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Gamification and technology acceptance model: a systematic review and future research directions

Mohd Hazim Afiq Kalana, Syahrul Nizam Junaini
Faculty of Computer Science and Information Technology, Universiti Malaysia Sarawak (UNIMAS), Samarahan, Malaysia

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ABSTRACT

Technological advancements have popularized "gamification" in recent years, yet few studies have explored its connection to the technology acceptance model (TAM). This paper aims to enhance understanding of the relationship between gamification and TAM by systematically reviewing current research trends. Employing a systematic literature review (SLR) method, we analyzed 72 papers identified via Scopus, focusing on 13 journal papers published between 2016 and 2020 that met our criteria for in-depth analysis. Our findings indicate a significant rise in research on gamification and TAM, with nearly half of the studies (49%) incorporating new external variables into the original TAM framework. The study identifies three key themes for future research. By providing a comprehensive review, this study contributes new knowledge and offers a critical summary for further investigation into the integration of gamification with TAM, highlighting potential avenues for future research and practical application.

Corresponding Author:

Syahrul Nizam Junaini
Faculty of Computer Science and Information Technology, Universiti Malaysia Sarawak (UNIMAS)
94300 Kota Samarahan, Malaysia
Email: syahruln@unimas.my

1. INTRODUCTION

Over the past few years, the concept of gamification has gained significant popularity. It focuses on incorporating game mechanics into non-game environments to introduce excitement into mundane tasks while providing motivational and cognitive benefits [1]. Gamification involves transforming practices, programs, services, goods, or organizational structures to include game-like experiences [2]. Though it originated from the digital media industry, it did not gain widespread acceptance until the 2010s [3]. Gamification is often associated with the video game industry. Johnson *et al.* [4] defines gamification as "the application of game design elements to non-game contexts". Rather than creating full-fledged games in serious contexts, gamification aims to influence users' actions and motivations through game-like interactions [5].

Unlike gamification, serious games are not designed primarily for entertainment [6]. They are described as games which do not have entertainment, amusement, or fun as their central motive [7] or games designed to entertain players while learning, training, or changing behavior [8]. Game elements such as scores, achievement badges, and leaderboards are crucial gamification strategies [9]. While the benefits of gamification for influencing user behavior are well-documented [10], the challenge of technology acceptance remains. The technology acceptance model (TAM) stems from the psychological theory of reasoned action (TRA) and effectively identifies determinants of human behavior regarding the adoption or rejection of technology [11]. TAM is one of the most widely used models for predicting technology usage, intention, and acceptance [12]. Numerous studies have verified TAM's robustness, highlighting its applicability to diverse user groups [13]. Despite previous findings, research on TAM from various perspectives continues [14].

However, specific drivers of technology use in gamification across different domains remain unclear [15]. Therefore, a systematic review is necessary to classify, assess, and interpret TAM in the context of gamification. This gap in understanding motivates the current review, aiming to synthesize existing research and identify future research directions.

Thus, the aim of this review is to systematically examine current research trends on gamification and TAM. This paper is the first attempt to bridge the gap between the theory and practice of gamification and TAM. It provides practitioners with insights into current gamification trends and how to integrate them into TAM implementations. The research questions guiding this study are presented in Table 1.

Table 1. Research questions

RQ	Research question
1	What are the main research purposes of the selected studies?
2	What is the main approach that is used by the researchers of the selected studies?
3	What are the active countries in the context of the selected studies?
4	To what extent is TAM capable of predicting the actual usage of technology?
5	What are the main disciplines or contexts in the selected studies?
6	What is the gamification framework or elements in the selected studies?
7	What are the benefits of gamification to users?
8	What are the types of TAMs used in the selected studies?
9	What is the background of the participants who are involved?
10	What is the future work proposed by their studies?

2. PREVIOUS RELATED REVIEW

Johnson *et al.* [4] and Sardi *et al.* [3] employed the PRISMA framework, focusing exclusively on empirical studies in gamification, the present study extends this approach by integrating TAM into the analysis, with a streamlined search across 72 databases, resulting in 13 articles. Notably, Klock *et al.* [2] did not specify their review methodology, though they conducted a broader search across 3400 databases, leading to 42 articles focused on gamification. This study's unique contribution lies in its dual focus on gamification and TAM, applying the PRISMA methodology to offer a more targeted and comprehensive synthesis of the literature.

3. METHOD

This study uses a systematic literature review (SLR) approach to analyze gamification and TAM research. Key stages include defining inclusion and exclusion criteria, selecting relevant databases (primarily Scopus), and using specific keywords like "gamification" and "technology acceptance model". The selected studies underwent rigorous quality evaluation and data extraction to ensure a comprehensive understanding of current research.

3.1. Inclusion and exclusion criteria

To classify the retrieved studies, a set of inclusion and exclusion criteria was created. Inclusion criteria focused on studies addressing gamification and TAM, while exclusion criteria filtered out irrelevant or low-quality research. The inclusion and exclusion criteria for this study focus on articles published between 2016 and 2020, specifically targeting final journal articles written in English that address gamification and TAM. Excluded were works published before 2016 or after 2020, non-article documents like conference papers, book chapters, reviews, or editorials, as well as articles in press or those in non-journal sources, and any publications not in English.

3.2. Data sources and search strategies

The analyzed articles in this systematic review were collected through a search from Scopus conducted in May 2021. The search includes the following keywords ("Technology Acceptance Model" AND "Gamification"). Table 2 shows the advanced query that is used for the search in this review study.

Table 2. Advanced search query string

Database	Advanced search query string
Scopus	TITLE-ABS-KEY (technology AND acceptance AND model AND gamification) AND (LIMIT-TO (PUBYEAR , 2020) OR LIMIT-TO (PUBYEAR , 2019) OR LIMIT-TO (PUBYEAR , 2018)) OR LIMIT-TO (PUBYEAR , 2017)) OR LIMIT-TO (PUBYEAR , 2016)) AND (LIMIT-TO (DOCTYPE , "ar")) AND (LIMIT-TO (LANGUAGE , "English")) AND (LIMIT-TO (PUBSTAGE , "final")) AND (LIMIT-TO (EXACTKEYWORD , "Gamification") OR LIMIT-TO (EXACTKEYWORD , "Technology Acceptance Model"))

The review analyzed articles from Scopus using keywords such as "Technology Acceptance Model" and "Gamification". The search identified 72 papers, which were narrowed down to 13 after excluding irrelevant studies. The PRISMA flow diagram in Figure 1 illustrates this process.

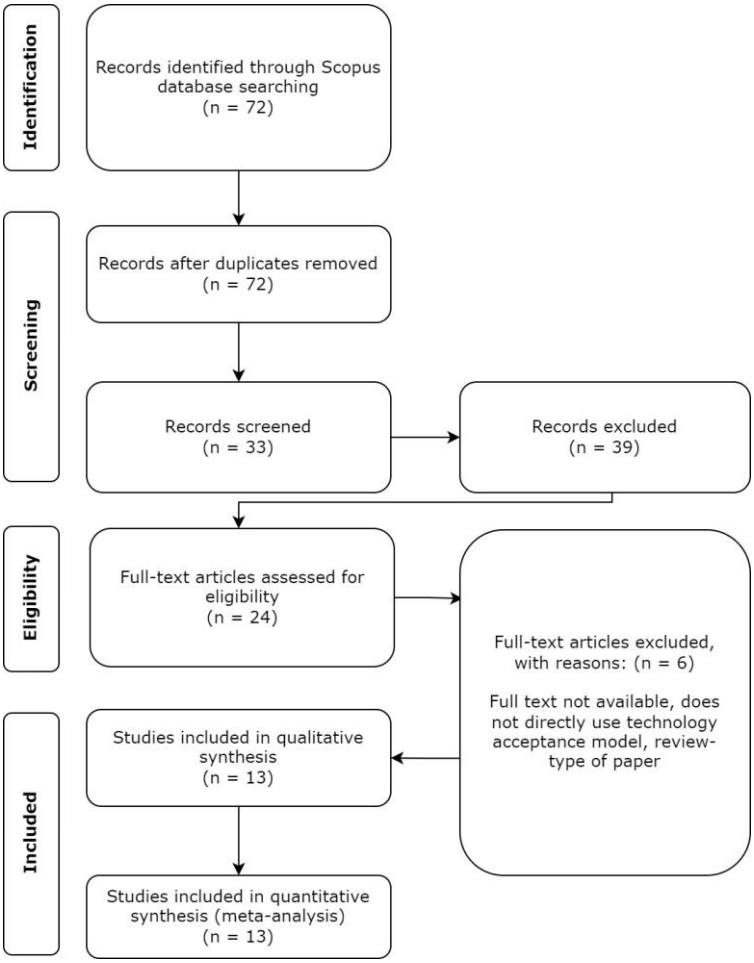

Figure 1. PRISMA flow diagram

4. RESULTS

4.1. Data extraction

The articles are published spanning a period from 2016 to 2020. The number of studies has increased from only one in 2016 to four in 2020. This trend shows gamification has become more acceptable in various domains.

4.2. Main research purpose

The review found four main objectives: motivation enhancement, application effectiveness, technology acceptance, and new technology/model development. Most studies (54%) focus on enhancing motivation, such as improving student participation [16], using TAM to assess the impact of gamified applications [17], and exploring gamified internet banking [18]. Others examine application effectiveness, including student engagement [19] and ERP simulation [20], [21]. Technology acceptance studies focus on areas like gamified tourism apps [22] and instructor training [23]. New technology developments include a mobile app for algorithm visualization [24] and a gamified model for anxiety and depression care [25]. Overall, motivation enhancement is the primary focus, significantly influencing gamification adoption, intention, and user engagement through interactive features.

4.3. Research approaches

This study classified the main approach used by researchers based on questionnaire surveys. Among them, seven studies adopted the 5-point Likert scale [16], [17], [19]–[21], [23], [26], while two studies utilized a

7-point Likert scale [18], [27]. Three studies employed web-based online surveys [17], [22], [28], and one study utilized TAM and technology-enhanced training effectiveness model (TETEM) surveys [24]. The findings indicate that all studies relied on questionnaires for data collection, aligning with previous systematic analyses suggesting questionnaire surveys as the dominant method in gamification research [29]. This is attributed to the widespread acceptance of survey instruments in technology acceptance studies, as they are considered accurate tools for evaluating relationships between conceptual models and respondents' perceptions [30].

4.4. Origin country of the studies

The studies originated from 13 countries, with Turkey leading at four publications. This small dataset challenges generalization across cultures. Future research should encompass more countries for broader applicability.

4.5. Extent of usage using TAM for evaluation

This section discusses the use of TAM for evaluation, focusing on perceived usefulness, ease of use, enjoyment or engagement, and intention to use. All articles discussed perceived usefulness, with only one omitting ease of use [18]. Most articles (69%) evaluated enjoyment or engagement, with four studies not mentioning it [16], [18], [23], [25]. Eleven articles evaluated intention to use, with two omitting it [16], [25]. Most studies evaluate perceived usefulness and ease of use in their applications. The results consistently indicate that these two factors significantly influence both the adoption and enjoyment of gamified applications. Specifically, perceived usefulness plays a crucial role in determining users' motivation and satisfaction [31]. Additionally, playfulness and enjoyment are also important in the adoption of gamification across various domains [32].

4.6. Domain of studies

The articles were categorized across various disciplines, with most studies focusing on education (N=7). Example include Janssen and Prasetiyowati [16] supporting students' activities through gamified applications, and other studies enhancing the learning environment [19]–[21], [24]. One study focused on improving the training evacuation system using augmented reality [27]. Internet banking was another focus, with studies enhancing e-banking experiences [17], [18]. E-commerce studies analyzed factors for adopting gamified systems [26], [28]. Other disciplines, such as tourism and healthcare, each had one study. Yoo *et al.* [22] developed a smart tourism application, while Dias *et al*. [25] studied the health domain, developing a gamified health system for depression and stress disorder patients. The prevalence of education aligns with a review by Trocky and Buckley [33], highlighting its ease of implementation in learning experiences.

4.7. Gamification elements used in the studies

Gamification, regardless of the application context, employs various game features to evoke a positive response from users [34]. However, different terminologies are used to describe typical game elements, which can lead to confusion. To clarify these elements, the following definitions were standardized based on authors' descriptions. An avatar represents a user in virtual worlds or as a fictitious character [35]. Badges are graphical illustrations accomplishments, serving as visual rewards [35]. Feedback provides relevant information about performance, helping users improve [36]. Similarly, leaderboard ranks players based on specific parameters like points or levels [36]. Levels monitor progress over time, often with visualizations like progress bars [36]. Narratives connect other game elements through plots, covering various themes and contexts to create a cohesive and engaging story [2]. Points provide numeric feedback, motivating users to complete tasks and improve scores [37]. Lastly, strategy adds complexity by requiring plans to minimize losses or maximize gains, enhancing engagement [2]. Seven studies used points as rewards [16], [17], [19]–[21], [25], [26], while five incorporated leaderboards to foster competition [16], [17], [19], [20], [23]. Four studies employed badges as rewards for task completion [16], [20], [23], [25]. Points, leaderboards, and badges were the most common elements, used in 69% (n=7), 38% (n=5), and 31% (n=4) of studies, respectively. Other elements like avatars, feedback, narratives, and strategies were also integrated to enhance engagement. Although prevalent, points, leaderboards, and badges are sometimes seen as limited in boosting deep user motivation [38], yet they are favored for their ease of integration [35]. Zaric *et al.* [36] also note their potential limitations in driving motivation.

4.8. Benefits of gamification and TAM research

Gamification integrates playful elements into routine tasks, making them more engaging, competitive, and interactive, which boosts user motivation and emotional engagement [39], [40]. It enhances satisfaction [21], self-esteem, and provides continuous feedback [41], encouraging sustained usage [16], [19]–[21]. Studies highlight that game elements help maintain high user participation [19], support ongoing application usage [17]–[19], [22], [23], [26], [27], and enhance simulation and engagement through appealing graphics and mechanics [22]. Gamification also promotes the continuous use of applications [17], [18], [23], [24], [26], [28] and offers health benefits by improving lifestyle habits and medication adherence for chronic illness patients [25].

4.9. Types of TAM

Overall, 8% (n=5) of the studies used the extended TAM, incorporating external variables to enhance the model's predictive validity. Another 38% (n=5) used the original TAM. The remaining studies (n=3) combined external variables with modifications to the TAM to explore factors influencing gamification acceptance. Most studies extended the original TAM with factors like task technology fit (TTF), social influence (SI), perceived learnability (PL), and others, significantly impacting gamification acceptance across various domains [11].

4.10. What is the background of the participants involved?

The researchers categorized participants into four groups: less than 10, 10-100, 100-200, and 200 or more. Four studies involved 10-100 participants [19], [23], [24], [27], and four involved 100-200 participants [17], [20], [21], [28]. Three studies had 200 or more participants [18], [22], [26], while one study had fewer than 10 participants [25]. Only one study did not report participant numbers [16]. Among the studies, 46% (n=6) of the studies focused on students, mostly university-level, with one on diploma students. 23% (n=3) centered on regular citizens with specific conditions, such as mobile app usage experience [22], targeting Pakistani citizens [18], and frequent website visitors from various countries [28]. Other studies included bank customers over 40 [17], university instructors [23], patients with anxiety, depression, and stress [25], and millennials and generation X amazon users [26].

4.11. What is the proposed future work from the studies?

61% (n=8) of the studies proposed future work, identifying seven categories. One study suggested expanding the research into fields beyond programming [24]. Aydin [28] and Oluwajana *et al.* [20] recommended future studies to examine gamification's impact on user behavior. To generalize findings, Vanduhe *et al.* [23] suggested including a broader participant pool, and Dick and Akbulut [21] recommended increasing the sample size. Dias *et al.* [25] proposed extending the data collection period to minimize errors. Additionally, improving application functionality and using a more comprehensive model were recommended for better outcomes [21], [25]. Two studies focused on developing applications. Catal *et al.* [27] aimed to create a safety system for a specific domain, and García-Jurado *et al.* [26] planned to design a gamified website to boost consumer buying intentions. Oluwajana *et al.* [20] also recommended using qualitative methods, such as interviews, for more accurate results.

5. DISCUSSION

5.1. Interpretation of results

This SLR explores how gamification and the TAM together influence user motivation and behavior, a connection that has been underexplored. It categorizes studies by focus, TAM evaluation, benefits, and game elements, showing intrinsic motivation, particularly in education, as key [12], [33]. TAM evaluations indicate that perceived usefulness boosts ease of use and enjoyment, with customized game elements enhancing experiences [2]. Notable benefits include increased motivation and satisfaction [42]–[44]. Approximately 38% of studies modified TAM, mostly involving students [45], reinforcing the focus on education [46]. The study calls for broader research to overcome geographic and methodological limitations, highlighting the potential of integrating gamification with TAM to enhance motivation and acceptance. Figure 2 encapsulates the findings.

5.2. Future research directions

Several studies, including [47]–[49], have identified key challenges for the future of gamification, such as addressing potential user manipulation, evaluating the effectiveness of different gamification elements across various contexts, and considering the ethical implications of gamified systems. To tackle these challenges, future research should focus on exploring the long-term impacts of gamification, investigating cultural and demographic factors that influence user engagement, and developing ethical frameworks for integrating novel gamification strategies into technology acceptance models.

5.2.1. Integrating various game elements

Combining different game elements enhances user interaction and engagement. The initial step in gamification is to integrate these elements into the learning experience. Research shows that gamified applications use multiple game elements to motivate users across various contexts [50], [51]. However, two common pitfalls are neglecting fundamental game features during design and applying a one-size-fits-all approach [52]. Most gamified applications focus on surface-level elements like points, badges, and leaderboards, often overlooking strategies that foster deeper engagement.

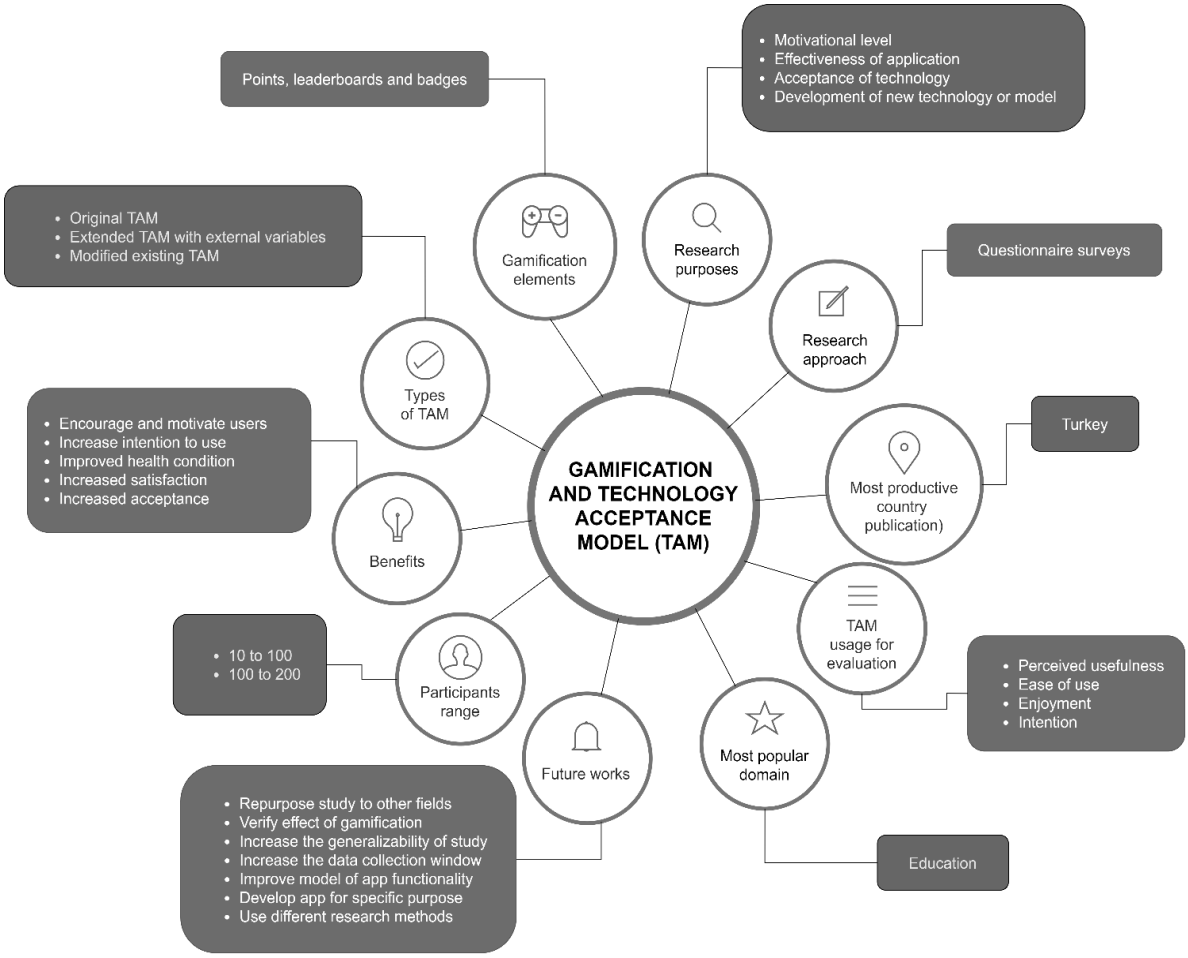

Figure 2. Summary of the main results

5.2.2. Personalizing gamification process

Effective gamification strategies require personalization, tailoring content to players' abilities, skills, and interests [53]. Without this, players may experience boredom and frustration [54]. Successful games offer realistic challenges and rewards, keeping players engaged, but this requires ongoing creativity from designers [55], [56]. While many applications customize content based on skills and objectives, they often neglect factors like player characteristics (e.g., preferences, styles, behavior, gender, age, personality) and physiological signals, which are crucial for enhancing engagement [57]–[61]. A framework for classifying player types is essential to prevent game abandonment due to unappealing features [62].

5.2.3. Enhancing reward system

Improved reward systems are crucial for boosting user engagement and behavior [6]. While badges, points, and leaderboards are common, they're often seen as simplistic scoring mechanisms [63], [64]. A new framework is needed to tailor rewards to individual play styles and motivations, especially for users lacking intrinsic motivation [65]. Future research should focus on enhancing gamification features, creating personalized games to sustain motivation, and integrating social features to further drive user engagement [66], [67].

5.3. Practical implications

This review provides key insights for practitioners incorporating gamification into TAM implementations. Expanding gamified TAM to accommodate diverse user backgrounds is crucial, particularly in educational settings where it can enhance learning outcomes [68]. Evaluating gamification's viability and usefulness through large-scale, longitudinal studies involving diverse groups is essential, as supported by prior research [21], [23], [49]. However, challenges include the rapid evolution of gamification technology and the need for expert involvement to implement robust solutions [69], [70]. Additionally, users unfamiliar with advanced gamified applications may struggle to adapt, necessitating training and a user-friendly interface [71]–[73].

5.4. Review limitations

This review has several limitations. The search strategy excluded conference proceedings and was limited to Scopus, possibly missing relevant studies from other databases like Web of Science or Google Scholar. The focus on article metadata (title, abstract, keywords) led to some manual exclusions, and the review was confined to journal articles on gamification and TAM, potentially overlooking other models and influencing factors. Additionally, book chapters and non-English papers were excluded, which may have omitted important insights from other languages and sources.

6. CONCLUSION

This systematic review on gamification and the TAM underscores key trends. Research since 2016 highlights the critical role of perceived ease of use and usefulness in technology adoption, with traditional gamification elements like points and badges proving effective. However, there's potential to explore new strategies and diversify methodologies beyond the prevalent use of surveys. Future work should consider the long-term effects, ethical issues, and refine TAM with new variables to enhance predictive accuracy. This review provides a foundation for understanding how gamification can improve technology acceptance and suggests directions for future research.

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BIOGRAPHIES OF AUTHORS

Mohd Hazim Afiq Kalana is a master's student in the Faculty of Computer Science and Information Technology at Universiti Malaysia Sarawak (UNIMAS). He received his bachelor's degree in Multimedia Computing from UNIMAS in 2020. His research interests include human-computer interaction (HCI), mobile applications, and augmented reality. He can be contacted at email: mhazimafiq47@gmail.com.

Syahrul Nizam Junaini is a senior lecturer at the Faculty of Computer Science and Information Technology (FCSIT), Universiti Malaysia Sarawak (UNIMAS). He was the Deputy Director (Learning Technology) at the Centre for Applied Learning and Multimedia (CALM), UNIMAS. He published his articles in top-tier Q1 journals such as agricultural systems, journal of cleaner production and education and information technologies journal. He can be contacted at email: syahruln@unimas.my.