Pause)	Attention - Grabbing	High Explainability and Honest
8	 Post Owner: psyhdept.help	The presence of a QR code and the phrase "Join us" clearly guide the user toward action. This makes the post intuitive and relatively easy to engage with.	Clean layout with good use of spacing and alignment. While not vibrant, the minimalism gives it a professional and trustworthy tone.	The QR code allows users to act immediately, reducing the number of steps and avoiding confusion about what to do next.	Moderate. The phrase "Join us" acts as a light emotional hook, though the overall colour scheme is subtle and may not fully capture fast-scrolling attention.	Good. The purpose (a workshop), CTA ("Join us"), and registration method (QR code) are all visible. However, it could be clearer on what users receive after joining.
9	 Post Owner: Ilkbs.bpkb	The poster includes a visible QR code, which gives users a clear method to take action. This improves intuitiveness and ease of access significantly.	The design is clean with good font choice and alignment. It presents a professional and neutral tone, though not particularly visually striking.	Theres QR code provided, users can scan and proceed directly. No extra searching or manual steps are needed.	Moderate. The main text is bold, and the title is specific, but there is no strong emotional or colour-based hook to fully grab attention	Clear and honest. The post shows what the course is about, and how to access it. Could be improved by explaining benefits (e.g., certificate, skills gained).
10	 Post Owner: Ques:internationaluniversity	The inclusion of a QR code provides a clear action pathway. The user can scan and proceed without needing further instruction, making it intuitive.	The design is clean and visually balanced. It uses a modern layout that appears friendly and informative, although not particularly colourful or emotional.	The QR code eliminates unnecessary steps and supports smooth user engagement.	Moderate. The title is clear and specific but lacks bright colours or powerful words like "Free" or "Join Now" to immediately grab attention.	The post accurately presents what the course is and how to access it, though it could benefit from briefly stating what learners will gain or receive.

7 RESULTS

A total of ten social media posts were analysed—five from TikTok and five from Instagram—focusing on sign language promotion in Malaysia. Each post was examined through five core CTA design elements identified by Mejtoft et al. (2021): intuitiveness & frictionless interaction, aesthetic appeal, attention-grabbing design, design friction, and explainability & honesty.

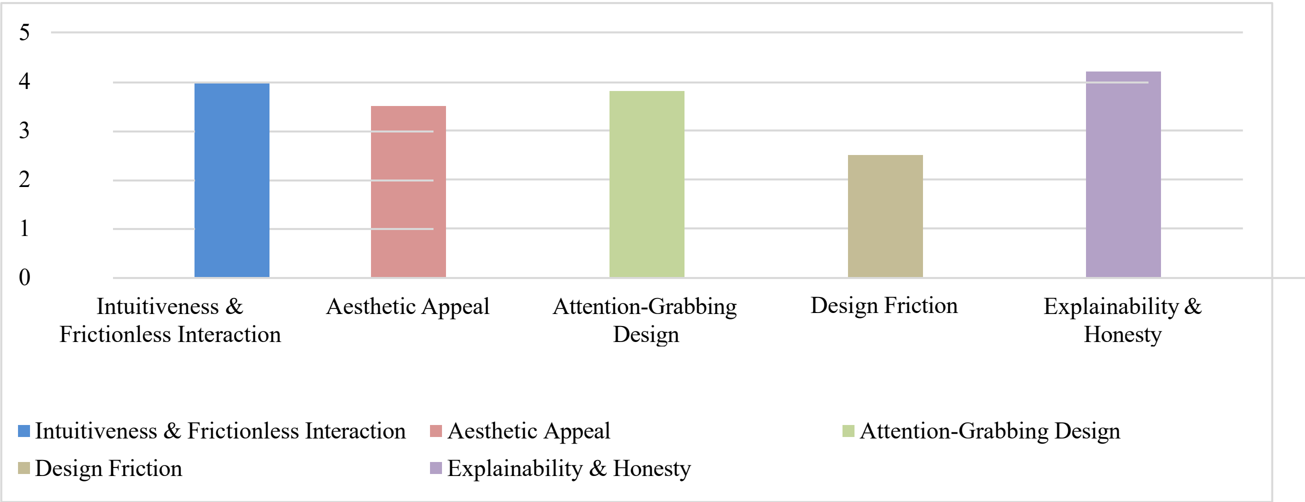

Figure 2 Result of Call-to-Action (CTA) Design Elements in Sign Language Social Media Content

7.1. Intuitiveness And Frictionless Design

Posts that included clear actions, such as QR codes accompanied by phrases like "Register Here" or "Join us," scored highest in intuitiveness. This was especially seen in Sample 4 (TikTok) and Samples 8–10 (Instagram), where users could immediately identify how to take action. In contrast, posts that only listed event details or contact numbers without instruction (e.g., Samples 5 and 7) were less intuitive, often leaving users unsure of what steps to take.

A recurring weakness was missing or vague next-step instructions, even when a QR code was present. For example, some posts included QR codes but lacked a direct phrase like "Scan to register," reducing clarity for less digitally literate users.

7.2. Aesthetic And Appealing Design

Most posts adopted clean, structured layouts with professional fonts and logical alignment. However, few employed strong colour contrast, character illustrations, or emotionally engaging visuals. TikTok posts tended to be more visually engaging (e.g., Sample 1 with cartoon characters), while Instagram posts leaned toward formal, text-based designs (e.g., Sample 7).

While the visual neatness generally aligned with good design standards, the lack of emotionally resonant or culturally vibrant elements reduced aesthetic impact.

7.3. Design Friction

Design friction was lowest in posts with QR codes and clear action phrases, such as Sample 4 ("Register Here") and Sample 8 ("Join us" + QR code). In contrast, posts that only included a contact number (e.g., Sample 5) or lacked any call-to-action language (e.g., Sample 6) created higher friction, requiring users to pause and figure out what to do next.

Interestingly, several posters displayed dates and event titles prominently but failed to connect those elements to actionable instructions—an overlooked source of friction across both platforms.

7.4. Attention-Grabbing Design

Only a few posts demonstrated strong attention-grabbing design. Sample 1 (TikTok) stood out for using bold text, red colour, and the word “FREE!!!”, immediately capturing user attention. Most other posts relied on formal titles and neutral colours, which—while clear—did not strongly compete in fast- scrolling environments like TikTok or Instagram.

Overall, the use of bold fonts alone was insufficient in grabbing attention without colour contrast, icons, or emotionally charged language.

7.5. High Explainability and Honesty

Posts that stated the nature of the course, level (e.g., "Beginner" or "Tahap 1"), and the action required were rated high in honesty and explainability. However, some posts (Samples 2, 3, and 6) did not explain what the user would gain (e.g., certificate, learning outcomes), which left their value proposition unclear.

All posts avoided misleading claims, but the absence of benefits or outcomes slightly weakened the trust-building potential of several CTAs.

8 FINDINGS

This study analysed five TikTok and five Instagram posts related to sign language awareness campaigns in Malaysia. The goal was to assess how effectively each post applied five core call-to-action (CTA) design elements as proposed by Mejtoft et al. (2021): intuitiveness and frictionless design, aesthetic appeal, attention-grabbing design, design friction, and explainability and honesty.

Intuitiveness and Frictionless Design was most evident in posts that included QR codes alongside clear prompts like “Register Here” or “Join us.” In contrast, posts that lacked action cues or only provided contact numbers caused uncertainty about the next steps.

Aesthetic Appeal was generally consistent, with most posts using clean layouts and professional formatting. However, few posts included visual storytelling or emotionally engaging graphics. TikTok content tended to be slightly more creative and friendly in tone compared to Instagram content, which leaned toward formal informational posters.

Design Friction was lowest in posts that made it easy for users to act (e.g., scan a QR code). Posts without any CTA components or instructions introduced unnecessary friction and could discourage engagement.
Attention-Grabbing Design was underutilized. Only a few TikTok posts used bold colour, emotional words like “FREE!!!”, or dynamic layout choices to stand out in the fast-paced scrolling environment of social media.

Explainability and Honesty were relatively well maintained. Most posts clearly stated what the event was about, but some failed to communicate what users would gain from joining — such as whether a certificate would be given or what learning outcomes to expect.

9 CONCLUSIONS

This study set out to evaluate how sign language awareness posts on TikTok and Instagram apply key Call-to-Action (CTA) design principles, based on the framework by Mejtoft et al. (2021). Through a qualitative content analysis of 10 social media samples, it became evident that while most posts demonstrated a solid grasp of visual organization, they often fell short in prompting user action effectively.

Posts that integrated clear CTA components—such as QR codes and direct instructions—were more intuitive and user-friendly. In contrast, posts that lacked actionable language or offered minimal engagement pathways created unnecessary friction. Aesthetic appeal was generally present, but attention-grabbing elements like colour contrast, emotionally resonant language, or urgency were underutilized, particularly on Instagram.

TikTok posts showed greater strength in combining visual clarity with emotional tone, aligning better with the platform's interactive nature. These findings underscore the importance of tailoring CTA design not only to visual standards but also to platform-specific user behaviours.

Ultimately, to successfully promote sign language content and foster broader engagement, designers and content creators should prioritize clarity, simplicity, and emotional relevance in their CTA strategies. Doing so can help bridge the gap between awareness and action—especially in inclusive, educational campaigns that rely on social participation.

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CONFLICT OF INTEREST

The author declares no potential conflict of interest with respect to the research, authorship, and/or publication of this article

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A Neurodivergent-Inclusive Restoration Park Design Framework: Integrating Environmental and Physical Design Attributes, Sensory Regulation and Spatial Sequencing

Syazana Abdullah Sani[1], *Farid Al Hakeem Yuserrie[2], Salahuddin Abdul Hakeem Abas[3], Mohammad Nazrin Zainal Abidin[4]

[1,2,3,4]Department of Built Environment Studies and Technology, Faculty of Built Environment, Universiti Teknologi MARA Perak Branch, Seri Iskandar Campus, 32610 Seri Iskandar, Perak, Malaysia

syazanaabdullahsani@gmail.com[1], *farid933@uitm.edu.my[2], hakem795@uitm.edu.my[3]
m_nazrin@uitm.edu.my[4]
***Corresponding author**

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ABSTRACT

Making green spaces accessible to diverse user groups has become a mainstream objective in contemporary planning, design, and built environment However, existing restorative environment research predominantly focuses on neurotypical populations, while sensory and cognitive considerations relevant to neurodivergent users remain insufficiently addressed within park design practice. Although restorative environment theories, particularly Attention Restoration Theory (ART) and Stress Recovery Theory (SRT), explain psychological recovery in natural settings, their translation into architectural design remains limited in accommodating diverse sensory needs. Consequently, there remains a lack of an evidence-informed design framework translating restorative theory into practical neuro-inclusive park design strategies. This study aims to develop a neurodivergent-inclusive restorative park design framework by integrating environmental and physical design attributes, sensory regulation principles, and spatial sequencing strategies into a coherent architectural model. The framework was developed through an integrative research approach combining findings from a systematic literature review, observational analysis of restorative attributes within an urban park environment, and thematic synthesis of expert perspectives with their validation. The study proposes a multi-layered framework comprising nature-based and biophilic attributes, multisensory environmental regulation, graded spatial sequencing and environmental complexity, and sociality with user autonomy. The framework contributes an evidence-informed design approach that bridges restorative environment theory and neuro-inclusive environmental design, providing practical guidance for developing restorative park environments that support diverse cognitive and sensory needs.

Keywords: *Neurodivergent-inclusive design, Restorative parks, Environmental attributes, Sensory regulation, Neurodivergent users.*

1 INTRODUCTION

Green spaces such as public parks and urban recreational spaces have been recognized for their role in supporting cognitive restoration, mental well-being, and overall quality of urban life. Natural environments have been widely recognised for their restorative potential, offering opportunities for psychological recovery and attentional renewal (Zhang et al., 2024). A growing body of research demonstrates that exposure to natural environments can reduce stress, enhance emotional regulation, and restore depleted attentional capacity, particularly within dense urban contexts where environmental stressors are prevalent (Kaplan & Kaplan, 1989; Stoltz & Grahn, 2021; Izana & Shobri, 2024). Restorative environment theories, particularly Attention Restoration Theory (ART) and Stress Recovery Theory (SRT), explain how natural environments support cognitive recovery and psychological well-being by allowing individuals to engage with environmental stimuli that require little directed mental effort (R.S. Ulrich et al., 2023). Hence, urban recreational parks are increasingly recognised not only as leisure spaces but also as environments that contribute to public health and well-being (Shobri et al., 2021). As awareness of neurodiversity population continues to expand, increasing attention has been directed towards how public environments can better accommodate diverse sensory and cognitive experiences. This shift highlights the need for design approaches that move beyond conventional notions of general accessibility towards environments capable of supporting varied patterns of perception, engagement, and restoration. This aligns with the goal of Sustainable Development Goal 3 (SDG 3): to ensure healthy lives and promote well-being for all ages (United Nations in Malaysia, 2025).

Early discussions on inclusive landscape design emphasised that public facilities, including parks and green spaces, should be designed to provide access for all diversity of society, reflecting the close relationship between a growing environmental quality and social equity (Selanon & Chuangchai, 2023). Current discussions on inclusive design acknowledge that accessibility extends beyond physical access but also include environmental comfort, usability, and the accommodation of diverse user needs within public environments (Ramli et al., 2023). Rather than functioning solely as recreational amenities, urban green spaces may therefore be understood as cognitive sanctuaries that mitigate mental fatigue and sensory overload. These considerations become particularly relevant for neurodivergent individuals, including those on the autism spectrum, who may experience either hyposensitivity or hypersensitivity to sensory input, and in some cases both simultaneously (Mostafa.M,2020). Hyposensitive individuals require more stimulation, such as physical movement or music, to engage and necessitate more dynamic situations for concentration. Certain individuals exhibit sensory neutrality, positioning themselves within a predictable middle range (Maćkowiak et al., 2025). Architects and designers must build environments that accommodate all individuals throughout this spectrum of sensitivities.

Such sensory variations shape spatial experience by shaping tolerance to environmental stimuli such as noise, crowd density, visual complexity, lighting conditions, spatial enclosure, and movement patterns. As a result, environments commonly perceived as restorative for neurotypical users may not necessarily provide equivalent restorative benefits for neurodivergent users. The restorative potential of park environments therefore cannot be assumed to be universal, highlighting the need for design approaches that incorporate sensory regulation, spatial choice, and graduated levels of environmental stimulation. In architectural practice, design elements such as space, volume, sequencing, colour, pattern and material can be manipulated to create environments that support varied neurodiverse users (Mostafa.M, 2020).

Landscape architects, architects and built environment professionals play an important role in responding to ongoing debates concerning the evolving role of urban green spaces and their capacity to accommodate increasingly diverse user needs. As expectations of inclusivity continue to evolve, there is a growing need to translate restorative environment knowledge into spatial and environmental strategies capable of supporting diverse cognitive and sensory experiences. Addressing this challenge requires a more integrated understanding of how environmental attributes, sensory experience, and spatial organisation interact to shape restorative outcomes within urban park environments.

1.1 Research Gap

Despite the expanding body of literature on restorative environments, significant gaps remain in translating restorative principles into inclusive spatial design practice. Designing for neurodiversity means creating environments that allow all occupants to find the right sensory settings to thrive. It requires considering concepts like environmental stimulation, social interaction, safety, predictability, and cognitive load, while supporting refuge and autonomy. Existing studies have predominantly focused on the general population, with limited attention given to how environmental and physical design attributes influence sensory regulation, emotional comfort, and attentional restoration among into designing strategies for neurodivergent users (Finnigan, 2024). While restorative environment theories, particularly Attention Restoration Theory (ART) and Stress Reduction Theory (SRT), have been widely applied to explain psychological and physiological recovery in natural settings, their application has rarely been adapted to address the diverse sensory processing and cognitive characteristics associated with neurodivergent communities (Li et al., 2019). As a result, current restorative environment frameworks provide limited guidance for integrating sensory regulation, spatial sequencing, and user autonomy into coherent design strategies for urban recreational parks. This gap highlights the need for an evidence-informed framework that bridges restorative environment theory with environmental and physical design considerations capable of supporting inclusive restorative experiences.

In response to this gap, this study aims to develop a neurodivergent-inclusive restorative park design framework by integrating environmental and physical design attributes, sensory regulation principles, and spatial sequencing strategies derived from systematic literature synthesis, observational analysis of park environments, and expert validation findings. By synthesising insights from restorative environment theory, observational analysis, and expert perspectives, the research seeks to translate interdisciplinary knowledge into a coherent architectural framework that informs urban planners, landscape architects, and designers in creating equitable, health-supportive, and cognitively restorative public spaces. Through this integration, the study contributes to advancing inclusive design discourse by providing practical spatial guidance for accommodating diverse sensory and cognitive needs within urban green space environments.

2 LITERATURE REVIEW

2.1 Neurodiversity Inclusivity in Built Environment

Neurodiversity refers to the neurological differences in human cognitive functioning, encompassing neurological profiles such as autism spectrum disorder (ASD), Attention-Deficit/Hyperactivity Disorder (ADHD), dyslexia, and dyspraxia. Neurodivergent individuals may experience environments differently due to variations in sensory processing, attention regulation, communication, and emotional control when compared to neurotypical populations (Kapp et al., 2023). These challenges highlight the importance of identifying spatial and environmental attributes that support restoration for the community. Many also report heightened sensitivity to sensory stimuli, such as noise, bright light, large crowds, or unpredictable motion. These environmental factors can lead to sensory overstimulation, distraction, and emotional dysregulation. (Finnigan, 2024; Pincus & Beller, 2025). Sensory discomfort frequently leads to withdrawal or avoidance of public spaces.

Because most public spaces are designed according to neurotypical norms, neurodivergent users often encounter barriers that reduce accessibility, comfort, and restorative potential. Recreational parks may serve as empowering environments tailored for neurodivergent individuals where they can also thrive in an urban green space regardless of their neurodiverse traits. To ensuring guidance in developing neuroinclusive park design that addressed these challenges, it needs to go beyond standard practices. When designing for neurodiversity, architects pay attention on spatial sequencing or zoning since different people have different sensitivities to have self- control, options and choices for each individual. In this area, designing an environment that support for solidarity and collaboration. Encouragement on movement and innovation can be helpful for neurodivergent users. Architectural research demonstrates that spatial configuration directly influences movement patterns, social interaction, and behavioural engagement within built environments. (Spence, 2020) mentioned that spatial experience is shaped through multisensory engagement rather than visual alone, suggesting that restorative environments require intentional spatial organisation to support flexibility social participation, sensory regulation and autonomy.

2.2 Restorative Environment Theories and The Role

The field of restorative environments has expanded and evolved in the late 1980s and has received greater relevance in recent decades within environment-behaviour and landscape studies. Restorative environment research explains how interaction with natural settings contributes to cognitive recovery (attentional performance) and affective (emotional regulation) and social development (communication). Restoration Theory (ART) proposes that natural environments facilitate recovery from directed attention fatigue through qualities such as providing psychological distance from daily life (being away), displaying well-organized content (extent), providing aesthetic value and generating interest (fascination), and meeting people's needs (compatibility) allowing involuntary attention to replace cognitively demanding tasks. Similarly, Stress Recovery Theory (SRT) emphasises the physiological and emotional benefits of natural environments, suggesting that exposure to natural elements can reduce stress and promote positive emotional states. Table 1 illustrates the restorative design theory expanded that influence in developing Neuro-Inclusive design framework. These theoretical components form the conceptual basis for the proposed design framework

Building on these theoretical foundations, recent restorative environment research emphasises that the presence of natural elements does not shape restorative outcomes alone, but also how environmental qualities are structured, perceived, and experienced through multisensory interaction. Restorative environments support wellbeing when spatial characteristics enable individuals to experience clarity, comfort, and a balanced level of environmental stimulation, allowing users to engage with their surroundings without cognitive overload (Ramli et al., 2023). Environmental features such as visual coherence, acoustic comfort, natural materials, and opportunities for sensory modulation contribute to psychological recovery by supporting both attentional restoration and emotional regulation (Hunter et al., 2023). In addition to restorative environment theories, sensory-therapeutic garden research emphasises multisensory engagement through vegetation, texture, sound, and spatial organisation, highlighting the role of sensory interaction in supporting psychological comfort and healing (Dinu Roman Szabo et al., 2023). In this context, restorative design extends beyond aesthetic integration of nature towards the deliberate orchestration of sensory experiences, spatial legibility, and environmental control, enabling users to regulate their interaction with space according to individual cognitive and sensory needs. This perspective is particularly relevant in neuroinclusive design, where restorative qualities must accommodate diverse sensory thresholds and patterns of environmental perception rather than assuming uniform user responses (Finnigan, 2024).

Table 1 Restorative Design Theory (Source: Abdullah Sani 2026)

Influencing Theories of Restorative Design	Attributes from theory
A.R.T Attention Restoration Theory (Kaplan & Kaplan, 1989)	• Extent • Being Away • Fascination • Compatibility
S.R.T Stress Reduction Theory (R.S. Ulrich et al., 2023)	• Sense of Privacy & Control • Social Support • Physical Movement & Exercise • Positive Natural Distractions
Sensory Therapeutic Gardens (Dinu Roman Szabo et al,2023	• Contextual • Organization • Accessibility and • Visibility • Sensory Stimulation • (through vegetation) • Biodiversity • Shade and Seating • Softscape Dominance

Biophilia theory proposed by biologist (Wilson, 1984)	• Water Features • Privacy • User interaction with nature • Biophilia: A genetic predisposition to seek and benefit from nature results in psychological restoration from green spaces. • Evolutionary needs for food, shelter, safety, and restoration realized in psychological response to natural spaces.

2.3 Environmental and Physical Design Attributes supporting restoration

Environmental and physical design attributes play a critical role in shaping restorative experiences within urban green spaces. Nature-based elements such as vegetation, water features, and biodiversity enhance opportunities for soft fascination and psychological relief, while spatial characteristics including enclosure, prospect, and environmental diversity influence perceptions of safety and comfort. Multisensory environmental qualities such as acoustic buffering, tactile engagement, and visual coherence also play an important role in shaping restorative outcomes (Zhuang, 2025). Environments with variable sensory conditions may diminish restorative potential, even with natural features present. This indicates that restorative design should prioritize sensory experience as a fundamental aspect of environmental quality instead of seeing it as a mere secondary accessibility issue.

While restorative environment research has primarily focus on biophilic components, more recent studies have highlighted the importance of environmental predictability and user control in supporting restorative experiences, particularly for individuals with sensory sensitivities. Design attributes that allow neurodivergent users to regulate exposure to environmental stimuli, such as the availability of quiet areas, refuge spaces, and alternative circulation routes, contribute to both emotional comfort and attentional recovery (Finnigan, 2024). A key insight from the theoretical would be to meet the needs of neurodivergent individuals we should highlight on choice and control. However, existing literature often examines these attributes independently, resulting in fragmented guidance for designers seeking to apply restorative principles in practice. At the end, architects should celebrate the unique ways in which people engage with their environment.

2.4 Spatial Sequencing, Autonomy, and Neuroinclusive Design

Spatial organisation plays a critical role in mediating sensory experience and user engagement within park environments. The concept of spatial sequencing refers to the arrangement of spaces along gradients of stimulation, allowing users to transition between environments of varying sensory intensity. Such sequencing supports gradual adaptation and reduces the risk of sensory overload, particularly for neurodivergent users who may require predictable transitions between spaces.

Autonomy became a fundamental element in facilitating inclusive restorative processes. Settings that foster social engagement while providing avenues for retreat enable users to modulate their participation based on personal comfort and sensory tolerance. The presence of both lively social sections and more peaceful refuge areas allows for flexible interaction patterns. This strengthens the feeling of control over the environment, which helps with emotional regulation and feelings of safety. This study indicates that inclusive restorative environments ought to support various types of involvement instead of favouring a singular pattern of usage.

Equally important is the provision of autonomy and choice within public environments. Neurodivergent users rely heavily on environmental clarity to navigate and feel secure (Mostafa, 2023). Clear spatial structure and predictable transitions improve confidence and independence. Opportunities for both social interaction and solitude enable users to regulate their level of engagement according to personal comfort and sensory tolerance. Neuroinclusive design therefore emphasises flexibility, environmental choice, and the coexistence of active and restorative zones within a single spatial system. Despite growing recognition of these principles, there remains limited integration of sensory regulation, spatial sequencing, and restorative theory within a unified architectural framework.

2.5 Neurodivergent-inclusive Restorative Park Design Framework

The preceding discussion highlights the need for a more integrative approach that bridges restorative environment theory, sensory-responsive design, and spatial organisation within urban park environment. While existing studies provide valuable insights into individual components of restorative environments, a coherent framework capable of translating interdisciplinary knowledge into practical design guidance remains lacking. Addressing this gap requires synthesising theoretical understanding with empirical and professional insights to develop a framework that supports diverse cognitive and sensory experiences within urban park environments. This study responds to this need by proposing an evidence-informed restorative park design framework that integrates environmental attributes, sensory regulation, spatial sequencing, and user autonomy into a unified architectural model. Hence, this is a good effort of sustainability and equality where neurodivergent be able to participate in enjoying green spaces.

3 METHODOLOGY

This study adopted a mixed-method research design aimed at developing a neurodivergent-inclusive restorative park design framework. To attain a comprehensive and all-encompassing understanding of the intricate and multifaceted research topic that is currently under examination, it is essential that a wide ranging and varied selection of both qualitative and quantitative data be meticulously collected and compiled through the synthesis of theoretical, empirical, and professional knowledge. Rather than relying on a single method, this triangulation methodology will generate an evidence-informed architectural framework. The collected data will then be analysed using thematic analysis tools to draw meaningful conclusions and recommendations that can enhance educational practices and promote an inclusive restorative environment. This approach enables the translation of restorative environment theory into spatial design strategies that respond to diverse sensory and cognitive needs within urban park environments.

The goal of a Systematic Literature Review (SLR) is to identify, evaluate, and synthesise relevant primary research to develop a comprehensive understanding of the topic under investigation. Environmental and physical design attributes associated with restorative experiences were identified through systematic literature synthesis. These attributes were then examined within an existing urban recreational park environment through observational analysis to understand how design attributes translated in spaces and effect on people's feel, perceived and experience the space. One day duration is conducted at Putrajaya Botanical Garden. The observation was then validated and incorporated by four expert perspectives for the relevancy of identified attributes within practical design contexts. The integration of these stages enabled the development of a coherent framework that connects restorative theory with neuro-inclusive environmental design.

The SLR was conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009). Peer- reviewed literature published between 2020 and 2025 was retrieved from Scopus, Web of Science, and Google Scholar using search terms related to restorative environments, environmental psychology, inclusive design, and sensory-responsive environments. Environmental and physical design attributes consistently associated with restorative outcomes were extracted and categorised into thematic domains. These domains provided the theoretical foundation for identifying key environmental attributes relevant to sensory regulation and cognitive restoration in park environments.

The second stage involved observational analysis conducted within an urban recreational park specifically at Putrajaya Botanical Garden setting to examine how restorative attributes identified in the literature are manifested spatially. The observation employed an adapted Restorative Design Scale (RDS), measuring the potential for mental restoration in urban green. The observation was conducted with the perspective of architectural designer where qualities and criteria that make for a successful healing and restorative environment was observed and synthesised from Attention Restoration Theory, Stress Recovery Theory, and sensory-based environmental considerations. Specifically, the assessment examined key Restorative Design Scale (RDS) criteria including novelty and intrigue, environmental diversity, sociality and movement, mindfulness, and design elements. Figure 1 illustrates the creation of the restorative design scale based on synthesizes of Attention Restoration Theory (ART), Stress Reduction Theory (SRT) and influence theory such as biophilic theory into five criteria of what creates a mentally restorative space. These criteria were evaluated through site observation and thematic categorisation to identify spatial configurations that support or constrain restorative experiences, particularly in relation to sensory comfort and environmental predictability.

To complement the literature findings, semi-structured expert interviews were conducted with purposively selected professionals from architecture, environmental psychology and occupational therapy. This approach enabled in-depth exploration of sensory comfort, accessibility, and restorative design strategies while maintaining consistency across interviews (Adhabi & Anozie, 2017).

The final stage involved cross-analytical synthesis across the three methodological components. Environmental attributes derived from literature synthesis were compared with observational findings and expert interpretations to identify recurring principles influencing restorative outcomes. These principles were subsequently organised into four interrelated framework components: nature-based and biophilic attributes, multisensory environmental regulation, spatial sequencing and environmental complexity, and sociality with user autonomy. The resulting framework represents an integrative model that translates restorative environment theory into spatial design guidance for neuroinclusive park environments. Figure 2 illustrates the development methodology of the neurodivergent-inclusive restorative park design framework through systematic literature review, observational analysis, and expert validation.

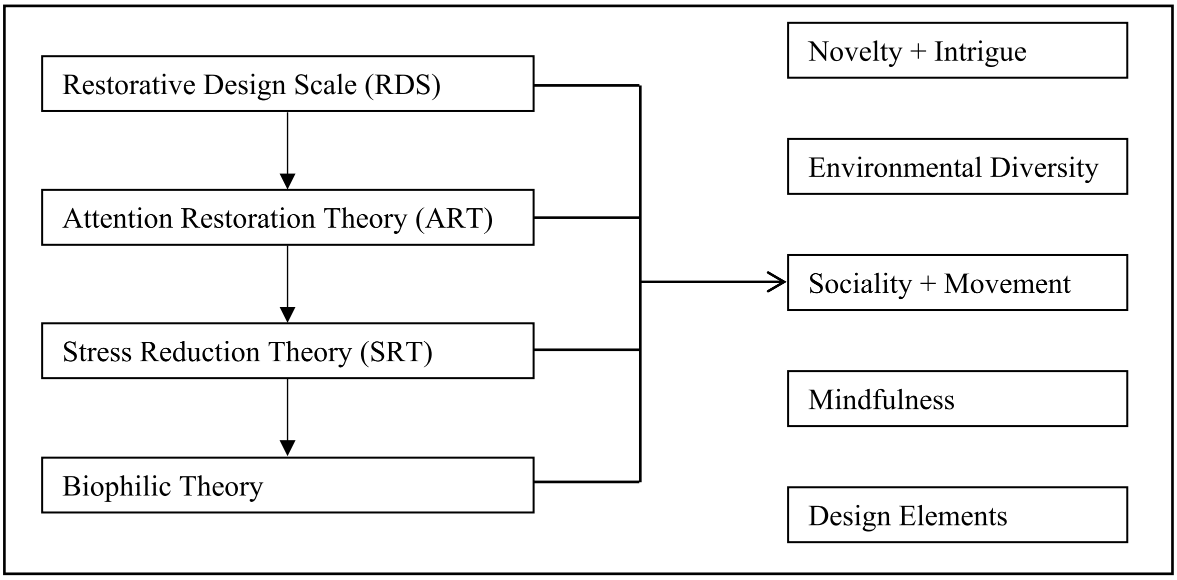

Figure 1 Theoretical study related to Restorative Design Scale (RDS)
(Source: Abdullah Sani, 2026)

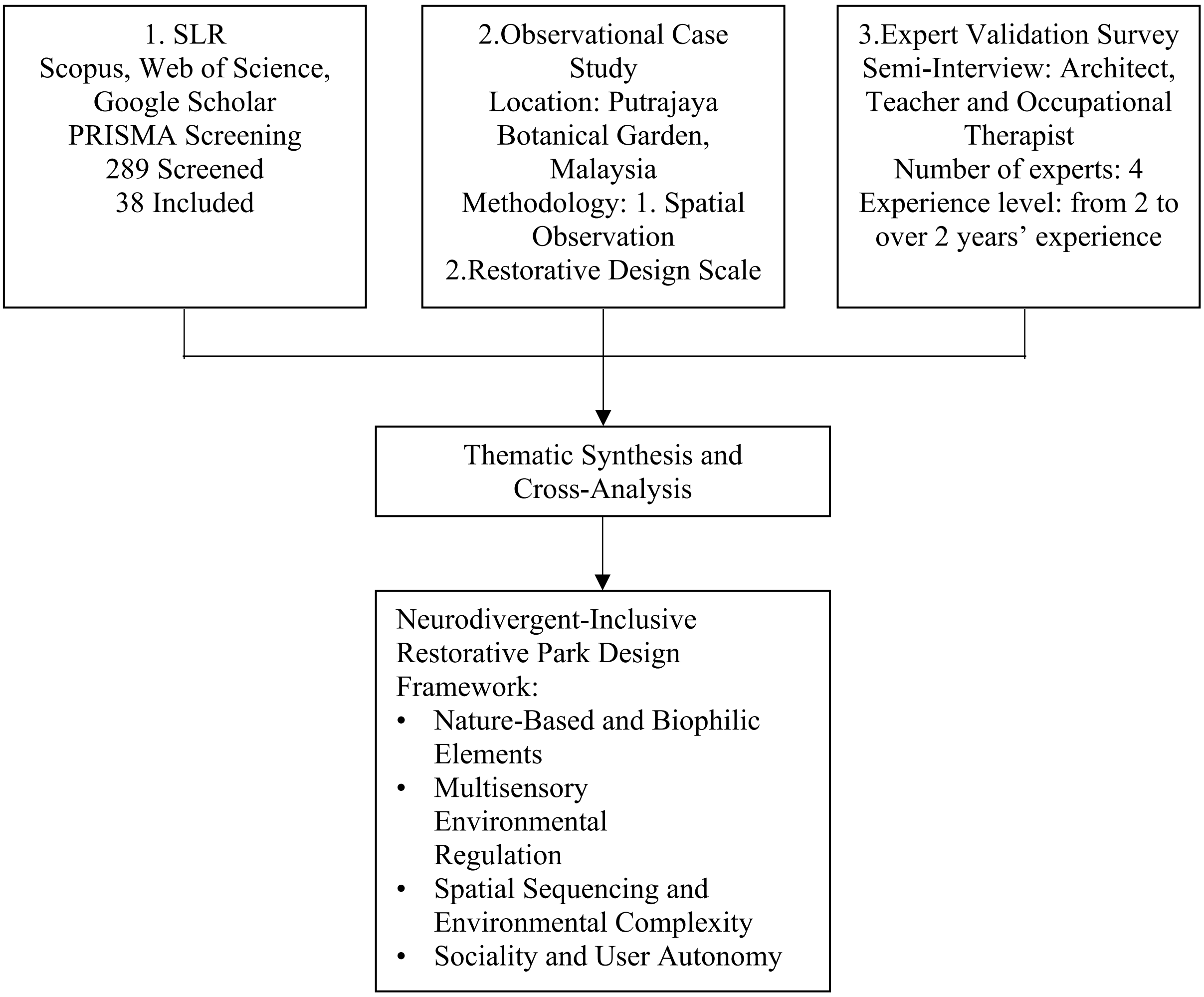

Figure 2 Development of the Neurodivergent-Inclusive Restorative Park Design Framework (Source: Abdullah Sani, 2026)

4 FINDINGS AND DISCUSSION

4.1 Development of a Neurodivergent-Inclusive Restorative Park Design Framework

The primary outcome of this study is the development of a neurodivergent-inclusive restorative park design framework that integrates restorative environment theory with sensory-responsive spatial design principles. The framework emerges through the synthesis of theoretical understanding, observational insights, and expert-informed perspectives, enabling restorative principles to be translated into spatially applicable design strategies. The framework conceptualises restorative experience as an interaction between environmental attributes, sensory regulation, and spatial organisation, recognising that restorative outcomes are shaped not only by the presence of natural elements but also by how environments are structured and experienced. Figure 3 illustrates conceptual framework for the development of a Neurodivergent-Inclusive Restorative Park Design.

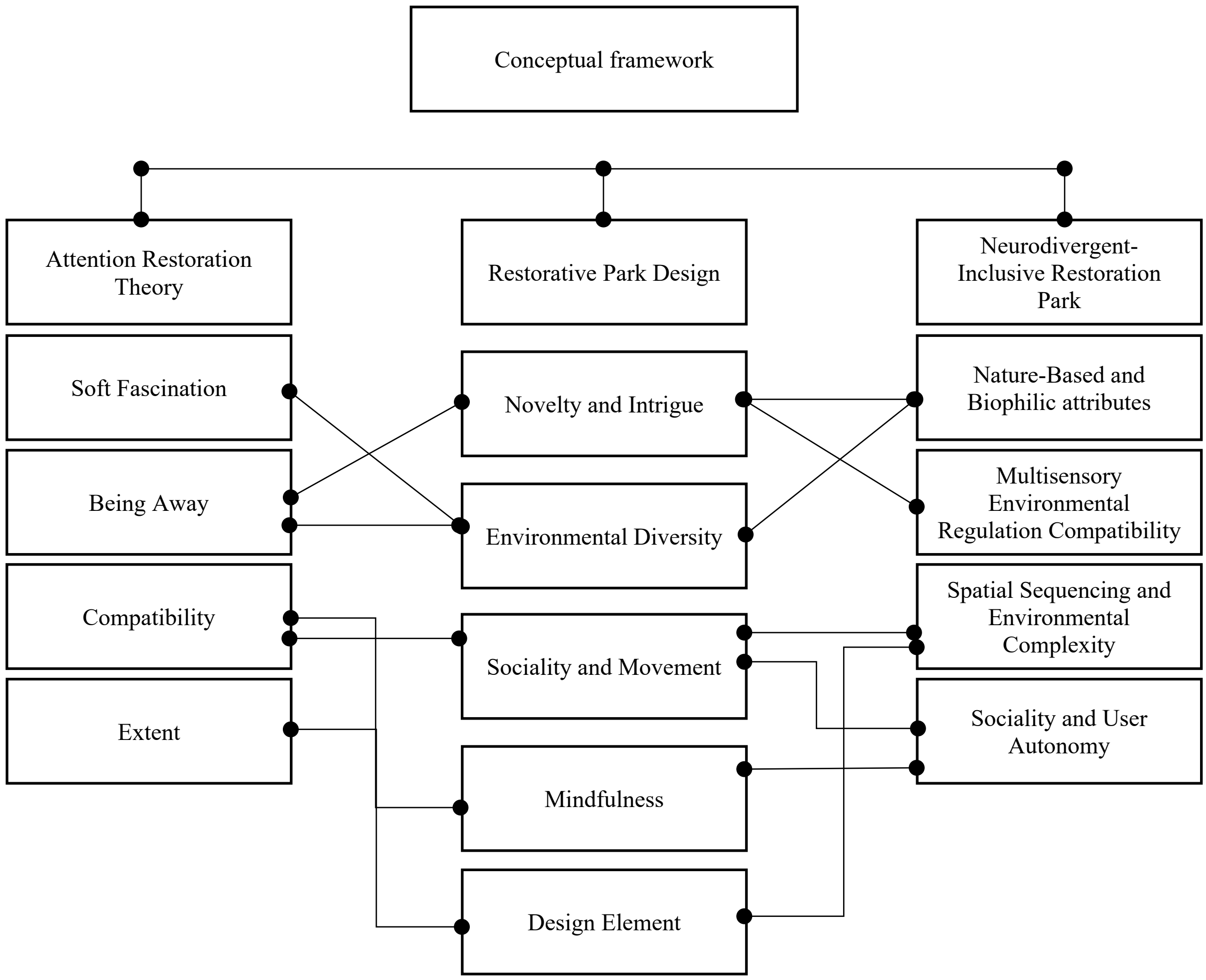

Figure 3 Development of the conceptual framework of Neurodivergent-Inclusive Restorative Park Design (Source: Abdullah Sani, 2026)

Table 2 Summary of the Neurodivergent-Inclusive Restorative Park Design Framework with Expert Validation (Source: Abdullah Sani, 2026)

Framework Component	Validated Design Attributes	Role in Restorative Experience	Implication for Framework Development
Nature-Based and Biophilic Attributes	Vegetation, water features, natural materials, shaded areas, biodiversity	Natural elements can promote calmness, emotional regulation, and attentional recovery. Restoration depends on how nature is organised and experienced.	Incorporation of vegetation layers, shaded areas, water features, and natural materials to create calming environments with reduced cognitive demand and predictable environmental conditions.
Multisensory Environmental Regulation	Acoustic buffering, visual calmness, controlled stimulation, refuge spaces	Sensory regulation and controlled levels of stimulation can influence emotional stability and attentional recovery	Acoustic buffering, visual filtering, low-stimulation zones, and gradual transitions between environments to allow users to regulate sensory exposure and reduce overstimulation.
Spatial Sequencing and Environmental Complexity	Gradual transitions, environmental gradients, spatial legibility, clear circulation	Supports restoration through gradual transitions between environments of varying stimulation	Organisation of park spaces along gradients of stimulation, clear spatial transitions, and legible circulation routes that enable gradual movement between active and calm environments.
Sociality and User Autonomy	Choice of engagement, alternative routes, social and quiet zones, withdrawal spaces	Enhances restorative engagement by allowing users to regulate levels of social interaction and environmental engagement according to individual comfort and sensory tolerance.	Provision of flexible social spaces alongside refuge areas, alternative movement routes, and seating arrangements that support autonomy and user-directed engagement.

4.2 Nature-Based and Biophilic Elements

Biophilic integration refers to the incorporation of natural elements within built and landscape environments to support human well-being through meaningful engagement with nature. The inclusion of living vegetation, water features, natural materials, and shaded environments has been widely associated with psychological restoration, improved concentration, and reduced cognitive fatigue (Soga & Gaston, 2020). Consistent with restorative environment theory, such natural features contribute to soft fascination, enabling users to disengage from directed attention demands and facilitating attentional recovery. However, restorative outcomes are influenced not only by the presence of natural elements but by how these elements are spatially organised and experienced. Natural environments that demonstrate clear spatial structure, visual continuity, and moderated levels of sensory stimulation are more likely to support emotional stability and sustained engagement, whereas environments characterised by excessive visual complexity or uncontrolled sensory exposure may diminish restorative benefits despite the availability of natural features (Hunter et al., 2023). The proposed framework therefore emphasises the organisation of biophilic elements in ways that enhance environmental legibility while supporting sensory regulation.

Within neuroinclusive park environments, sensory gardens represent a biophilic design strategy that supports multisensory engagement while maintaining environmental predictability. By enabling interaction with nature through visual, tactile, olfactory, and auditory stimuli, sensory gardens create opportunities for controlled sensory exploration that can promote relaxation, attentional recovery, and emotional comfort (Bahr, 2024). The use of diverse planting species, textured surfaces, and natural materials allows environmental variation to be experienced without generating excessive stimulation, which is particularly important for neurodivergent users with varying sensory sensitivities. Elements such as soft planting textures, natural fragrances, and moderated soundscapes can encourage calm engagement with the environment, while flexible spatial arrangements allow for both individual reflection and social interaction. In this context, sensory gardens function not only as aesthetic landscape features but as spatial mechanisms that facilitate sensory regulation and support inclusive restorative experiences within public park settings (Syed et al., 2025).

4.3 Multisensory Environmental Regulation and Restorative Experience

A key finding of the framework is the central role of multisensory environmental regulation in shaping restorative experiences for neurodivergent users. Although restorative environment theories primarily focus on visual interaction with nature, incorporating sensory factors reveals that auditory, visual, and kinetic cues profoundly affect environmental comfort and attentional restoration. Sensory predictability and environmental control are essential factors that promote emotional stability, especially for persons with increased sensory sensitivity. Sensory predictability and environmental control emerged as critical conditions supporting emotional stability, particularly for individuals with heightened sensory sensitivity (Qu & Ma, 2024). In accordance with neuroinclusive architectural research, spatial experience is influenced by the interplay of various sensory systems rather than solely by visual perception, indicating that restorative environments should be regarded as multisensory experiences rather than merely visual landscapes. (Syed et al.,2025)

Design strategies that mitigate excessive stimulation, provide refuge spaces, and allow gradual engagement with environmental stimuli contribute to more inclusive restorative environments by providing gradual transitions between high- and low-stimulation zones will help in support attentional recovery by allowing users to adjust their level of environmental engagement over time. The provision of refuge spaces or moments of withdrawal further enables users to recalibrate sensory input before re-engaging with shared environments, reinforcing autonomy and perceived control as essential components of restorative experience (Egan, 2024). Sensory regulation therefore becomes a foundational mechanism within restorative park design rather than an auxiliary accessibility consideration. Acoustical buffering can be created through dense vegetation belts, water features that mask noise while maintaining natural soundscapes. Visual calmness may be supported through coherent planting palettes, reduced visual clutter and the use of natural materials that mimic organic elements.

4.4 Spatial Sequencing And Environmental Complexity

Spatial sequencing is also identified by the framework as a key mechanism that connects ambient characteristics and user experience. Restorative outcomes were found to be influenced by transitions between spaces rather than by isolated environmental features. Organising Park environments along gradients of environmental complexity allows users to adjust to varying levels of stimulation, supporting sensory adaptation and reducing cognitive fatigue (British Standards Institution, 2021). According to recent studies, spatial continuity and environmental transitions assist attentional recovery and emotional control by enabling progressive adjustment across environments with varying sensory intensities, which in turn contributes to felt comfort.

Environmental complexity, when appropriately structured, contributes to soft fascination and exploratory engagement without imposing excessive cognitive demand. Predictable spatial transitions and clear environmental cues enhance orientation and psychological comfort, particularly for neurodivergent users who may rely on environmental consistency to navigate public environments (Finnigan, 2024). The findings therefore suggest that spatial sequencing operationalises restorative theory within design practice by structuring environments that support gradual engagement between exposure to open social areas and quieter refuge spaces within experiential continuity. The findings therefore suggest that spatial sequencing implements restorative theory within design practice by structuring environments that support gradual engagement and experiential continuity, translating restorative principles into spatial strategies that accommodate diverse sensory and cognitive needs.

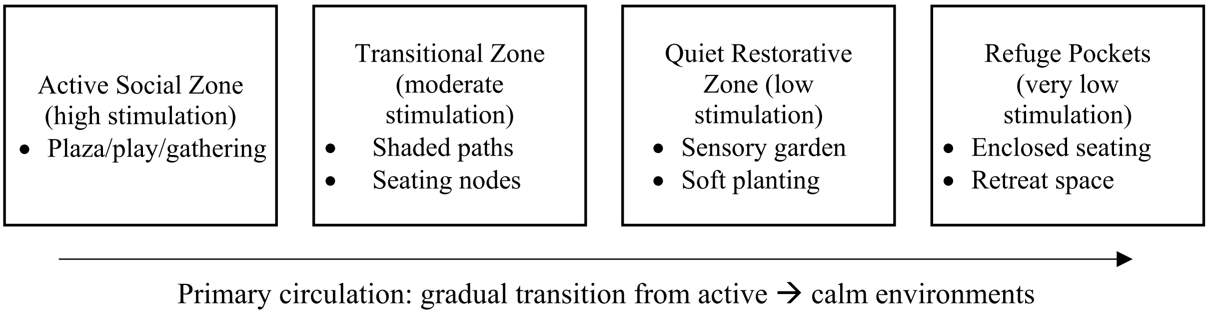

Figure 4 Example of spatial sequencing in restorative park (Source: Abdullah Sani, 2026)

4.5 Sociality, Autonomy, and Inclusive Restorative Engagement

The significance of spatial settings that enable people to control social contact and environmental engagement in accordance with their own comfort and sensory tolerance is highlighted by the discovery that autonomy and user-directed engagement are essential elements of inclusive healing environments. Autonomy and user-directed engagement emerged as essential components of inclusive restorative environments. People can control their participation based on their own comfort level and sensory tolerance when social contact and withdrawal chances are provided. (Egan, 2024). Flexible patterns of involvement are made possible by the presence of socially busy regions and more sedate refuge spaces, which strengthens the sense of environmental control that promotes emotional regulation.

By integrating autonomy into spatial design, the framework expands the understanding of accessibility beyond physical inclusion towards experiential inclusion. Restorative environments are therefore conceptualised as adaptable systems that accommodate diverse patterns of engagement, acknowledging that restoration may occur through both social interaction and solitude depending on individual needs.

4.6 Theoretical and Design Implications

The proposed framework contributes to restorative environment discourse by extending the application of Attention Restoration Theory and Stress Recovery Theory into the domain of neuroinclusive environmental design. While existing theories explain mechanisms of psychological recovery, the framework demonstrates how these mechanisms can be translated into spatial and environmental strategies applicable within park design. This integration bridges environmental psychology and architectural practice, providing a structured approach for designers seeking to create restorative environments that respond to diverse cognitive and sensory experiences.

Importantly, the findings challenge the assumption of universal restorative response by highlighting the role of sensory variability in shaping environmental experience. Inclusive restorative design therefore requires environments that allow flexibility, environmental choice, and graduated exposure to stimulation. The framework positions restoration as an outcome of spatial organisation, sensory regulation, and environmental diversity, offering practical guidance for architects and landscape architects in the development of neuroinclusive urban green spaces.

5 CONCLUSIONS

This study developed a framework for restorative park design that is inclusive of neurodivergent individuals, merging restorative environment theory with principles of sensory-responsive spatial design. By synthesising insights from literature, observational understanding of park environments, and expert-informed perspectives, the research translates restorative concepts into a coherent architectural framework applicable to inclusive park design. The findings demonstrate that restorative experiences within urban green spaces are not determined solely by the presence of natural elements, but emerge through the interaction between environmental attributes, sensory regulation, spatial sequencing, and user autonomy. In this respect, restorative environments are understood not as static settings but as adaptable spatial systems capable of accommodating varying sensory responses and patterns of engagement. The framework therefore reframes restoration as a spatially mediated and experience-dependent process, extending the application of Attention Restoration Theory and Stress Recovery Theory towards neuroinclusive environmental design.

The study further highlights that neuroinclusive restorative environments require design approaches capable of supporting a spectrum of sensory experiences rather than a single optimal condition. Environments that allow spaces to transition between stimulation and calmness, openness and refuge, and social interaction and solitude enable users to regulate their own engagement according to individual comfort and sensory needs. Such an approach positions spatial diversity, environmental legibility, and sensory flexibility as essential qualities in inclusive park design, allowing environments to simultaneously support users with differing sensitivities. By emphasising adaptability, predictability, and user autonomy, the proposed framework contributes to both theoretical and practical discourse by bridging restorative environment research with architectural and landscape practice. While further empirical validation across different contexts is required, the framework provides a foundation for future research and design applications aimed at advancing neuroinclusive, inclusive, and health-supportive urban environments that accommodate difference as an inherent aspect of public space design. Future research should focus on applying and testing the proposed framework within real-world design projects to evaluate its practical effectiveness and adaptability across different park contexts.

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AUTHOR CONTRIBUTIONS

All authors played equal contributions towards the production of this paper.

CONFLICT OF INTEREST

The author declares no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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Experimental Design for User-Centric Kitchen Customisation Based on Anthropometric Data

Chen Lin [1], *S'harin Mokhtar[2], Haszlin Shaharudin[3]
[1,2,3]Faculty of Creative Arts, Universiti Teknologi MARA, 40450 Shah Alam, Selangor, Malaysia

lynne54453062@163.com[1], *sharin2066@uitm.edu.my[2], haszlin@uitm.edu.my[3]
***Corresponding author**

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ABSTRACT

This paper presents an experimental design aimed at evaluating the ergonomic benefits of kitchen cabinet customisation based on individual anthropometric data. The study adopts a within-subjects protocol, in which participants perform a series of typical kitchen tasks — including reaching, chopping, distributing ingredients, lifting, and stirring — in both standard-dimension kitchens and kitchens customised according to each participant' s body measurements. Key anthropometric parameters, such as stature, standing elbow height, and functional reach, are measured to inform the user-specific kitchen configurations, resulting in two experimental conditions with the same set of tasks performed in each. During both conditions, data are collected using Electromyography (EMG), Galvanic Skin Response (GSR), Electrocardiogram (ECG), and motion capture systems. By comparing participants' physiological responses between the two kitchen environments, the study quantitatively assesses differences in muscle workload, physiological stress, and range of motion. The experimental protocol, sample size calculation, and data collection methods are all designed to enable rigorous, quantitative comparison of ergonomic outcomes in different kitchen settings. This experimental design establishes a basis for developing guidelines to help designers integrate anthropometric data and minimise ergonomic risks in customised kitchen design.

Keywords: *Kitchen Customisation, Anthropometric Data, Experimental Design, Electromyography (EMG)*

1 INTRODUCTION

China has a long-standing tradition encapsulated in the saying "food is the paramount necessity of the people," highlighting its rich culinary culture centred around grains and encompassing various cooking methods such as frying, boiling, frying, stewing, steaming, and roasting (Gao Yang & Miaoxing, 2023). Cooking is a meticulous activity that follows structured procedures and comprehensive guidelines (Kamal Baharin, Ahmad Nizam, Mohd Faharul, Azizan, & Mohd Nordin, 2025). Today, the kitchen has evolved from a mere cooking space to the heart and centre of family life (Man & Chongxi, 2021).

With the rise in household consumption in China, consumers' demands for personalisation have also surged (Qian, 2022). Modern homeowners are not just looking for standard kitchens; they seek spaces that resonate with their own personalised needs and characteristics, adapt to their unique lifestyles, and contribute to their overall well-being. Traditional standardised products struggle to meet these increasingly diverse and personalised needs (Li Ruiqi, Ji Tingyu, Han Li, Guotao, & Chengran, 2021).

To address this challenge, mass customisation in furniture production has emerged. This method uses advanced technologies such as information technology, new materials, and flexible manufacturing to successfully reconcile the contradiction between mass production and personalised customisation (Zhi-hui, 2016).

Anthropometrics, a key aspect of ergonomics, is crucial for kitchen customisation. Accurate measurements of users' body dimensions and habits enable designers to craft layouts that enhance both comfort and efficiency. This ensures cabinets' dimensions align with user needs, minimising the risk of injuries from repetitive tasks. As demand for personalised kitchens grows, integrating anthropometrics more effectively into design processes becomes vital. Future research should focus on methods facilitating the transition to mass-customised production systems, addressing the practical challenges highlighted by Da Silveira, Borenstein, & Fogliatto (Da Silveira, Borenstein, & Fogliatto, 2001). While the trend leans towards customisation, many current practices overlook anthropometrics and user-centric design. By leveraging anthropometrics and technological advancements, we can elevate the kitchen customisation process to be both ergonomic and user-friendly.

When designing and developing products, we shoulder pay attention to the aspects of visual design, storytelling, and user interaction (Nazri et al. 2025). Design operates as a culturally mediated practice, reflecting and shaping the values of society (Yang et al. 2025). It is important to explore ergonomic factors in household kitchens, considering diverse user needs influenced by physical characteristics (Chen et al., 2024). While the 2010 revision of China's "Kitchen Furniture" standard (QB/T 2531 — 2010) provides valuable reference points, mere compliance with technical guidelines does not ensure an optimal design. (J. Chen, 2023). Industry- standard guidelines like the NKBA offer valuable insights for home kitchen design, just focusing on functionality and aesthetics within minimal dimensional requirements (H. Chen et al., 2024). However, Jinwang et al. reveals that some cabinet designs, especially integrated ones, use a uniform height across all these workspaces (Jinwang et al. 2019). Some methods may propose ideal kitchen dimensions, yet they may not satisfy all users due to individual size variations (H. Chen et al., 2024). Charu's study of 200 participants found that standard kitchen designs often don't match anthropometric measurements, leading to joint and back pain (Amit Bhatia, 2019). Similarly, research by Sultana and Prakash showed that ergonomic kitchen design can significantly reduce discomfort and musculoskeletal problems (Sajida & Chitra, 2014). While technical guidelines provide a starting point, following them alone does not guarantee an optimal design. The different evaluation results of different samples indicate the necessity of customised requirements (Chen, 2023). Given demographic differences, it is crucial to provide users with personalised and optimised measurements, especially for those who exceed anthropometric thresholds (Krishna & Mehta, 2021). Based on the above content, the following problems has been identified:

1. The discrepancy between standard customisation kitchen designs and individual anthropometric measurements, leading to discomfort and pain.
2. The challenge lies in understanding the relationship between physical fatigue resulting from kitchen activities and the design height of the kitchen, which contributes to ergonomic risks.
3. There is a lack of a comprehensive guideline for designers in the customisation design process by integrating anthropometric measurements, optimising design proposals according to user needs, and minimising primary ergonomic risks.

1.1 Research Objectives

Based on the above three problems, three corresponding objectives were proposed.

1. Examine the prevalent use of standard dimensions in kitchen customisation design reveals a neglect of the diverse anthropometric needs of users, leading to primary ergonomic risks.
2. Examine the use of user-specific dimensions in kitchen customisation design can reduce primary ergonomic risks.
3. Propose a guideline to assist kitchen customisation designers in the design process by integrating anthropometric data.

1.2 Hypotheses

In order to achieve research objective i, H1-H5 is proposed. In order to achieve research objective ii, H6-H10 is proposed. Based on the comparison of the verification results of H1-H5 and H6-H10, H11 is proposed to achieve objective iii, as follows:

- H1: In customised kitchens using universal standard dimensions, performing kitchen activities involving repetitive or sustained awkward postures may result in biomechanical stress and physical fatigue.
- H2: In customised kitchens using universal standard dimensions, high frequency of repetitive kitchen tasks may result in biomechanical stress and physical fatigue.
- H3: In customised kitchens using universal standard dimensions, maintaining static postures for long periods of time while performing kitchen activities may result in biomechanical stress and physical fatigue.
- H4: In customised kitchens using universal standard dimensions, kitchen activities that require force may cause biomechanical stress and physical fatigue.
- H5: In customised kitchens using universal standard dimensions, kitchen activities involving contact stress may result in biomechanical stress and physical fatigue.
- H6: In customised kitchens incorporating user-specific dimensions, performing kitchen activities involving repetitive or sustained awkward postures may result in less biomechanical stress and physical fatigue than in a kitchen with universal standard dimensions.
- H7: In customised kitchens incorporating user-specific dimensions, performing high-frequency repetitive kitchen tasks may result in less biomechanical stress and physical fatigue than in a kitchen using universal standard dimensions.
- H8: In customised kitchens incorporating user-specific dimensions, prolonged kitchen activities in static postures may result in less biomechanical stress and physical fatigue than in a kitchen with universal standard dimensions.
- H9: In customised kitchens incorporating user-specific dimensions, exerting force in kitchen activities may result in less biomechanical stress and physical fatigue than in a kitchen with universal standard dimensions.
- H10: In customised kitchens incorporating user-specific dimensions, performing kitchen activities with contact stress may result in less biomechanical stress and physical fatigue than in a kitchen using universal standard dimensions.
- H11: Integrating anthropometric guidelines can help designers create customised kitchen designs that are more ergonomic and increase design efficiency.

2 LITERATURE REVIEW

2.1 Kitchen Customisation

Driven by the discrepancy between customer demands and production constraints, mass customisation (MC) has emerged as a solution to balance mass production with personalised customisation. Davis first introduced the concept of MC as a means to offer uniquely tailored products through flexible and integrated processes, aiming balance user needs with large-scale production (Davis, 1989). Pine argues that the goal of mass customisation is to offer customers a wide range of product choices and services, enabling them to purchase products that meet their specific needs at reasonable prices. He defines mass customisation as a production method that uses high-efficiency, low-cost design, production, and service techniques to fulfil individual customer needs within a product category through mass production (Pine, 1999). This definition underscores two key features of mass customisation: large-scale production and personalised needs fulfilment. For products like home appliances, bicycles, clothing, furniture, and computers, which are stable in quality, easy to standardise, and mature, mass customisation is more achievable (Zhang & Ju, 2002).

Whole-house customisation treats the overall living environment as the central focus for design and renovation. When crafting the overall design and individual components, it's essential not only to maintain a consistent style but also to balance functionality, ergonomics, and aesthetic (Rui et al. 2017). Ergonomics is instrumental in optimising kitchen spaces for both comfort and efficiency. This discipline focuses on the interaction between individuals and their working environments, aiming to ensure safety and minimise risks (Hrovatin et al. 2015). In the realm of kitchen design, ergonomics takes into account the entire work system, processes, and outcomes. The objective is to enhance movement efficiency and mitigate injuries resulting from repetitive actions (Chen et al. 2024). Practices in kitchen ergonomics are geared towards improving movement efficiency and reducing the strain caused by repetitive tasks during cooking, thereby preventing potential injuries. Furthermore, these practices also strive to enhance user interactions within the kitchen space during culinary activities (Occupational Health and Safety Agency for Healthcare in British Columbia, 2003).

2.2 Anthropometry In Kitchen Customisation

Kitchen tasks generally follow the sequence of "washing vegetables — chopping — cooking — washing dishes," primarily utilising three workspaces: the sink, countertop, and stove（Chen, 2023）. Common kitchen actions like bending over to chop vegetables or reaching into cabinets to fetch items can cause fatigue and lead to musculoskeletal disorders due to lifting and sustained poor posture. Awkward postures during kitchen tasks can lead to MSDs (Fatima et al. 2023; Mondal & Bhattacharjee, 2017).

In 1927, a German designer, Erna Meyer, proposed that to improve comfort in kitchen chores, the kitchen design should be adjusted to suit the user's height (Meyer, 1926), as illustrated in Figure 1.

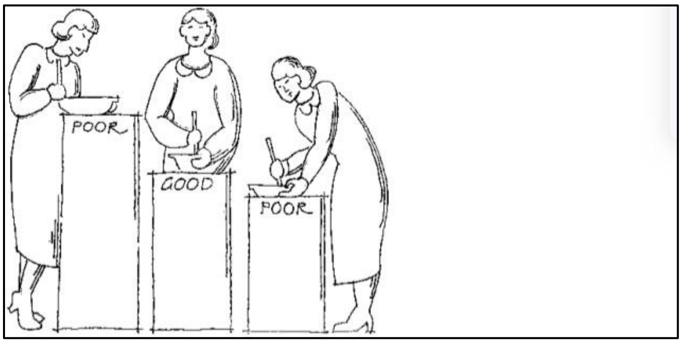

Figure 1 Kitchen Furniture Adjusted to the height of its Users
(Sources: Meyer,1926, Copyright Consent: Permissible to Publish)

Generally, the stove and the countertop are at the same height. However, since women typically use the stove for longer periods, to avoid shoulder and neck pain from holding their arms too high, the stove height should be lower than the countertop height. The sink height is often too low, causing lower back strain with prolonged use. Therefore, the sink height should be raised so users can wash dishes comfortably while standing upright (Li, 2007). Dong suggested that the stove surface height should account for the combined height of the stove and pots. For tabletop stoves, the height should be 200 mm lower than the regular countertop, making it between 600 mm and 650 mm. For built-in stoves, it should be 100 mm lower, resulting in a height between 700 mm and 750 mm.

Researchers proposed the recommended countertop heights for women of different heights are shown in Table 1 (Li, 2007). This has significant implications for the ergonomic study of kitchens, as it identifies the correlation between women's height and comfortable countertop heights, with small size intervals. However, it does not reveal the intrinsic relationship between them. While height provides some guidance on countertop height, it is more directly related to the elbow height in a standing posture.

Table 1 The Most Comfortable Operating Height Corresponding to the Different Stature

Stature	150cm	153cm	155cm	158cm	160cm	163cm	165cm	168cm	170cm
Operating height	79cm	80cm	81.5cm	83cm	84cm	85.7cm	86.5cm	88cm	89cm

(Source：(Li, 2007)

The general principles for selecting human body dimensions percentiles in product design are as follows (Baoxiang, 2017):

- For general products, the 95th and 5th percentiles (P95 and P5) are commonly chosen, or alternatively, P90 and P10 may be selected as appropriate.
- For products related to health and safety, the 99th and 1st percentiles (P99 and P1) are selected, or alternatively, P95 and P5 as appropriate.
- For products used by both adult men and women, the larger percentile is chosen based on the male P90, P95, or P99, and the smaller percentile based on the female P10, P5, or P1.

Since the kitchen is a product used by both genders, choosing the female P10 to the male P95 percentile (GB/T 10000-1988) range can satisfy 85% of the adult population in China (Table 2). According to data, the 10th percentile stature (P10) for Chinese adult females (aged 18-55) is 1503 mm, and the 95th percentile stature (P90) for Chinese adult males (aged 18-60) is 1775 mm. Therefore, the appropriate height range is 1500 mm to 1800 mm.

Table 2 Main Body Dimensions (GB/T 10000-1988) (Unit: mm)

Age group	Men (18 to 60 years old)							Women (18 to 55 years old)						
Measuring items	1	5	10	50	90	95	99	1	5	10	50	90	95	99
1.1 Height	1543	1583	1604	1678	1754	1775	1814	1449	1484	1503	1570	1640	1659	1697
1.2Weight /kg	44	48	50	59	70	75	83	39	42	44	52	63	66	71
1.3Upper arm length	279	289	294	313	333	338	349	252	262	267	284	303	302	319
1.4Forearm length	206	216	220	237	253	258	268	185	193	198	213	229	234	242
1.5Thigh length	413	428	436	465	496	505	523	387	402	410	438	467	476	494
1.6Calf length	324	338	344	369	396	403	419	300	313	319	344	370	375	390

(Sources: Baoxiang, 2017)

The design methods for various functional areas are as follows (Jun, 2009):

- Sink height = elbow height - 50 mm
- Stove height = elbow height - (100-150) mm
- Countertop height = Stature x 6/11

This study reveals the true relationship between various human body measurements and kitchen cabinet dimensions, providing very valuable guidance for this thesis. Using the provided formulas, the appropriate heights of different kitchen countertops can be accurately calculated for each user.

In summary, anthropometry in ergonomics is crucial for custom kitchen design. Previous studies have explored the relationship between countertop heights and human measurements, providing a reference for future research. However, the heights of various countertops used in current kitchen customisation processes are still designed according to standardised dimensions, without considering individual differences. This can lead to physical discomfort for users. Addressing this gap will be the focus of this thesis.

3 METHODOLOGY

The research design utilises a quantitative approach to data collection and analysis. Objective numerical data on physical workload and task efficiency are obtained through anthropometric measurements, Xsens motion capture, surface Electromyography (EMG), Galvanic Skin Response (GSR), and Heart Rate monitoring. The primary ergonomic risk factors in the kitchen are frequent task repetition, forceful movements, extended or repetitive awkward postures, prolonged static positions, and pressure from contact. Tasks such as chopping vegetables, bending during food preparation, reaching for items on shelves or in upper cabinets, and lifting utensils and pots are commonly carried out in the kitchenette (Bhatia & Singla, 2019). To examine the relationship between dimensional design and ergonomic risk in kitchen, five experimental tasks were designed: reaching for items on high cabinets, chopping vegetables, distributing ingredients into different containers or bowls, lifting heavy pots, pans, and containers, and stirring ingredients in pots and pans, simulating a complete cooking process in the kitchen. The five experiments were conducted in both customised kitchens using standard dimensions and those using user-specific dimensions, resulting in ten experiments in total. Table 3 illustrate the specific tasks conducted in each kitchen setup.

Table 3 The Specific Tasks Conducted in Each Kitchen Setup (Sources: The Author, 2025)

The primary ergonomic risk factors	Task
Extended or repetitive awkward postures	Accessing items from upper shelves
Frequent task repetition	Cutting and preparing vegetables
Prolonged static positions	Transferring ingredients to different containers
Forceful movements	Handling and moving heavy kitchenware
Pressure from contact	Mixing and stirring contents in pots

3.1 Sampling

3.1.1 Participant Recruitment

Inclusion criteria required participants to be free from severe musculoskeletal disorders, willing to participate, and have prior experience with common kitchen tasks such as cooking, chopping, and cleaning. Exclusion criteria included physical conditions that might impede safe task execution and professional cooking experience.

3.1.2 Sample Size Determination

In order to ensure adequate statistical validity of the study, the sample size was predicted using G*Power 3.1.9.7 software. G*Power (Erdfelder et al. 1996) is a free and highly versatile software for conducting statistical power analysis, and has become a standard tool in social and behavioural sciences. The latest release, G*Power 3.1.9.7, significantly enhances its previous capabilities by supporting a comprehensive array of statistical tests—including t, F, χ^2, z, and several exact tests—across both Windows and Mac OS platforms. The software features improved effect size calculations, flexible input parameters, and robust power analysis options, making it an indispensable and practical resource for researchers seeking rigorous sample size estimation and study planning (Faul et al. 2007). The statistical analysis was conducted using an F test, specifically a repeated measures analysis of variance (ANOVA) incorporating a within-between interaction. An a priori power analysis was performed with the following parameters: a significance level (α) of 0.05, a target statistical power of 0.80, a between-subjects factor representing height group (six groups), and a within-subjects factor representing the configuration of the operating table (two conditions: standard height and individualised height). Based on these specifications, the power analysis determined that a minimum total sample size of 60 participants is necessary to ensure sufficient statistical power for detecting meaningful effects. The calculation interface of G*Power 3.1.9.7 is shown in Figure 2.

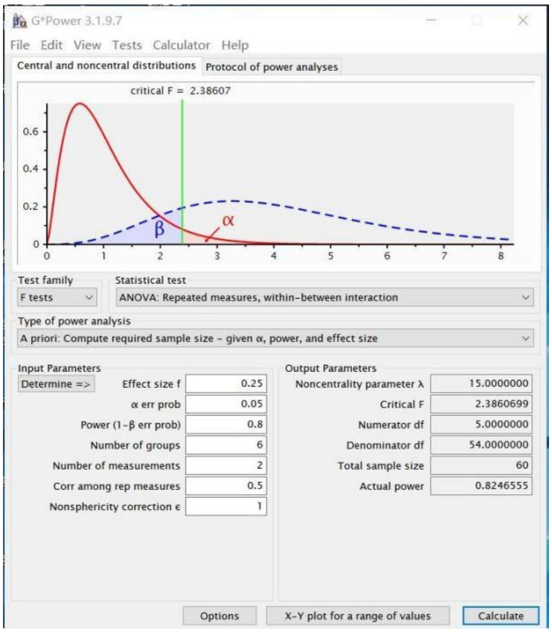

Figure 2 The Calculation Interface of G*Power 3.1.9.7
(Source: The Author, 2025)

In accordance with the GB/T 10000-1988 standard for Chinese adult anthropometry, participants were divided into six stature-based groups spanning from 1500 mm to 1800 mm (1500–1550, 1550–1600, 1600–1650, 1650–1700, 1700–1750, and 1750–1800 cm), ensuring coverage of approximately 85% of the adult Chinese population. A total of 60 participants (10 per group) were recruited, as determined by a priori power analysis using G*Power.

4 FINDINGS

Based on the literature review, the Conceptual Framework is proposed and showed in Figure 3.

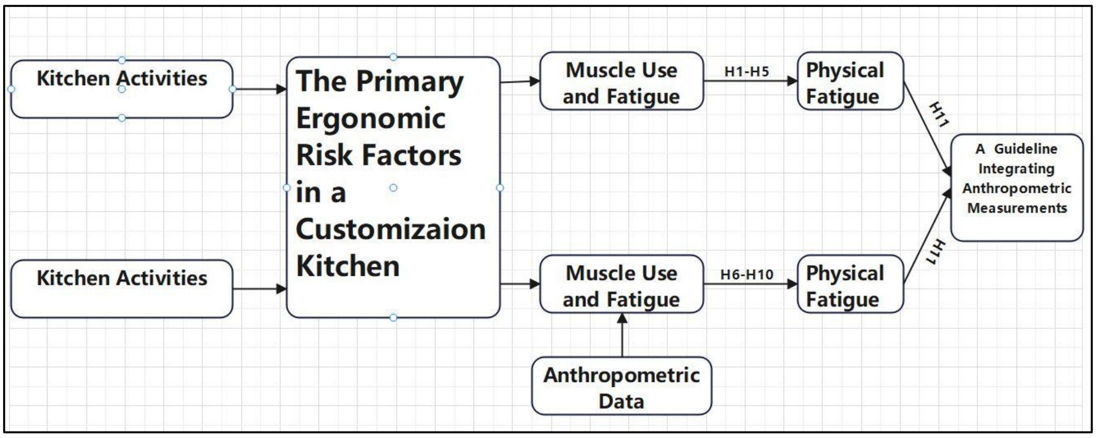

Figure 3 The Conceptual Framework
(Source: The Author, 2025)

Figure 4 shows the research process. basically, the research has divided into 3 phases after a pilot test. Phase 1 is conducted through experiments with tasks in customised kitchens with standard kitchen dimension, Phase 2 is conducted through experiments with tasks in customised kitchens with user-specific dimension, and Phase 3 is verified through in-depth interviews.

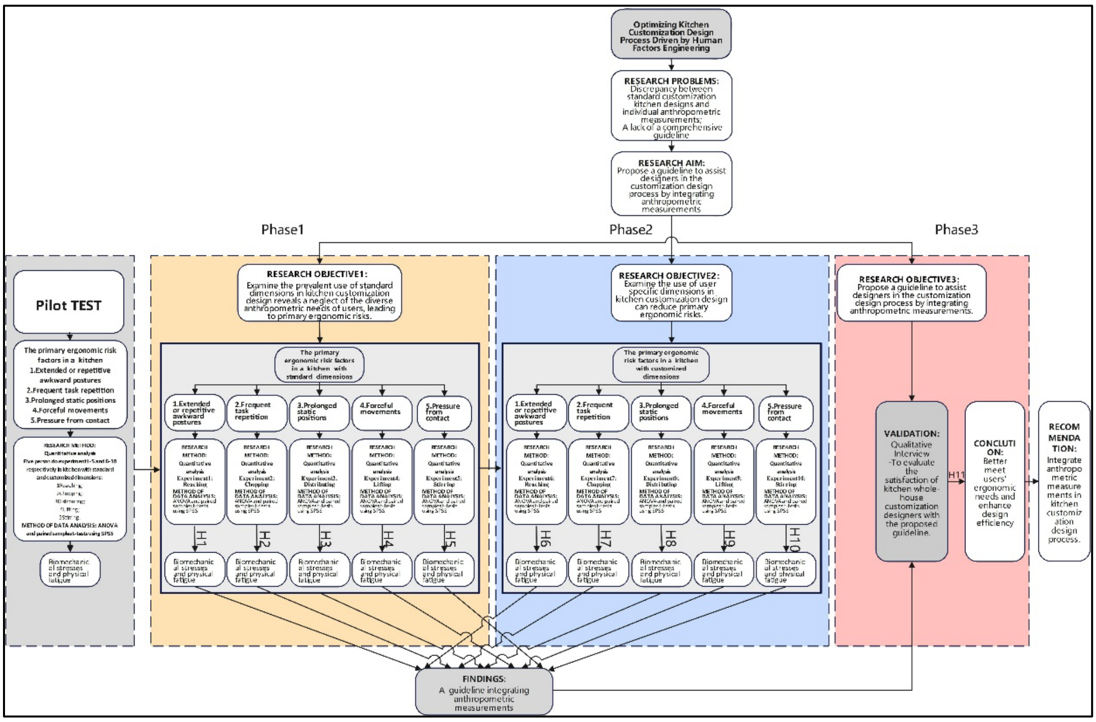

Figure 4 Research process
(Source: The Author, 2025)

3.2 Experimental Setup

Based on anthropometric measurements, two types of kitchen operating environments were established for each participant to enable subsequent ergonomic comparison experiments:

3.2.1 Customised kitchens with standard kitchen dimension

This configuration employed industry-standard kitchen dimensions commonly used in whole-house customisation, without considering individual user differences. Specifically, the operating table height was set at 820 mm, the stove height was achieved by placing a 50 mm stove support on top of the countertop, and the bottom height of the hanging cabinet was set at 1900 mm (vertical distance from the floor). This group served as the control condition, simulating the prevalent practice of applying uniform dimensions regardless of user variability.

3.2.2 Customised kitchens with user-specific dimension

This configuration was tailored for each participant according to their individual anthropometric data, with the aim of optimising ergonomic comfort and operational efficiency while reducing muscle load.

Operating table height was set as: Elbow height (with shoes) minus 100 mm. This approach ensures the user’s forearms rest comfortably with a slight downward angle (approximately 5°–15° above the table surface), facilitating shoulder relaxation and horizontal wrist alignment, while minimising upper limb muscle strain. The height of the stove was set as the participant’ s standing elbow height minus 200 mm, with a wok placed on a 50 mm stove support.

Hanging cabinet bottom height was set as: Functional arm reach height (with shoes) minus 150 mm. This ensures participants can access both lower and upper shelves comfortably while standing flat-footed, reduces excessive shoulder elevation, and helps prevent postural overcompensation or safety hazards such as frequent head bumps or unstable reach manoeuvres.

These two experimental setups allow for direct comparison of a conventional standardised kitchen and a user-specific, ergonomically optimised kitchen environment. This provides a robust methodological basis for evaluating physiological and behavioural differences across conditions, in line with a user-centred approach to kitchen customisation. The configurations of the two kitchens are shown in the Figure 5.

Figure 5 The Configurations of the Two Kitchens
(Source: The Author,2025)

3.3 Testing Process

3.3.1 Pilot Test

The pilot test aimed to validate the feasibility, reliability, and clarity of the experimental protocol prior to the main study.

Seven participants were recruited for the pilot: one “zero participant” for initial process calibration, and one participant from each of six distinct height groups to ensure anthropometric diversity. All participants were free from severe musculoskeletal disorders and had no professional cooking experience.

This pilot test ensured that all procedures, measurement tools, and data collection methods were appropriate and effective, providing a solid foundation for the subsequent full-scale experiment.

3.3.2 Phase 1

3.3.2.1 Procedure

Each participant received a detailed briefing on the study’ s objectives, procedures, and task requirements before providing written informed consent, in accordance with institutional ethical approval. Anthropometric data — including stature, standing elbow height, and functional overhead reach — were collected using standardised instruments. Participants then completed a standardised sequence of five kitchen tasks (reaching, chopping, distributing, lifting, and stirring) in customised kitchens configured to standard dimensions.

3.3.2.2 Data Collection Instruments

During all tasks conducted in customised kitchens with standard dimensions, full-body motion data were recorded using the Xsens MVN Link IMU-based system. Surface EMG sensors measured muscle activity to assess workload and fatigue, while heart rate monitoring and galvanic skin response (GSR/EDA) were used to evaluate physical exertion, autonomic arousal, and stress. These physiological measures provided comprehensive data on participants’ responses under standardised kitchen conditions.

3.3.3 Phase 2

3.3.3.1 Procedure

Customised kitchen dimensions — including countertop, cabinet, work surface, and stovetop heights—were calculated for each participant based on their anthropometric measurements, ensuring ergonomic alignment with individual body dimensions. Participants then performed the same standardised sequence of five kitchen tasks in these user-specific kitchen environments.
3.3.3.2 Data Collection Instruments

Motion capture, electromyography (EMG), heart rate monitoring, and galvanic skin response (GSR) were still used to collect participants’ physiological data during this experimental phase. The wearing effect on participants is shown in the Figure 6.

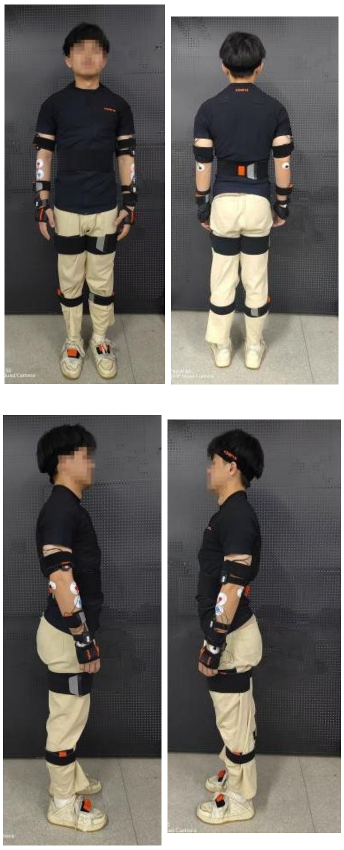

Figure 6 The wearing effect on participants
(Source: The Author,2025)

3.3.4 Phase 3

Three experienced kitchen customisation designers (minimum 5 years' professional experience) will be recruited for in-depth interviews to assess the proposed design guidelines. After obtaining informed consent, participants will provide feedback on guideline effectiveness, feasibility, and user impact, guided by open-ended interview questions. Only designers with ergonomic kitchen experience will be included. This process aims to gather expert insights and suggestions for further improvement.

CONCLUSION

This research outlines a comprehensive research approach aimed at addressing effective customisation challenges in kitchen design, meeting user ergonomic needs, and ensuring their physical health during kitchen activities. A research method incorporating quantitative method was proposed through experiments. The research design focuses on identifying the main ergonomic risk factors and designing experiments to verify hypotheses related to standards and user specific kitchen sizes. By comparing two types of kitchen environments through experiments, the aim is to provide guidance for designers to better meet the ergonomic needs of users. The development process of research instruments includes designing experiments, and conducting pilot tests to improve experimental procedures. The formal experiment is divided into the first and second stages, focusing on customised kitchen design in different aspects. The first stage studied the use of standard sizes, and the second stage explored the application of user specific sizes. This experimental design provides a foundational framework for proposing guidelines that assist designers in integrating anthropometric measurements, optimising customisation according to user needs, and minimising ergonomic risks in kitchen design.

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AUTHOR CONTRIBUTIONS

Each author contributed equally in this research.

CONFLICT OF INTEREST

The author declares no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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Play to Place Physical Gameboard as Learning Tools of Engagement and Collaboration Towards Learning Outcomes

Ahmad Faiz Mohd Nadzamuddin[1], Sayed Muhammad Aiman Sayed Abul Khair[2*], Muhammad Assyahmizi Mohd Yunus[3], Muhammad Faris Arman[4], Mohammad Nazrin Zainal Abidin[5], Farid Al Hakeem Yuserrie[6]

[1,2,3,4,5,6] *Department of Built Environment Studies and Technology, Faculty of Built Environment, Universiti Teknologi MARA, Perak Branch, 32610, Seri Iskandar, Perak, Malaysia*

[1]ahmadfaizmn@uitm.edu.my, [2*]sayed705@uitm.edu.my, [3]assyahmizi@uitm.edu.my, [4]farisarman@uitm.edu.my, [5]m_nazrin@uitm.edu.my, [6]farid933@uitm.edu.my

***Corresponding author**

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ABSTRACT

Gamification offers new possibilities for architectural education by transforming site analysis from a passive, descriptive task into an active and collaborative learning experience. Traditional approaches often limit engagement and critical interpretation, whereas gamified methods can sustain motivation, usability, and peer collaboration while linking site data to meaningful learning outcomes. This study examines the Play to Place Physical Gameboards – Seri Iskandar (P2P–SI) module, designed to integrate local cultural narratives, tangible play mechanics, and storytelling into site exploration. Grounded in constructivist and experiential learning traditions and supported by gamification theory, the research focused on three dimensions: engagement and usability, social and collaborative impacts, and learning outcomes. The module was implemented with 101 second-year architecture students at Universiti Teknologi MARA, Perak Branch, during site analysis exercises. Data were collected through a structured questionnaire and analysed using Partial Least Squares Structural Equation Modelling (PLS-SEM) to test the relationships between the three dimensions. The results show that engagement and usability directly influenced learning outcomes and strongly shaped social and collaborative impacts, while collaboration in turn enhanced learning outcomes. Students highlighted that clear rules, intuitive play, and immediate feedback supported sustained engagement, while collaborative play improved communication, teamwork, and shared site interpretation. These findings demonstrate that embedding usability and collaboration within gamified tools can produce stronger outcomes, including spatial reasoning, cultural understanding, and reflective thinking. The study positions P2P–SI as a student-centred and culturally relevant pedagogical innovation that bridges technical knowledge with social and reflective dimensions of architectural design education.

Keywords: *Architecture gamification, learning engagement, learning outcome, collaborative learning, site-based pedagogy*

1 INTRODUCTION

1.1 Background of Study

Site analysis is a critical stage in architectural education, shaping how students interpret spatial, cultural, and environmental contexts before design begins. Traditional methods such as lectures, guided tours, and inventories often reduce learners to passive observers, limiting active engagement and deeper connections with site data (Hilhorst, 2021). To address this, gamification has emerged as an innovative approach to increase motivation, usability, and collaboration, linking abstract knowledge with meaningful outcomes. The Play to Place Physical Gameboards (P2P–SI) module demonstrates this by combining board game mechanics with local cultural narratives, transforming site exploration into an interactive, student-centred process. Grounded in experiential learning theory (Kolb, 1984) and constructivist principles (Vygotsky, 1978), it encourages learning through doing and co-construction of knowledge. Structured play enhances retention, teamwork, and problem-solving as students negotiate meaning and co-create richer interpretations (Schnabel, Lo, & Aydin, 2014; Redondo et al., 2020). Engagement and usability remain central; clear rules, intuitive design, and feedback sustain focus and motivation (Deterding et al., 2011; Toda et al., 2019; El-Zeini, 2024). By embedding collaboration, engagement, and usability, P2P–SI fosters spatial reasoning, cultural understanding, and critical reflection (Ortiz-Rojas et al., 2025), while its integration of Malaysian handicraft aesthetics enhances inclusivity and contextual relevance (Mohd Nadzamuddin et al., 2025)

1.2 Problem Statement

In architectural education, site analysis is often reduced to a procedural task rather than a transformative learning experience. Conventional methods such as lectures, guided visits, and manual inventories position students as passive observers, limiting opportunities for engagement, collaboration, and critical interpretation of site data (Hilhorst, 2021). Gamification has emerged as a promising alternative, showing potential for enhancing motivation, contextual awareness, and teamwork (Schnabel et al. 2014; Redondo et al., 2020). However, challenges remain. Social and collaborative dimensions are often underdeveloped, with poorly structured mechanics or competitive biases restricting deeper peer interaction and shared meaning-making (El Mehelmy & El-Zeini, 2024). Engagement and usability also vary, as complex rules, unclear objectives, or culturally irrelevant designs can frustrate learners (Goli et al., 2022). Moreover, the connection between engagement and long-term learning outcomes such as spatial reasoning, cultural understanding, and critical reflection remains underexplored in Southeast Asian architectural contexts (Eltahir, Zulkifli, & Samad, 2023). In Malaysia, while gamified tools show promise, concerns persist regarding their cultural adaptation and effectiveness in studio-based learning. This study, therefore, examines the Play to Place Physical Gameboards – Seri Iskandar (P2P–SI) through three key questions:

1. What are the perceptions of architecture students regarding the engagement and usability of the Play to Place Physical Gameboards (P2P–SI) in the context of site analysis activities?
2. How effectively does the gameboard promote social and collaborative interactions among learners in a studio-based environment?
3. How do engagement, usability, and collaboration contribute to meaningful learning outcomes?

1.3 Literature Review

1.3.1 Gamified Learning in Architectural Education

Gamification in architectural education relies on constructivist and experiential learning theories, transforming passive students into active co-constructors of knowledge (Kolb, 1984; Vygotsky, 1978). By embedding site data into playful mechanics, game-based approaches shift site analysis from routine description to an active, social, and reflective process, enhancing motivation and contextual understanding (Schnabel et al. 2014; Redondo et al. 2020). Within the Malaysian higher education context, Saad and Mansor (2024) found that gamification revitalises static learning materials, significantly boosting student engagement. Furthermore, embedding local cultural narratives sustains learner interest while preserving heritage. Aligning with these findings, the P2P–SI module integrates Malaysian aesthetics, transitioning site analysis into a culturally resonant, collaborative, and highly engaging academic pursuit.

1.3.2 Social and Collaborative Impact

Collaboration is a cornerstone of architectural practice, and gamified environments provide structured opportunities for teamwork and peer learning. Studies confirm that collaborative play in design studios fosters co-created site interpretations, active participation, and mutual reflection (El Mehelmy & El-Zeini, 2024; Redondo et al., 2020). Within the developing collaborative pedagogy of Malaysian education, Yuhaniz et al. (2018) found that board game modules in architecture classes significantly heighten peer collaboration and critical thinking. Aligning with these findings, tools like the Play to Place Physical Gameboards offer a culturally resonant medium for peer-to-peer interaction. This enables learners to connect site data with cultural narratives, effectively operationalising the Community of Inquiry (CoI) framework to create meaningful, shared learning (Swan et al. 2009).

1.3.3 Engagement and Usability

While collaboration is vital, learning outcomes strongly depend on whether gamified tools are engaging and user-friendly. Usability ensures learners navigate mechanics without confusion, focusing on site data interpretation rather than struggling with gameplay (Deterding et al., 2011; Toda et al., 2019). Clear mechanics, intuitive design, and immediate feedback are key to sustaining this engagement (El-Zeini, 2024). Highlighting this in the Malaysian context, Azhar and Che Din (2025) emphasise that well-structured, user-centric gamification strategies are essential to bridge passive observation with active, consistent participation. Conversely, inadequately organised or culturally irrelevant mechanics can frustrate learners and diminish educational effectiveness (Goli et al., 2022). Consequently, engagement and usability serve as crucial intermediaries, determining the extent to which collaborative play yields significant learning outcomes.

1.3.4 Towards Learning Outcomes

The primary goal of incorporating gamified methods into site analysis is to enhance educational outcomes, especially in spatial reasoning, cultural awareness, and critical design thinking. The EDUGAME4CITY project demonstrated the effectiveness of gamification in enhancing students' ability to link abstract urban data to design choices (Redondo et al., 2020). Similarly, Ortiz-Rojas et al. (2025) found that gamification enhanced autonomy, competence, and relatedness, consistent with Self-Determination Theory (SDT), and promoted greater engagement in learning.

The Play to Place Physical Gameboards (P2P–SI) module addresses this by embedding local landmarks, storytelling, and cultural aesthetics into its mechanics, thereby linking cultural inclusivity with educational outcomes (Mohd Nadzamuddin et al., 2025). This demonstrates how thoughtful integration of social collaboration, engagement, and usability can elevate site analysis from a procedural task into a transformative learning experience.

Gamification in architectural site analysis offers a shift from passive data collection toward active, participatory, and culturally relevant learning. The Play to Place Physical Gameboards (P2P–SI) module demonstrates how social and collaborative impacts, combined with engagement and usability, can generate stronger learning outcomes. These outcomes extend beyond technical knowledge to include spatial reasoning, cultural awareness, reflective thinking, and teamwork. Figure 1 shows the proposed conceptual framework of P2P-SI, which illustrates the relationship of Social and Collaborative Impacts (SC), Engagement and Usability (EU) and Learning Outcomes (LO), summarising the central focus of this study, positioning gamified tools as powerful approaches to enrich architectural pedagogy through integration of cultural, social, and reflective dimensions.

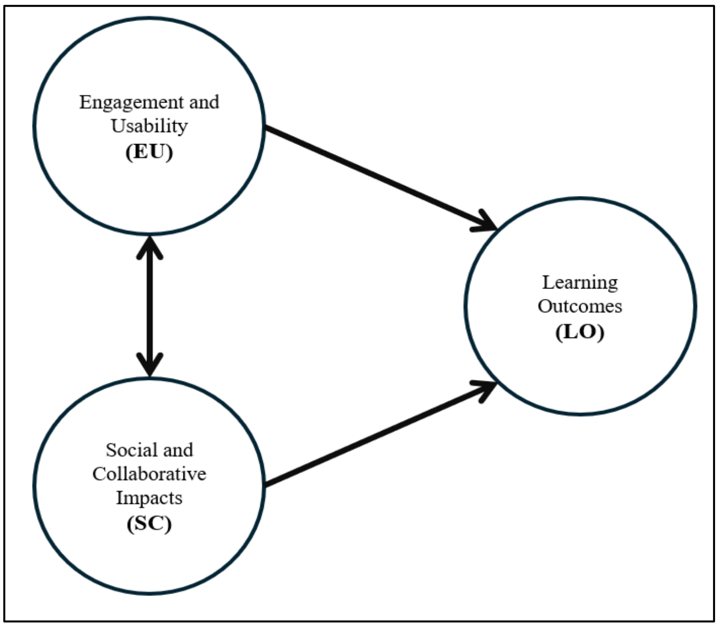

Figure 1 Proposed Conceptual Framework of Play to Place Physical Gameboard as Learning Tools of Engagement and Collaboration Towards Learning Outcomes (Source: author)

1. METHODOLOGY

2.1 Research Design

This study utilised a quantitative research design, specifically employing Partial Least Squares Structural Equation Modelling (PLS-SEM), to investigate the relationships between Engagement and Usability (EU), Social and Collaborative Impact (SC), and Learning Outcomes (LO) within the framework of the Play to Place physical gameboard. PLS-SEM was chosen for its appropriateness in analysing models that include latent constructs, its capability to manage smaller sample sizes, and its focus on research that prioritises prediction (Hair, Hult, Ringle, & Sarstedt, 2017).

2.2 Population and Sampling

The participants in this study were students engaged with the Play to Place physical gameboard during their educational activities. A purposive sampling technique was employed to focus on 101 second-year undergraduate architecture students who had firsthand experience utilising the gameboard during their site exploration task. The final sample size was established in accordance with the minimum requirements for PLS-SEM analysis, adhering to the "10-times rule" (Hair et al., 2019) and validated through power analysis to guarantee adequate statistical power for identifying medium to large effect sizes (Cohen, 1988).

2.3 Research Instrument

The measurement tool utilised was a structured questionnaire aimed at gathering participants' perceptions of:

1. Engagement and Usability (EU): assessed using four (4) reflective indicators.
2. Learning Outcomes (LO): assessed via three (3) reflective indicators
3. Social and Collaborative Impact (SC): evaluated using two (2) reflective indicators.

A five-point Likert scale (1 = strongly disagree, 5 = strongly agree) was employed to assess responses.

2.4 Data Collection Procedure

Data collection occurred during the 10th week of the semester, following the introduction of the Play to Place gameboard in the design studio hours during the 3rd week. The students received an overview of the goals of the learning task prior to commencing their work. The questionnaire survey has been disseminated to the students via Google Form. Figure 2 illustrates the structure of the module and its innovation and operation compared to conventional learning tasks.

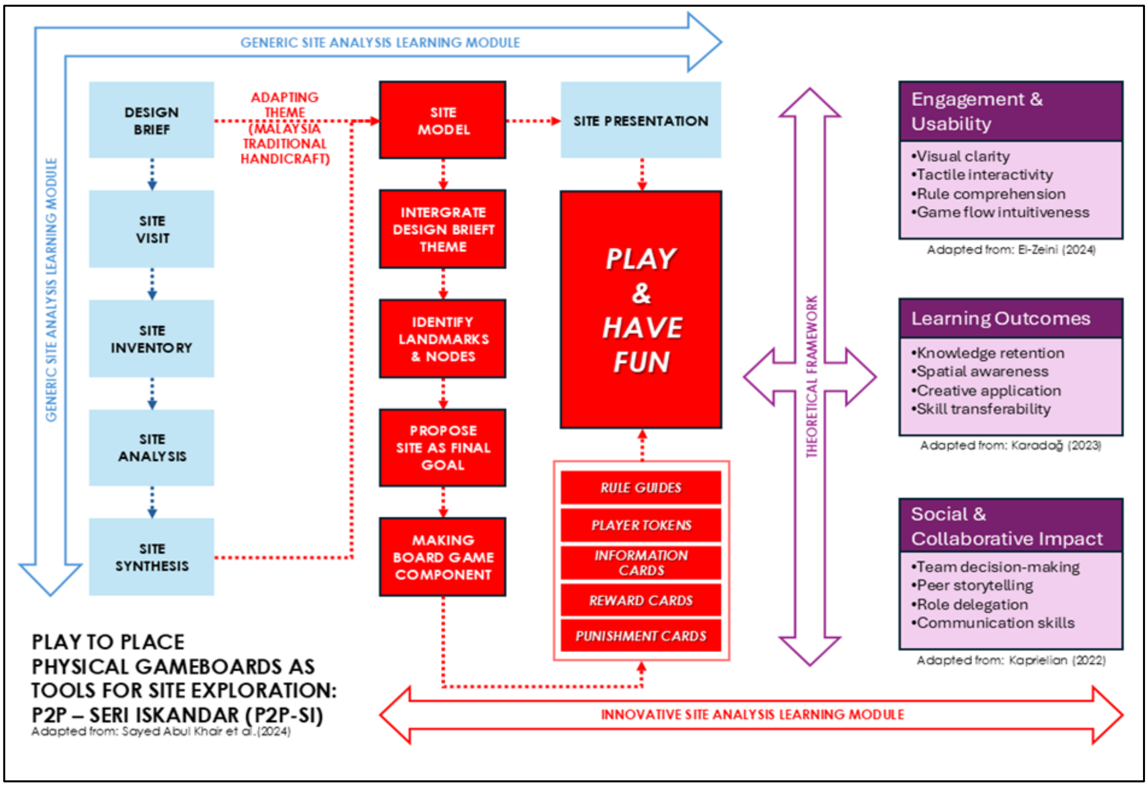

Figure 2 Play to Place Physical Gameboards as Tools for Site Exploration:
P2P - Seri Iskandar (P2P-SI) framework
(Source: Mohd Nadzamuddin et al., 2025)

2.5 Data Analysis Technique

Data analysis followed a two-step approach in PLS-SEM:
The Measurement Model Assessment stage involved evaluating the following aspects:

1. Indicator Reliability: standardised loadings were examined, with values above 0.708 considered acceptable.
2. Internal Consistency Reliability: assessed using Cronbach's alpha and Composite Reliability (CR), with thresholds of 0.70 for acceptable reliability and >0.90 for excellent reliability (Nunnally & Bernstein, 1994; Hair et al., 2022).
3. Convergent Validity: evaluated through the Average Variance Extracted (AVE), where values greater than 0.50 were deemed adequate (Fornell & Larcker, 1981).
4. Construct Validity: examined using the Standardised Root Mean Square Residual (SRMR), d_ULS, d_G, Chi-square, and Normed Fit Index (NFI) to confirm overall model fit.
5. Collinearity Assessment: Variance Inflation Factor (VIF) values were checked to ensure the absence of multicollinearity, with thresholds of <5 (Diamantopoulos & Siguaw, 2006).

Structural Model Assessment – This stage tested the hypothesised relationships among EU, SC, and LO. Path coefficients (β), t-statistics, p-values, and confidence intervals were obtained using bootstrapping with 5,000 resamples (Hair et al., 2017). Significance was evaluated at both 5% and 1% levels using two-tailed tests. Effect sizes were interpreted using Cohen's (1988) guidelines (0.10 = small, 0.30 = moderate, 0.50 = strong).

3 RESULT AND DISCUSSION

3.1 Indicator Reliability

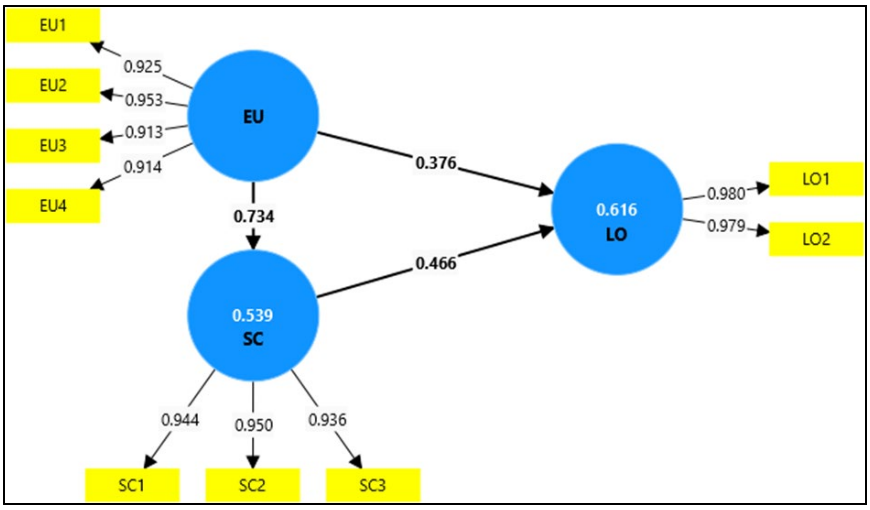

Figure 3 Measurement Model of Play to Place Physical Gameboard as Learning Tools of Engagement and Collaboration Towards Learning Outcomes

The findings presented in Table 1 indicate that every measurement item in this study meets or surpasses the suggested loading threshold. Indicators for Engagement and Usability (EU) varied from 0.913 to 0.953, indicators for Learning Outcomes (LO) were measured at 0.979 and 0.980, and indicators for Social and Collaborative Impact (SC) fell between 0.936 and 0.950. The results indicate that each indicator effectively reflects its corresponding latent construct, thus affirming a high level of reliability throughout the model.

The findings are consistent with earlier methodological guidelines that emphasise the importance of robust loadings to ensure construct validity in PLS-SEM models (Chin, 1998; Hair et al., 2019). Furthermore, the consistently high loadings noted in this analysis surpass the minimum threshold, demonstrating that the indicators are both reliable and significantly meaningful in reflecting the underlying constructs. This result enhances the reliability of the measurement model and guarantees that future evaluations of construct reliability, validity, and structural relationships are based on dependable indicators.

Table 1 Results of Indicator Loadings for the Measurement Model

Items/Constructs	EU	LO	SC
EU1	0.925		
EU2	0.953		
EU3	0.913		
EU4	0.914		
LO1		0.980	
LO2		0.979	
SC1			0.944
SC2			0.950
SC3			0.936

3.2 Internal Consistency (Composite Reliability) and Convergent Validity (AVE)

Table 2 indicates that all constructs in this study surpass the suggested thresholds for both Cronbach's alpha and CR. Engagement and Usability (EU) demonstrated a Cronbach's alpha of 0.945 and a CR of 0.960. Learning Outcomes (LO) achieved scores of 0.957 and 0.979, whereas Social and Collaborative Impact (SC) recorded values of 0.938 and 0.960. The findings demonstrate that the items reliably assess their respective constructs, offering robust support for internal consistency reliability. The results indicate AVE values of 0.858 for EU, 0.959 for LO, and 0.890 for SC. The findings provide robust evidence of convergent validity, demonstrating that each construct accounts for a significant amount of indicator variance beyond the influence of measurement error.

The findings collectively indicate that the constructs examined in this study show strong internal consistency and convergent validity. This enhances assurance in the measurement model and establishes a robust basis for assessing structural relationships. The results align with earlier suggestions in the PLS-SEM literature, indicating that assessments of reliability and validity are essential for a significant evaluation of the structural model (Hair et al., 2019; Sarstedt, Ringle, & Hair, 2020).

Table 2 Internal Consistency Reliability

	Cronbach's Alpha	Composite Reliability (rho_a)	Composite Reliability (rho_c)	Average Variance extracted (AVE)
EU	0.945	0.948	0.960	0.858
LO	0.957	0.958	0.979	0.959
SC	0.938	0.938	0.960	0.890

3.3 Construct Validity (Assessment of Goodness of Fit, GOF)

The findings presented in Table 3 indicate that the VIF values for the constructs examined in this study fall within the range of 1.000 to 2.171. Engagement and Usability (EU) documented a VIF

of 2.171, Learning Outcomes (LO) indicated 1.000, and Social and Collaborative Impact (SC) similarly noted 2.171. The values presented are significantly lower than the suggested cut-off points, indicating that there are no collinearity issues present in the structural model.
While values exceeding 0.90 are preferred, those near this threshold can still be deemed acceptable in PLS-SEM applications (Bentler & Bonett, 1980; Hair et al., 2022). This study presents an NFI value of 0.887, which, although slightly under the 0.90 threshold, suggests an adequate model fit considering the predictive focus of PLS-SEM. Ultimately, the reported Chi-square statistic (120.354) corresponds with expectations for intricate models, although in PLS-SEM, the interpretation of chi-square is approached with caution due to the method's lack of assumption regarding multivariate normality (Hair, Risher, Sarstedt, & Ringle, 2019).

Collectively, the GOF indices indicate that the measurement model shows robust construct validity. The extremely low SRMR and satisfactory values for d_ULS and d_G indicate that the model closely aligns with the empirical data. While the NFI is marginally under the optimal threshold, its closeness to 0.90, along with the predictive capabilities of PLS-SEM, reinforces the assertion that the model sufficiently aligns with the data. The findings correspond with contemporary suggestions that highlight a practical perspective on GOF in PLS-SEM, advocating for a focus on predictive accuracy and reliability instead of rigid compliance with CB-SEM standards (Henseler et al., 2016; Sarstedt, Ringle, & Hair, 2020).

Table 3 Construct Validity (Assessment of Goodness of Fit - GOF)

	Saturated model	**Estimated model**
SRMR	0.036	0.036
d_ULS	0.059	0.059
d_G	0.183	0.183
Chi-square	120.354	120.354
NFI	0.887	0.887

3.4 Assessment of Collinearity

The findings presented in Table 4 indicate that the VIF values for the constructs examined in this study fall within the range of 1.000 to 2.171. Engagement and Usability (EU) documented a VIF of 2.171, Learning Outcomes (LO) indicated 1.000, and Social and Collaborative Impact (SC) similarly noted 2.171. The values presented are significantly lower than the suggested cut-off points, indicating that there are no collinearity issues present in the structural model.

The absence of problematic collinearity reinforces the conclusion that the predictor constructs (EU and SC) account for variance in the dependent construct (LO) without redundancy. This reinforces the reliability of the estimated path coefficients and boosts confidence in the model's capacity to depict theoretically significant relationships. Furthermore, these findings are consistent with earlier methodological guidelines that highlight the importance of conducting regular collinearity assessments as a fundamental aspect of sound practice in PLS-SEM studies (Hair, Risher, Sarstedt, & Ringle, 2019; Sarstedt, Ringle, & Hair, 2020).

In conclusion, the results validate that collinearity does not distort the structural model, thereby guaranteeing that future assessments of path significance and effect sizes are both valid and reliable.

Table 4 Variance Inflation Construct (VIF) for Assessment of Collinearity

Construct/VIF Value	EU	LO	SC
EU		2.171	1.000
LO			
SC		2.171	

3.5 Assessment of Coefficients

The findings shown in Table 5 demonstrate that all three proposed relationships are statistically significant and align with the anticipated positive direction. Initially, the relationship between Engagement and Usability (EU) and Learning Outcomes (LO) demonstrated a moderate positive effect ($\beta = 0.376$, $t = 2.820$, $p = 0.005$, CI [0.142, 0.658]). This indicates that when learners view educational tools as more user-friendly, their academic results are notably improved. Second, the analysis of Engagement and Usability (EU) in relation to Social and Collaborative Impact (SC) demonstrated a significant positive correlation ($\beta = 0.734$, $t = 8.464$, $p < 0.001$, CI [0.539, 0.875]), highlighting that engagement and usability play a crucial role in enhancing collaborative behaviours among students. Ultimately, the relationship between Social and Collaborative Impact (SC) and Learning Outcomes (LO) showed a moderate positive effect ($\beta = 0.466$, $t = 3.352$, $p = 0.001$, CI [0.166, 0.711]), indicating that collaborative engagement among learners significantly enhances learning outcomes.

Table 5 Judgment of β

Step	Validity Type	Criteria	Acceptance Level
Significance and relevance of structural model	t-value	$P < 0.05$ $t > 1.96$ (Two tailed) $t > 1.645$ (One tailed) $P < 0.01$ $t > 2.58$ (Two tailed) $t > 2.33$ (One tailed)	Hair et al., (2017)
	Beta value (β)	0.10 – Small 0.30 – Moderate 0.50 – High	Cohen (1988)

3.6 Implication of Engagement, Usability, and Collaboration on Learning Outcomes

This study's findings offer strong empirical support that engagement and usability are crucial for improving learning outcomes, both directly and by affecting social and collaborative impact. The structural model reveals strong and significant path coefficients (EU → LO: $\beta = 0.376$, $p = .005$; EU → SC: $\beta = 0.734$, $p < .001$), indicating that students who perceived the Play to Place physical gameboard as engaging and user-friendly were more inclined to report meaningful learning experiences and demonstrate collaborative behaviours. The results support the current body of work, indicating that elements of gamification, including points, contextualised content, and storytelling, enhance intrinsic motivation and ongoing engagement, particularly when combined with well-defined mechanics and user-friendly design (Feng et al., 2025; Nguyen-Viet & Nguyen-Viet, 2023; Ismail et al., 2024). The robust indicator reliability and internal consistency values (all CR > .95) in this study reinforce the significance of these constructs in influencing learner outcomes.

The usability of the gameboard significantly diminished cognitive load, fostering a seamless learning atmosphere that maintained focus and promoted engagement. This is consistent with findings that prompt feedback, and well-organised interfaces enhance learner satisfaction and performance (Rey & Defensor, 2024; Jurgina et al., 2025). Through the integration of usability features into an engaging and culturally relevant gameboard, Play to Place established conditions that prioritised the learner, promoting deeper understanding and reducing disengagement (Fahlevi et al., 2024). The importance of the EU → SC relationship in the model further reinforces the claims made by Teo (2011) and Venkatesh and Davis (2000) that perceived ease of use and usefulness in educational technologies are strong predictors of user acceptance and collaborative behaviours.

This study further emphasises the importance of collaboration in enhancing learning outcomes, as evidenced by the findings (SC → LO: $\beta = 0.466$, $p = .001$). The findings align with the principles outlined in social interdependence theory (Johnson & Johnson, 2009), suggesting that collaboration among peers enhances the construction of shared meanings and promotes more profound cognitive involvement. Through organised team activities, students were motivated to engage in communication, negotiate site interpretations, and collaboratively build knowledge as essential components of architectural education. Additionally, the collaborative mechanics of the Play to Place module improved learners' sense of relatedness and engagement, consistent with recent studies indicating that cooperative gamification enhances attitudinal outcomes, social skills, and cognitive performance (Slamet & Meng, 2025; Dindar et al., 2021; Marinho et al., 2025).

The synthesis of quantitative data and theoretical frameworks indicates that the incorporation of engagement, usability, and collaboration within gamified tools has the potential to convert passive learning into dynamic, participatory experiences. In the realm of site analysis, where students are required to integrate spatial, cultural, and contextual data, these components are essential in promoting learning that transcends mere content absorption, fostering critical reflection and design reasoning. The Play to Place physical gameboard illustrates the intentional combination of game mechanics, accessible interfaces, and collaborative learning, which can enhance transferable skills like spatial reasoning, communication, and cultural sensitivity. This highlights the educational significance of gamified learning tools in architectural education and advocates for their wider implementation as drivers of transformative, student-focused learning.

4 CONCLUSION

The findings of this study show that engagement and usability (EU) and social and collaborative impacts (SC) play a significant role in shaping learning outcomes (LO) in architectural site analysis through the Play to Place Physical Gameboards (P2P–SI). EU directly enhanced LO and strongly influenced SC, while SC in turn positively affected LO. These results address the research questions by confirming that students perceive P2P–SI as engaging and easy to use, that collaborative play strengthens communication and shared interpretation, and that the combined effects of EU and SC lead to meaningful outcomes such as improved spatial reasoning, cultural understanding, and reflective thinking. From a pedagogical perspective, the study suggests that site analysis should move beyond being a descriptive task and instead be reframed as an interactive, collaborative, and culturally relevant activity. Educators can improve student learning by incorporating gamified tools that emphasise intuitive design, clear feedback, and structured opportunities for teamwork. Such approaches not only sustain engagement but also help students develop transferable skills needed in professional practice. For future research, there is value in examining the long-term impacts of gamified learning on design studio performance, exploring how cultural context shapes usability and engagement, and comparing different game mechanics such as collaborative versus competitive play. These directions can strengthen understanding of how gamification can be systematically integrated into architectural curricula, bridging technical learning with social, cultural, and reflective dimensions to better prepare students for real-world design challenges.

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AUTHOR CONTRIBUTIONS

All authors collaboratively conceived and designed the research within the team-teaching framework of the second-year architecture design studio. Ahmad Faiz Mohd Nadzamuddin and Sayed Muhammad Aiman Sayed Abul Khair led the overall study direction, developed the methodology, and conducted the formal data analysis. Muhammad Assyahmizi Mohd Yunus, Muhammad Faris Arman, Mohammad Nazrin Zainal Abidin, and Farid Al Hakeem Yuserrie facilitated the pedagogical implementation regarding the students' contextual analysis, conducted the literature evaluation, and proofread the manuscript. All authors have read and agreed to the published version of the manuscript.

CONFLICT OF INTEREST

The author declares no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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Unveiling Narrative: A Visual Analysis of Muslimah (Female Muslim) Characters in Monsta Animation

Ida Shaheera Azhar[1], Azahar Harun[2], Mohamed Razeef Shah Mohmad Rafik[3], Mohd Faizol Haini[4], Li Jin E[5]

[1]Faculty of Art & Design, Universiti Teknologi MARA, Shah Alam Campus, Selangor, Malaysia
[2]Faculty of Art & Design, Universiti Teknologi MARA, Alor Gajah Campus, Melaka, Malaysia
[3] Faculty of Mass Communication & Media Studies, Universiti Teknologi MARA, Shah Alam Campus, Selangor, Malaysia
[4] Faculty of Art & Design, Universiti Teknologi MARA, Puncak Alam Campus, Selangor, Malaysia
[5]Faculty of Art & Design, Fuzhou University of International Studies and Trade, China

[1]2022745483@student.uitm.edu.my, [2]azahar581@uitm.edu.my, [3]razeef.mohd@uitm.edu.my, [4]mohdfaizol@uitm.edu.my, [5]lijine@bjedus.cn
***Corresponding author**

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ABSTRACT

The portrayal of Muslimah (female Muslim) characters in animation often grapples with a complex interplay of stereotypes, cultural representation, and societal expectations. While there has been a notable increase in the visibility of Muslimah characters in recent years, several Muslimah characters have appeared in Malaysian animation. From international characters to local Malaysian Muslimah characters, this paper discusses their roles and the importance of this representation in animation. This paper presents a study of the representation of women in superhero archetypes, specifically female Muslim (Muslimah) figures in Monsta's IPs: BoBoiBoy, Mechamato, and PapaPipi. Monsta is the mastermind behind numerous engaging and acclaimed creative works suitable for all ages. These animations have captivated audiences worldwide, entertaining millions through compelling storytelling. This research offers a comprehensive analysis of three female characters: Yaya from Boboiboy, Tamara from Mechamato, and Pipi from PapaPipi. Adopting a qualitative approach, this study utilizes visual analysis methodologies inspired by Gillian Rose. Through triangulation analysis, the research questions focus on three key aspects: syntactic analysis (visual form), pragmatic analysis (context and interpretation), and semantic analysis (content and meaning). The study suggests that such nuanced representation is essential for fostering broader societal understanding and proving that religious identity is not a hindrance to heroism, but rather a source of strength and integrity.

Keywords: *Female Representation, Female Muslim Representation, Muslimah Superheroes, Malaysian Animation, Semiotics*

1 INTRODUCTION

The portrayal of female Muslim (Muslimah) characters in animation often grapples with a complex interplay of stereotypes, cultural representation, and societal expectations. While there has been a notable increase in the visibility of Muslimah characters in recent years, many of these portrayals still perpetuate harmful stereotypes that can undermine the authentic representation of Muslim women. Female superheroes are often portrayed as muscular, overly sexualized, and frequently appear to appeal to the male gaze, which has become a norm portrayed in pop culture. When portraying Muslimah superheroes, various visual styles aim to challenge stereotypes about how women are depicted. As the industry evolves, animation portrayals and narratives are changing to reflect contemporary values, modern aesthetics, and advanced animation technologies (Li et al. 2019). This research will dive into how Monsta portrayed their female superheroes on screen.

1.1 Female Muslim (Muslimah) Appearance

Muslim women wear a diverse range of clothing, with styles varying worldwide due to cultural and traditional influences. The fundamental principle of dress for women in Islam is modesty. The term "hijab" signifies covering, screening, or curtaining, and it refers both to a specific type of veil worn by some Muslim women and to the general modest Islamic style of dress. Therefore, the hijab worn by a woman is the most apparent visual connotation that she is, in fact, a Muslim. One of the key aspects of hijab fashion is its capacity to convey personal identity and self-expression. Research shows that many Muslim women choose hijab fashion to express their individuality while remaining true to their cultural and religious values. This duality enables them to navigate their identities in an authentic and stylish manner (Hassan & Ara, 2021; Hassan & Harun, 2016).

It is important to understand that mere representation is not enough; the quality and authenticity of that representation are crucial. There is an increasing need for Muslim women to have a role in shaping their own narratives, ensuring that their voices and experiences are genuinely reflected (Al-Mutawa, 2013; Hosein, 2024). One of the key issues surrounding the portrayal of Muslim women is the frequent depiction of these women as oppressed and powerless. Another significant concern is the sexualization of these characters. For instance, characters like Dust from Marvel Comics have faced criticism for transitioning from veiled figures to sexualized representations upon assuming superhero identities (Hossein, 2024; Davis & Westerfelhaus, 2012). This transformation not only objectifies the characters but also reinforces the notion that liberation for Muslim women requires abandoning their cultural and religious identities. Such portrayals can contribute to a misunderstanding of the hijab and other forms of modest dress, which are often misinterpreted as symbols of oppression rather than expressions of personal choice and empowerment (Wagner et al., 2012; Chakraborti & Zempi, 2012).

1.2 Monsta’s Female Characters

Monsta is a Malaysian animation studio founded in 2009 that creates innovative visual content for both Malaysian and international markets. Monsta is recognized for its numerous family-friendly, award-winning intellectual properties, enjoyed by millions of viewers worldwide. They are known for their animation, like BoBoiBoy, Mechamato, and PapaPipi. Monsta is known for its superhero storytelling. In Malaysia, Monsta has actively showcased Muslimah characters across their various intellectual properties, highlighting their commitment to diverse representation.

Monsta believes that entertaining content should also have positive aspirations. This is why they are unafraid to portray Muslimah characters as superheroes, emphasizing their vital roles in narratives and providing diverse representation. By doing so, they not only challenge stereotypes but also celebrate the strength and resilience of these figures, enriching the storytelling landscape with their unique perspectives and experiences. According to Monsta, their principle in creating is known as the 3Ms: Modest, Moderate, and Modern. This principle applies to creativity, decision-making, and business strategy.

Realizing that parents are concerned about the safety of content for their children these days, Monsta is committed to creating content that prioritizes the safety and well-being of its viewers. Their characters’ modest appearance and positive behaviour serve as a model for others to emulate. Through these representations, viewers can see the value of embracing modesty while embodying strength and integrity, encouraging them to adopt similar traits in their own lives. This portrayal not only champions diversity but also reinforces the idea that one can be both a superhero and a role model, promoting both personal and cultural values in a relatable and uplifting manner.

2 LITERATURE REVIEW

2.1 Female Muslim (Muslimah) Appearance

The portrayal of female characters in animation has evolved significantly over the years, reflecting broader societal changes regarding gender roles and expectations. Historically, animated films, particularly those produced by Disney, have been criticized for reinforcing traditional gender stereotypes. For instance, characters like Cinderella exemplify a narrative where physical beauty is paramount for female acceptance and success, which can be interpreted as disempowering from a contemporary feminist perspective (Fathy & Fahmy, 2020). This portrayal is indicative of a broader trend where female characters are often depicted as passive, needing protection or validation from their male counterparts (Maity, 2014).

Research indicates that animated films frequently perpetuate the “beauty-goodness” stereotype, where female characters are not only more numerous but are also more likely to be associated with beauty and moral virtue compared to their male counterparts (Bazzini et al., 2010). This trend is evident in the Disney canon, where a significant percentage of characters are female, yet they often embody stereotypical traits that align with traditional femininity, such as submissiveness and emotional sensitivity (Baker & Raney, 2007). The implications of these portrayals are profound, as they shape children’s perceptions of gender roles from a young age, influencing their understanding of social values and expectations (Ahmed & Wahab, 2014; Batool et al., 2017).

2.2 Muslimah Superhero Portrayal in Pop Culture

There are several Muslim superheroes portrayed in Pop Culture, such as the Kismet (Man of Fate), Simon Baz (Green Lantern), Bilal Alsselah (Nightrunner), etc. However, Muslimah has also appeared in comics and on the silver screen. One of the most notable examples of a Muslimah superhero is Kamala Khan, also known as Ms. Marvel. Introduced by Marvel Comics in 2023, Kamala Khan is a Pakistani American teenager living in New Jersey who grapples with her cultural identity while navigating the challenges of adolescence and superhero responsibilities. Kamala Khan’s character representation is a significant shift in the superhero genre, moving towards greater diversity and inclusion Andreassen (2019).

Even so, Kamala Khan is not the first Muslimah to appear in Western pop culture. Dust, who makes her debut in the "New X-Men" series shortly after the September 11 attacks, serves as a significant representation of Muslimah superheroes in comic book culture. Her real name is Sooraya Qodir, and she is portrayed as a devout Sunni Muslim. Dust is easily recognizable by her striking black hijab and niqab, which she wears as a symbol of her faith and identity. What makes her character particularly compelling is how she seamlessly weaves her religious beliefs into her role as a superhero. Unlike traditional portrayals, she challenges the norms of superhero narratives, showcasing that one's faith can coexist with the responsibilities and challenges of being a hero rather than a hindrance (Davis & Westerfelhaus, 2012). However, Dust also has been critiqued for their transformation from veiled figures to sexualized representations. Such portrayals can lead to a misunderstanding of the hijab and other forms of modest dress, which are often misinterpreted as symbols of oppression rather than personal choice and empowerment (Wagner et al., 2012; Chakraborti & Zempi, 2012).

Notable mentions include the female characters in Ejen Ali, an animation series created by Wau Animation Studios. Iman, Dayang, and Aliya are three female characters believed to be Muslimahs based on their appearance. Iman and Dayang were introduced in the series, while Aliya was introduced later in the Ejen Ali Movie. Iman is a young agent at the MATA Academy, the daughter of a Wushu master, and is recognized for her flowy scarf adorned with darts and her exceptional combat skills. Dayang serves as the chief pillar of TEKNO and is distinctive for styling her hijab as a turban. Aliya, who is Ali's late mother, is celebrated for her inventions, courage, and kindness. Each of these female characters embodies the spirit of female empowerment, demonstrating that wearing a hijab is never an obstacle. The practice of wearing a headscarf or hijab is consistent with the prevailing social expectation of modest dress among Muslim women in Malaysia. (Abdul Wahab et al. 2025; Halim, 2011).

2.3 Muslimah Superheroes Challenging Stereotypes

The portrayal of Muslimah superheroes in contemporary media serves as a critical lens through which to examine and challenge stereotypes associated with Muslim women. The emergence of characters such as Kamala Khan (Ms. Marvel) and Sooraya Qodir (Dust) reflects a significant shift in the representation of Muslim women in popular culture, particularly in the context of a post-9/11 world. These characters not only embody the complexities of their identities but also serve as vehicles for broader discussions about faith, empowerment, and agency.

Moreover, the narrative surrounding these Muslimah superheroes often serves to alleviate societal anxieties and misconceptions about Islam and Muslim women. As noted by Hosein, the introduction of Muslim superheroines during the War on Terror can be seen as a response to the need for more nuanced representations that counteract negative stereotypes (Hosein, 2024). This dual function of representation – both as a means of empowerment for Muslim women and as a tool for broader societal understanding – underscores the importance of diverse narratives in media.

The empowerment of Muslimah superheroes also resonates with the broader feminist discourse, as these characters challenge not only gender stereotypes but also cultural misconceptions. By asserting their agency and autonomy, they encourage audiences to reconsider the narratives surrounding Muslim women and their roles in society (Medina, 2014). This shift is particularly significant in a media landscape that has historically marginalized or misinterpreted these identities

3 METHODOLOGY

The research adopts a qualitative approach using a semiotic and visual analysis (Rose, 2016) framework (refer to Figure 1). By applying the triangulation model, the Muslimah characters in Monsta were analysed through three distinct lenses: Syntax (form) and Pragmatics (user/audience relationship). And Semantics (meaning). The analysis comprises two phases, with the first focusing on visual observation. This phase aims to examine the representation of Muslimah characters depicted in Monsta's animation. Three main characters have been intentionally selected for in-depth analysis based on this visual examination.

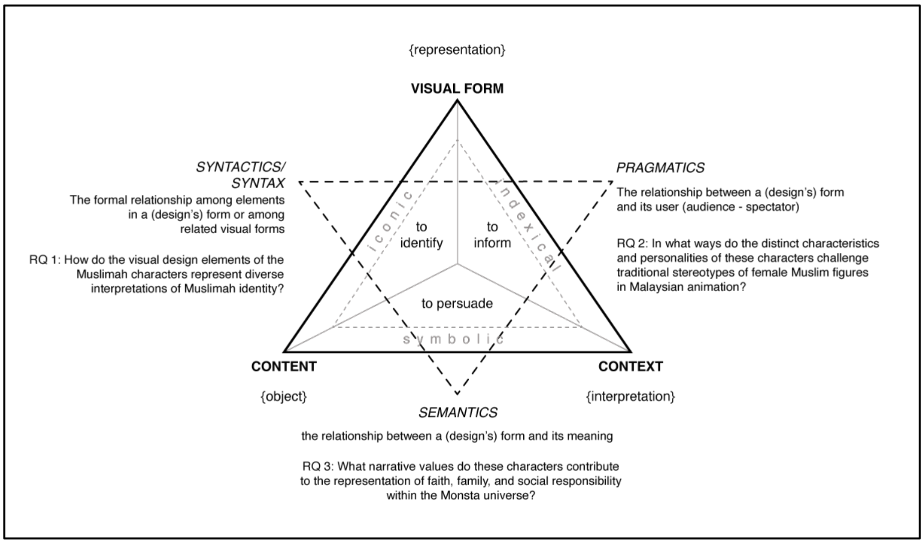


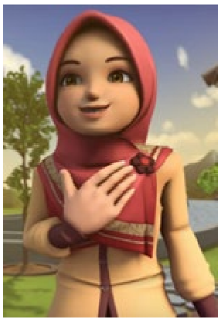
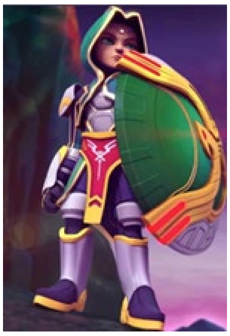
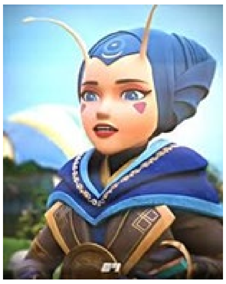
Figure 1 Visual analysis triangulation to analyse the Muslimah characters in Monsta's animation

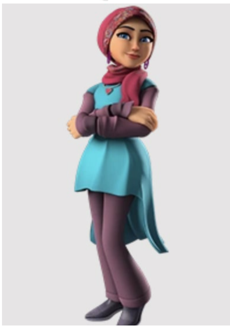
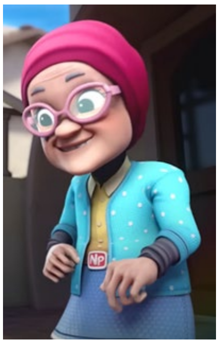
3.2 Visual Observation Analysis

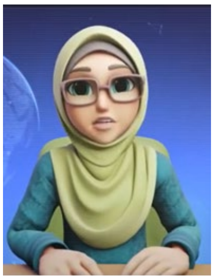
The first phase of this study is to observe the Muslimah characters in Monsta's film, series, and mini-series. The objective of this method is to investigate how Muslimah characters are visually represented, and all the female characters representing Muslimah from Monsta's animation series: BoBoiBoy, Mechamato, and PapaPipi are listed (Table 1). Monsta's characters are intertwined within its storytelling universe; each character is related across series. In the world of animated series, four notable Muslimah characters are featured in BoBoiBoy, each with unique traits and stories. Additionally, Mechamato introduces two strong Muslimah characters who play pivotal roles in the narrative. Finally, PapaPipi showcases another two Muslimah characters, adding diversity and representation to its storyline.

Visually, not all the characters wear the same style of hijab. Culturally, Malaysian Muslim women commonly wear the signature *tudung bawal*, shawls, and various other hijab styles. Monsta typically begins with a concept of how a character should look, followed by a creative design of appealing costumes that suit the character's personality. An animated character's race is typically depicted through their character design. This includes their face characteristics, typical body proportions, clothing, and props. These elements represent the character's race (Rizalman, Azri Hilmi, et al.). Research is important in character design. Due to restrictions on portraying hijab in some regions, character designers will use their creativity to express it in various ways.

Table 1 List of female characters from the Monsta animated series

No.	Animation	Name	Role	Character	Character Description
1	*Boboiboy*	Yaya	Deuteragonist		The first female character appears in the series. Yaya is the second most favoured character in the series after BoBoiBoy.
2		Makcik Wawa (Yaya's Mother)	Minor Character		Yaya's mother. She shares the same trait as Yaya: competitiveness.
3		Shielda	Side Character		Shielda is Sai's twin sister. She is believed not to be human because she mocks Boboiboy as a weak earthling during an endurance test.
4		Kuputeri	Deuteragonist		Tuanku Kuputeri is a humanoid extraterrestrial character from Windara. Her first debut in the Windara arc for Boboiboy Galaxy. She is the only character who wears a turban.
5	*Mechamato*	Mara (Maskmara)	Deuteragonist		Mara is one of close friends of Amato and is the first disabled character introduced in the entire franchise.

No.	Animation	Name	Role	Character	Character Description
6		Umi	Minor Character		Amato's mother. She appeared several times, but her role is not as prominent as Aba/ Tok Aba.
7	*PapaPipi*	Pipi Zola	Protagonist		Pipi Zola is the cheerful daughter of Papa Zola and Mama Zila. Pipi has a doll named Joya.
8		Mama Zila	Side Character		Mama Zila is Papa Zola's wife and Pipi's mother. Unlike Papa Zola, she is a perfectionist.
9		Nekpi	Side Character		NekPi is Pipi's grandmother, which makes her Papa Zola's mother. She is as energetic and vibrant as the rest of the family.
10		Melur	Minor Character		Melur is one of Pipi's classmates and sits next to Pipi in class. She once offered her *karipap* when Pipi did not bring food to school.

No.	Animation	Name	Role	Character	Character Description
11		Teacher Warni	Minor Character		Teacher Warni is Pipi's class teacher. She is a caring person who knows how to interact with children effectively.
12		Cik D/ Doktor, Newsreader,	Extra		This unknown female character is an extra. She appeared several times in the series as a doctor and a newsreader.

The female characters depicted are often assumed to be Muslim based on their appearance. While many may not overtly express their beliefs, they typically embrace modest fashion by wearing loose-fitting clothing and head coverings, including hijabs, except for Pipi Zola. These characters exemplify positive qualities that reflect the values associated with being Muslim. Additionally, the hijab serves not only as a visible marker of Muslim identity but also as a powerful tool to challenge and reshape the stereotypes that frequently surround Muslim women (Almanssori, 2023).

3.3 In-Depth Visual Analysis

From 12 Muslimah characters, three main female superheroes from each animation were selected: Yaya (BoBoiBoy), Mara (Mechamato), and Pipi Zola (PapaPipi) (Table 2). These three characters were analysed, and their narratives were later unveiled by the animation practitioners during the focus group discussion.

Table 2 Character Analysis of Yaya, Mara, and Pipi Zola

Character	Yaya	Mara	Pipi Zola
Visual			
Series	BoBoiBoy, Fly with Yaya	Mechamato	PapaPipi
Film	BoBoiBoy The Movie (2016), BoBoiBoy the Movie 2 (2019)	Mechamato Movie (2022)	BoBoiBoy Movie 2 (2019), PapaZola The Movie: Game On (2025)

Character	Yaya	Mara	Pipi Zola
First Appearance	Season 1, Episode 1: The Beginning, The Rise of BoBoiBoy	Season 1, Episode 2: King of the Chill (Di Bawah Paras Beku)	BoBoiBoy Movie 2
Name	Yaya	Mara (Tamara)	Pipi Zola (Puteri Intan Payung Indah Zulaikha Odelia Ladasyia Absyari)
Date of Birth	5th August	–	27th July
Age	Not specified (but an early teenager)	Not specified (but an early teenager)	Not specified (around 4 – 6 years old)
Alignment	Good	Good	Good
School	Sekolah Rendah Pulau Rintis	Sekolah Kota Hilir	Tadika Warni
Occupation	TAPOPS Lance corporal (BoBoiBoy Galaxy) Secondary school student Primary school student (BoBoiBoy season 1 – season 3), BoBoiBoy the Movie	Secondary school student, secretly a superhero – Maskmara	Kindergartener
Role	Deuteragonist	Deuteragonist	Papa Zola's sidekick/ Confidante
Catchphrase	–	–	Daughter of Justice! Cousin to cuteness! *(Anak kebenaran! Saudara kecomelan!)*
Superpowers/ Weapon	Strength, Gravity Manipulation	Suit of armour	Power Sphera Eggabot
Costume Design	Long sleeve peplum top, paired with long pants, hijab, five petals flower pin, a pair of goggles, boots, and a power watch	Long-sleeve purple hoodie jacket with floral patterns, a yellow baseball cap, gold-and-yellow mafla, cat-eared headphones, and sitting in a wheelchair.	Double bun hairstyle with pink bows, white short-sleeve shirt paired with knee-length blue pinafore, blue and yellow striped leggings, a bib with P initial,
Colour Palette	Fuchsia pink, magenta, and yellow	Purple and pink	Vibrant light blue and pink
Personality	Very reliable in the team, gentle, empathetic, and competitive.	The smartest, analytical, courageous, responsible, and strong-willed.	Cheeky, vibrant, talkative, and quick-witted.
Back Story	Yaya is Tok Aba's neighbour. She is the first female character to appear in the BoBoiBoy series, helping BoBoiBoy look for Tok Aba's Kokotiam when he first arrived in Kota Hilir.	In the 10th episode of Mechamato's first season, it is revealed that Mara saves a girl from a fire, and her bravery becomes the talk of the town. Unfortunately, she is paralyzed after the incident.	
Trivia	Yaya is not very good at baking cookies.	Mara can sing very well.	Highly imaginative and very good at mathematics.
Product Placement	Yakult	–	Prego Malaysia, Eco-Shop

4 ANALYSIS & RESULTS

4.1 Yaya: The Empowering Superhero

Yaya is the first female character introduced in the BoBoiBoy series, and her character design has undergone many changes (Figure 2). Her true name has never been revealed; she is known as Yaya and will remain so. Yaya's primary aesthetic is pink, symbolizing femininity, and her floral signature is present in all her character designs. In the first season of BoBoiBoy, Yaya is portrayed as a primary school girl studying at Sekolah Rendah Pulau Rintis. The new Yaya now resembles a teenager, and her story focuses on her role as a member of the TAPOPS (Tracker and Protector of Power Sphera). According to Monsta, Yaya is the most favoured female character and the second most famous character after BoBoiBoy.

When creating Yaya, Monsta wanted to create a Muslimah superhero that would inspire the audience. Being a superhero is not just about superpowers; it is also about being kind to others. Understanding the importance of influence, they have set a good example. Yaya is portrayed as kind and empathetic. Even so, Yaya has a competitive side to her. Although Ying is her best friend, they both always want to be the best on the test.

In the earlier series, Yaya received a power watch from Ochobot, which granted her the ability to manipulate gravity; as a result, she could fly. Although she was a small girl at that time, she demonstrated strength and helped her friends. Being a reliable team member, Yaya never let her teammates down and always helped as much as she could. Her gravity manipulation allows her to lift or carry her friends and fight bad guys without touching them. This aligns with what a devout Muslimah should do, and her beliefs do not hinder her from becoming a superhero.

Figure 2 One of the earliest versions of Yaya

Yaya has her own spin-off show titled "Fly with Yaya." According to Monsta, when they initially presented the concept to the Tohoku Tourism Board, they were pleasantly surprised by the Japanese audience's acceptance of Yaya wearing her hijab. They demonstrated a deep understanding and respect for her decision to wear the hijab for religious reasons. Following the positive reception of the first season of "Fly with Yaya," the second season follows Yaya as she travels alongside her Japanese friend, Tomoyo. Notably, Yaya speaks Bahasa Malaysia, while Tomoyo speaks Japanese.

4.2 Mara: The Secret Superhero

Mara is one of Amato's best friends, alongside Pian, and Deep in the Mechamato series. In Bahasa Malaysia, "mara" is a verb meaning "to move forward". However, her real name is Tamara, derived from the word "Tamar," meaning "date." One of the key strengths of the date palm is its resilience to harsh climatic conditions. The tree is well-adapted to harsh environments, demonstrating a remarkable ability to survive with minimal water. This resilience is attributed to its deep root system, which allows it to access groundwater and withstand drought conditions (Abu-Soad et al., 2017). The character's name is a metaphor for their personality, reflecting who they are.

Figure 3 Screenshot of Mara saving a girl in episode 10: The Arsonist (Api Jadi Lawan)

Mara is the first disabled character introduced by Monsta. Mara's outfit draws inspiration from streetwear fashion, showcasing a unique interpretation of modesty. Instead of wearing a traditional hijab, she opts for a cap and a hoodie to cover her hair, blending contemporary style with her values. Mara relies on her wheelchair to navigate her surroundings, but that doesn't deter her adventurous spirit. With her friends by her side, she embraces every opportunity for exploration, whether it's solving a mystery, catching bad robots, or embarking on a camping trip. Mara's determination and enthusiasm inspire her friends, as they seamlessly adapt their adventures to ensure everyone can participate and enjoy the experience together.

In episode 10 of season 1: The Arsonist, it is revealed that Mara was once a normal girl who could walk. Mara recalls a time when she tried to save a little girl trapped in a house due to a fire. Unfortunately, she was hit by falling debris, which is why she is now paralyzed. However, this incident never breaks her spirit; in fact, she is portrayed as someone who always moves forward and views everything positively. This representation is essential for fostering a deeper understanding of disability and promoting empathy among audiences (Shaji, 2023).

In the later episodes, it becomes clear that Mara is one of the secret superheroes known as Maskmana. This incredible suit of Armor is worn by multiple individuals, effectively concealing the wearer's true identity and adding an intriguing layer of mystery to the character. When Mara puts on the suit, she becomes Maskmara and regains the ability to walk.

4.3 Pipi Zola: The Cute Superhero

Pipi Zola is the only child of Papa Zola and Mama Zila. The name Pipi Zola is an abbreviation for *Puteri Intan Payung Indah Zulaikha Odelia Ladasyia Absyari*. This name confidently reflects the trend among modern parents in Malaysia who favour elaborate, lengthy names for their children. She is affectionately called Pipi, a name that translates to "cheek" in Bahasa Malaysia, which perfectly captures her playful, cheeky personality. Pipi is first introduced in BoBoiBoy Movie 2 and has her own Power Sphera, Eggabot. Although Pipi’s appearance on screen may not be as heroic as that of other characters, she left a significant mark on the film.

Figure 3 Screenshot of Pipi in her school uniform

Pipi has a very close relationship with her father, Papa Zola. They star in their own animated series called "PapaPipi." Unlike other animated titles produced in Malaysia, this title has no gaps or conjunctions. This choice is intentional, reflecting the strong bond between father and daughter. PapaPipi is a series of family-friendly short animations featuring the adventures of Papa Zola and Pipi Zola. Together, they embark on small quests that sometimes grow into larger experiences.

In PapaPipi, Pipi is always shown alongside others on screen, emphasizing the importance of children's safety. This reflects the idea that children should never be left unattended and must always have guardians by their side to ensure they remain in a secure and nurturing environment. It's essential to communicate this subliminal message thoughtfully and unobtrusively to the audience. This approach will ensure that the message is received positively and effectively in a more entertaining way.

Among all of Monsta's Muslimah characters, Pipi is the only one portrayed without a hijab. But Pipi is the one who practices her faith, evidently on screen. In the series, Pipi reminded her father about the upcoming month of Ramadhan, reciting the Quran, and fasting during Ramadhan. Ramadan is challenging for a child like her, but she makes it an enjoyable journey.

In addition to being a Muslimah, Pipi also symbolizes the children of Generation Alpha. She is quick-witted, yet she never talks back to her parents. She exemplifies how a child can be smart and spontaneous while remaining polite and obedient.

5 CONCLUSION

Yaya, Mara, and PipiZola showcase diversity by challenging global stereotypes. The research concludes that Monsta’s animation serves as a critical tool for reclaiming the narrative of Muslimah. Through Yaya, the narrative offers a traditional yet empowered superhero; through Mara, it provides an inclusive representation of disability and modern modesty; and through PipiZola, she demonstrates the joyful practice of faith and family values. By depicting these characters as superheroes and tole models who are simultaneously devout and empowered, Monsta alleviates societal misconceptions about Islam. The study suggests that such nuanced representation is essential for fostering broader societal understanding and proving that religious identity is not a hindrance to heroism, but rather a source of strength and integrity.

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CONFLICT OF INTEREST

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The Impact of Visual Merchandising on Consumer Buying Behaviour

Megat Amirul Ashraf Megat Zambri[1], *Rohana Zur[2], Maarof Saleh[3]
[1,2]*Faculty of Creative Arts, Universiti Teknologi MARA, Shah Alam Campus, 40450 Selangor, Malaysia*
[3]*Faculty of Creative Arts, Universiti Teknologi MARA, Seri Iskandar Campus, Perak Branch, 32610 Seri Iskandar, Perak, Malaysia*

megatamirulashraf92@gmail.com[1], *rohan316@uitm.edu.my[2], arop92@gmail.com[3]

***Corresponding author**

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ABSTRACT

The importance of visual merchandising on consumer buying behaviour in a fashion retail store was high. This research has discussed how the main visual merchandising characteristics, such as store layout, lighting, signage and displaying of products, influence the purchase intentions of the consumers. This study was based on a quantitative research design through administering a survey questionnaire to consumers in the fashion retail outlets. The data gathered were analysed through statistical means in order to determine the correlation between the aspects of visual merchandising and buying behaviour among consumers. The results showed that the successful application of visual merchandising techniques, which included clean product displays, proper lighting and the store layouts were important determinants of the purchase intentions among consumers and aroused the impulse buying behaviour. Positive emotional reactions towards the visual stimulation in the retail setting also led to consumer involvement towards the products. The given study has added to the existing body of literature because it used the Stimulus Organism Response (S-O-R) model to clarify how the visual merchandising stimuli affected internal reactions of consumers and the following purchase behaviour. The results were practical to the fashion retailers to create effective visual merchandising strategies to the customer experience and improve retail performance.

Keywords: *Visual merchandising, Consumer Buying Behaviour, Retail Strategies, Store Design.*

1 INTRODUCTION

Visual merchandising is the new strategy that plays a significant role in the consumer buying behaviour influencing in the fashion retail setting, as more and more retailers turn to visual merchandising as the method to attract customers and make their in-store experiences more captivating (Kotler et al., 2017; Murad and Raju, 2022). Visual merchandising is the art of visually displaying products in terms of store layout, lighting, signage, and display of products in stores to generate appealing retail spaces that customers use to capture their attention and motivate them to make purchases (Baker et al., 2002; Kim and Lee, 2021). These visuals are a type of marketing stimuli that influence consumer's perceptions and emotional reactions when they engage in retail spaces (Underhill, 2009; Mondol et al., 2021).

Past research has shown that appropriate visual merchandising systems could improve product visibility, consumer engagement, and purchase intention in the retail setting (Mondol et al., 2021; Murad and Raju, 2022). To control consumer flow and formulate their decision making process when shopping, retailers strategically plan the layouts and lighting of the stores, as well as displays of their merchandise (Baker et al., 2002; Kim and Lee, 2021). The visual merchandising aspects are capable of triggering the sensory and emotional reactions of consumers, which can result in the emergence of the impulse buying behaviour and the purchase intentions (Underhill, 2009; Behera and Mishra, 2021).

Physical shops still provide a distinctive level of sensory experience that cannot be completely recreated through online platforms, despite the rapid development of the e-commerce platforms (Dube and Renaghan, 2017; Verhoef et al., 2015). The physical store setting enables consumers to touch the product and feel the atmospheric aspects like lighting, colour, space pattern, and presentation of the product (Baker et al., 2002; Kim and Lee, 2021). Such environmental stimuli are also instrumental in determining emotional reactions and buying behaviour of consumers in retail environments (Dube and Renaghan, 2017; Mondol et al., 2021).

Megat Zambri and Saleh (2025) discovered that creative visual merchandising and sustainable retail display techniques could be useful in promoting brand perception and enhancing customer engagement with the products in fashion retail outlets. Their results indicate that attractive retail displays are important in capturing consumer attention and enhancing long-term customer relationships with retail brands (Megat Zambri and Saleh, 2025).

Though the current literature emphasizes the significance of visual merchandising in consumer behaviour, most of the past studies concentrate on the independent effect of a single visual stimuli in a retail shop, instead of the joint impact of various visual stimuli (Mondol et al., 2021; Murad and Raju, 2022). Moreover, few studies have used the Stimulus Organism Response (S-O-R) model to describe the effect of visual merchandise stimuli on the emotional and cognitive reaction of consumers that eventually result in purchase behaviour within the context of a fashion retail location (Kim and Lee, 2021; Verhoef et al., 2015).

The Stimulus Organism Response (S-O-R) model is one model that was proposed by Mehrabian and Russell (1974) to explain the effect of environmental stimuli on the internal emotional state of people, which in turn affects behavioural responses. Visual merchandising components, used in the case of retail, act as stimulus and can change the behaviour of consumers by triggering internal emotional response (organism) and consequently behavioural response (response), such as intention to purchase and buying behaviour (Mehrabian and Russell, 1974; Kim and Lee, 2021).

Thus, this research focus on how the main visual merchandising factors, such as store layout, lighting, signs, and product display, affect the consumer purchasing behaviour in the retailing fashion store (Baker et al., 2002; Mondol et al., 2021). Using the Stimulus Organism Response (S-O-R) framework, the study will give a more profound insight into the effectiveness of visual merchandising stimuli in triggering emotional reactions and buying behaviour amongst consumers in the context of a fashion store (Kim and Lee, 2021; Verhoef et al., 2015). The presented study is likely to add to the already existing literature on retail marketing and to offer some practical implications to the retailers interested in the possibility to improve customer experiences and enhance retail performance by utilizing the effective visual merchandising strategies (Kotler et al., 2017; Murad and Raju, 2022).

1.1 Visual Merchandising and Consumer Behaviour

As it has been established widely, visual merchandising is a key driver to consumer buying behaviour in a retail setting, especially in a fashion retail environment where visual product presentation is one of the key factors to attract consumer attention to the product (Kotler et al., 2017; Mondol et al., 2021). As the concept of strategic arrangement of products, visual merchandising is the employment of store layout, lighting, signs, colour schemes, and displays of products as a means of improving the overall shopping experience and consumer decision making processes (Baker et al., 2002; Kim and Lee, 2021). These visual messages are marketing triggers that indicate the value of products and influence the perceptions of consumers regarding the store setting (Underhill, 2009; Murad and Raju, 2022).

Previous research has shown that successful visual merchandising approaches can have a considerable effect on the attitudes, perceptions, and buying behaviour of the people in the retail premises (Mondol et al., 2021; Kim and Lee, 2021). Indicatively, Mondol et al. (2021) established that attractive retail displays have a positive effect on product visibility and generate more urge in consumers to spend more time viewing merchandise, which in turn enhances purchase intention. In this case, Underhill (2009) posited that effective product displays in fashion retail settings trigger the affective reactions of consumers and in most instances results in impulse buying behaviour.

Recent studies have also given significant focus on the role of visual merchandising in enhance consumer involvement and brand recognition in the fashion retailing. According to Megat Zambri and Saleh (2025), creative and sustainable visual merchandising practice can support the brand perception and boost the customer engagement with retail visual displays. They argue that attractive retail displays are highly important in the capture of consumer attention and the increase of consumer activity in regard to product involvement in the store setting.

Theoretically, the Stimulus Organism Response (S-O-R) model describes how environmental stimulus in the retail settings affects consumer behaviour (Mehrabian and Russell, 1974; Kim and Lee, 2021). Based on this model, the visual merchandising properties serve as external stimuli that exert on the inner emotional and cognitive state of consumer (organism), which in turn, prompts behavioural reaction in the form of purchase intention and buying behaviour (response) (Mehrabian and Russell, 1974; Verhoef et al., 2015). Thus, successful visual merchandising practices have the potential to develop emotional retail experiences that can arouse positive consumer reactions and drive purchase decisions in fashion retail stores (Murad and Raju, 2022; Mondol et al., 2021).

1.1.1 The Role of Store Layout and Product Placement

The basic forces of visual merchandising that greatly affect consumer purchasing behaviour in the retail setting are store layout and product placement (Baker et al., 2002; Kim and Lee, 2021. Previous studies indicate that store design and merchandising configuration has the potential to influence the browsing behaviour, movement patterns and engagement with the products in the retailing setting (Murad and Raju, 2022).

An efficient store design enables a retailer to direct the consumer through the retail space in a way that is strategic in that the consumer is better placed to come across more products and promotional displays (Baker et al., 2002). It has also been found that the strategies used in product placement can have a powerful impact on consumer buying behaviour by enhancing the visibility and accessibility of products in the retailing premises (Hwang and Kim, 2022). As an example, high margin or promotional merchandise should be displayed at eye level or close top checkout points as it may draw in and stimulate impulse buying behaviour among consumers (Milliman, 1982).

Besides product placement in the store, the retail entrances and the window displays are also significant in customer attraction and contributing to the initial impression of the retail environment (Dube and Renaghan, 2017). According Kotler et al. (2017) referred to the window displays and entrance of the store as a silent salesperson since it conveys the brand image of the store and affects the consumer perceptions even before they can come into direct contact with sales people.

1.1.2 Lighting and Colour As Emotion Triggers

Lighting and colour are important visual merchandising elements that can significantly influence consumers' emotional responses and purchasing behaviour in retail environments. The strategy to use of lighting and colour schemes helps retailers create specific atmospheres that enhance the overall shopping experience and attract consumer attention toward particular products (Baker et al., 2002; Kim et al., 2021). Lighting plays a crucial role in shaping consumer perceptions and behaviour within retail spaces. For example, warm lighting can create a welcoming and comfortable shopping environment, encouraging consumers to spend more time in the store and increasing the likelihood of purchase (Huang and Benyoucef, 2023; Miller, 2017). Proper lighting can also highlight product features and improve product visibility, which enhances customer engagement with merchandise (Miller, 2017).

In addition to lighting, colour psychology has been widely studied in retail marketing due to its influence on consumer emotions and decision-making processes. Research indicates that different colours evoke distinct emotional responses among consumers. For instance, red is often associated with excitement and urgency, while blue is linked to trust, calmness, and reliability (Behera and Mishra, 2021; Bellizzi et al., 1983). The effective combination of lighting and colour can therefore create emotionally appealing retail environments that influence consumer perceptions and encourage purchase behaviour.

Part of theoretical perspective, lighting and colour function as environmental stimuli that influence consumers' internal emotional responses. According to the Stimulus Organism Response (S-O-R) framework, these visual stimuli affect consumers' psychological states, which subsequently shape behavioural responses such as purchase intention and impulse buying. Therefore, the strategy use of lighting and colour in visual merchandising can enhance consumer engagement and influence purchasing decisions within retail environments.

1.1.3 The Impact of Digital Integration on Visual Merchandising

The intensive development e-commerce has stimulated traditional physical retail stores to adopt digital technologies as visual merchandising strategies so as to keep pace with the contemporary retail markets (Verhoff et al., 2015). The implementation of digital visual merchandising tools (interactive displays and digital screens as well as virtual fitting rooms) is becoming gradually more popular in the fashion retail setting to promote consumer interaction and improve the overall shopping experience (Dube and Renaghan, 2017).

The adoption of digital technologies in the retail setting allows the retailer to offer individualized product information and interactive shopping experiences, which are able to generate better customer satisfaction and purchase intention (Behera and Mishra, 2021). Digital screens and virtual product displaying are interactive technologies that enable consumers to learn the features of products different ways of styling and promotional messages in real time, reinforcing consumer engagement with merchandise (Verhoeff et al., 2015).

Verhoeff et al., (2015) indicate that digitalisation turns physical retailing stores into a hybrid shopping experience where consumers can enjoy the services of both actual engagement with the products and online availability of the information. Such hybrid retail experiences are especially essential in the context of the fashion retail business where consumers tend to demand the acquisition of the product experiences and digital product information before committing to a purchasing decision (Dube and Renaghan, 2017).

The current research emphasises the increased importance of digital visual technology in the perception of consumers and engagement with brands. Jusoh et al. (2025) mentioned that digital content created visually and new visual technology can influence consumer perception, improve brand image and increase customer interest in products and retail.

However, although there has been an upsurge in the research on digital retail technology. Significant portion of the current research has focused on the individual visual merchandising features separately instead of their joint impact on consumer behaviour (Behera and Mishra, 2021). Thus, the proposed study aims to research the effect of combining various visual merchandising elements, such as digital technologies, store design, lighting and merchandise presentation in the fashion retail for purchasing behaviour.

2 VISUAL MERCHANDISING AS A PERCEPTUAL EXPERIENCE

The poor visual merchandising strategies can have negative impacts on how consumers perceive the retail environments and the willingness of consumers to interact with products on display (Namira and Adnans, 2023; Turley and Milliman, 2000). Unhealthy product displays or low-appealing store aesthetics can result in a negative emotional response that can reduce the purchasing intention and shopping experience of the consumers (Baker et al., 2002; Mondol et al., 2021).

The perception of visual merchandising among consumers might also be different depending on the culture in which people live because culture affects the way people perceive the visual components and signs of the stores (Elliott et al., 2006). Visual merchandising can be influenced by culture, in terms of the meanings that consumers assign to colours and store layouts. The store atmospherics that consumers use in their perceptions (Elliott et al., 2006). As an illustration, some colours can have varying meanings in different cultures, which affect the way consumers react and make buying decisions in the retail context (Elliott et al., 2006; Behera and Mishra, 2021).

Besides cultural factors, social factors also influence the perception of the consumers on visual merchandising and display of products in the retail stores (Cialdini, 2009; Cialdini and Goldstein, 2004). The social proof strategies, like emphasizing on the products popular with people or showcasing client advice, may change the views of the product worthiness and believability among the recipients (Cialdini and Goldstein, 2004). As a result, perceptual, cultural and social elements as part of visual merchandising strategies can have a powerful impact on the consumer purchasing behaviour in the fashion retail setting (Dhillon et al., 2024; Mondol et al., 2021).

Perceptual processes may be described in terms of the Stimulus Organism Response (S-O-R) model according to which environmental stimuli in retail settings alter the inner emotional and cognitive condition of consumers, eventually determining the behavioural outcomes, including the purchase intention and the buying behaviour (Mehrabian and Russell, 1974; Kim and Lee, 2021).

3 S-O-R MODEL APPLICATION TO VISUAL MERCHANDISING

A well-known theoretical concept in environmental psychology is the Stimulus Organism Response (S-O-R) model, which describes how environmental stimuli induce changes in the inner emotional states and behavioural reactions of people (Mehrabian and Russell, 1974; Kim and Lee, 2021). The external environmental factors are viewed as stimuli which influence the internal psychological and emotional processes (organism) of individuals which in turn result in behavioural outcomes (response) (Mehrabian and Russell, 1974; Turley and Milliman, 2000). Store layout, lighting, colour schemes, and product displays are several examples of visual merchandising in retail settings that is an environmental stimulus and affects the consumer perceptions and emotional reactions in shopping experiences (Gupta and Sharma, 2023).

The visual merchandising stimuli is tactically created to draw the attention of the consumers and condition the way they will think about the retail space and merchandise (Kotler et al., 2017). The previous research indicated that the structured store layouts make consumers spend less time in the retail setting, evoking positive emotional reactions, including comfort and satisfaction (Kotler et al., 2017; Kim and Lee, 2021).

The colour schemes are also significant to influence consumer perception and emotions in the retail setting (Bellizzi et al., 1983; Behera and Mishra, 2021). Studies on colour psychology indicate that warm colours (red and orange) tend to elicit the feeling of excitement and urgency whereas the cool colours (blue and green) can give the impression of trust, calmness, and reliability (Bellizzi et al., 1983; Behera and Mishra, 2021). These visual merchandising details are thus stimuli of the environment that impact the psychological and emotional positions of consumers as they deal with retail displays (Chen and Zhang, 2023; Mondol et al., 2021).

In the S-O-R model, the organism component reflects the inner emotional and cognitive reactions of consumers in retail settings that they develop because of the influence of environmental stimuli (Mehrabian and Russell, 1974). According to Hagtvedt and Brasel (2016) retail atmospherics have the potential to invoke consumers to emotional responses, including pleasure, excitement, and relaxation, and can influence the perception of retail environments and its appeal to a shopping experience. Looking at the example, visual merchandising and the proper arrangement of the store layout can cause the interest and joy. However, bad display designs can lead to confusion or even adverse emotional responses in consumers (Turley and Milliman, 2000; Mondol et al., 2021).

Mohd Nasir et al. (2023) indicated that visual design aspects have a role in interpretation, emotional involvement, and perception of the visual information in the communication set ups. These results imply that the visual presentation can shape the interpretation of visual information and consumer reaction to the retail settings through visual presentation strategy, such as the design of retail displays.

Store atmospheres that lead to positive emotional responses may extend the amount of time consumers spend in stores, increase their interest in merchandise, and boost purchase intentions (Chen and Zhang, 2023). On the other hand, negative emotions in stores might cause the consumer to walk out of the store without buying anything or lowering his desire to go back to the same store again (Schmitt, 1999; Turley and Milliman, 2000).

Altogether, S-O-R framework offers a valuable theoretical approach on the ways of how visual merchandising stimuli affect consumer perception, emotional reaction on the stimulus, and purchasing behaviour in fashion retailing settings (Hagtvedt and Brasel, 2016; Kim and Lee, 2021). Using the S-O-R model, this research describes the ideologies of visual merchandising as elements of the environment that stimulate consumer internal psychology and associated psychological factors to predetermine their intentions to purchase in a fashion retail store (Mondol et al., 2021).

4 METHODOLOGY

The research design in this study was a quantitative one in order to test out the connections between visual merchandising factors, consumer emotions, and consumer purchasing behaviour within a fashion retail setting (Creswell and Creswell, 2018). Consumer behaviour research is one of the fields where quantitative research methods are widely applicable since they enable the researcher to examine relationships among variables through statistical methods and structured methods of data collection (Hair et al., 2019). Visual merchandising items store layout, lighting, colour scheme, and product displays were considered as independent variables in the current research and the form of environmental stimuli in retail settings (Baker et al., 2002; Kim and Lee, 2021).

In line with the Stimulus Organism Response (S-O-R) model, the emotional reaction of consumers was assumed to be the organism aspect of interaction in the form of internal psychological responses to the retail stimuli (Mehrabian and Russell, 1974; Turley and Milliman, 2000). The emotional reactions covered the feelings of excitement, trust and frustration that the consumers were experiencing when engaging in the activity of the retail spaces (Kim and Lee, 2021; Mondol et al., 2021). Consumer buying behaviour, which consisted of purchase intention, time inside the store, and actual purchasing behaviour was used as the response component of the model (Underhill, 2009; Verhoef et al., 2015).

The target study population included the consumers who made purchases in fashion retail stores in shopping malls and high street retail sections. The participants were recruited through a convenience method sampling technique as those that were willing to participate in the study and visited retail stores

(Etikan et al., 2016). The convenience sampling method is widely used in retail and consumer behaviour studies due to its efficiency as a researcher is able to gather data through convenient respondents in their natural shopping conditions (Hair et al., 2019; Mondol et al., 2021). This sampling technique can restrict the applicability of the results, because the participants in this study can be not fully representative of the whole population of consumers (Etikan et al., 2016).

To get a detailed picture of the perceptions and behaviours of consumers in retail settings, data to be used in this research were collected through a structured survey questionnaire and observation. The survey questionnaire featured multiple sections with the perceptions of the visual merchandising elements of the store layout, lighting, colour schemes, and product display on the five-point Likert scale items of strongly disagree, strongly agree (Hair et al., 2019). Emotional reactions of consumers such as excitement, trust and frustration during the process of shopping at retail outlets were also covered by the questionnaire (Kim and Lee, 2021).

Besides the survey data, the observational data was also used in order to document the consumer behaviour in the retail settings. The researcher monitored the buying behaviour of the shoppers such as the duration of stay in the store, time with the product display and planning of purchases or impulse buying (Underhill, 2009). The survey and observational approach contributed to the better representation of the ways in which visual merchandising aspects affected the emotional reactions and buying behaviour of consumers in the context of the fashion retail settings.

The data obtained were examined through the statistical analysis methodology including regression and mediation analysis to identify the association between visual merchandising factors, emotional reactions, and consumer purchase behaviour. The strength and direction of the relationship between visual merchandising stimuli and consumer responses were determined using regression analysis and mediation analysis. The relationships between visual merchandising components and consumer buying behaviour were tested whether the relationships were mediated by emotional responses (Hair et al., 2019). These research methodologies allowed the researcher to consider the relationship between visual merchandising strategies and consumers in fashion stores in terms of emotional processes and their decisions to purchase.

5 FINDINGS

5.1 Descriptive Statistics

Table 1 shows the descriptive statistics of the key variables under analysis in this study, and they are those of store layout, lighting, colour scheme, display of product, emotional responses and consumer buying behaviour.

Table 1 Descriptive Statistics of Study Variables

Variable	Mean	Standard Deviation
Store Layout	3.85	0.72
Lighting	3.78	0.69
Colour Scheme	3.74	0.71
Product Display	3.92	0.68
Emotional Response	3.88	0.70
Consumer Buying Behaviour	3.81	0.73

(Source: Authors, 2025)

The descriptive statistics show that the respondents had a positive perception of the elements of visual merchandising in the fashion retail stores. Product display had the best mean score (M = 3.92) which is why the respondents considered product display as the most important aspect of visual merchandising. The mean value of emotional response was also relatively high (M = 3.88), as it is possible to suggest that consumers had positive emotional reactions upon engaging with retail environment that was visually attractive.

5.2 Regression Analysis

There was a regression analysis performed to determine the role of elements of visual merchandising in consumer buying behaviour.

Table 2 Visual Merchandising Elements and Consumer Buying Behaviour Regression Analysis

Independent Variable	Beta (β)	t-value	p-value
Store Layout	0.31	4.21	0.001
Lighting	0.27	3.89	0.002
Colour Scheme	0.24	3.56	0.004
Product Display	0.35	4.72	0.000

(Source: Authors, 2025)

The regression findings show that the visual merchandising factors play a very important role in determining the consumer purchasing behaviour in the fashion retail setting. Display of product had the greatest effect on the consumer buying behaviour (= 0.35, $p < 0.001$), then store layout (= 0.31, $p < 0.01$). There were also significant positive effects of lighting (0.27, $p <0.01$) and colour scheme on consumer buying behaviour (0.24, $p <0.01$).

The findings can lead to a conclusion that retail environments can significantly influence consumer buying scenarios because they are visually appealing. Specifically, product displays and efficient store plans will motivate consumers to touch and feel products and enhance the chances of making purchases.

5.3 Mediation Analysis (S-O-R Model)

A mediation was performed to analyse the perception of the relationships between visual merchandising factors and consumer purchasing behaviour, which is in line with Stimulus Organism Response (S-O-R) framework.

Table 3 Emotional Response Mediation Analysis.

Relationship	Direct Effect	Indirect Effect	p-value
Visual Merchandising ➡ Emotional Response	0.52	-	0.000
Emotional Response ➡ Buying Behaviour	0.46	-	0.001
Visual Merchandising ➡ Buying Behaviour	0.29	0.24	0.002

(Source: Authors, 2025)

Results of the mediation analysis show that there is a significant mediation effect of emotional response in between visual merchandising and consumer buying behaviour. The elements of visual merchandising were positively impacted on the emotional reactions of the consumers (0.52, $p < 0.001$) which indicated that the visually attractive retailing environments can provoke the positive emotional reactions of the consumers.

Moreover, the emotional reactions had a strong impact on consumer buying behaviour (= 0.46, $p = 0.01$), meaning that consumer with positive emotions of excitement and trust had a higher probability of buying decisions. The emotional reactions to the visual merchandising also had a significant aspect of indirect effect on buying behaviour ($B = 0.24$, $p = 0.01$) and this contributes to the mediating aspect of the emotional responses to the S-O-R relationship.

The results are in line with theoretical postulation of the Stimulus Organism Response model that environmental stimulus like visual merchandising influences internal emotional reactions which in turn affects behavioural consequences including intention to purchase and buying behaviour.

6 DISCUSSION

The main aim of the study was to understand how the aspects of visual merchandising affect the consumer purchasing behaviours in the fashion retail setting through the Stimulus Organism Response (S-O-R) framework. Few studies have conducted research on several visual merchandising features together and their impact on consumer emotional reactions and purchasing behaviour in a fashion store setting. Past studies have focused on individual visual merchandising components, including lighting or store layout, individually (Mondol et al., 2021; Murad and Raju, 2022). This research project has filled this research gap by examining how store layout, lighting, colour scheme and display of goods affect consumer purchasing behaviour.

The findings of this research show that the visual merchandising plays an important role in consumer purchase behaviour. The results of the regression analysis indicated that the visual merchandising variables were found to contribute to the consumer buying behaviour with an approximation of 58% (R 2 = 0.58) indicating that the retail design elements influence consumer purchase behaviour. The product display was the most significant variable among the variables analysed to the extent that it added about 35% of the consumer purchase intention variation, and then came the store layout (31%) and lighting (27%). These results align with the findings of the previously conducted researches showing that product display and store layout are key factors that increase product visibility and prompt consumer interaction with merchandise (Kim and Lee, 2021; Underhill, 2009).

The results further indicated that about 72% of the respondents admitted to having positive emotional reactions like excitement and trust when they were using aesthetically pleasing retailing settings. This observation helps in affirming the organism element of the S-O-R model which postulates that the environmental stimuli in the retail spaces affect the internal emotional conditions of consumers (Mehrabian and Russell, 1974). These affective reactions were discovered to have a great impact on the consumer buying behaviour, whereby the mediation analysis showed that about 46% of the impact on the purchase intention was indirectly affected by the emotional engagement. These results are in line with the earlier research indicating that retail atmospherics do influence consumer emotions, which in turn influence decision to make a purchase (Turley and Milliman, 2000; Hagtvedt and Brasel, 2016).

Moreover, the research established that 68% of the consumers said that attractive retail displays promoted impulse buying behaviour especially where merchandise was well-organized and illuminated through effective lighting. This finding is consistent with the findings of Underhill (2009) who indicates that appealing product displays trigger spontaneous buying behaviour by intensifying the consumer curiosity and interaction with the products.

The findings further prove that lighting and colour schemes do affect consumer perceptions of retail environments. About 64% of the respondents indicated that the appropriate use of lighting and colour schemes promoted their sense of the store attractiveness and professionalism. This result is aligned to other earlier studies that imply that colour psychology and atmosphere of lighting effects in the consumer perception and store judgment are significant (Bellizzi et al., 1983; Baker et al., 2002).

Altogether, the results of the study give empirical evidence of the Stimulus Organism Response (S-O-R) framework and prove the idea that the visual elements of merchandising can be affected as environmental stimuli that trigger the emotional response of the consumer, and consequently, influence the purchasing behaviour. This study also adds value to the existing literature by creating a more detailed insight into the role of retail design elements in driving consumer behaviour in fashion retailing settings by combining several elements of visual merchandising in the same framework.

7 CONCLUSION

The research has analysed how visual merchandising factors can be used to predict the consumer purchasing behaviour in the fashion retail store setting through the Stimulus Organism Response (S-O-R) model. The findings suggest that the emotional responses of the customers to the retail store can be evoked by the visual appeal of the stores, and in turn, it may enhance customer interactions with the products and their readiness to take purchase decisions. Specifically, product displays and store layout were discovered to be the most influential on consumer buying behaviour which makes sense of the strategic product presentation in fashion retail stores.

This research is relevant to the literature on retail marketing in that it offers empirical data to support the use of the S-O-R model to determine the consumer reactions to visual merchandising stimuli. The results also indicate that emotional reactions mediate the association between visual merchandising components and consumer purchase behaviour.

Besides the theoretical contributions of this research, it has some practical implications to the retailers intending to improve customer experiences by employing effective visual merchandising strategies. Increasing the retail environment design and presentation will enable retailers to develop more exciting shopping experiences which ensure consumers touch and feel and make purchase decisions.

8 RECOMMENDATION

Regarding the results of this work, a number of recommendations can be offered to fashion retailers and researchers of the future. To begin with, fashion retailers ought to invest in good visual merchandizing strategies which give importance to product display and efficient store layouts. The use of suitable merchandise placement can make its products more visible and prompt the consumer to browse products in the shop.

Second, the retailers ought to pay close attention to the store atmospheres to design them with proper lighting and colour schemes to make the shopping experiences emotionally uplifting. Lighting and colour are significant in consumer perception and emotional reaction which may affect the purchase behaviour.

Third, retailers need to concentrate in developing continuous and attractive retail experiences that make the brands more recognizable and more trusted by the consumers. Emotional bonds with the brands can be enhanced by making the retail spaces visually appealing which enhances customer satisfaction and loyalty.

Lastly, future studies might elaborate on application of visual merchandising in other retail backgrounds and cultures. More research can also examine how digital technologies of visual merchandising, including interactive displays and augmented reality, influence the consumer buying behaviour in contemporary retail settings.

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Spatial and Environmental Requirements for Integrating Decentralised Wet Anaerobic Digestion Systems in Heritage Urban Contexts: George Town, Penang

Fikriah Hani Omar Bakhri[1], *Salahuddin Abdul Hakeem Abas[2], Farid Al Hakeem Yuserrie[3], Muhammad Assyahmizi Mohd Yunus[4]

[1,2,3,4]Department of Built Environment Studies and Technology,
Faculty of Built Environment, Universiti Teknologi MARA Perak Branch,
Seri Iskandar Campus, 32610 Seri Iskandar, Perak, Malaysia.

fikriahhani@gmail.com[1], * hakem795@uitm.edu.my[2], farid933@uitm.edu.my[3], assyahmizi@uitm.edu.my[4]
Corresponding author

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ABSTRACT

Integrating decentralised food waste-to-energy (FWtE) systems within heritage urban environments demands alignment between technical infrastructure, spatial feasibility, and conservation responsibility. While decentralised wet anaerobic digestion (AD) systems have been extensively studied from engineering and environmental perspectives, limited research has translated their operational parameters into architectural integration frameworks for heritage adaptive reuse contexts. This study examines the spatial and environmental requirements for integrating decentralised wet AD systems within heritage urban settings, with reference to George Town, Penang. An analytical literature review was conducted to extract and categorise operational and biochemical parameters of wet AD systems, identifying their structural and environmental implications. This was followed by a comparative precedent analysis of three decentralised installations to evaluate spatial configuration, structural loading, and environmental control conditions. Through process-to-space mapping and cross-case synthesis, technical process requirements were translated into architectural integration criteria. The findings reveal consistent functional compartmentalisation across feedstock preparation, digestion, gas handling, energy conversion, and digestate management zones, each imposing specific structural, ventilation, safety, and service access requirements. The study proposes a structured set of spatial and environmental criteria that convert technical process demands into architectural considerations, enabling informed early-stage feasibility evaluation of decentralised wet AD integration within conservation-sensitive urban contexts.

Keywords: *Wet anaerobic digestion, heritage urban context, food waste-to-energy (FWtE), adaptive reuse, spatial and environmental requirements*

1 INTRODUCTION

The growth of food waste in cities due to rapid urbanisation and alteration in consumption habits has placed a growing burden on the available waste management systems. Food waste is one of the leading sources of greenhouse gases in the world, especially when it is disposed of in landfills (Food and Agriculture Organization of the United Nations, 2019; United Nations Environment Programme (UNEP), 2024). Food waste contributes a significant part of municipal solid waste in Malaysia and is still mostly handled by centralised collection and landfill, which leads to environmental overloads and unutilised resource potential (Solid Waste and Public Cleansing Management Corporation, 2022).

This model of linear waste management is particularly problematic in urban settings that have a strong density and a stronger impact on the environment.

In heritage cities like George Town, Penang, these issues are also compounded by conservation policies and high-density urban form. George Town, as a UNESCO World Heritage Site, is also typified by the reuse of the old shophouses to cafes, restaurants, and food-related businesses (George Town World Heritage Incorporated, 2022). Although such functions result in the continuous food waste streams, waste management is still externalised in a way that it further promotes the division of food production and waste recovery in the built environment.

Anaerobic Digestion (AD) system is the most commonly accepted type of food waste-to-energy (FWtE) technology, which has been highly praised due to its environmental advantages and the ability to handle high-moisture organic wastes (Mata-Alvarez et al., 2014; Khalid et al., 2019). Wet AD systems particularly apply to urban food waste since they operate as a slurry-based system, have a compact design, and may be decentralised (Li et al., 2022). The pilot implementation projects indicate that modular wet AD systems can be deployed in urban environments that are limited (Walker et al., 2017; Tiong et al., 2024).

Nevertheless, existing research on AD systems has predominantly focused on technical optimisation, environmental performance, and policy frameworks, with limited attention to their spatial and architectural implications within heritage adaptive reuse contexts. This absence is significant because the integration of decentralised wet AD systems directly affects structural loading, spatial zoning, ventilation requirements, and safety management factors that are critical in conservation-sensitive environments. Without translating operational parameters into architectural criteria, implementation risks structural incompatibility, regulatory conflict, and inappropriate intervention within protected heritage fabric.

The incorporation of decentralised wet AD systems introduces structural, environmental, and operational demands that influence spatial planning and building performance. These requirements are particularly consequential in heritage settings, where conservation principles emphasise minimal intervention, reversibility, and protection of character-defining elements (ICOMOS, 2013). Accordingly, this study examines the spatial and environmental requirements for integrating decentralised wet AD systems in heritage urban contexts, using George Town, Penang as a reference case. By synthesising technical literature and precedent analysis, the study establishes a process-based architectural framework to support feasibility evaluation within adaptive reuse environments.

2 LITERATURE REVIEW

2.1 Food Waste Management in Urban Context

The world has experienced rapid urbanisation as well as shifting consumption patterns, which have aggravated food waste production in urban areas. One-third of the food produced to be consumed by humans is lost or wasted globally, and when disposed of in landfills, these wastes emit a large portion of greenhouse gases (Food and Agriculture Organization of the United Nations, 2019; UNEP, 2024). Food waste represents a significant proportion of the municipal solid waste streams in Malaysia and remains a largely centralised collection and landfill waste management system. It has been reported that food waste in urban Malaysia is over 15,000 tonnes per day and that the largest part of municipal waste streams is organic (Solid Waste and Public Cleansing Management Corporation, 2022). This is a linear approach of waste management whereby mounting pressure is put on the landfill space as well as adding to the emission of methane and the degradation of the environment in the long-term.

The generation of food waste is usually centralised in commercial districts in a dense urban environment which are characterised by restaurants, markets and other food related businesses. In addition to the solid food residues, other related by-products like cooking oil used and organic slurry waste are also sources of environmental pressures when discharged inappropriately. Research in Malaysian urban settings points out that unregulated dumping of food-related waste into the drainage systems are among the factors that lead to blocked drainage systems, breeding of pests and water pollution. An example is an example of a community-based program where 86,000 ml of used cooking oil were collected by 172 households in a variety of urban areas, which demonstrates that despite the scattered but large amount of food-related waste at neighbourhood levels. (Merman et al., 2023).
In heritage cities like George Town, the reuse of historic shophouses into food-based enterprises has contributed to localised food waste generation (George Town World Heritage Incorporated, 2022). Nevertheless, the treatment of waste is externalised to the built environment, which strengthens the separation between consumption and the process of recovery. Such circumstances provide a systemic imperative of decentralised food waste-to-energy (FWtE) plans that can be executed in spaces with a high density of urban environments, especially in small heritage urban areas where infrastructural growth is restrained.

2.2 Decentralised Anaerobic Digestion in Urban Settings

Decentralised FWtE systems have emerged as alternatives to large-scale centralised waste treatment facilities, reducing transportation demands, enhancing local resource recovery, and enabling on-site energy generation by locating treatment processes near waste generation points (Mata-Álvarez et al., 2014). In high-density urban environments, where land availability and infrastructural expansion are constrained, decentralisation offers logistical and spatial advantages over conventional centralised models.
Among FWtE technologies, Anaerobic Digestion (AD) is well established as a biological conversion system that transforms organic waste into biogas and digestate, thereby recovering both energy and nutrient value. Wet AD systems are particularly suited to high-moisture urban food waste due to their slurry-based operation and controlled feeding processes (Khalid et al., 2019). Advances in mobile and containerised technologies have enabled the deployment of small- to medium-scale wet AD systems within compact urban footprints (Li et al., 2022), allowing installation in proximity to commercial food-generating premises.

However, the decentralisation of AD systems fundamentally repositions waste-processing infrastructure from remote industrial zones into the architectural domain of buildings and urban blocks. Unlike centralised facilities, decentralised wet AD systems require integration within existing structural frameworks, mechanical systems, and spatial hierarchies. Their implementation introduces demands related to structural loading, floor slab reinforcement, ventilation routing, fire safety zoning, acoustic control, service circulation, and segregation between technical and public areas.

These requirements expand the role of architects beyond formal or programmatic adaptation to infrastructural mediation. Architects must evaluate spatial allocation, structural feasibility, service integration, conservation compatibility, and regulatory compliance. In heritage urban settings, where adaptive reuse operates under principles of minimal intervention and reversibility, decentralised AD integration must be carefully positioned within non-character-defining zones to avoid compromising significant architectural fabric.

Therefore, decentralised wet AD systems should not be considered solely as environmental technologies, but as embedded building infrastructures whose feasibility depends on architectural planning, structural assessment, and conservation-sensitive design strategies.

2.3 Operational Process of Wet Anaerobic Digestion

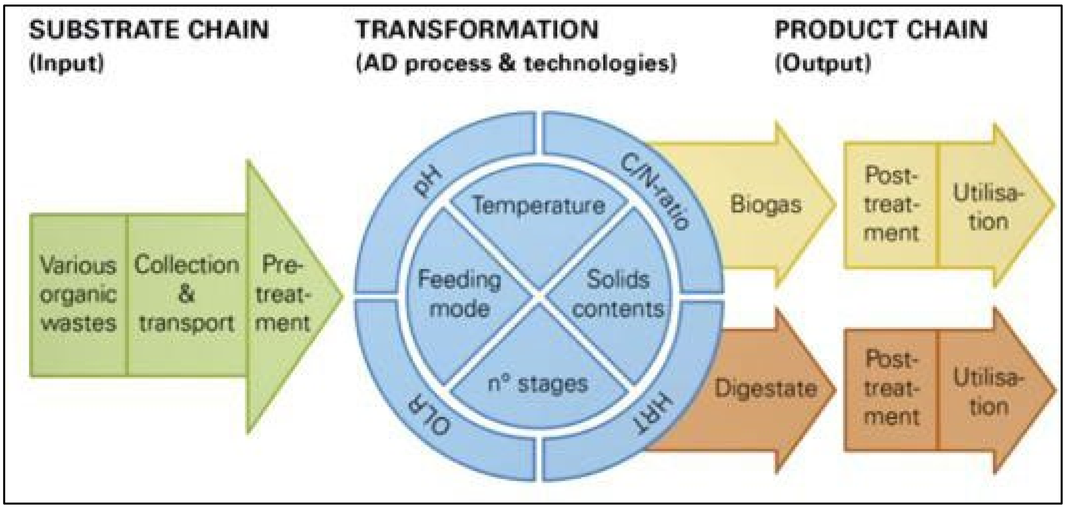

Figure 1 Overview of the anaerobic digestion process showing substrate input, transformation stages, and product outputs.
(Adapted from: Weiland, 2010).

AD is a controlled biological process in which microorganisms decompose organic material in the absence of oxygen, producing biogas and digestate as primary outputs. As illustrated in Figure 1, the AD process can be understood as a transformation chain linking substrate input, biochemical conversion, and product output. (Weiland, 2010; Mata-Álvarez et al., 2014)

2.3.1 Substrate Chain (Input Stage)

The process starts by the collection and preparation of organic waste. Under urban food waste, substrates are usually kitchen and restaurant waste with a high moisture content and a changing composition. The feedstock is pre-treated before the digestion by sorting, shredding, homogenisation and dilution to achieve uniform particle size and formation of slurry. This pre-treatment is essential to enhancing microbial accessibility and stabilisation of feed conditions. (Weiland, 2010; Karki et al., 2021)

2.3.2 Transformation Stage (Anaerobic Digestion Process)

The transformation step takes place in a closed digestion compartment in a non-aerobic environment. It is divided into four main stages of biochemical processes, namely hydrolysis, acidogenesis, acetogenesis, and methanogenesis. In hydrolysis, complex organic polymers are degraded into simpler soluble compounds. These compounds are further transformed into volatile fatty acids, hydrogen and carbon dioxide by acidogenesis and acetogenesis. The last stage involves the use of the methanogenic microorganisms to convert the intermediate products into methane rich biogas. The efficiency and stability of the digestion process are governed by several operational parameters, as indicated in Figure 1:

1. Temperature: Wet AD systems typically operate within the mesophilic range (approximately 30–40°C), requiring relatively stable thermal conditions.
2. Potential of Hydrogen (pH): Optimal methanogenic activity occurs within a neutral pH range (approximately 6.5–7.5).
3. Carbon-to-Nitrogen (C/N) ratio: A balanced carbon-to-nitrogen ratio supports stable microbial metabolism.

4. Hydraulic Retention Time (HRT): Determines the duration of substrate residence within the reactor.
5. Organic Loading Rate (OLR): Influences microbial activity and gas production rate.
6. Solids content and feeding mode: Affect reactor configuration and mixing requirements.

These parameters directly inform reactor design, equipment configuration, and environmental control requirements (Weiland, 2010).

2.3.3 Product Chain (Output Stage)

Biogas and digestate are the major products of wet AD (Weiland, 2010). Biogas generally comprises of methane (CH_4) and carbon dioxide (CO_2) and might need purification prior to use (Mata-Alvarez et al., 2014). It can be applied as a generator of electricity, as producing heat or as a combination of heat and power (CHP). The remaining semi-liquid by-product, called digestate, can be subjected to post-treatment and then used as a fertiliser or soil amendment (Khalid et al., 2019).

2.4 Urban Heritage Conservation Principles and Regulatory Context in George Town

Heritage urban areas represent layered cultural landscapes in which architectural fabric, spatial morphology, and socio-economic activities collectively contribute to cultural significance. In UNESCO-designated sites such as George Town, conservation extends beyond individual monuments to encompass streetscape continuity, scale, material authenticity, and intangible heritage practices (George Town World Heritage Incorporated, 2022).

International conservation doctrine, particularly the Burra Charter developed by ICOMOS (2013), establishes key principles including minimal intervention, retention of significant fabric, compatibility of new additions, and reversibility of change. These principles recognise that transformation within heritage environments is not prohibited; rather, it must be carefully managed to safeguard authenticity and integrity while accommodating contemporary needs.

Within George Town World Heritage Site, these international principles are operationalised through a structured governance framework administered by the Penang State Government, the George Town World Heritage Incorporated, and the Penang State Heritage Department. Development control is guided by the Special Area Plan (SAP) for George Town, which outlines conservation and alteration guidelines for buildings within the Core and Buffer Zones.

Although particular technical standards depend on the typology of the building and the conservation level, the heritage control systems in George Town typically demand that new insertions do not cause an irreversible change of the meaningful fabric, do not impose a significant visual impact on primary facades, and do not cause compatibility with the existing urban scale and materiality. Mechanical and service installations will be thus incorporated in a way that does not hurt streetscape integrity and architectural authenticity.

Structural modifications within heritage buildings may be feasible through the introduction of supplementary support systems; however, such interventions must be carefully evaluated to maintain the integrity and reversibility of significant fabric. Accordingly, the integration of decentralised infrastructural systems in heritage settings must operate within clearly defined conservation parameters, balancing technical feasibility with regulatory and ethical responsibilities.

2.5 Adaptive Reuse and Circular Urban Metabolism

Adaptive reuse has emerged as a central strategy in contemporary heritage conservation, extending the functional lifespan of historic buildings while reducing demolition waste and embodied carbon loss. Rather than replacing obsolete structures, adaptive reuse reprogrammes existing fabric to accommodate evolving socio-economic functions, thereby sustaining both cultural value and environmental performance (Bullen & Love, 2011).

In the context of sustainability, adaptive reuse is closely related to the principles of the circular economy that emphasises the preservation of resources, their reuse, and the regeneration of value instead of the extraction and disposal of resources (Geissdoerfer et al., 2017). In these regards, adaptive reuse can be seen as a kind of architectural upcycling, in which already existing built resources are revalorised and re-integrated into current urban metabolism, instead of being taken out of it.

The concept of urban metabolism further frames cities as systems of material and energy flows, in which waste streams represent potential resource inputs rather than terminal outputs (Kennedy et al., 2007). This perspective becomes particularly relevant in George Town, where historic shophouses and colonial-era buildings have been adaptively reused as restaurants, cafés, boutique hotels, and food-oriented commercial enterprises. These programmes generate continuous streams of organic waste, revealing an overlooked metabolic dimension within heritage districts.

AD is also a material upcycling process involving production of biogas and digestate out of organic waste. The comparison of the spatial upcycling (reuse of historic structures) with the material upcycling (reuse of food waste into energy) implies a consistent cyclical reasoning of the urban system. Nevertheless, in contrast to traditional building services, wet AD systems are managed technical infrastructure with specified spatial, structural and environmental imperatives.

The question is not whether adaptive reuse and decentralised AD are conceptually aligned however, but how infrastructural systems can be brought in as reversible and conservation-friendly layers in heritage buildings. The decentralised AD systems can also add to the circular urban metabolism without compromising the heritage integrity when properly incorporated in the non-character-defining spaces and appropriately supported by the structural and environmental controls.

2.6 Selection and Overview of Decentralised Wet Anaerobic Digestion Precedents

To examine the operational and spatial characteristics of decentralised wet AD systems in dense urban environments, three decentralised precedents were selected: the SEaB Flexibuster™ system, the Singapore Hawker Pilot system, and the Camley Street micro-scale AD facility in London. These precedents were chosen based on three criteria:

1. Decentralised deployment,
2. Availability of documented operational and spatial configuration data,
3. Implementation within constrained urban settings.

2.6.1 SEaB Flexibuster™

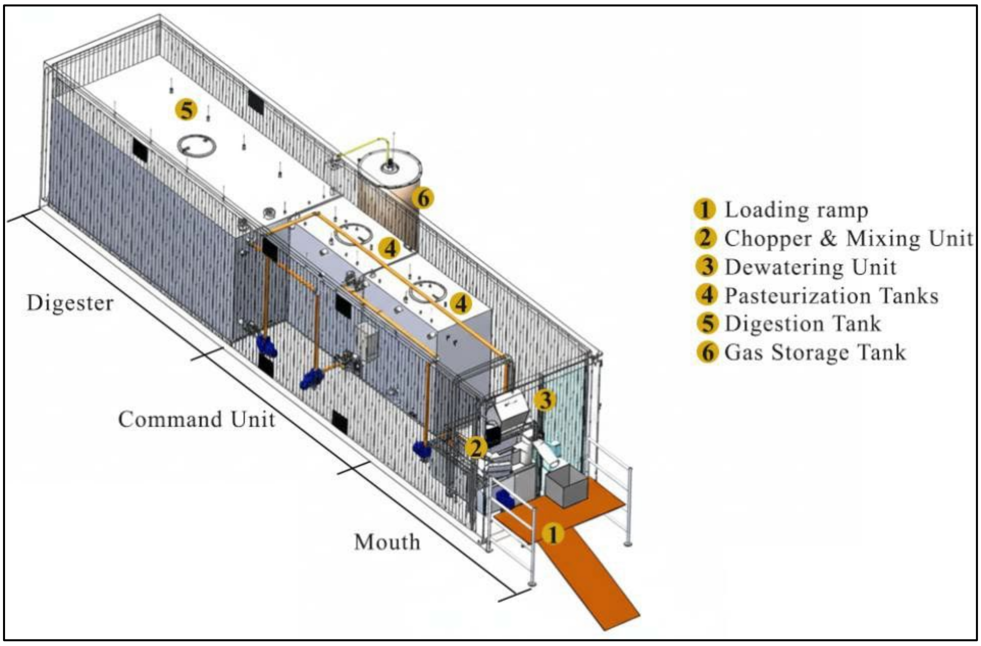

Figure 2 Spatial configuration of the SEaB Flexibuster™ containerised wet AD system (Adapted from: SEaB Energy, 2020).

SEaB Flexibuster™ is a containerised wet AD system that is used to treat food waste in a decentralised, on-site manner. The system is spatially structured in a typical container module in a linear sequence of processes as shown in Figure 2. The setup starts with a loading ramp to a chopper and feedstock preparation mixing unit, dewatering and pasteurisation tanks. The main digestion tank is located in the middle of the container, and gas storage components are located at the end of the module. This structure depicts process-based zoning and safety distance on a small footprint.

With a remotely monitored automated process of combining grinding, controlled feeding, AD and pasteurisation, the system transforms some 500-3000 kg/day of food waste into electricity, heat and digestate. The system can be run under mesophilic conditions with an approximate hydraulic retention time (HRT) of around 15-20 days, and it occupies about 20-40 m2 per container unit. The most important structural element of the module is the digestion tank, whereas the gas storage units must be enclosed and separated because of the generation of methane.

Figure 3 On-site Implementation of the SEaB Energy Flexibuster™ Wet AD System at a Continente Supermarket, Portugal.
(Source: SeaB Energy website, 2020)

The technology has been adopted in commercial purposes where it has been installed in the Continente supermarket in Portugal (Figure 3) where it takes food waste produced in the supermarket and turns it into electricity and heat which is used in the same supermarket. This is a closed-loop design that minimizes the use of external waste transport and allows on-site recovering of resources based on small commercial footprint. (SEaB Energy, 2020).

2.6.2 East Coast Lagoon Food Village (ECLFV), Singapore

Figure 4 Associate Professor Tong Yen Wah, who leads the NUS team, is pictured next to the anaerobic digester at the East Coast Lagoon Food Village.
(Source: News@NUS, 2024).

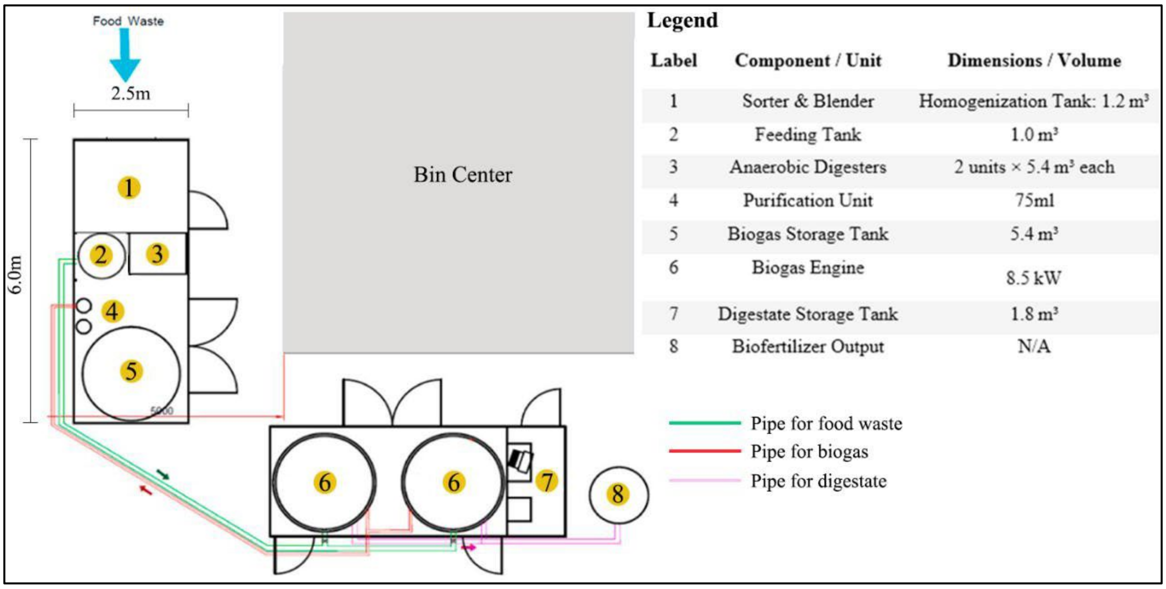

Figure 5 Layout plan of the Singapore Hawker Pilot wet AD system.
(Adapted from: Tiong et al., 2024).

This Singapore Hawker Pilot system (Figure 4) represents a wet AD application which is decentralised and installed in a working urban hawker centre with about 60 food stalls that produces about 150 kg of food waste in a day. The system will be located next to the current bin centre such that the food waste can be collected and processed in the same commercial area.

As shown in Figure 5, the installation is modularised into two containerised modules which harbour the sequential steps of feedstock preparation, digestion, gas storage and energy conversion. The set up combines pre-treatment modules, closed digestion systems, gas management systems, and a biogas engine into a small service base. The spatial design is a linear process flow that is clearly functional with wet-processing areas and gas-handling clearly segregated.

The system is meant to handle mixed food waste produced by the hawker stalls, and it is operated under mesophilic conditions. Digestion of biogas is transformed into electricity and used to operate the facilities of the community in the hawker centre such as outdoor fans and mobile charging points. This arrangement is an example of a closed-loop model where food waste that is produced as a result of commercial affairs is processed into usable energy in the same urban environment. (Tiong et al., 2024)

Overall, the pilot installation illustrates the feasibility of decentralised wet AD deployment in dense commercial environments, particularly where food waste generation is concentrated and spatial integration must occur within constrained service areas.

2.6.3 Camley Street Micro-Scale AD Facility (London, UK)

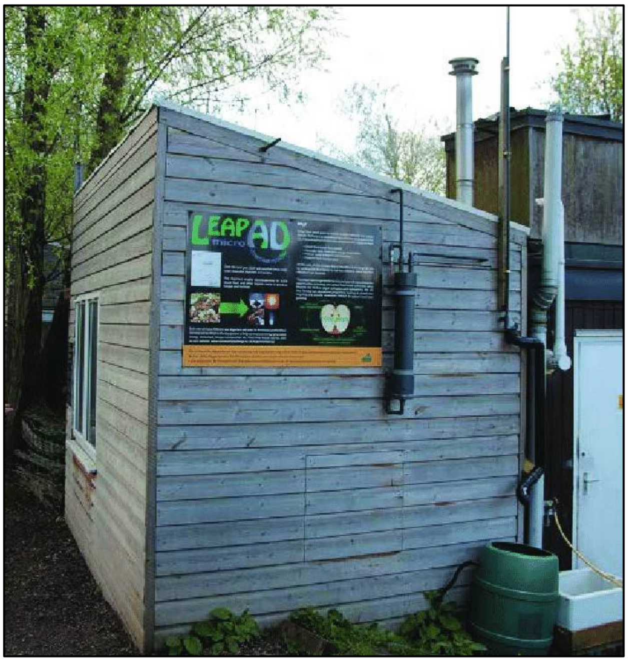

Figure 6 Camley Street Park, London (UK): Building hosting the micro-scale AD facility (Source: Pracucci & Zaffagnini, 2019).

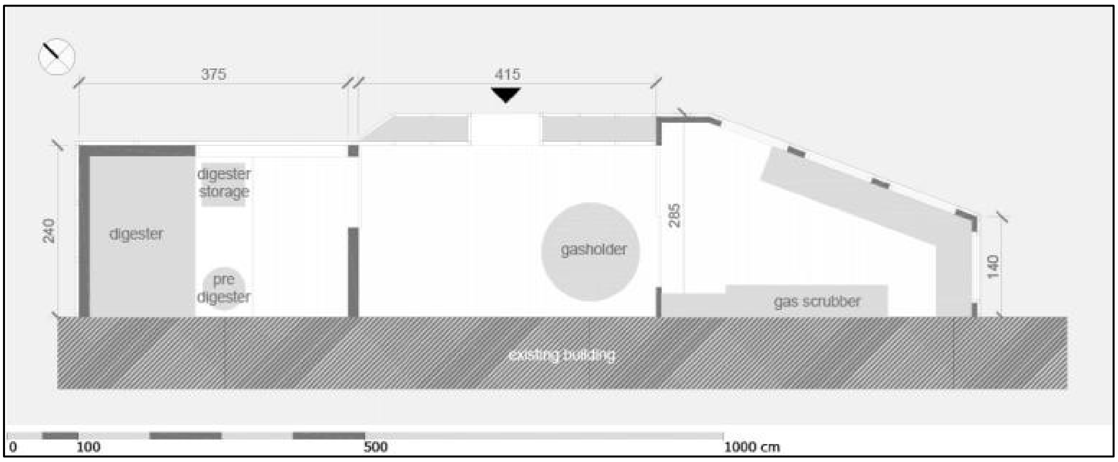

Figure 7 Layout plan of the Camley Street micro-scale anaerobic digestion facility. (Adapted from: Pracucci & Zaffagnini, 2019).

The Camley Street micro-scale AD plant in London (Figure 6) is a small-scale urban application in the form of a pilot installation monitored. This project, unlike a containerised commercial system, was an experimental demonstration of the concept of decentralised digestion on a limited urban site, which investigated the technical feasibility of recovering organic waste at the neighbourhood scale.

The system was fitted into the current site boundary and was arranged in sequential stages as shown in Figure 7 as primary digestion, gas storage, gas treatment and digestate handling. The small-scale layout is indicative of the linear process logic of wet AD systems but accommodates the space constraints of inner-city settings.

Over a 319-day monitoring period, the facility digested 4,574 kg of organic waste, and the average daily feed rate was about 14.3 kg/day. The documented hydraulic retention time was about 127.2 days which indicated low organic loading rates which is characteristic of micro-scale systems. These small-scale digesters are generally well adapted to small organic feeds and have low spatial demands with footprints that may vary between about 5-15 m 2 depending on the design. (Pracucci & Zaffagnini, 2019)

The biogas produced by the system was used in the local community cafe on site to cook and heat food, which was an example of direct localised energy recovery. Even though of limited scale, the pilot installation demonstrated empirically that even micro-scale wet AD systems can be run steadily in dense urban settings, when managed properly.

The Camley Street project therefore illustrates the experimental potential of decentralised digestion as a community-level waste management strategy, particularly in sites where organic waste volumes are relatively low but spatial constraints are significant.

Collectively, these precedents illustrate that decentralised wet AD systems can operate across varying scales while maintaining compartmentalised process zoning and controlled operational environments. These characteristics provide the empirical basis for analysing the spatial, environmental, and operational requirements of integrating decentralised wet AD systems within heritage urban contexts. (Walker et al., 2017).

3 METHODOLOGY

3.1 Research Design

This study adopts a qualitative analytical approach to examine the spatial and environmental implications of decentralized wet Anaerobic Digestion (AD) systems within heritage urban contexts. The research is structured in two sequential stages:

1. Literature-based analytical review of wet AD operational processes,
2. Precedent study examination of decentralised wet AD implementations.

This multi-layered approach allows technical process requirements to be translated into architectural and environmental criteria relevant to adaptive reuse settings.

3.2 Literature-Based Analytical Review

A structured review of academic and technical literature was conducted to synthesise the operational processes and technical parameters of wet AD systems. The review focused on:

- Process stages (feedstock preparation, digestion, gas handling, digestate management)
- Reactor configuration and scale
- Temperature requirements (mesophilic range)
- Moisture characteristics of urban food waste
- Gas production and safety considerations

The objective of this analysis was to establish the technical and biochemical basis that determines spatial and environmental requirements for decentralised wet AD integration within existing buildings.

3.3 Precedent Study Analysis

To examine spatial configuration in real-world deployment, three decentralised wet AD implementations were analysed. The cases were selected based on the criteria outlined in Section 2.6, including documented decentralised deployment, availability of spatial and technical configuration data, and implementation within constrained urban environments comparable to heritage settings.

The selected precedents represent variation in operational scale and typological context, encompassing containerised commercial systems, modular community-based installations, and micro-scale neighbourhood applications:

- SEaB Flexibuster™ containerised system
- East Coast Lagoon Food Village (ECLFV) modular pilot system (Singapore)
- Camley Street Micro-AD facility (London)

Layout diagrams, volumetric capacities, equipment dimensions, and structural loads were examined to identify:

- Functional zoning
- Spatial sequencing
- Structural implications
- Environmental control requirements

Cross-case comparison revealed consistent process-based compartmentalisation and spatial logic across varying scales and contexts. The recurrence of these patterns provided sufficient analytical depth and conceptual saturation to synthesise architectural integration criteria applicable to decentralised wet AD systems within heritage urban environments.

3.4 Integrated Spatial Synthesis

The literature-based analytical review and precedent analysis findings were integrated to come up with architectural spatial, environmental, and operational requirements. The synthesis codes the process based technical requirements into architectural requirements that can be applied to heritage adaptive reuse situations, specifically the spatial attributes of George Town, Penang.

4 RESULTS AND DISCUSSION

4.1 Integrated Spatial Synthesis

According to the literature analytical review, the urban food waste is highly moist and constantly generated, which means that wet Anaerobic Digestion (AD) is especially consistent with this type of waste. The wet AD systems are slurry-based processing and mesophilic and can be deployed in a decentralised manner in a modular or containerised system.

The analysis of precedents demonstrates that decentralised wet AD systems can be accommodated within compact urban footprints, without requiring extensive industrial-scale spatial allocation. The modular design of all the systems analysed provides integration in service domains of the existing buildings. These results indicate that wet AD can be technically applicable in decentralised food waste management in dense heritage urban areas, provided that the spaces and structures are viable.

4.2 Operational Process and Spatial Configuration

Across all precedents, wet AD systems exhibit consistent functional compartmentalisation into five primary zones:

1. Feedstock intake and pre-treatment
2. Digestion chamber
3. Gas handling and storage
4. Energy conversion (where applicable)
5. Digestate management

Sequencing of these zones indicates the route of transformation of organic waste starting with input of substrates to the production of energy and release of by-products. In precedents, the spatial organization is impacted by operational logic, safety demands and equipment specification. The feedstock intake and pre-treatment zone is always at the start of the order and comprises of shredding, homogenisation, or controlled feeding units. The digestion chamber is the centre of the system and usually takes up the greatest spatial and structural area. Gas handling and storage areas are separated into wet-processing areas, which implies safety-based spatial compartmentalisation. Energy conversion units are situated in service-based plant areas that need ventilation and acoustic management whereas the digestate storage is at the end of the process flow that can be removed under control.

The documented spatial and technical characteristics of each zone across the selected precedents are summarised in Table 1.

Table 1 Process-Based Spatial Characteristics of Selected Decentralised Wet AD Precedents

Operational Zone	SEaB Flexibuster™	ECLFV (Singapore)	Camley Street Micro-Scale AD Facility (London)
Feedstock Intake & Pre-treatment	3.1m container intake module	1.2m³ homogenisation tank, 1.0m³ feeding tank	Breaker mill for size reduction
Digestion Chamber	6.1m container, structural loads up to 24,000kg	Dual 5.4m³ digesters	2.0m³ and 0.65m³ digesters in enclosed chamber
Gas Handling & Storage	Integrated gas storage tank separated from digestion zone	Gas purification unit, 5.4m³ gas storage	Dedicated gas holder separated from digester
Energy Conversion (CHP)	On-site electricity & heat generation	8.5kW biogas engine	Biogas used directly in community cafe
Digestate Management	Output digestate tank with controlled discharge	1.8m³ digestate storage tank	Post-treatment and controlled removal

(Source: Omar Bakhri, 2026)

The recurrence of these compartmentalized areas in all the precedents proves that wet AD systems are controlled service infrastructure and not integrated habitable space. Process needs, equipment size, and safety are the major factors that define spatial organization as opposed to architectural flexibility. This consistent operational configuration provides the empirical foundation for synthesising spatial, environmental, and operational requirements in the subsequent section.

4.3 Synthesised Spatial, Environmental and Operational Requirements

Based on the reported spatial arrangement revealed in Section 4.2 and the operation parameters elaborated in Section 2.3, an integration of decentralised wet AD systems can be synthesised into three main requirement categories, namely spatial, environmental, and operational. These are not arbitrary architectural choices but are directly based on the conditions of the processes, equipment sizes and safety considerations of wet AD systems.

Spatial demands are found mainly due to the size of the reactor, structural loading and the sequence of the processes. The digestion chamber is always the most structurally challenging part where the reinforced floor slabs are used, and the foundations are to be stable to take the weight of a tank and dynamic loading during the mixing process. Pre-treatment areas require sufficient clearance of mechanical equipment and direct access of service to daily feedstock delivery. The compartmentalisation across zones implies both the functional and safety aspects.

The biochemical stability of wet AD processes and associated gas management conditions determine key environmental requirements, including thermally stable enclosures for mesophilic digestion, controlled ventilation, gas detection systems, and fire-rated separation of gas handling areas. Wet-processing spaces also require drainage systems and moisture-resistant finishes to maintain hygiene and prevent material degradation. These environmental demands are closely linked to operational requirements derived from the linear sequence of waste input, biological transformation, energy conversion, and digestate discharge. Safe and continuous operation necessitates clear circulation pathways, restricted access to technical zones, and buffer spaces for feedstock and digestate management. The integrated architectural implications of these environmental and operational requirements are summarised in Table 2.

Table 2 Synthesised Spatial and Architectural Requirements for Decentralised Wet AD Systems

Operational Zone	**Integrated Architectural Criteria**
Feedstock Intake & Pre-treatment	Enclosed wet-handling room; floor drainage, washable non-porous finishes, direct service access, buffering space, separation from public areas
Digestion Chamber	High load-bearing slab, stable foundation, insulated enclosed chamber, maintenance clearance, restricted access
Gas Handling & Storage	Mechanical ventilation, methane detection, fire-rated enclosure, safety clearance buffer; separation from wet zone
Energy Conversion (CHP)	Ventilated plant-room environment, acoustic mitigation, exhaust routing, integration with building MEP systems
Digestate Management	Floor drainage, moisture-resistant surfaces, containment edge, proximity to service exit, controlled handling zone

(Source: Omar Bakhri, 2026)

Collectively, the synthesis demonstrates that wet AD systems function as controlled technical infrastructure embedded within the built environment. Their architectural integration depends on accommodating structural loads, environmental control systems, and operational circulation patterns rather than aesthetic adaptation alone.

4.4 Discussion: Implications for Heritage Urban Integration

The findings show that the wet AD systems can technically be applied in the decentralised urban context, but their integration into the heritage context is heavily limited by building typology and structural capacity, as well as operational scale. In George Town where adaptive reuse of old buildings into food related programmes is becoming a common practice, the viability of wet AD systems needs to be evaluated in terms of spatial practicality as well as conservation constraints.

While food-oriented adaptive reuse generates consistent organic feedstock, spatial and structural characteristics vary considerably across heritage typologies. Traditional shophouses, which constitute a substantial portion of the historic urban fabric, typically feature narrow structural bays, limited-service zones, and timber upper-floor systems. The structural demands of containerised digestion modules may exceed the load-bearing capacity of upper floors, thereby restricting installation primarily to reinforced ground-level areas or secondary service spaces. Structural assessment therefore becomes a prerequisite for implementation within adaptive reuse projects. Such interventions must also align with conservation principles of minimal intervention and reversibility, as discussed in Section 2.4, ensuring that supplementary structural systems do not compromise character-defining fabric or permanently alter significant spatial configurations.

In addition to the structural issues, the compartmentalised and service-oriented structure of wet AD systems has an additional impact on spatial suitability. The separation between feedstock handling, digestion, gas storage, and energy conversion areas, which are required, are more compatible with back-of-house areas like rear yards, internal courtyards, or ancillary rooms compared to the main heritage interiors. This makes integration strategies to focus on non-character defining spaces to maintain architectural importance and allow infrastructural improvements. This supports the governance-based solution integrated into the Special Area Plan (SAP) according to which the new service insertions are supposed to be aesthetically secondary and spatially compliant in the heritage environment.

Operational scale introduces an additional layer of feasibility. Even though small micro-scale systems can be physically fitted into smaller heritage buildings, processing can be too small to produce significant energy recovery or even digestate reuse. The limited spatial capacity and relatively low waste volumes at single-shophouse scale may reduce operational effectiveness.

However, in comparison, bigger food-based typologies like public markets, food courts, hawker centres, and shopping complexes provide a more feasible setting to the decentralised wet AD integration. The typologies generate more consistent and substantial organic waste streams, offer stronger structural frameworks, and have less ambiguous service zoning. The concentration of wet AD systems in these environments will maximize resource recovery and minimise intrusive intervention to sensitive heritage interiors.

Operational logistics must also be carefully planned to ensure continuity within dense urban environments. Feedstock collection, maintenance access, and digestate removal should be coordinated through service circulation routes that do not disrupt pedestrian movement or compromise the visual integrity of heritage streetscapes. Integration therefore depends on synchronising technical infrastructure with existing spatial hierarchies and conservation priorities.

From a circular urban metabolism perspective (Section 2.5), decentralised wet AD integration represents a potential re-internalisation of waste recovery within adaptive reuse typologies. However, such metabolic closure must be balanced against conservation responsibility, indicating that sustainability objectives alone cannot supersede heritage protection imperatives.

Taken together, these results indicate technical compactness alone does not determine integration feasibility in heritage settings. Instead, successful implementation depends on aligning infrastructural demands with building typology, operational viability, and conservation requirements. Interdisciplinary and context-specific approaches to placement are thus necessary in order to reconcile sustainability goals and heritage protection.

5 CONCLUSION

This study examined the spatial, environmental, and operational implications of integrating decentralised wet anaerobic digestion (AD) systems within heritage urban contexts, using George Town, Penang as a reference case. Through analytical literature review and comparative precedent analysis, the findings demonstrate that while decentralised wet AD systems are technically viable for urban food waste recovery, their architectural integration depends on typological scale, structural capacity, and environmental control constraints. By translating operational parameters into spatial and environmental criteria, the study develops a set of spatial and environmental criteria to support conservation-sensitive integration and early-stage feasibility evaluation within adaptive reuse settings.

The findings reveal that wet AD systems function as compartmentalised service infrastructure requiring structural reinforcement, environmental control, and clear zoning separation. In heritage settings characterised by adaptive reuse, integration feasibility varies significantly across building types. Smaller shophouse typologies may face structural and spatial constraints that limit operational efficiency, whereas larger food-oriented sites such as markets, food courts, and hawker centres offer more viable conditions for decentralised deployment.

This study contributes to bridging the gap between technical food waste-to-energy (FWtE) research and architectural conservation practice by translating operational parameters into spatial criteria relevant to adaptive reuse contexts. It emphasises that successful integration is not merely a matter of technological compactness, but of aligning infrastructural demands with building typology, urban scale, and conservation responsibility.

5.1 Limitations

The research is limited to literature review and documented precedent analysis. No on-site structural assessment or simulation modelling was conducted for specific buildings in George Town. Operational data were derived from published case studies rather than primary measurements. Therefore, conclusions remain conceptual and indicative rather than implementation specific.

5.2 Recommendations for Architectural Practice

Architects involved in adaptive reuse projects should evaluate decentralised FWtE system integration at early design stages, particularly in relation to structural capacity, service routing, and ventilation systems. Installation should prioritise non-character-defining zones and back-of-house areas to safeguard heritage value while accommodating technical infrastructure.

5.3 Recommendations for Policy and Heritage Governance

Heritage governance frameworks may benefit from developing technical guidelines that support the integration of sustainable infrastructure within protected urban areas. Clear regulatory pathways for structural reinforcement, mechanical systems, and fire safety upgrades would facilitate environmentally responsive retrofitting while preserving architectural integrity.

5.4 Future Research

Future research may include structural feasibility assessments of specific heritage typologies in George Town, pilot implementation studies within larger food-based adaptive reuse sites, and lifecycle performance evaluations of decentralised wet AD systems in heritage contexts. Empirical case implementation would provide further validation of the spatial criteria developed in this study.

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CONFLICT OF INTEREST

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Kajian Arca 'Menggenggam Keris': Representasi Identiti Budaya Melalui Seni Arca Awam Dalam Konteks Budaya Perak

Study of the Sculpture 'Menggenggam Keris': Representation of Cultural Identity Through Public Sculpture Art in the Cultural Context of Perak

Aznan Omar[1], *Md Yusof Hamid [2], Syed Abdul Haris Syed Mustapa[3], Ahmad Zamil Zakaria[4], Mohd Hafiz Bujang[5]

[1,2,3,4]Universiti Teknologi MARA, Cawangan Perak, Kampus Seri Iskandar, 32610 Seri Iskandar, Perak, Malaysia

[5]Puncak Emas Infra Sdn Bhd

aznan760@uitm.edu.my[1], *yusof344@uitm.edu.my[2], syeda488@uitm.edu.my[3], zamil227@uitm.edu.my[4], admin@peinfra.com[5]

***Corresponding author**

ABSTRAK

Kajian ini membincangkan penciptaan dan penghayatan arca awam bertajuk "Menggenggam Keris" yang dibina di Dataran Jeti Bagan Datuk, Perak. Arca ini merupakan hasil projek kolaboratif antara Universiti Teknologi MARA, pihak berkuasa tempatan dan komuniti setempat sempena program Tahun Melawat Perak 2024. Karya ini mengangkat keris sebagai simbol utama yang mewakili sejarah, adat dan identiti budaya Kesultanan Perak, sekali gus berfungsi sebagai medium visual yang menghubungkan warisan tradisi dengan konteks kontemporari seni awam. Kajian ini memberi tumpuan kepada analisis simbolisme bentuk dalam pembentukan makna budaya. Selain itu, kajian turut meneliti peranan arca awam sebagai medium pemerkasaan budaya, interaksi sosial dan penyatuan komuniti melalui penglibatan pelbagai pihak dalam proses perancangan dan pelaksanaan karya seni arca awam yang berupaya berfungsi bukan sahaja sebagai mercu tanda fizikal, tetapi juga sebagai wahana kesenian, komunikasi budaya dan pengukuhan identiti tempatan dalam ruang awam.

Kata kunci: *Arca Awam, Identiti, Budaya Perak*

ABSTRACT

This study provides an in-depth discussion of the innovative outcomes of the public sculpture project titled "Menggenggam Keris", produced through a grant-based initiative and collaboration with the Perak State Government and supported by funding from a local concession company. The sculpture features the image of a hand gripping a keris, symbolizing strength, heritage, unity, and the sovereignty of the Malay community while contemporarily representing local cultural aspirations. This study focuses on the meanings, symbolism, and design aspects including material and color selection as well as the potential of this sculpture as a medium of visual communication in public space. It also examines the collaborative process between academic institutions, local authorities, and the community in realizing this sculpture as a landmark in Bagan Datoh, Perak. Comparative references are made to public sculpture works by prominent Malaysian artists such as Raja Shahriman Raja Aziddin, Ariffin Ismail, and Ramlan Abdullah to evaluate the position of this work within the national public sculpture discourse. The study demonstrates that sculptures grounded in local symbols and community values are capable of creating significant visual impact and meaning within the contemporary cultural landscape.

Keywords: public sclupture, identity, Perak culture

1 PENGENALAN

Karya Arca bertajuk “Menggenggam Keris” merupakan hasil daripada projek pembinaan arca awam yang dibina di Dataran Jeti (Waterfront) Bagan Datuk, Perak. Projek ini merupakan inisiatif geran komuniti (CSR) yang bertujuan meraikan pekan Bagan Datuk sempena Tahun Melawat Perak yang telah berlangsung meriah pada tahun 2024, dengan promosi besar-besaran oleh Tourism Perak bagi mengetengahkan tarikan di setiap daerah, dan sambutan ini turut disokong penuh sempena 500 Tahun Kesultanan Perak yang akan disambut pada 2028 nanti. Projek ini menyimpan hasrat untuk menjadikannya salah satu destinasi pelancongan pilihan. Pelaksanaan projek ini melibatkan kerjasama antara sekumpulan pengarca dari Universiti Teknologi MARA (UiTM), Cawangan Perak, Kampus Seri Iskandar bersama pihak kerajaan tempatan iaitu Majlis Daerah Bagan Datuk dan Teluk Intan, serta syarikat konsesi Puncak Emas Infra Sdn. Bhd.

Tema arca ini berkait rapat dengan sejarah pertabalan Sultan Perak yang pertama di Beting Beras Basah, menjadikan lokasi Bagan Datuk sebagai tapak signifikan dalam naratif diraja negeri Perak. Projek ini disasarkan untuk mewujudkan ruang seni awam yang membolehkan masyarakat mengalami persekitaran secara estetik dan memperkukuh ekspresi terhadap identiti budaya Malaysia khususnya budaya Melayu melalui simbol kepahlawanan dan kesultanan. Subjek keris digunakan sebagai lambang utama dalam budaya Melayu yang sarat dengan nilai spiritual, simbolik dan sejarah. Di negeri Perak, keris seperti Taming Sari, Cura Si Manja Kini, dan Keris Kuasa adalah sebahagian daripada alat kebesaran diraja. Penubuhan negeri Perak yang bermula di Beting Beras Basah oleh Sultan Mudzaffar Shah pada tahun 1528 menjadikan keris sebagai simbol penting dalam sistem pemerintahan, adat istiadat dan identiti negeri. Kajian ini meneliti bagaimana unsur warisan ini diterjemahkan ke dalam bentuk arca awam kontemporari.

Projek Menggenggam Keris dihasilkan bertujuan memartabatkan seni arca awam sebagai medium yang menyumbang kepada pemerkasaan budaya, pendidikan, dan inovasi seni yang lestari serta inklusif, dengan matlamat untuk memperkenalkan arca awam sebagai wahana seni kontemporari yang menyatukan unsur warisan, simbolisme, dan inovasi dalam konteks budaya Negeri Perak. Melalui pendekatan seni awam, projek ini mencipta satu titik tumpu ruang sosial yang tidak hanya berfungsi sebagai hiasan fizikal, tetapi juga sebagai medium peringatan sejarah, pemaknaan simbolik, dan penyatuan identiti komuniti pelbagai kaum. Kehadiran seni awam seperti ini dapat memperindah ruang fizikal, memberi daya tarikan unik kepada kawasan setempat, dan membuka peluang kepada masyarakat untuk lebih menghargai elemen seni dalam kehidupan harian mereka. Selain menjadi mercu tanda baharu, arca ini turut berperanan sebagai pemangkin kepada interaksi sosial, perhimpunan komuniti, serta pencetus minat terhadap sejarah dan warisan tempatan tambahan pula Kesutanan Perak akan mencapai 500 tahun penubuhannya pada 2028. Ia juga berpotensi menggalakkan semangat kebersamaan dan medan ukhuwah antara generasi lama dan baharu melalui perkongsian naratif sejarah tempatan yang dizahirkan dalam bentuk seni. Projek ini juga merupakaan inovasi yang memperkenalkan bentuk ekspresi arca awam yang menggabungkan elemen estetika moden dengan makna tradisional Melayu, menjadikan arca ini sebagai naratif visual yang relevan dengan masyarakat hari ini. Inovasi turut dilihat dalam pendekatan kolaboratif antara institusi pendidikan, komuniti dan pihak berkuasa tempatan yang memperkukuhkan potensi seni awam sebagai jambatan antara seni, warisan dan pembangunan sosial.

1.1 Objektif Kajian

1. Menganalisis bagaimana seni arca awam berfungsi sebagai medium representasi identiti budaya Perak, khususnya melalui simbol, ikon dan nilai sejarah yang berkaitan dengan Kesultanan Perak.

2. Meneliti peranan arca awam dalam membentuk naratif budaya tempatan di ruang awam, sebagai manifestasi hubungan antara warisan tradisi, identiti kolektif dan konteks sosial masyarakat Perak.

3. Menilai keberkesanan seni arca awam sebagai penanda identiti budaya dan memori kolektif, khususnya dalam memperkukuh imej dan jati diri Perak dalam landskap budaya dan pelancongan negeri.

2 SOROTAN LITERATUR

Arca awam merupakan medium komunikasi visual yang menghubungkan sejarah, ruang dan masyarakat melalui representasi simbolik yang dizahirkan menerusi bentuk, bahan dan konteks penempatannya dalam ruang awam. Miles (1997) dan Hein (2006) menegaskan bahawa arca awam berfungsi sebagai alat komunikasi visual dan dialog sosial yang menghubungkan sejarah, tempat dan komuniti. Pandangan ini kekal relevan dalam konteks kontemporari apabila seni arca awam semakin dilihat bukan sekadar elemen estetika, tetapi sebagai ruang wacana budaya yang membentuk makna dan identiti kolektif dalam sesebuah masyarakat. Dalam konteks seni visual Malaysia, kajian turut menunjukkan bahawa karya seni awam berupaya berfungsi sebagai penanda identiti tempat serta medium penyampaian nilai budaya kepada masyarakat setempat (Rahman & Ismail, 2019).

Dalam konteks yang lebih luas, Sharp, Pollock dan Paddison (2005) menyatakan bahawa seni awam berupaya menzahirkan inklusiviti serta memantulkan kepelbagaian budaya dalam komuniti majmuk melalui representasi simbol dan naratif tempatan. Selari dengan pandangan ini, seni arca awam berfungsi sebagai medium yang merakam memori sosial dan pengalaman kolektif, dalam masa yang sama dapat memperkukuh hubungan antara masyarakat dengan ruang awam yang mereka diami. Konsep ini yang menekankan bahawa makna dalam seni awam terbentuk melalui interaksi antara bentuk visual, orientasi, bahan dan konteks spatial, menjadikan arca awam sebagai medium komunikasi antara sejarah, tempat dan komuniti. Penyelidikan dalam konteks seni visual tempatan turut menegaskan bahawa penggunaan simbol budaya dalam karya seni awam berperanan penting dalam membentuk naratif identiti dan memori kolektif masyarakat (Zainuddin & Abdullah, 2021).

Dalam konteks pembangunan seni arca awam di Malaysia, kajian oleh Omar (2021) berkaitan projek PublikArt di Iskandar Puteri, Johor turut menunjukkan bahawa seni arca awam berperanan sebagai medium komunikasi visual yang menghubungkan idea kontemporari dengan pengalaman masyarakat dalam ruang bandar. Begitu juga, Ibrahim (2012) menjelaskan bahawa arca awam bukan sahaja berperanan memperindah ruang fizikal, tetapi turut berfungsi sebagai medium penyampaian naratif identiti nasional serta kesinambungan sejarah dan budaya tempatan. Beberapa penyelidikan mutakhir antaranya oleh Mohd Anis (2020) serta Rashid, Abdullah dan Mohamad (2023) menunjukkan bahawa seni arca awam di Malaysia semakin berkembang ke arah peranan yang lebih signifikan, khususnya dalam aspek interpretasi budaya, pemerkasaan identiti setempat dan penjenamaan tempat. Perkembangan ini menandakan peralihan seni awam daripada objek pasif kepada penanda identiti dan simbol memori kolektif dalam landskap budaya tempatan. Ahmad dan Othman (2020) turut menegaskan bahawa dalam seni visual kontemporari Malaysia, elemen simbolik yang berakar daripada warisan budaya sering digunakan sebagai strategi artistik untuk mengekalkan kesinambungan identiti budaya dalam ruang awam moden.

Keris sebagai subjek seni arca membawa dimensi warisan yang kukuh dan berakar dalam tamadun Melayu. Miksic dan Tranchini (1990) membuktikan bahawa keris berasal dari Kepulauan Melayu dan tersebar luas di seluruh Nusantara bukan sahaja sebagai senjata, tetapi juga sebagai lambang status sosial, spiritual dan kuasa. Helmi (2019) menegaskan bahawa keris merupakan warisan penting tamadun Melayu yang perlu terus dipelihara maknanya secara visual dan konseptual, bukan sekadar sebagai objek material tetapi sebagai naratif budaya yang memuatkan unsur kosmologi, kepahlawanan dan identiti bangsa. Kajian oleh Yusof et al. (2022) turut menunjukkan bahawa fungsi keris telah mengalami transformasi makna daripada alat pertahanan kepada simbol kesultanan, kedaulatan dan identiti budaya Melayu. Transformasi ini amat ketara dalam konteks institusi Kesultanan Perak, di mana keris berperanan sebagai simbol kuasa dan kedaulatan diraja. Keris-keris utama seperti Keris Taming Sari, Pedang Cura Si Manja Kini, Keris Kuasa dan Keris Seri Gading menjadi elemen penting dalam adat pertabalan dan ritual istiadat Kesultanan Perak, yang memperkukuh peranan keris sebagai lambang kedaulatan dan identiti negeri (Laman Web Rasmi Sultan Perak, n.d.).

Penyelidikan terkini oleh Mohd Zamberi dan Rahman (2020) serta Kassim (2021) menegaskan bahawa pengupayaan semula simbol keris dalam seni kontemporari, khususnya dalam bentuk seni arca dan seni awam, berupaya melestarikan ingatan budaya Melayu dalam bentuk visual moden yang relevan dengan konteks semasa. Pendekatan ini membolehkan simbol keris berfungsi sebagai penanda identiti budaya yang berterusan, merentas generasi dan ruang, serta memperkukuh naratif budaya tempatan dalam landskap seni awam. . Dalam konteks ini, seni arca awam berasaskan simbol tradisi bukan sahaja berperanan sebagai ekspresi artistik, tetapi turut menjadi medium penting dalam memperkukuh hubungan antara warisan budaya, ruang awam dan masyarakat kontemporari (Rahman & Ismail, 2019; Zainuddin & Abdullah, 2021).

3 KONTEKS

Kajian kontekstual merujuk kepada analisis yang meneliti hubungan antara karya seni dengan konteks persekitarannya. Tema arca "Menggenggam Keris" menyentuh pelbagai aspek penting yang berkait rapat dengan merangkumi aspek sejarah, budaya, sosial, geografi, politik dan institusi yang membentuk makna pada karya. Dalam kajian ini, konteks tidak terhad kepada bentuk visual, tetapi merangkumi lokasi, komuniti, naratif sejarah dan fungsi sosial karya dalam ruang awam, budaya, dan identiti masyarakat Malaysia, khususnya negeri Perak.

3.1 Representasi Identiti Budaya Perak

Berdasarkan imej arca pada *Figure 1*, arca ini menampilkan tangan kanan yang menggenggam keris secara menegak ke atas, satu gestur simbolik yang kuat dalam budaya Melayu. Posisi genggaman yang kukuh dan orientasi keris yang menjulang ke atas melambangkan kedaulatan, keberanian dan unsur kuasa, selari dengan peranan keris sebagai simbol kesultanan dan identiti negeri Perak. Bentuk keris yang berlekuk (luk) menegaskan kesinambungan tradisi warisan Melayu, manakala skala arca yang berskala besar, memperkukuh fungsinya sebagai ikon visual identiti budaya dalam ruang awam.

Dalam konteks ini, arca tidak berfungsi sebagai objek hiasan semata-mata, tetapi sebagai representasi simbolik identiti Perak yang boleh ditafsir oleh masyarakat setempat dan pengunjung. Genggaman tangan melambangkan pemilikan dan pemeliharaan warisan, Ia mencerminkan hubungan antara generasi kini dengan sejarah, adat dan kaitan dengan alat kebesaran Kesultanan Perak.

Figure 1 Illustrasi Tiga Komposisi arca dan arca "Menggenggam Keris" di Dataran Jeti, Bagan Datuk, Perak

3.2 Analisis Bentuk melalui Ikon dan Simbol

Bentuk arca Menggenggam Keris menampilkan imej tangan kanan yang menggenggam keris secara tegak dan menghala ke langit, satu komposisi simbolik yang merujuk secara langsung kepada falsafah Melayu iaitu; "di mana bumi dipijak, di situ langit dijunjung". Falsafah ini menggambarkan keseimbangan antara kehidupan duniawi dan ketaatan kepada nilai spiritual, di mana manusia berakar pada adat dan tanah tempat berpijak, namun tetap menjunjung perintah Tuhan dan struktur pemerintahan beraja (Wan Hashim, 2010). Dalam konteks ini, orientasi keris yang menjulang ke atas menzahirkan hubungan antara manusia dan penciptanya. Begitu juga dalam konteks kenegaraan menunjukkan kesetiaan kepada kedaulatan raja-raja dan sekali gus mengukuhkan makna kesetiaan dan legitimasi kuasa dalam budaya Melayu Perak.

Pemilihan tangan kanan sebagai elemen utama arca turut membawa makna simbolik yang signifikan. Dalam tradisi Melayu dan Islam, tangan kanan sering dikaitkan dengan keadilan, kemuliaan dan perbuatan yang terpuji serta beradap. Warna perak pada tangan tersebut melambangkan rakyat negeri Perak sebagai tonggak utama yang mendukung institusi kesultanan dan kesinambungan warisan budaya. Warna perak juga sering dikaitkan dengan nilai kesederhanaan, kejujuran dan kebersihan niat. Ia memperlihatkan hubungan timbal balik antara rakyat dan raja iaitu pemimpin dalam struktur sosial Melayu.

Hulu keris yang dihiasi dengan batu nilam berwarna-warni pula membawa simbol kemewahan, kehalusan seni dan kepelbagaian budaya. Dalam konteks sejarah Melayu, hulu keris bukan sekadar elemen fungsional, tetapi lambang status, keindahan estetika dan kekayaan makna simbolik. Kepelbagaian warna batu nilam pada hulu keris boleh ditafsirkan sebagai representasi masyarakat majmuk Malaysia yang hidup dalam kerangka budaya Melayu sebagai teras, selari dengan pandangan Sharp, Pollock dan Paddison (2005) bahawa seni awam berupaya memantulkan pluraliti budaya dalam ruang awam.

Selain itu, kedudukan arca di atas tapak yang tinggi membolehkan pengunjung mendekati dan melihat bahagian hulu keris dari sudut bawah mewujudkan pengalaman interaksi simbolik yang signifikan. Manakala dari satu posisi tertentu, seakan memberi ilusi seolah-olah pengunjung sedang mencium keris, satu perlakuan yang merujuk kepada elemen penting dalam istiadat diraja Melayu sebagai tanda taat setia dan penghormatan terhadap kedaulatan raja. Interaksi ini menjadikan arca bukan sekadar objek visual statik, tetapi medium pengalaman budaya yang menghubungkan khalayak dengan tradisi dan memori kolektif Kesultanan Perak dalam ruang awam kontemporari.

3.2.1 Warisan Sejarah dan Kebudayaan: Simbol Kedaulatan dan Kepahlawanan

Keris merupakan senjata tradisional yang mempunyai kedudukan istimewa dalam budaya Melayu, bukan sahaja sebagai alat pertahanan fizikal, tetapi sebagai simbol kepahlawanan, keberanian dan kedaulatan. Dalam sejarah Melayu, keris sering dikaitkan dengan pahlawan, pembesar dan institusi kesultanan, sekali gus melambangkan kuasa, maruah dan legitimasi pemerintahan. Penggunaan subjek keris dalam arca Menggenggam Keris menegaskan usaha untuk mengangkat dan memelihara makna simbolik warisan ini dalam bentuk visual kontemporari, sekali gus menekankan kepentingan mempertahankan kesinambungan sejarah dan identiti budaya negeri Perak dalam ruang awam.

Dari sudut semiotik, keris dalam arca ini berfungsi sebagai tanda visual yang membawa lapisan makna sejarah dan budaya yang mendalam. Ia bukan sekadar merujuk kepada kepahlawanan fizikal, tetapi juga kepada kepahlawanan moral dan tanggungjawab menjaga kedaulatan negeri serta kesejahteraan rakyat. Seperti yang dihujahkan oleh Yusof et al. (2022), makna keris telah berkembang daripada senjata peperangan kepada simbol kedaulatan, kuasa politik dan identiti budaya Melayu, khususnya dalam konteks institusi diraja. Justeru, kehadiran keris dalam arca awam ini memperkukuh peranannya sebagai lambang kedaulatan yang dapat dihayati oleh masyarakat umum.

Perkaitan arca ini dengan adat pertabalan Sultan Perak di Beting Beras Basah memperlihatkan hubungan langsung antara simbol keris dengan sejarah awal Kesultanan Perak. Upacara pertabalan yang berakar di Beting Beras Basah bukan sahaja menandakan permulaan pemerintahan Sultan Perak yang pertama, tetapi juga menjadi simbol kesinambungan tradisi, kuasa dan hubungan antara raja dan rakyat. Dengan merujuk secara simbolik kepada adat pertabalan ini, arca Menggenggam Keris berfungsi sebagai peringatan visual terhadap asas sejarah dan budaya negeri Perak yang berteraskan institusi kesultanan.

Dalam konteks seni arca awam, pengolahan simbol keris sebagai ikon utama membolehkan warisan sejarah dan kebudayaan ini diterjemahkan dalam bentuk yang mudah dikenali dan dihayati oleh khalayak pelbagai lapisan. Pendekatan ini selari dengan pandangan Hein (2006) yang menegaskan bahawa seni awam berupaya berfungsi sebagai medium komunikasi sejarah dan memori kolektif dalam ruang awam. Oleh itu, arca ini bukan sahaja menzahirkan simbol kepahlawanan dan kedaulatan, tetapi turut memainkan peranan penting dalam mengekalkan ingatan budaya dan identiti Kesultanan Perak dalam konteks kontemporari.

3.2.2 Spiritual dan Keesaan

Bilah keris yang menghala ke arah langit dalam arca ini membawa makna simbolik yang berakar dalam falsafah hidup masyarakat Melayu, khususnya melalui pepatah “di mana bumi dipijak, di situ langit dijunjung.” Pepatah ini merujuk kepada prinsip keseimbangan antara tanggungjawab manusia terhadap dunia nyata yang didiami (bumi) dan ketaatan terhadap perintah Tuhan Yang Maha Esa (langit). Dalam konteks budaya Melayu yang berteraskan Islam, falsafah ini mencerminkan kesatuan antara aspek jasmani dan rohani, di mana kehidupan duniawi tidak terpisah daripada nilai spiritual dan keimanan.

Orientasi bilah keris yang menjulang ke atas menzahirkan konsep menjunjung nilai ketuhanan dan keesaan Tuhan sebagai asas pembentukan akhlak, kepimpinan dan tatanan sosial. Simbol ini selari dengan pandangan Nasr (1997) yang menegaskan bahawa dalam kosmologi Islam, arah menegak sering dikaitkan dengan hubungan transendental antara manusia dan Pencipta. Dalam arca ini, hubungan menegak tersebut diterjemahkan secara visual melalui keris, yang berfungsi sebagai medium penghubung antara dimensi spiritual dan realiti kehidupan masyarakat.

Pada masa yang sama, genggaman tangan terhadap keris menandakan kebertanggungjawaban manusia sebagai khalifah di bumi. Ia melambangkan keperluan untuk memelihara keseimbangan antara keimanan, etika dan tanggungjawab sosial dalam kehidupan bermasyarakat. Konsep keseimbangan merupakan asas penting dalam pandangan alam Melayu Islam, di mana ketaatan kepada Tuhan harus dizahirkan melalui tindakan yang adil, beretika dan berfaedah kepada masyarakat.

Oleh itu, pengolahan bilah keris yang menghala ke langit dalam arca Menggenggam Keris bukan sahaja menegaskan nilai spiritual dan keesaan Tuhan, tetapi turut berfungsi sebagai peringatan visual tentang kepentingan menyatukan keimanan, tanggungjawab sosial dan identiti budaya dalam ruang awam. Arca ini mengajak khalayak merenung hubungan antara manusia, Tuhan dan masyarakat, sekali gus memperkukuh peranan seni arca awam sebagai medium refleksi spiritual dan pembentukan jati diri budaya dalam konteks kontemporari.

3.2.3 Simbol Identiti Negeri Perak, Kepelbagaian Budaya dan Perpaduan

Masyarakat Cina dan India di Malaysia, sebagai sebahagian daripada komuniti yang berbilang kaum, mungkin mempunyai pandangan yang berbeza mengenai keris berdasarkan latar belakang budaya dan sejarah masing-masing. Walaupun keris secara tradisionalnya berkait rapat dengan budaya Melayu, terdapat beberapa aspek yang boleh dikaitkan dengan budaya Cina dan India melalui nilai-nilai universal seperti keberanian, kekuatan, spiritualitas, dan penghormatan kepada warisan dan seni. Masyarakat berbilang kaum di Malaysia dapat melihat keris sebagai simbol perpaduan dan penghargaan terhadap kepelbagaian budaya yang wujud di negara ini.

Hulu keris yang bertatahkan batu nilam dengan pelbagai warna pula menambah dimensi makna yang berkaitan dengan kemewahan, kehalusan seni dan nilai estetika dalam budaya Melayu. Dalam tradisi seni halus Melayu, penggunaan batu permata pada hulu keris bukan sekadar elemen hiasan, tetapi melambangkan status, kebijaksanaan dan penghormatan terhadap keindahan seni. Penggunaan warna merah, biru dan hijau pada batu nilam boleh ditafsirkan sebagai representasi masyarakat majmuk Malaysia yang terdiri daripada pelbagai latar etnik dan budaya. Warna-warna ini berfungsi sebagai metafora visual kepada kepelbagaian, keharmonian, dan seni awam berperanan memantulkan pluraliti budaya serta menyumbang kepada pembentukan perpaduan sosial dalam ruang awam.

Selain itu, arca ini mencerminkan kepelbagaian budaya dan bangsa di Malaysia, termasuk masyarakat Cina, India, dan lain-lain etnik. Kepelbagaian ini akan digambarkan melalui elemen-elemen tambahan dalam arca tersebut:

Table 1 Pandangan Masyarakat Cina dan India terhadap Simbolisme Keris

Aspek	Pandangan Masyarakat Cina	Pandangan Masyarakat India
Simbolisme Keberanian	Mengaitkan keris dengan kekuatan seperti senjata tradisional (jian, dao) dalam seni mempertahankan diri.	Mengaitkan keris dengan keberanian dan spiritualitas seperti senjata dewa dalam ikonografi Hindu.
Penghormatan Warisan	Menghargai keris sebagai simbol warisan Melayu, mencerminkan penghormatan budaya silang kaum.	Melihat keris sebagai elemen penting dalam menghargai tradisi dan kepelbagaian budaya Malaysia.
Seni & Estetika	Mengagumi ukiran halus dan nilai estetika keris, sejajar dengan minat terhadap seni tradisional Cina.	Menghargai ukiran dan hiasan keris, sesuai dengan kecintaan terhadap seni dan batu permata.

3.2.4 Penggunaan Warna Dalam Arca

Penggunaan warna boleh membawa makna yang mendalam dan berkait rapat dengan pelbagai elemen budaya dan simbolik, terutama dalam konteks negeri Perak dan kepelbagaian kaum di Malaysia.

Secara asasnya warna arca dicadangkan menggunakaan warna dari kesan logam (*metal look)* melibatkan warna emas, perak dan gangsa, dan juga penggunaan perbagai warna untuk permata nilam yang tertera pada bahagian hulu keris seperti merah, biru dan hijau. Berikut adalah bagaimana warna-warna ini boleh dikaitkan:

3.2.4.1 Warna Perak (Silver)

1. Bentuk tangan yang mengenggam - diwarnakan perak untuk melambangkan negeri Perak dan kedaulatannya dan tangan genggaman melambangkan mutlak hak milik orang Perak.
2. Simbol Negeri Perak - warna perak secara langsung boleh dikaitkan dengan negeri Perak. Nama negeri ini sendiri berasal dari perkataan "perak," yang merujuk kepada logam berharga yang melambangkan kemakmuran dan kekayaan. Menggunakan warna perak dalam arca ini akan menekankan hubungan khusus dengan identiti negeri Perak dan rakyatnya. Arca tangan diwarnakan dengan warna perak membawa erti rakyat negeri Perak secara simbolik sedang mengenggam Keris.
3. Ketenangan dan keberanian - warna perak juga melambangkan ketenangan, kemurnian, dan keberanian. Ini selaras dengan nilai-nilai yang dipegang oleh masyarakat Malaysia yang berbilang kaum, termasuk Cina dan India, yang menghargai ketenangan dan keberanian dalam tradisi budaya Malaysia.

3.2.4.2 Warna Emas (Gold)

1. Hulu keris diwarnakan menggunakan warna emas untuk melambangkan kekayaan dan keagungan.
2. Simbol kekayaan dan keagungan - warna emas sering dikaitkan dengan kekayaan, keagungan, dan kemuliaan. Dalam budaya Melayu, emas melambangkan keagungan dan kedaulatan. Masyarakat Cina juga melihat emas sebagai simbol kekayaan dan nasib baik, manakala masyarakat India mengaitkannya dengan kemuliaan dan keberuntungan.
3. Penghargaan Universal - emas adalah warna yang dihargai oleh semua budaya di Malaysia. Menggunakan warna emas pada elemen tertentu pada arca, seperti hulu keris atau hiasan nilam, boleh menonjolkan nilai universal penghargaan terhadap kekayaan budaya dan sejarah.

3.2.4.3 Warna Gangsa (Bronze)

1. Bilah Keris diwarnakan dengan warna gangsa untuk melambangkan ketahanan dan keabadian, serta kepelbagaian budaya warisan.
2. Simbol ketahanan dan warisan - warna gangsa melambangkan ketahanan dan kekuatan. Dalam konteks sejarah, gangsa sering digunakan untuk membuat patung dan senjata, melambangkan ketahanan dan keabadian. Ini sesuai dengan keris yang melambangkan kepahlawanan dan kekuatan.
3. Kepelbagaian dan kesatuan - gangsa, yang merupakan campuran beberapa logam, boleh melambangkan kepelbagaian budaya di Malaysia. Ia mencerminkan bagaimana pelbagai elemen budaya yang berbeza boleh bersatu untuk membentuk sesuatu yang kuat dan tahan lama.

3.2.4.4 Warna Tambahan (Merah, Biru dan Hijau)

1. Warna Tambahan; arca diwarnakan dengan warna-warna seperti merah, biru, dan hijau, untuk menonjolkan kepelbagaian budaya kaum di Malaysia.
2. Tatah Batu Nilam - Batu permata pada hulu keris diwarnakan merah, biru dan hijau bagi menambahkan elemen kemewahan dan kemurnian, melambangkan kepelbagaian bangsa dan budaya di Malaysia

Dengan menggabungkan warna-warna ini, arca "Menggenggam Keris" bukan sahaja menjadi simbol keagungan dan kekuatan, tetapi juga penghormatan kepada tradisi dan sejarah yang mendalam. Penggunaan warna perak, emas, dan gangsa akan menambah dimensi simbolik yang mencerminkan kepelbagaian dan kekayaan budaya masyarakat Malaysia, sambil menonjolkan hubungan khusus dengan negeri Perak.

Secara keseluruhan, pengolahan warna perak, simbol adat mencium keris dan penggunaan batu nilam berwarna-warni dalam arca Menggenggam Keris memperlihatkan usaha menyepadukan identiti negeri Perak, nilai tradisi Melayu dan realiti masyarakat majmuk Malaysia. Gabungan elemen-elemen ini menjadikan arca tersebut bukan sahaja sebagai representasi identiti budaya tempatan, tetapi juga sebagai simbol perpaduan dan keharmonian dalam landskap seni awam kontemporari.

3.3 Naratif Budaya dalam Ruang Awam

Penempatan arca di kawasan terbuka berlatar belakangkan langit dan persekitaran maritim Bagan Datuk memberikan konteks unik yang signifikan. Hubungan antara arca, ruang dan persekitaran memperlihatkan bagaimana seni arca awam membentuk naratif budaya tempatan yang berakar pada sejarah dan geografi setempat. Bagan Datuk sebagai kawasan pesisir dan pintu masuk pelancongan daerah diperkukuh identitinya melalui kehadiran arca ini sebagai penanda budaya dan mercu tanda visual. Komposisi arca dengan gestur menegak yang dominan dalam ruang local, mencipta pengalaman visual yang autoritatif, mengajak khalayak berinteraksi secara simbolik dengan sejarah dan identiti tempatan. Pengunjung khususnya para pelancong akan tertarik membuat *content* dan akan *update* status mereka di media siosial apabila berkunjung ke Bagan Datuk. Dalam konteks ini, arca berfungsi sebagai medium wacana budaya, di mana ruang awam menjadi tapak pertemuan antara warisan, masyarakat dan memori kolektif. Lebih penting lagi, arca ini memperkukuhkan hubungan antara masyarakat dan warisan budaya melalui seni awam yang menyentuh pelbagai lapisan komuniti.

3.3.1 Lokasi Strategik, Economi dan pelancongan

Menempatkan arca awam di lokasi strategik seperti kawasan hadapan jeti (waterfront) Bagan Datuk berpotensi meningkatkan daya tarikan pelancongan melalui pembentukan identiti visual yang jelas dan mudah dikenali. Seni arca awam yang ditempatkan di ruang tumpuan pelawat sering berfungsi sebagai mercu tanda (landmark) yang membentuk pengalaman pertama pengunjung terhadap sesuatu tempat serta mengukuhkan imej destinasi tersebut. Dalam konteks ini, arca Menggenggam Keris bukan sahaja memperkayakan landskap visual kawasan pesisir, tetapi turut berfungsi sebagai penanda identiti budaya Perak yang mampu menarik perhatian pelancong tempatan dan antarabangsa.

Kehadiran mercu tanda seni awam di kawasan waterfront juga selari dengan konsep *place branding*, di mana elemen budaya dan warisan dimanfaatkan untuk meningkatkan nilai simbolik dan ekonomi sesebuah lokasi. Arca awam yang berteraskan simbol budaya tempatan dapat memperkukuh naratif tempat serta mewujudkan hubungan emosi antara pelawat dengan destinasi, sekali gus meningkatkan tempoh lawatan dan keterlibatan pengunjung. Dalam konteks lokasi Bagan Datuk, arca ini berpotensi menjadi ikon pelancongan baharu yang menyokong agenda Tourism Perak dalam mengetengahkan tarikan di peringkat daerah.

Penempatan arca Menggenggam Keris di Dataran Jeti Bagan Datuk bukan sahaja menyumbang kepada nilai estetika dan simbolik ruang awam, tetapi turut berperanan sebagai pemangkin pembangunan pelancongan dan ekonomi setempat melalui pendekatan seni awam berteraskan identiti budaya. Ia menjadi mercu tanda visual serta menyumbang kepada peningkatan ekonomi tempatan. Peningkatan kehadiran pelancong secara langsung dijangka merangsang aktiviti ekonomi komuniti setempat. Menurut Richards (2011), pelancongan berasaskan budaya dan seni awam mampu mewujudkan limpahan ekonomi kepada penduduk tempatan, khususnya dalam sektor perkhidmatan. Kehadiran pelancong membuka peluang perniagaan dalam bidang penginapan, makanan dan minuman, perkhidmatan bot atau rekreasi pesisir, serta penjualan cenderamata berasaskan identiti tempatan. Seni awam di Malaysia berupaya menyumbang kepada pemerkasaan ekonomi komuniti melalui pengukuhan identiti tempat dan peningkatan aktiviti pelancongan.

3.3.2 Tapak Arca

Imej *Figure 1* menunjukkan arca dipasang di atas tapak batu marmar yang kukuh, melambangkan asas sejarah dan kesinambungan tradisi. Tapak ini berfungsi bukan sahaja sebagai struktur sokongan fizikal, tetapi sebagai simbol kestabilan identiti budaya Perak. Kehadiran arca dalam ruang awam membolehkan ia menjadi titik rujukan visual yang berulang kali dialami oleh masyarakat dan pelawat, seterusnya membentuk memori kolektif berkaitan warisan Melayu dan Kesultanan Perak.

Dalam konteks lima dekad Kesultanan Perak, arca ini boleh ditafsir sebagai manifestasi awal naratif sejarah negeri yang dizahirkan melalui seni visual kontemporari. Keberkesanan arca sebagai penanda identiti bukan terletak pada naratif teks, tetapi pada kekuatan simbol visual yang mudah dikenali, berdaya ingat dan mampu merentas latar belakang khalayak yang pelbagai.

4 KESIMPULAN

Kajian ini dapat dirumuskan bahawa seni arca awam Menggenggam Keris berperanan secara signifikan sebagai medium representasi identiti budaya Perak dalam ruang awam kontemporari. Melalui pengolahan ikon dan simbol keris, bentuk genggaman tangan, orientasi menegak serta pemilihan warna dan material, arca ini berjaya menzahirkan nilai sejarah, kedaulatan dan falsafah hidup masyarakat Melayu yang berakar pada institusi Kesultanan Perak. Dapatan ini secara langsung menjawab kajian, iaitu bagaimana seni arca awam berfungsi sebagai medium representasi identiti budaya Perak.

Dari sudut naratif budaya, kajian ini menunjukkan bahawa penempatan arca di lokasi strategik Dataran Jeti Bagan Datuk membolehkan karya ini berfungsi sebagai penanda identiti tempatan dan pembentuk naratif budaya dalam ruang awam. Hubungan antara simbol keris, konteks geografi pesisir dan sejarah pertabalan Sultan Perak mewujudkan makna berlapis yang menghubungkan warisan tradisi dengan pengalaman sosial semasa, iaitu meneliti peranan arca awam dalam membentuk naratif budaya tempatan serta hubungan antara sejarah, ruang dan masyarakat.

Selain itu, kajian ini turut mendapati bahawa Menggenggam Keris berkesan sebagai penanda memori kolektif dan simbol perpaduan masyarakat majmuk. Elemen seperti adat mencium keris, penggunaan warna perak sebagai representasi identiti negeri, serta batu nilam berwarna-warni sebagai metafora kepelbagaian budaya, memperkukuh peranan arca ini sebagai wahana komunikasi budaya yang inklusif. Dapatan ini sangat menyokong kajian ini menilai keberkesanan seni arca awam sebagai penanda identiti budaya dan memori kolektif dalam landskap budaya Perak.

Secara keseluruhan, kajian ini membuktikan bahawa seni arca awam bukan sekadar elemen estetika atau mercu tanda fizikal, tetapi medium strategik yang mampu mengartikulasikan identiti budaya, memelihara warisan sejarah dan memperkukuh jati diri tempatan dalam ruang awam. Dalam konteks inisiatif Tourism Perak dan persediaan menuju sambutan 500 Tahun Kesultanan Perak pada tahun 2028, arca Menggenggam Keris berfungsi sebagai manifestasi visual warisan yang relevan dan berkesan, serta menyumbang kepada pembentukan imej budaya negeri yang berterusan dan bermakna.

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Art and Design for Sustainable Cultural Income Generation: A Socio-Ecological Framework for Creative Economic Empowerment in Malaysian Senior Citizen Centres

Nor Zhafira Adlina Mohammad Mazani[1], *Mohd Nasiruddin Abdul Aziz[2], Shahrel Nizar Baharom[3]

[1,2,3]Faculty of Art and Design, Universiti Teknologi MARA, Perak Branch, 32610 Seri Iskandar, Perak, Malaysia

2024455662@student.uitm.edu.my[1], *mohdn571@uitm.edu.my[2], shahr169@uitm.edu.my[3]

***Corresponding author**

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ABSTRACT

Senior citizen centres in Malaysia are increasingly exposed to financial vulnerability due to demographic transitions and continued dependence on welfare-based funding structures. Despite possessing extensive cultural knowledge, artisanal expertise, and intangible heritage assets, these institutions rarely operationalise art and design as structured economic systems. This study addresses this theoretical gap by proposing a design led socio ecological framework that reconceptualises senior citizen centres as creative ecosystems capable of generating sustainable income. Grounded in the integration of the Triple Bottom Line and the Socio Ecological Model, the framework positions art and design as socio economic infrastructure embedded within multi-level sustainability systems. Five interrelated dimensions namely social engagement, economic growth, environmental sustainability, operational capacity and technology integration are theorised as key drivers of financial resilience and cultural sustainability. By reframing aging communities from welfare recipients to active cultural producers, this conceptual model advances Art and Design scholarship beyond aesthetic discourse toward systemic economic empowerment. The framework offers a foundation for future empirical validation and practical implementation within community based cultural enterprises.

Keywords: *Senior Citizen Centres, Creative Ecosystems, Art and Cultural Tourism, Sustainable Income Generation, Socio-Ecological Framework.*

1 INTRODUCTION

Malaysia's transition toward an aging society presents structural challenges for institutions supporting older adults. Senior citizen centres traditionally rely on public funding, charitable contributions, and limited service-based income streams. As demographic shifts intensify, such welfare-oriented models become increasingly fragile and unsustainable.

The research problem underpinning this study lies in the limited theoretical articulation of art and design as structured economic systems within senior communities. Although senior citizens embody significant reservoirs of cultural memory, craft expertise, traditional aesthetics, and performative heritage, these intangible assets are rarely systematised into sustainable economic frameworks.

Within Malaysian design scholarship, the importance of visual communication in preserving and promoting cultural heritage has been clearly demonstrated. Mat Nashir@Mohd Nasir & Daimin (2022) show how digital illustration functions as a strategic medium for sustaining Kelantan's cultural identity, highlighting the economic and communicative potential of design practice. Such findings suggest that heritage-based design interventions can extend beyond representation toward structured cultural economies.

Similarly, research examining traditional colour schemes and cultural symbolism in animation contexts reveals how aesthetic decisions function as dynamic cultural mediums that influence perception and audience engagement (Farhan et al., 2025; Wenhui Cheng, 2009). These studies reinforce the notion that art and design are not merely aesthetic outputs but cultural systems capable of generating value.

However, there remains a theoretical gap in translating these design capacities into community-based economic empowerment models for aging institutions. Cultural tourism literature indicates that community-driven heritage initiatives can stimulate local economic development while preserving identity (Liu et al., 2023; Wondirad et al., 2020). Yet, few studies integrate these insights into an Art and Design cantered framework tailored specifically to senior citizen centres.

This study addresses that gap by proposing an integrated framework grounded in sustainability theory and socio-ecological systems thinking, positioning art and design as drivers of creative economic resilience.

2 THEORETICAL FRAMEWORK

This study adopts an integrated theoretical framework combining the Triple Bottom Line (TBL) and the Socio-Ecological Model (SEM) to examine the sustainability of art and cultural tourism initiatives within senior citizen centres. The framework provides a multi-dimensional lens to analyse how economic viability, social inclusion, and environmental responsibility interact across interconnected individual, organisational, community, and policy levels to support sustainable income generation.

2.1 Triple Bottom Line and Cultural Sustainability

The Triple Bottom Line (TBL) framework conceptualises sustainability through economic viability, social equity, and environmental stewardship (Elkington, 1997). Sustainable business model scholarship further emphasises that innovation must simultaneously create financial value while generating positive social and environmental impact (Bocken et al., 2014).

When applied to art and design initiatives within senior centres, TBL enables cultural production to be evaluated not solely as expressive activity but as structured economic infrastructure. Craft enterprises, cultural exhibitions, and experiential heritage workshops can produce revenue while strengthening community inclusion and promoting environmentally responsible material practices.

2.2 Socio-Ecological Model and Multi-Level Cultural Systems

The Socio-Ecological Model (SEM) emphasises that sustainable outcomes emerge from interactions across individual, interpersonal, organisational, community, and policy levels (McLeroy et al., 1988). In tourism development contexts, stakeholder collaboration across these layers significantly influences sustainability outcomes (Wondirad et al., 2020).

Participation in cultural production strengthens social capital and collective identity (Zhang et al., 2020). Within senior citizen centres, art and design initiatives operate across interconnected systems. Seniors function as creative producers at the individual level; collaborative craft-making reinforces interpersonal bonds; organisational capacity determines economic scalability; community partnerships embed production within tourism networks; and policy structures influence institutional sustainability.

2.3 Integrating Sustainability and Socio-Ecology in Design

The integration of TBL and SEM produces a systemic framework in which art and design function within structured socio-economic ecosystems. Cross-sector collaboration enhances socio-ecological resilience and sustainable development (Dentoni et al., 2020). Through this integration, art-based initiatives move beyond symbolic representation and become embedded economic systems.

3 CONCEPTUAL FRAMEWORK

Within the proposed model, art and cultural tourism operate as design-mediated catalysts transforming intangible heritage into creative enterprises. Through curation, branding, experiential design, and digital dissemination, traditional practices are integrated into structured market systems.

Social engagement enhances authenticity and strengthens institutional legitimacy, contributing indirectly to financial sustainability (Zhang et al., 2020). Economic growth emerges from diversified creative income streams such as craft sales, cultural workshops, and experiential tourism (Liu et al., 2023).

Environmental sustainability reinforces long-term viability by preserving cultural landscapes and heritage materials (Salman et al., 2021). Operational capacity determines scalability and resilience through governance and partnership coordination (Dentoni et al., 2020).

Technology integration extends cultural production into digital domains. Research within Malaysian design contexts demonstrates that 3D design integration significantly enhances digital tourism engagement (Noor Hishamuddin et al., 2024). Digital platforms, e-commerce systems, and social media branding expand audience reach and income diversification (Zhou & Sotiriadis, 2021).

Collectively, these dimensions shape sustainable income generation within senior citizen centres.

4 HYPOTHESES DEVELOPMENT

Based on the integrated socio-ecological and sustainability framework, social engagement in art and design initiatives is expected to positively influence sustainable income generation by reinforcing authenticity, strengthening social capital, and enhancing community participation. When seniors actively contribute to cultural production and heritage-based design practices, the resulting collective ownership and identity formation are anticipated to increase institutional credibility and visitor engagement, thereby indirectly supporting financial sustainability. In parallel, economic growth driven by creative cultural production is anticipated to enhance financial resilience through diversified income streams derived from craft enterprises, experiential workshops, and cultural tourism programming.

In addition, environmentally sustainable design practices are projected to strengthen long-term institutional viability by preserving heritage resources and reinforcing the authenticity of cultural offerings. Operational effectiveness is hypothesised to amplify income outcomes through coordinated management structures, strategic partnerships, and efficient resource utilisation. Finally, technology integration is expected to expand market access and improve financial sustainability by enabling digital promotion, online commercialisation, and innovative engagement platforms. Collectively, these hypotheses position art and design not as peripheral cultural activities but as structured drivers of economic resilience within senior citizen centres.

5 CONTRIBUTION TO ART AND DESIGN SCHOLARSHIP

This study advances Art and Design scholarship by reframing senior citizen centres as creative ecosystems rather than passive welfare institutions. It builds upon Malaysian design research demonstrating the economic and communicative power of digital illustration and cultural visualisation (Mat Nashir@Mohd Nasir & Daimin, 2022) and extends visual-cultural studies into socio-economic engagement systems, particularly examining how digital media facilitates cultural consumption and interaction (Yusuf et al., 2023). By integrating sustainability and socio-ecological theory, the framework positions art as economic infrastructure embedded within community development processes. In doing so, it shifts the disciplinary focus of Art and Design from object-based production toward systems-oriented design thinking, aligning with recent conceptual framework that connect art and cultural tourism initiatives with sustainable income generation for senior citizen centres (Mohammad Mazani et al., 2025).

The study significantly contributes to the field by bridging cultural aesthetics with structured economic viability. While previous research has demonstrated how visual communication and traditional aesthetic elements shape cultural identity and audience perception (Mat Nashir@Mohd Nasir & Daimin, 2022; Utoyo, 2023), such works primarily emphasise communicative and symbolic dimensions. The present framework extends these insights by demonstrating how heritage-based design practices can be strategically organised into sustainable creative economies. This repositioning connects visual culture, craft traditions, and experiential design directly to long-term income generation and institutional resilience.

Furthermore, the research expands design for social innovation discourse by foregrounding aging communities as sites of creative production. Design scholarship frequently centres on youth-driven entrepreneurship, digital innovation, or urban regeneration, yet rarely conceptualises older populations as active cultural producers. By recognising seniors as custodians of intangible heritage and contributors to structured creative enterprises, the study challenges age-based assumptions within design research and broadens the inclusivity of innovation narratives within the discipline.

Finally, the integration of the Triple Bottom Line and the Socio-Ecological Model introduce a systemic evaluative structure into Art and Design research. By embedding creative practice within sustainability metrics and multi-level socio-economic systems, the framework offers a transferable conceptual model for assessing and implementing community-based design interventions. This systemic approach strengthens the theoretical rigor of design scholarship and reinforces the role of art and design as transformative forces in cultural sustainability and economic development.

6 CONCLUSION

This research proposes a design-led socio-ecological framework that transforms senior citizen centres into hubs of creative economic activity. By aligning sustainability principles with multi-level institutional dynamics, the model demonstrates how art and design can generate financial resilience while preserving cultural heritage and strengthening social inclusion.

As aging populations continue to expand, design-driven cultural sustainability models offer scalable strategies for integrating creativity with economic development. Future empirical validation will further strengthen the framework's applicability across diverse contexts.

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AUTHOR CONTRIBUTIONS

All authors contributed equally to the development and writing of this manuscript.

CONFLICT OF INTEREST

The authors declare no potential conflict of interest with respect to the research, authorship, and/or publication of this article.

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