Persuasive Technologies using Social Media to Influence Behaviour Change in Malaysia

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Abstract

The effective use of persuasive technology in social media can influence behaviour change. By 2020, 88.7% of Malaysians were active internet users, and various social media platforms to change users' behaviour had emerged via the internet. This paper examines how persuasive technology has been used in Malaysian health care and behaviour change over the past ten years. The goal is to discover how well technology has been used to change people's behaviour. The findings of this paper anticipate an in-depth study about underexplored topics, such as the most effective strategy to embed PT in Social Media applications to improve health.

Keywords: Persuasive technology; behavioural change; social media

1.0 Introduction

The idea and development of a system based on the principle of persuasion are called persuasive technology (PT). It uses social ideas like persuasion and social influence to alter someone's attitude or behaviour without using physical force. In recent years, PT has been used in several areas that directly or indirectly affect health and behaviour modification. Almonani, Husain, San, Almomani, & Al-Betar, 2014, have found that there are two main subfields of PT: illness management and prevention (Aziz, Salleh, Yusof, & Roseli, 2017) and health management and prevention.

According to statistics, Malaysia had the highest rate of adult obesity compared to other Southeast Asian nations until 2019, with 50% of adults reporting overweight (30.4%) or obesity (19.7%) issues. Most Malaysians don't care about how unhealthy their eating habits are or how little they know about self-care health. On the other hand, Malaysians have wide access to social media. In 2021, 94% of Malaysians used YouTube, 89% used Facebook, and 75% used Instagram.

The focus of PT for health prevention and promotion is on individual behaviours with the intention of preventing sickness, identifying pre-illness signs, and promoting overall well-being (Orji, Vassileva, & Mandryk, 2014). This motivation includes healthy habits like eating a balanced diet (Salim, Ali, & Noah, 2017), preventing obesity (Yahaya & Hashim, 2018), being aware of environmental issues (W. N. W. Ahmad & Ali, 2018), teaching children about sex education (Oyibo, Orji, & Vassileva, 2017), and taking care of their children's dental health (Puad, Rahim, Firdaus, Sayedi, & Mohadis, 2019). Qasim, Ahmad, Omar, Zulkifli, and Bakar (2017) say that the goal of PT for disease management is to help people get better at taking care of their health by showing them how to deal with specific illnesses, teaching them how to get the proper treatment, making medical appointments, and helping them make decisions about their health.

The significant contributing factor to obesity was that Malaysians like to eat a lot while entertaining their guests. Malaysia has the highest prevalence of obesity among adults in South East Asia. In the 2019 National Health and Morbidity Survey, 50.1% of our adult population was reported to be overweight (30.4%) or obese (19.7%) (SPM, 2022). They also have significantly less physical activity (M. N. Ismail et al., 2002). By 2016, World Health Organization (WHO) reported that the causes of death in Malaysia were ischemic heart disease (20.1%), stroke (2.6%), diabetes mellitus (3.3%), and kidney diseases (1.9%). The probability of dying before age 70 for males is 52%, and for females, it is 38%. In the 2017 Economist Intelligence Unit report "Tackling Obesity in Asean" (Unit, 2017), Malaysia had the highest number of obese people. The report stated that only 30% of Malaysian adults had exercised, and only 14% had done proper exercise.

The use of social media in Malaysia showed signs of increasing healthcare consciousness. Design professionals, medical professionals, government agencies, ministries, stakeholders, and developers have created persuasive technologies to influence patients' behaviours. Therefore, an empirical literature review shows the trends, research gaps, best practices, and where PT research should go. This paper will highlight several significant findings from the review, including 1) Trends in Persuasive Technology in Social

Media, 2) Effectiveness of Persuasive Technology using Social Media, 3) Persuasive Technology Strategies, 4) Persuasive Technology Behaviour Theories, 5) Persuasive Technology Behaviour Outcomes and 6) Persuasive Technology Target Group used in all PT research using social media conducted by Malaysian researchers.

Most studies on persuasive technology for health care have only looked at games, mobile and computer apps, social media, websites, and simulations. No specific research has been done on using animated or motion graphics as a persuasive agent.

This research aims to help the Agenda Nasional Malaysia Sihat (ANMS) by giving Malaysians the tools they need to take care of their health. Hopefully, the new persuasive technology framework will help people in Malaysia develop healthy habits.

This study's implications include those for society, academia, and industry. For society, the proposed persuasive technology system is thought to be a strong, persuasive agent that uses social influence without using force by giving young Malaysians a free, easy-to-use platform to learn important self-care management skills, especially healthy eating habits. While academia will add to what we know about persuasive technology, especially how to use animated graphics to get people to take better care of themselves. For industry, the implications are that people who want to make a persuasive animated graphic for different reasons will find this proposed framework helpful. This will empower social media, creative content creation, and the healthcare industry.

In Malaysia, there is still a lack of research on how to use technology to persuade the public about important health issues, like how they eat (Kamalruzzaman et al., 2021). They found that social influence-based persuasion technology is used in business, when people buy products, how well they do their jobs, when they give money to charity, when they advance in their careers, and when they go to school. Data suggest that persuasive technology can significantly encourage positive behaviour in many areas of health and wellness, such as boosting physical activity, good eating, and reducing sedentary behaviour (Aldenaini N et al., 2020). Research on this topic should be undertaken to fill in the gaps in our knowledge and pave the way for future research.

2.0 Literature Review

Individuals' changing attitudes and behaviours show the effects of the environment on them. Nevertheless, altering one's behaviour rarely happens by chance and requires much effort. Technology that uses social influence and persuasion rather than coercion to alter users' views or behaviours is known as persuasive technology (Fogg, 2002). The idea of "Computers as Persuasive Technology" combines computers and persuasion (captology). By creating the proper intention, persuasion can produce a social influence that changes behaviour (Bardhan, Bahuman, Pathan, & Ramamritham, 2015). One needs to be adequately motivated, capable of performing the behaviour, and triggered to change their behaviour (Brian J. Fogg, 2009). The motive, ability, and trigger must all be present simultaneously for the behaviour to change. The combination between both aspects of computer and persuasion will generate a persuasive agent under the name of Captology.

The three elements of motivation, ability, and trigger were utilised with persuasive technology. To influence users' good behaviour, a persuasive system must offer them an acceptable manner of motivation, convenience of use, and rewards that initiate the activity (Brain J. Fogg, 2009) in Figure 1.
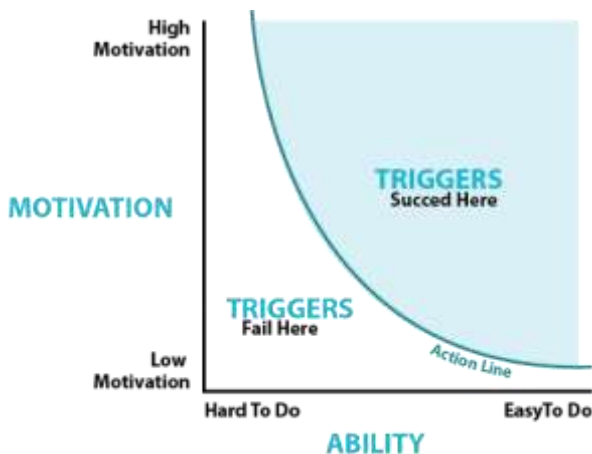

Figure 1: The Fogg's Behaviour Model
(Source: Fogg,2009)

This model postulates that to trigger a behaviour change, a system must have to provide proper motivation, high ability to use it, and triggers that can spark an attitude or behaviour change. Low motivation and low ability (hard to use) will harden the triggers more likely to occur if the system cannot break the action line.

Healthcare Persuasive Technology

The major contributing factor to obesity is that Malaysians like to eat a lot in the culture of entertaining their guests. They also have significantly less physical activity (Ismail et al., 2002). By 2016, the World Health Organization (WHO) reported that the causes of death in Malaysia were ischemic heart disease (20.1%), stroke (2.6%), diabetes mellitus (3.3%), and kidney diseases (1.9%). The probability of dying before age 70 for all males is 52% and for females, it is 38%. [32]. Malaysia had the highest obesity prevalence in Southeast Asia, according to the 2017 Economist Intelligence Unit report "Tackling Obesity in Asean" (Unit, 2017). The report stated that only 30% of Malaysian adults had ever exercised and only 14% had done proper exercise. The evidence that persuasive technology may successfully encourage behaviours in many areas of health and wellness, such as boosting physical activity, good eating, and reducing sedentary behaviour (Aldenaini N, Alqahtani F, Orji R, & Sampalli S, 2020). The researchers identified persuasive designs for leveraging technology to encourage behaviour change. They highlighted the potential and opportunity for different multimedia applications to alter unbehaviour. Some have summarised a

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compelling strategy that persuaded older workers (aged 50 to 65) to increase their physical activity with smartphones (Mohadis & Ali, 2016).

Many industries have made use of persuasive multimedia with the main goal of changing how people act in their daily lives. Pereira, Figueiredo, Esteves, and de Souza (2014) made the game "We4Fit" to encourage healthy lifestyle choices and change eating habits. (Almonani, Husain, San, Almomani, and Al-Betar, 2014) (Chittaro, Corbett, McLean, and Zangrando, 2016) MACO wants to reduce childhood obesity with a fun mobile application, and Learn to Brace teaches people about aeroplane safety. Ismail, Ahmad, Rosmani, and Shuib (2012) made Smoke Shooter, an interactive mobile game that schools use to teach kids about the dangers of smoking. When used at the right time, persuasion technology can encourage behaviour change (Fogg, 2003). Information, Communication and Technology (ICT) applications of persuasive technology played a significant role in influencing people's thinking, behaviour, and decision-making, which had a positive impact on raising awareness, assisting with prevention and support for change, and persuading people to lead healthier lives (Aziz et al., 2017).

Mobile phone-based PT is a good way to get people to be more active and less sedentary. Aldenaini (2020) looked at 79 trials of mobile games that used persuasion technology to change player behaviour and found that 79% of them were successful or partly successful. All these modern multimedia tools for persuasion are thought to influence people to behave better. The foundation of it is persuasive technology theory. Outside of medicine, persuasive technology is often used in online systems like e-commerce platforms to change people's behaviour or attitudes (Adaji, Oyebo, and Vassileva, 2020).

Several techniques were used to persuade the system, including personalization, self-monitoring, and social influence, which could cause the behaviour change (Oinas-Kukkonen & Harjumaa, 2009). Other persuasive systems make use of technology applications like interactive user control (Orji, 2016), mobile games (Almonani et al., 2014), social media (Hassan, Shiratuddin, & Ab Salam, 2015), web 2.0 e-learning (Widyasari et al., 2019), mobile apps (Meedya et al., 2019), social robots (Ahtinen & Kaipainen, 2020), and fitness systems (Oyibo & Vassileva, 2020). Fit4Life provides instructions on maintaining weight (Purpura et al., 2011).

(Wan Ahmad & Ali, 2018) A PT is considered successful if it can get people to move to a state they already know. (Wan Ahmad & Ali, 2018) A PT is considered successful if it can get people to move to a state they already know. Prior research has shown that social influence or social factors can increase the likelihood of healthy behaviour change (Sun, Y., Feng, Y., Shen, X. -., & Guo, X. 2023, Oyibo et al., 2017). Researchers hope that using social media as the main PT channel will have a big impact on as many people as possible while making the most of social influence. The main PT channel can have a big impact on as many people as possible and use social influence to its own benefit.

Industries, including business (Hassan, Shiratuddin, & Ab Salam, 2015), education and higher education (Z. Ahmad, Ab Rahim, & Ya'acob, 2019), e-commerce (Hamid, Cheun, Abdullah, Ahmad, & Ngadiman, 2019), informal learning (Al-Sabaawi & Dahlan, 2019), and pro-environmental behaviour (Taha, Wu, Emea, Z. Ahmad et al., 2019) social media

communication (Golmohammadi, A., Gauri, D. K., & Mirahmad, H. 2023). As a result of the advent of social media platforms like Facebook, WhatsApp, Instagram, and many others, 81% of Malaysians now actively use SM (Miller, 2021). Also, we found compelling design frameworks that will influence various demographic groups' behaviour positively, notably in global smartphone applications, virtual reality, and social media interaction (Faisal, Nor, & Abdullah, 2019). Increasing social activities on ICT platforms has given PT greater leverage as a social influencer to encourage positive behaviour change (Muhamad & Shahrom, 2020).

3.0 Methodology

The quantitative content analysis was used to comprehensively assess the state-of-the-art in the field of research. This technique enables categorising the data based on several themes and concepts and comparing, contrasting, and comparing the data (Stinson, 2021). We used a few journal databases for our literature search to ensure adequate coverage of technological PT intervention in behavioural change across various domains, including education, healthcare, health management, productivity, business, and other related areas. These are Google Scholar, Elsevier, PubMed, IEEE Xplore, and Springer, among other databases. We have focused our search on the Malaysian setting to ensure the research goals are met. "Persuasive Technology in Malaysia," "Persuasive Technology in Malaysian social media," "Social Media Behavioural Change in Malaysia," and "Malaysian Behaviour Change Using Persuasive Technology" are the keywords we used for our search.

We have used a two-stage filtering procedure for each article's title and abstract after determining the number of unique articles, as shown in Figure 1. Table 1 displays the coding schemes.
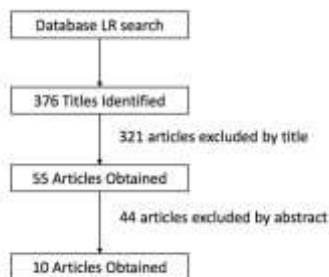
Figure 2: Articles identification process from databases

Table 1: Persuasive technology classification and analysis coding scheme

S/N	Codes	Items
1	Trends	Categories of PT using SM for behavioral changes
2	Effectiveness	Positive, partially positive or negative study
3	Strategies	Motivational strategies used.
4	Behaviour Theories	Theory of planned behaviour, dual coding theory etc.

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5	Behaviour Outcomes	Weight loss, physical activity, heart problems etc.
6	Target group	Older, adult, young adult, children etc.
7	Evaluation	Qualitative, quantitative and mixed method

The coding scheme was developed from the specific issues identified as main themes issued by each unique article in which previous researchers highlighted their primary intention to investigate specific areas of studies. The analysis is categorized according to the following: Trends in Persuasive Technology in Social Media, Effectiveness of Persuasive Technology using Social Media, Persuasive Technology Strategies, Persuasive Technology Behaviour Theories, Persuasive Technology Behaviour Outcomes and Persuasive Technology Target Group.

4.0 Results

At this stage, we have located ten research papers that demonstrate the state-of-the-art in Malaysian persuasive technology research using social media. To make the conclusions more apparent, we presented the data in a complete summary of all the original studies examined. We use categories such as the author) names, PT projects, targeted behaviour domains, the technology used, motivational strategies, behaviour theories applied, and the result obtained as shown in Table 2.

4.1 Trends in Persuasive Technology in Social Media

Each examined study has issued some key aspects as the 'trends'. We have identified several trends of persuasive technology used in social media which are the effectiveness, strategies, behaviour theories, behaviour outcomes and target group as shown in Table 3 to Table 7.

Table 2. Effectiveness of PT using social media in Malaysia

Arthur	PT Project	Behaviour Domain	Technology	Strategy	Behaviour Theory	Result
(Almonani et al., 2014)	MACO Online Game	Healthy lifestyle	Mobile game	Tracking, monitoring and reminder	Not specified	Partially positive
(Hamid et al., 2019)	Acceptance of e-Commerce site	Product purchase	E-commerce	Social support and social influence	User acceptance	Positive
(Hassan et al., 2015)	Social media business survey	Product purchase	Social network	Not specified	Perceived impact of social media as a PT	Positive
(Ishak et al., 2020)	Social media survey	Social media usage	Social network	Feedback	Not specified	Partially positive
(Mohamad, Yahaya, &	Mobile assistive technology	Healthy lifestyle	Mobile apps	Tracking and monitoring	Not specified	Positive

Wahid, 2018)						
(Muhamad & Shahrom, 2020)	Social media survey	Social media engagement	Social network	Social influence and feedback	Social media engagement behaviour	Positive
(Nawi, Nasir, & Al Mamun, 2016)	Social media survey	Choosing business platform	Social network	Social influence and feedback	Unified Theory of Acceptance and Use of Technology	Positive
(Noor & Shahrom, 2021)	Social media survey	Job performance	Social network	Feedback	Employee job Performance	Positive
(Rahman, 2016)	Charity Video	Charity	Social network	Feedback	Not specified	Positive
(Salim et al., 2017)	Nutrihealth Mobile Apps	Healthy lifestyle	Mobile game	Tracking and monitoring	Unified Theory of Acceptance and Use of Technology	Positive

4.2 Effectiveness of Persuasive Technology using Social Media
Majority of the papers we reviewed seem to be having a positive impact on the desired behaviour. 20% of the research did not demonstrate a fully favourable effect on the desired behaviour. The negative impact of social media, which serves as a persuasive technology for behavioural change in Malaysia, is not represented in any of the reviewed papers.

Table 3. Effectiveness of PT using social media in Malaysia

Outcome	Study	Total	Overall (%)
Positive	(Hassan et al., 2015), (Hamid et al., 2019), (Rahman, 2016), (Muhamad & Shahrom, 2020), (Mohamad et al., 2018), Nawi, Nasir, & Al Mamun, 2016), (Noor & Shahrom, 2021), (Salim et al., 2017)	8	80
Partially positive	(Ishak et al., 2020), (Almonani et al., 2014)	2	20
Negative		0	0

4.3 Persuasive Technology Strategies
According to data in Table 4, feedback has the highest percentage, at 30%, and is followed by social influence, feedback, and tracking and monitoring, both of which have a 20% share. The remaining strategies each have a 10% coverage.

Table 4. Persuasive motivational strategies

Strategies	Studies with positive result	Studies with partially positive result	Studies with Negative Results	Total	Overall (%)
Feedback	(Rahman, 2016), (Noor & Shahrom, 2021)	Ishak et al., 2020	0		30
Social support and social influence	(Hamid et al., 2019)		0		10

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Social influence and feedback	(Muhamad & Shahrom, 2020), (Nawi et al., 2016),		0	20
Tracking and monitoring	(Salim et al., 2017), (Mohamad et al., 2018)		0	20
Tracking, monitoring and reminder.		(Almonani et al., 2014)	0	10
Not specified	(Hassan et al., 2015)		0	10

4.4 Persuasive Technology Behaviour Theories

The behavioural theories used in the majority of Malaysian studies on PT using SM are not mentioned However, the remaining 60% have specified with the highest percentage being the Unified Theory of Acceptance and Use of Technology.

Table 5. Persuasive behaviour theories

Behaviour Theory	Studies with positive result	Studies with partially positive result	Studies with Negative Results	Total	Overall (%)
Employee job Performance	(Noor & Shahrom, 2021)		0	1	10
Perceive impact of SM	(Hassan et al., 2015)		0	1	10
User acceptance	(Hamid et al., 2019)		0	1	10
Social media engagement behaviour	(Muhamad & Shahrom, 2020)		0	1	10
Unified Theory of Acceptance and Use of Technology	(Nawi et al., 2016), (Salim et al., 2017)		0	2	20
Not Specified	(Rahman, 2016), (Ishak et al., 2020), (Mohamad et al., 2018)	Ishak et al., 2020), (Almonani et al., 2014)	0	4	40

4.5 Persuasive Technology Behaviour Outcomes

Behaviour outcome is the final target or objective of a persuasive system. Researchers' most frequent behaviour is a healthy lifestyle with 30%, followed by product purchase behaviour with 20%. The rest of the behaviour outcomes are a charity, choosing a business platform, job performance, social media engagement and social media usage.

Table 6. Persuasive behaviour outcome

Behaviour Outcome	Studies with positive result	Studies with partially positive result	Studies with Negative Results	Total	Overall (%)
Charity	(Rahman, 2016)		0	1	10

Choosing business platform	(Nawi et al., 2016)		0	1	10
Healthy lifestyle	(Salim et al., 2017), (Mohamad et al., 2018)	(Almonani et al., 2014)	0	3	30
Job performance	(Noor & Shahrom, 2021)		0	1	10
Product Purchase	(Hassan et al., 2015), (Hamid et al., 2019)		0	2	20
Social media engagement	(Muhamad & Shahrom, 2020)		0	1	10
Social media usage		(Ishak et al., 2020),	0	1	1O

4.6 Persuasive Technology Target Group

In Table 7, we recorded that half of the research targets social media users. The other target respectively, presents 10% of all PT using SM in Malaysia.

Table 7: Persuasive behaviour outcome

Target group	Studies with positive result	Studies with partially positive result	Studies with Negative Results	Total	Overall (%)
Children		(Almonani et al., 2014)	0	1	10
E-commerce users	(Hamid et al., 2019)		0	1	10
Elderly	(Salim et al., 2017)		0	1	10
Social media users	(Hassan et al., 2015), (Rahman, 2016), (Muhamad & Shahrom, 2020) , (Noor & Shahrom, 2021)	(Ishak et al., 2020)	0	5	50
Entrepreneur students	(Nawi et al., 2016)		0	1	10
Visually impaired children	(Mohamad et al., 2018)		0	1	10

5.0 Discussion

The findings show that PT's use of Social Media (SM) to influence behaviour is effective in Malaysia. Malaysia, as we found that 80% of the research is relevant. In the coming years, 81% of Malaysia's population is projected to be regularly using social media, exceeding the percentage of social media behaviour change targets. With that frequency, social influence will be more likely to occur, which will encourage positive behaviour change.

Yet, there isn't much local information in a study that looks at how social media can be used to change people's minds. In other ICT platforms including e-learning, general healthcare, websites, computer applications, and other electronic media, most academics, stakeholders, and developers only concentrated on PT. Further research on the effects of PT through SM is crucial because there are many active SM users around the nation. While the research was able to employ novel motivational techniques, such as user feedback,

social support, tracking, monitoring, and reminders, other persuasive techniques, such as competition and leader boards, video-based persuasion, persuasive text messages, achievement sharing, social learning, virtual rehearsal, self-monitoring, cooperation and collaboration, positive feedbacks, and objective reward, have been put into practice by researchers around the world.

The main goal of PT, a technological platform, is to produce successful behavioural outcomes. We also want to highlight some potential areas for future research in the body of knowledge of PT using SM in the Malaysian context, (1) the relationship between persuasion strategies and PT outcome, (2) the relationship between target health behaviour to PT outcome; and (3) the relationship between behaviour theory and PT outcome.

6.0 Conclusion

This study looks at trends, the latest research, and how well persuasive technology (PT) and social media (SM) work together in Malaysia from 2011 to 2021. We observed that PT has a promising strategy for fostering positive behaviour change in a variety of circumstances, such as work, charitable work, and other types of social engagement. Even though there are a lot of people in Malaysia who use social media, not much research is done here. It is advised that additional PT related studies be conducted in Malaysia going forward. With future research, we can anticipate discovering more in-depth information about underexplored topics such as the most effective strategy to embed PT in Social Media applications.

Acknowledgement

Article Contribution to Related Field of Study

This article contributes to the body of knowledge where there is a gap in the documentation of the state-of-art persuasive technology used in social media in Malaysia. This article fills a gap in what is known about the most up-to-date persuasive technology used in social media in Malaysia.

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