A Conceptual Integrated Persuasive Behavioral Change Framework Based on Maqasid al-Shariah to Encourage Green Practices of Municipal Solid Waste (MSW) Disposal

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Abstract

Waste disposal has been a worldwide concern for several decades and the situation is worsening in developing countries including Malaysia due to the progressive increase in waste generation in recent years. Improper waste disposal causes a detrimental effect on the environment and human health. In many developing countries, environmentally friendly practices (reduce, reuse and recycle) have been introduced to reduce the amount of waste generated and alternative methods of final waste disposal are increasingly used to reduce environmental impact. However, most Malaysians have weak awareness of such green practices of MSW disposal despite numerous efforts made by the government. Therefore, how to motivate Malaysians to adopt green practices has been of concern. Within sustainable HCI, persuasive technology has been used to intentionally change user's behaviors and attitudes through persuasion. However, one of the major limitations of persuasive technologies is, it does not consider how one's culture and religious views shapes their behavior. As Malaysia is a Muslim-majority country and largely influenced by religious views in guiding and making a positive change in their attitudes and behaviors, we believed integrating persuasive technology with Maqasid al-Shariah would enhance its persuasive power at encouraging green practices of solid waste disposal. Accordingly, in this paper we are proposing a conceptual integrated persuasive behavioral change framework based on Maqasid al-Shariah aiming to encourage green practices of MSW disposal among Malaysians. We hypothesized this framework will be beneficial to increase Malaysian community awareness on the importance of disposing MSW based on Maqasid al-Shariah and eventually reduce risks to health and the environment due to improper waste disposal

Keywords: *Municipal solid waste disposal, green practices, persuasive technology, Maqasid al-Shariah, behavior change, Malaysia.*

1. Introduction

The problem of disposal of Municipal Solid Waste (MSW) is one of the critical issues that require a holistic approach in Malaysia. The environmental awareness of the public and their participation has enabled improvement in waste disposal. However, this scenario hardly exists in developing countries like Malaysia where the daily production of 22,000 tons of waste by the urban population is a major problem. The World Bank (2012) estimates that the total urban population is projected to increase from 24.4 million in 2018 to 27.2 million by 2025 and the total waste generation are expected to be double to 51,655 tons per day. This figure exceeds the 30,000 tons of daily waste production projected by the government, indicating that Malaysians are continuously producing waste at an unmanageable rate (Alias et al., 2018).

Currently, there are three main methods to disposed MSW in Malaysia which are through landfills, recycle and compost. However, Malaysia is still very dependent on landfills for the final disposal of nearly all types of waste (Malakahmad et al. 2017). According to Pariatamby (2017) 81.5% of the national waste enters the landfills, with recycle rate only 17.5% and compost only 1%. This low recycling rate among the public increased the volume of solid waste generation that sends to landfill year after year. Further, as the Malaysian population producing large amounts of waste on a daily basis, 80% of our landfills will be closed in the next few years due to reaching full capacity. This means that more land will have to be acquired for new landfills, which will eventually lead to further environmental damage as landfills are one of the major causes of water pollution, air pollution and climate change. Sanitary landfill was introduced as an initiative to reduce the negative impact of landfills to the environment. However, sanitary landfills are very expensive to operate and maintain, so any additional sanitary landfill will inevitably lead to an increase in government spending on waste management. According to 2015 data from the Ministry of Housing and Local Government (MHLG), the federal government bears 61% of the total budget for solid waste management and public cleanup, while local governments bear 39% of the total budget.

Therefore, the most cost-effective solution to deal with these problems is to minimize the solid waste generation. This could be done by encouraging Malaysians to reduce and separate waste at home before disposal. Thus, the National Strategic Plan (NSP) has emphasized on the needs to provides understanding on the green practices (reduce, reuse, and recycle) of waste disposal among the communities. Despite numerous efforts to raise awareness about green practices, the actual implementation of green practices in daily life is not convincing. Malaysians are still sporadic and skeptical of the benefits of green practices. It is estimated that about 65% of municipal solid waste is the recyclable products that end up in landfill in a day (Rahman et al. 2020). This shows that Malaysians are still lagging behind in terms of recycling knowledge, recycling benefits and awareness of the purpose of recycling. A survey conducted by Solid Waste Management and Public Cleaning Corporation; Recycling & Public Awareness Division showed that 89% of the respondents were aware of recycling programs but only 68.8% expected to put this awareness into practice (SWCorp, 2012). A more recent study by Abdullah et al, 2017, shows similar results with only about 34% of respondents actually reusing or recycling their waste to minimize waste disposal in landfills. This percentage is quite low considering that various campaigns have been conducted to educate people about the benefits of recycling waste and recycling bins have been placed in many places. Their findings support another study by Zainu & Songip (2017) who also found that recycling campaigns receive low response from the public. These previous studies indicate that there is low level of awareness on recycling, and even "much lower" level of awareness on the 3Rs (reduce, reuse and recycle). Thus, public knowledge and awareness of 3Rs should be intensifying especially on the importance of implementing 3Rs and solid waste segregation.

2. Persuasive Technology for Behavior Change

In this context, technology could be developed to promote conservation and discourage behaviors that threaten our environment and human health. In recent years, the study of human-computer interaction (HCI) has played a significant role in everyday life in the development of interactive systems that can motivate or persuade people to change their thinking, attitudes, and behavior. According to Fogg (2003), persuasion as "willing to change behavior" and persuasive technology as a tool to supports the process of this behavioral change. Persuasive technology defined as "any interactive computing system designed to change people's attitudes or behaviors" (Fogg, 2003). Within persuasive systems, the standard method is to design systems that motivate individuals to behave in a more desirable way by providing information, tracking user progress, or giving them feedback (Oduor and Oinas-Kukkonen, 2021). For example, Nike + Running is a fitness and training app that has a significant impact on changing a user's mindset by monitoring their runs, pace, location, distance, heart rate, and mile splits, and providing guided running workouts, custom coaching plans, and friendly motivation from friends and other users to encourage them to keep training and reach their goals. These attitudinal

and behavioral changes are achieved through the use of various persuasion design principles. Oinas-kukkonen and Harjumaa (2009) presented the Persuasive System Design (PSD) framework, which groups the persuasive design principles into four different categories such as primary task support, dialog support, system credibility support, and social support. The design principles in the primary task category include seven principles that assist users in performing the primary tasks and achieving their goals. The Dialogue Support category includes design principles that focus on supporting the user by providing some level of feedback that might increase the user's motivation to achieve their target behavior. The system credibility support category includes principles that make the system more credible and persuasive, while social support denotes principles that largely influence the user's interpersonal relationships with other people such as friends and family. Table 1 shows the description of each persuasive design principles of the PSD framework.

Table 1: Persuasive Design Principles of the PSD Framework

Category	Design principles	Description
Primary task support	Reduction	Reduce user effort by breaking down complex behaviors into simple ones to help them perform the target behavior.
	Tunneling	Guide the user through a process and provide incentives along the way.
	Tailoring	Provide information that is more compelling when it is tailored to the potential needs, interests, personality, context of use or other factors of a specific user group.
	Personalization	Offer personalized content or tailored services to users
	Self-monitoring	Enable users to track and monitor their performance, progress to achieve their goals
	Simulation	Enable users to observe the relationship between the cause and effect of their behaviors
	Rehearsal	Provide users with the opportunity to rehearse their target behavior.
Dialogue support	Praise	Offer praise in the form of symbols, words, pictures or sounds as feedback to users to encourage them to achieve their target behavior.
	Rewards	Offer virtual rewards for users when they perform their target behavior.
	Reminders	Remind users of their target behavior to help them to achieve their goals
	Suggestion	Provide users appropriate suggestions for achieving their target behaviors
	Similarity	Remind users of themselves in a meaningful way or adopt trending features.
	Liking	Contains a visually attractive appearance that matches users' preferences
	Social role	Adopts a social role such as provide communication between users and the system's specialists
System credibility support	Trustworthiness	Provide truthful, reasonable, and unbiased information to users
	Expertise	Provide information that demonstrate competence, experience, and knowledge
	Surface credibility	Contains a competent appearance that promotes the credibility of the system based on users' initial assessments
	Real-world feel	Show information about people or organizations behind the content or services
	Authority	Refer to people in the role of authority
	Third-party Endorsement	Highlight endorsements from reputable and well-known sources
	Verifiability	Provide opportunities to verify the accuracy of the content through external sources.
Social support	Social learning	Allows users to observe the performance and results of other users as they perform the same target behavior.
	Social comparison	Enables users to compare their performance with that of other users.
	Normative influence	Enables users to gather with others who share the same goals to feel norms
	Social facilitation	Enables users to recognize other users performing the target behavior
	Cooperation	Motivate users to cooperate with other users to achieve the goal of the behavior
	Competition	Motivate users to compete with other users to achieve the target behavior
	Recognition	Provide public recognition to users, e.g., in the form of a ranking.

(Adapted from Oinas-Kukkonen and Harjumaa, 2009)

These persuasive design principles have been targeted to influence behavior in a variety of domains, including health and wellness (Orji and Moffatt, 2018), e-commerce (Nkwo et al., 2018), education (Abdullahi et al., 2018), and energy conservation (Bockle et al., 2020). For example, in the healthcare field, fitness activity trackers are used to track and monitor personal data (e.g., user's PA level, step count, heart rate, and time spent sitting), and these devices have implemented a *personalization* design principle to provide users with feedback on their PA progress, personalized feedback, and personalized

recommendations. Francillette et al. (2018) implemented a *personalization* design principle in a smartphone exergame app to motivate people with severe mental illness to integrate PA into their daily lives. This app allows players to plan and set their PA goals based on player profiles, which enables the system to generate various PA choices with different difficulty levels according to players' predetermined choices as personalized goal recommendations. These PA choices were provided to players at appropriate times as personalized intervention timing. Further, Orji and Moffatt (2018) examined several persuasion strategies that have been shown to be effective in persuading large numbers of patients to change their health behaviors.

Persuasive design principles can also be used in the design of persuasive waste management apps to encourage and educate people to adopt environmentally friendly MSW management practices. Few recent studies have systematically evaluated mobile apps for sustainable waste management to determine what persuasive features they offer. For example, in the area of waste management, researchers systematically evaluated 148 mobile apps based on the type of waste management activities and identified distinct persuasive design principles from the PSD framework and how they may be implemented on the apps to support targeted waste management activities (Nkwo et al., 2021). The results of this study showed that primary task support was the most commonly used category by 89% of the apps, followed by system credibility support implemented by 76% of the apps, dialogue support implemented by 71% of the apps, and social support used least by 34% of the apps. Specifically, reduction, personalization, real-world feel, surface credibility, reminder and self-monitoring were the most commonly used persuasive design principles in mobile apps. Another study conducted a user-based study and identified the factors that promote improper waste handling behaviors among students at a university campus in Nigeria. The results of this study showed that the design of the prototype of waste management app motivated students to dispose of their waste properly and protect the university environment (Nkwo et al., 2018). The researchers used social influence strategies of Persuasive System Design (PSD) and personalization to tailor the design to individual performance. This study demonstrated the potential of using persuasive design principle to motivate individuals and groups towards sustainable waste management. This study also showed how these persuasive strategies are employed in the design of mobile apps for sustainable waste management to encourage users to adopt desired behaviors without coercion. The researchers then extended their earlier study to people living in a local community in south-eastern Nigeria. The results of this study, which were similar to the earlier study, were mapped to the relevant persuasive design principles of the PSD framework. These design principles were used to develop socially oriented persuasion strategies for building a mobile persuasion technology to promote positive waste management behavior in communities in the African country (Nkwo, 2019).

Moreover, persuasive technology is closely linked to the processual state of behavior change. To explore how persuasive technology changes behavior in the different stages, Merz and Steinherr integrates the PSD model and the Transtheoretical Model (TTM) with the aim of recommending appropriate design principles according to users' stage of behavior change and the targeted transition. This study linked the 28 design principles of the PSD model to the transitions along the stages of behavior change of the TTM model. For example, in the first stage of transition (I) from precontemplation to contemplation, behavior change support system (BCSS) disclose problem behavior to users in order to raise awareness. Therefore, the most fitting design principles for transition (I) are simulation, social learning, tunneling and normative influence. These design principles are able to reveal the problem behavior to users.

In the next transition (II) from contemplation to preparation, BCSS highlights the problematic behavior and show the benefits of a changing behavior and therefore generate an intention to change. For this stage, tunneling, tailoring, simulation, and social learning design principles are strongly recommended to raise awareness of the problematic behavior and to form an intent to change behavior.

Users who are in transition (III) from preparation to action, need BCSS to get them to perform the target behavior. The design principles of reduction, suggestion, rehearsal, tailoring, praise, social learning,

and normative influence are strongly recommended for this transition. These design principles provide guidance for change, and the social components emphasize the motivation to change behavior.

To help users transition (IV) from action to maintenance, BCSS support users' new behavior and strengthen users' will to maintain their changed behavior. In this stage, strongly recommended design principles are self-monitoring, praise, rewards, reminders, social comparison, social facilitation, cooperation, competition, and recognition.

For the final transition (V) from maintenance to termination, BCSS help users to make habit and change behavior their regular behavior to prevent relapse. For transition (V), self-monitoring, praise, rewards, reminders, social comparison, cooperation, competition, recognition, tailoring, suggestion, social facilitation are recommended to change the behavior.

3. Persuasive Design Principles Employed in Waste Management Apps
Both within and outside academia, persuasive design principles have proven useful in addressing unsustainable waste management behaviors. However, in this section, we present the most relevant sustainable waste management apps that have successfully implemented persuasive design principles from the PSD framework: (1) the iRecycle app, (2) the garbage and waste sorting app, and (3) the waste recycling trash games. These are described below:

iRecycle is an app that allows users to find the nearest location to recycle a variety of common items based on current location, ZIP code, address or city. This app provides access to more than 1,600,000 opportunities to recycle over 350 materials across the United States. The app provides information on 12 types of recycling items on the home screen including batteries, glass, electronics, hazardous materials, household products, paper, and plastic and so on. Users can click on any category (e.g., batteries) to get a list of dozens of items to choose from. This app uses the GPS in the smartphone and its directory of recycling locations to help the user find the nearest recycling location. The interface design of iRecycle app is shown in Figure 1.
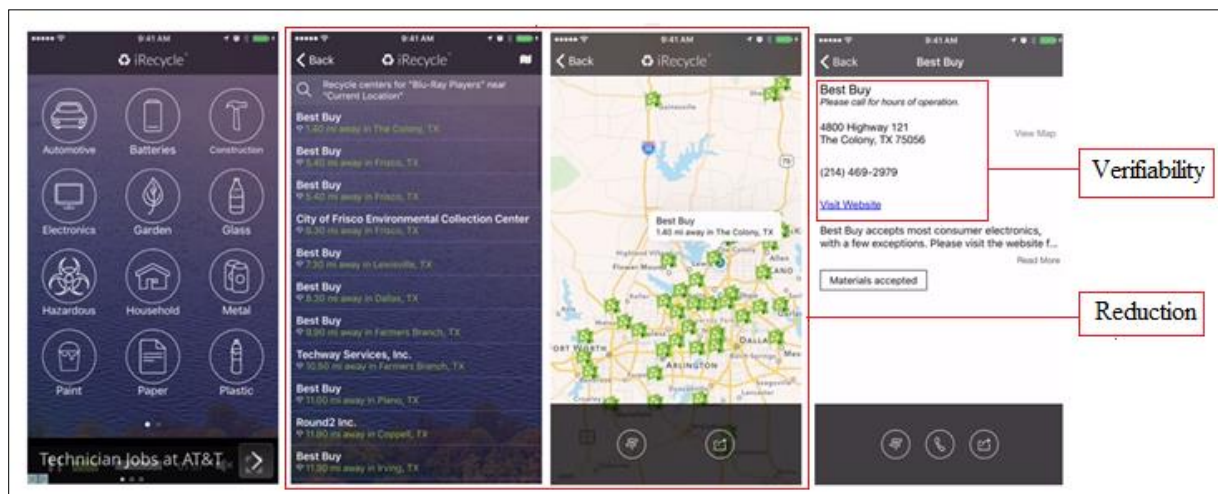

Figure 1: The interface of the iRecycle application

iRecycle application has implemented *reduction* strategy by showing list the names of nearby recycling centers, distance in mile to the user, and providing map that shows a visual picture of nearby recycling location and reducing the time spent in finding the closest one. The *reduction* strategy is applied so that users can complete the target behaviors without much effort. *Verifiability* is another principle that states that credibility principle will enhance if a system makes it easy for users to check outside sources to verify the accuracy of the site's content. The *verifiability* principle in this application

is employed to provide the name of recycling center, a link to their website and contact information to verify the accuracy.

The Garbage and Waste Sorting Guide of Marugame City provides useful information about garbage separation and disposal methods via smartphones. The guide to waste separation was developed for residents of Marugame City in Japan. This app includes a garbage collection calendar, a guide to separate garbage by type, a reminder of the garbage collection calendar, and frequently asked questions and answers about garbage disposal, etc. The user interface can be seen in Figure 2.
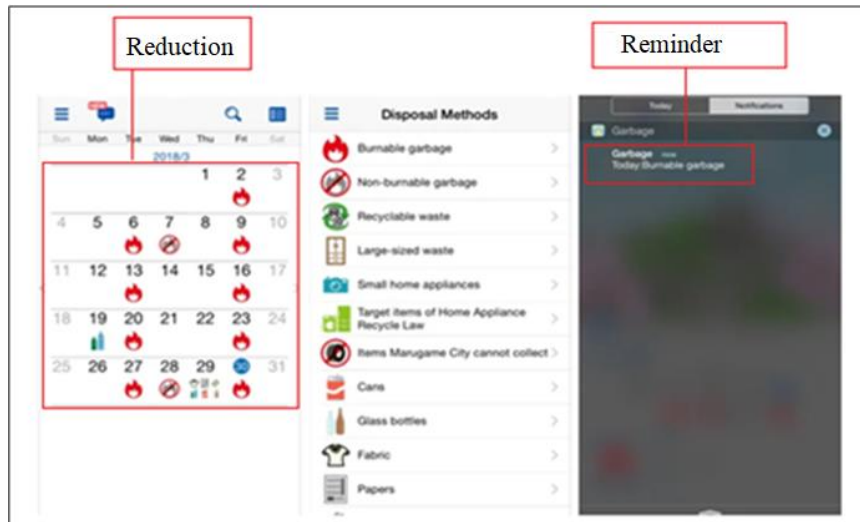

Figure 2: Interface of Garbage and Waste Sorting application

The garbage and waste sorting app has implemented a *reduction* strategy that provides a calendar view of the trash collection schedule with color coding of disposal methods. This strategy aims to reduce the effort for the user to identify and execute the targeted behaviors. The principle of *reminder* is very active in this application by reminding users of their target behavior to achieve their goals. For example, the principle of *reminder* is used in this application through push notification that reminds the user about the date of garbage collection and the type of garbage through the phone.

Finally, Wilaiwan Somboontham (2018) developed Garbage Recycling Trash Games only for the iOS platform to educate people about proper waste separation and help them dispose of their trash in the correct bin. Figure 3 shows the interface of the game. The game consists of 4 different colored bins, such as blue bin (non-recyclable waste), yellow bin (recyclable waste), green bin (food waste), red bin (toxic waste), and the player has to select the piece of waste and dispose it in the correct bin.

In this app, the *personalization* principle postulates that the persuasive system provides tailored content and services to improve the user experience. For example, on Garbage Recycling Trash Games, the *personalization* principle was implemented which allows the user to choose their preferred language. The next principle that is used in the application is the *rehearsal* principle, which allows people to practice a certain behavior so that they can change their attitude or behavior in the real world. It can be observed that *rehearsal* strategy is used to help the user to practice waste separation activities that can help them in their everyday waste separation. The next principle is *praise* which can be used through words, pictures, icons or sounds to give feedback to the user about their behavior. In addition, apps also use the *reward* principle, which provides users with virtual rewards for performing the target behavior. In Garbage Recycling Trash Games, *praise and reward* strategy are used by congratulating the user for completing a level and awarding golden starts for a high score.

Figure 3: Interface of Garbage Recycling Trash Games

Therefore, with the aim of encouraging green practices of waste disposal in the urban community, this study proposes a conceptual framework that integrates persuasive behavior change strategies and Maqasid Al-Shariah perspective. Consequently, in this paper, we hypothesize that a waste management application developed based on this integrated Persuasive-Maqasid framework would be more effective at encouraging green practices of MSW compared to other existing applications in the market.

4. Problems

Promoting environmental sustainability in waste management is a unique opportunity to achieve the policy goals of the Separation at Source Initiative (SSI) in Malaysia. However, the main problems with this existing PSD framework are that it may not work for the Muslim majority of the Malaysian population.

First, the most pressing problem is that the framework is highly generic - in the sense that it is unknown which persuasive behavior change strategies have effect on user intention to change their behavior toward environmentally friendly practices such as reduce, reuse, and recycle.

Second, the existing framework does not take into account how culture influences the way people accept or resist persuasion attempts. As research on persuasive technologies has largely focused on behavior change in the Western community, it is questionable whether similar persuasion attempts would work in the Malaysian community. According to Kolodziej-Smith (2013) different cultural backgrounds perceive persuasive messages differently, understanding the impact of cultural differences on a person's reception or resistance to attitudinal persuasion should be valuable to ensure a successful attempt at persuasion and behavior change. Further, designers need to understand the different needs of people with different cultural backgrounds and values when designing the application (Hoehle et al., 2015, as cited in Nielsen, 2012). Therefore, it is important to consider cultural differences when designing the framework of mobile applications.

Another major problem with the applications on the market is that they have completely ignored the influence of spiritual and religious values on human behavior. Since, Malaysia is a majority Muslim country with 61.3% (19.5 million) of the population belonging to Islam, the role of Islamic values and their influence on Malaysian Muslim behavior cannot be ignored.

Despite the limitation of persuasive technology such as cultural differences, Shariah can be used to facilitate better methods to change the behavior and raise awareness of the importance of appropriate municipal solid waste disposal as a Muslim-majority country like Malaysia. This is because, religion influences culture and culture influence religious beliefs and practices (Zed, 2021). For Muslims, their culture plays a major role in their lives. The Muslims who have faith in Allah (s.w.t.), human performance in persuasive technology should take into account the preservation of religion, life, intellect, lineage and property, which are necessities (daruriyyah) from the perspective of Maqasid al-Shariah. For example, if technology is designed to encourage users to properly separate waste at home and keep their environment clean, then this is in line with the protection of religion, which is also one of the daruriyyah. On the other hand, persuasive technology can take into account to the preservation of life by properly disposing waste to maintain the cleanliness of the home and keep the environment clean. Moreover, technology can be used in conjunction with Shariah to learn, understand and adopt green practices for future generations, and motivate to consume food in moderation in order to protect intellect, lineage, property. Therefore, there is a need to design the applications from a Shariah perspective to serve as a compass for how people should behave in relation to waste management in order to protect the environment and fulfil their obligations to society and their lives.

5. Persuasion from Shariah Perspective

Generally, the term "persuasion" means an effort to change an individual or group's belief, attitude, and behavior. According to Perloff (2016), persuasion is a "communicative process to persuade or influence the person to change their attitude or behavior regarding a matter through the communication of a message in an atmosphere of free choice." Persuasion forms an essential aspect in the field of human interaction. Various types of persuasion help to persuade people to behave in a certain way.

Persuasion always concentrates on man, who is the highest level of creatures in the world, as Allah (s.w.t) said:

> *"And We have certainly honored the children of Adam and carried them on the land and sea and provided for them of the good things and preferred them over much of what We have created, with preference" (Surah al-Isra:70).*

The ultimate goal of persuasion is a communicative act that seeks to influence people. The Quran has such a feature which is to influence people and develop a new attitude in their souls. Prophet Muhammad (PBUH) was sent as a communication role model to influence people and develop new attitudes and behaviors. From the perspective of Shariah, persuasion is a practice between two parties in which one party tries to influence or change the other party's perception of a certain behavior, such as praying on time, giving donations, and taking care of parents (Bawazir et al., 2018).

The principles of Shariah always emphasized the use of a persuasive method to encourage the establishment of strong relationships between people and Allah (s.w.t.) through commitment to His commands and doing good deeds to gain reward from Allah (s.w.t.). Allah said in the Quran:

> *"Let there be a group among you who call ˹others˺ to goodness, encourage what is good and forbid what is evil—it is they who will be successful" (Surah al-Imran verse 104).*

To increase the impact created by persuaders on the minds of end users, persuaders typically use technology to create awareness and persuade behavioral change, with the ultimate goal of increasing well-being and quality of life.

6. Religious Belief as Persuasion in Solving Waste Disposal Problem

Waste disposal problems are cascading and increasingly affecting the environment, human health, and well-being. Human activities, awareness, and their willingness are of paramount importance in

remedying the waste disposal problem. On the other hand, the shaping of attitude, behavior, perception, and practices to solve the waste disposal problem is closely associated with their belief, culture, worldview, and tradition. Hence, religion plays an important role in persuading the new patterns of behavior toward waste disposal. According to Schuman et al., (2018), human behavior is undeniably persuaded by religious beliefs and religion. Such behavioral persuasion includes how people observe and interact with the environment. Another study by Chuvieco (2012) and Tucker and Grim (2016) also highlighted that religious belief is a strong motivation of the environmental concern, as religions include a particular cosmology that explains the role of the human being to the environment. In the context of Malaysia, it is evident that the condition of waste disposal in Malaysia is worsening as the country continues to urbanized, industrializes and populated dramatically. As a country with over 60% Muslims, it is necessary to persuade them to change or improve their behavior to adopt green practices from their religious belief.

Based on the Quranic view, the environment builds upon the belief that Allah is the only creator of the universe. The entire universe was created with perfect wisdom and the perfect ecological balance by Allah and should therefore be preserved as such. The environment is considered an important portion of faith in Islam. It is also observed in the following Quranic verses:

> *"It is He Who created all things and ordered them in due proportions" (Surah al-Furqan: 2)*
> *"Verily in the heavens and the earth, are Signs for those who believe. And in the creation of yourselves and the fact that animals are scattered (throughout the earth) are Signs for those of assured Faith. And the alteration of Night and Day, and the fact that God sends down Sustenance from the sky, and revives therewith the earth after its death, and in the change of the winds, -are Signs for those that are wise." (Surah al-Jathiya: 3-5)*

Further, Islam's main concern is to obey God and the penalties for disobedience. Thus, human beings are always accountable for sustaining and protecting the environment and natural surroundings. In turn, these religious beliefs will persuade people's attitude and behavior to adopt the green practices and will extend the relationship between humans and the environment, as religion warns believers of the consequences of disobedience and exploitation of the environment. Therefore, religious belief can influence attitude and behavior to deal with the problem associated with waste disposal. According to Newman & Fernandes (2016), religious beliefs can influence perceptions and behaviors related to environmental challenges. Similarly, Skirbekk et al. (2021) emphasized that comments, religion is known to influence many aspects of lifestyle that affect the environment, including climate change, natural resource use, greenhouse gas emissions, as well as willingness to take action to mitigate environmental degradation. This is because the kinds of attitudes people hold and the behavior they exhibit are influenced by religion, therefore religious belief plays a large role in persuasion. Therefore, in this study, we believed by increasing Muslims understanding of Maqasid al-Shariah perspectives on proper MSW disposal, will be effective to persuade Muslims to positively change their behavior and attitudes towards environmental sustainability and green practices of waste disposal.

7. Overview of Maqasid al-Shariah

The word Maqasid al-Shariah comes from two Arabic words, maqasid and al-shariah. Maqasid is a plural word meaning "aims" (Majma', 2004), "purposes" or "goals" (Auda, 2008). Shariah is usually translated as "Islamic law". Technically, Shariah refers to what Allah has declared to His servants about al-din (the way of Islam) in the form of the various commandments concerning faith, morals and ethics and actions (Al-Ashqar, 1982; Zaydan, 1985; Al-Qaradawi, 1990). Therefore, Maqasid al-Shariah can be defined as the higher objectives of Legislator (Al-Raysuni, 2005). The main objective of Maqasid al-Shariah is to safeguard the interests of all beings (maslahah). In this study, the Maqasid al- Shariah according to its five-essential objective of Shariah as described by Imam al-Ghazali (d. 505 AH/1111 AD) which are the protection of the faith (din), lives (nafs), intellect (aql), posterity (nasl) and wealth (mal).

7.1 Waste Disposal in Maqasid al-Shariah Perspective

Protection of the environment is one of the goals of Islamic law. In several verses, the Quran commands people to protect the environment. Therefore, violating this command is considered a great sin. The Quran and the Sunnah provide the guideline on how to preserve the welfare of humanity and the environment by eliminating all kinds of damage caused by uncontrolled waste management. Therefore, addressing the problem of municipal waste disposal can be considered a great maslahah (benefit) as it avoids problems related to the opening of new landfills which pose a threat to humanity and the environment. The roles of the Maqasid al-Shariah in waste disposal are as follows:

i. Protection of faith/belief (al-Din):

The first objective of Shariah is the protection of faith, which refers to the right of individuals to practice their faith. Preservation of faith is the most important thing that leads people to understand the greatness of Allah which guides him to fulfill the role of Khalifah (man's vicegerency) religiously towards people and the environment. The word Khalifah in the Qur'an refers to all humans being considered God's agents or stewards on earth, and God establishes clear principles about this stewardship to care of oneself, others, and the planet. As a khalifah, humans have the responsibility to manage, steward and protect the environment, are in fact an 'amanah' (trust) from Allah and should therefore strive to protect it and avoid any behavior that harms the environment (Samori et al., 2017). This notion of stewardship is a powerful concept used to change behavior to protect the environment. Prophet Muhammad (s. a.w.) mentioned in the hadith that "The world is green and beautiful, and Allah has appointed you his guardian over it." The following surah emphasizes the point:

> "Believe in Allah and His messenger, and spend of that whereof He hath made you trustees." (Surah al-Hadid: 7)

The Quran also stated in surah al-Anam verse 165:

> "For He it is Who has made you Khalifa on earth, and has raised some of you by degrees above others, so that He might try you by means of what he has bestowed on you. And thereupon We made you their Khalifa on earth, so that We might behold how you act." (Surah al-Anam: 165)

In addition, the above verses summarize the roles of human that should have with nature. Therefore, it is the duty of Muslims as Allah's stewards and trustees to protect the environment with utmost care. With reference to the above Quranic verses and Hadith, it can be said that effective and efficient municipal waste management is important not only for the protection of the environment but also for the protection of human beings. Consequently, any action to protect and manage the environment, such as minimizing waste, is considered to achieve the goal of protecting the faith. The Prophet (s. a. w.) mentioned in a hadith that the act of cleaning garbage and materials hazardous to health from roads and streets is among the seventy branches of faith. Furthermore, Yusuf al-Qardawi in his book titled Riayah al- Biah fi al-Shariah al-Islamiyah stated that protecting the environment is the same as observing religion (hifddiin), as this is stated in the Qur'an:

> "And do not cause corruption in the earth, when it has been set in order." (Surah al-A'raf:56)

Damage to the environment, misuse and mismanagement of natural resources lead to the elimination of the principle of true faith in religion, harm human functioning on earth, and violate God's commands to preserve the environment, which is related to man's relationship with Allah (s.w.t) (Muslimin et al., 2018). The most important of these goals is to preserve the faith by building the agreed pillars and leaving the agreed forbidden things. In this sense, the preservation of faith is closely related to the management and protection of the environment created by Allah (s.w.t.), and Allah (s.w.t.) warns His servants should not exploit it and use its resources wastefully.

Protecting the environment is another form of ibadah (worship) like prayer and fasting, which is promised with reward in the Hereafter (Nasir, 2017). Therefore, it is our responsibility to respect,

nurture and care for the environment and not to abuse the trust (amanah) that has been given to us. From the Islamic point of view, human is accountable for upholding the unity of Allah's creation and protect the environment and its segments associated with it. On the Day of Judgment, Muslims will be responsible before Allah for how they preserved the balance and harmony of creation. Therefore, every Muslim needs to preserve his/her own faith, and that is by obeying Allah (s.w.t) and fulfilling His amanah, and one way of obeying and fulfilling the amanah is by protecting the environment and avoiding injustice against Allah's earth because that has been commanded in the Quran in Surah al-A'raf verse 85 in following words:

> "...and make no mischief on earth after it has been set in good order. That will be best for you, if ye have faith." (Surah al-A'raf: 85)

The Quran further speaks in Surah Al-Maida, Ayah 64 that Muslims are treated as khalifah or trustees of Allah to protect the environment and Allah does not love those who spread disorder and corruption in the earth. And further similar injunction repeats in Surah al-An'aam verse 141:

> "It is He Who has brought into being gardens - the trellised and untrellised - and the palm trees, and crops, all varying in taste, and the olive and pomegranates, all resembling one another and yet so different. Eat of their fruits when they come to fruition and pay His due on the day of harvesting. And do not exceed the proper limits, for He does not love those who exceed the proper limits." (Surah al-An'aam:141)

Therefore, it can be concluded that the absence of true faith in Allah (s.w.t.) has led to an imbalance and lack of balance between man and the environment. Shariah confirms that man was created to fulfill his role as Allah's Khalifa, to become His obedient servant and thus to preserve the environment to be part of the religion.

ii. Protection of life/body (al-Nafs):

The second objective of Shariah is to protect life. Our safety and health hazard is associated with waste management. People are now continuously producing waste at an insurmountable scale. This accumulation of large amount of waste at landfills increases the carbon and methane emissions that are hazardous to human health. As long as this continues, the danger of human life will likely to increase. Thus, people should be made aware that reducing amount of waste is indeed crucial to protect life and body. The Qur'an warns people to take personal responsibility for their wellbeing and health in Surah al-Yunus verse 23:

> "O people! The excesses you commit will harm only yourselves. Enjoy the (lawful) pleasures of this world" (Surah al-Yunus: 23)

In order to protect our life and body, we should maintain cleanliness of the environment. In Islam, health and cleanliness are linked to purity and purification. This is because a clean surrounding will enable us to save our lives and reduce the toll of disease. Maximize the waste generate cause the environment to lose its cleanliness. With the importance of cleanliness, the Prophet (s. a. w.) has mentioned in a hadith that "cleanliness is half of faith". He (pbuh) also ordered to take care of the cleanliness of the house and garden, "You must clean your house and not follow in the footsteps of the Jews" (reported in Al-Tirmidhi)". Moreover, Allah (s.w.t.) also loves cleanliness. This is also mentioned in the Quran:

> "He loves those who keep themselves pure and clean". (Surah al-Baqarah: 222)

Moreover, the Prophet (PBUH) also cared for the cleanliness of the road, and asserted that "Whoever harms Muslims in their paths is cursed" and "removing harmful things from the roads is a charitable act" (Bukhari and Muslim)". Considering the importance of cleanliness in Islam, it is therefore our religious duty to be clean and lead a hygienic lifestyle, including body, clothing, household as well as our surroundings.

iii. Protection of intellect/reasoning (al-Aql):

The third objective of Shariah is the protection of the intellect. According to Sarkawi et al., (2015), the protection of the intellect covers the way for people to gain knowledge and be able to judge right from wrong. There are many verses in the Quran that mentioned about the intellect in action shows that thinking is obligatory and strongly encouraged. Qur'an motivated people to use their intellect by asking a question *"afala ta'qilun"* (will you not use your intellect?). Therefore, in the context of waste management, people should feel obliged to learn green practices (reduce, reuse, recycle) that would assist them to make a good judgment in handling municipal solid waste disposal at home.

The most effective way to increase environmental awareness of green practices (reduce, reuse, recycle) is to acquire environmental knowledge and education. Apart from government plans and campaigns, the success of effective waste disposal depends on our attitude, behavior and contribution, which are strongly influenced by our knowledge. Thus, there is an opportunity to improve our daily behavior in dealing with household solid waste if our knowledge of environmentally friendly waste management practices is improved.

iv. Protection of lineage/prosperity (al-Nasab):

The fourth aim of Shariah is the protection of lineage. Islam pays great attention to social life through the preservation of lineage. The existence of human being on earth is the will of Allah. The natural wealth of the environment that exists is not only to be enjoyed but also to be provided for the next generation. To harm the environment is to deprive it of its rights. The current generation is obligated to preserve its environment as a form of responsibility (Weiss, 2017).

The protection of generations is part of the preservation of descent, human honor, and moral descent. Therefore, to achieve this goal in the context of waste disposal, people should be made aware that we can reduce air and water pollution through green practices. So that our children (offspring) can grow up in a healthy natural environment. The use of environmental resources is bound to a certain period of time. Allah mentioned in the Quran:

> *"On earth will be your dwelling-place and your means of livelihood - for a time." (Surah al-Baqara: 36)*

The above verse sums up that the definite time frame obliges man to use the natural resources accurately as they belong not only to the present generation but also to the future generation. Moreover, our greed, extravagance and ignorance should be prohibited in order to get the maximum benefit from the natural resources, especially for the future generation. It is our duty to protect the resources from pollution and waste, and to adopt the 3Rs to pass them on in good condition to the next generation to enjoy the benefits.

v. Protection of wealth (al-Maal):

Allah has created wealth as a support for human life. Property is not always money or gold, but also natural resources such as land, trees, plants, animals, water and oceans that need to be protected. The preservation of property is a goal that must be wisely protected because of its close relationship to environmental protection and the preservation of its capabilities. Islam has strongly emphasized the wise use of natural resources and the environment. In this regard, any overconsumption, such as wasting food, is indeed non-Islamic as it leads to harmful effects on the environment, such as opening new areas due to inadequate landfills, which eventually lead to an increase in carbon and methane emissions. The Quran has ordered in Surah al-Araf verse 31:

> *"Eat and drink: But waste not by excess, for Allah loveth not the wasters." (Surah al Araf: 31)*

The above verse is sufficient to show the dislike of Almighty Allah (s.w.t.) towards the extravagant people. Moreover, Islam forbids extravagant behavior and excessive consumption. Meanwhile, it

encourages moderation in all actions and practices. The Qur'an praises the behavior in Surah al-Furqan verse 67:

> *"those who, when they spend, are not extravagant and not niggardly, but hold a just (balance) between those (extremes)." (Surah al-Furqan: 67)*

Further, Rasulullah (pbuh) stated that the best of all practices lies in moderation. With regard to this environmental protection, as unreasonable excess is more likely to harm the objectives. Therefore, to minimize the waste, our consumption should be based on an overall order and balance of nature. Therefore, to minimize waste, our consumption should be guided by the overall order and balance of nature. The Quran practices an ecological theme when it exhorts mankind to moderation. This is evident from the commandments laid down in the Quran:

> *"It is He who produces gardens, both cultivated and wild, and palm trees and crops of diverse kinds and olives and pomegranates both similar and dissimilar. Eat of their fruits when they bear fruit and pay their dues on the day of their harvest, and do not be profligate. He does not love the profligate." (Surah al-An'âm: 141).*

Thus, Shariah provides both the moral norms and the legal structure where Muslim state can make concrete decisions regarding specific ecological issues. In an Islamic context, Shariah is not only essential for decision making but also provides exceptional examples for theoretical discussion of Islamic environmental beliefs (Mamat et al., 2017). Therefore, it can be accomplished that whatever theories and beliefs are applied in the perspective of environmental science, as long as they are based on the idea of stewardship (khilafah) which is the responsibility (amanah) assigned by Allah in the implementation of Shariah application, it will surely lead to sustainable environmental protection.

Furthermore, from the Islamic perspective, psychology is not only the study of behavior, as Western scholars like to propagate, but is primarily concerned with spiritual matters. According to Othman (2017), not only is the presentation of behavior important, but the spiritual dimension that triggers a particular behavior should also be studied. Therefore, we proposed an integrated persuasive behavior change framework based on Maqasid Al-Shariah to promote green practices -3R (reduce, reuse, recycle) of municipal solid waste disposal in an urban community.

8. The Conceptual Framework

Figure 4 illustrates the conceptual framework of the study and explores new ways to persuade the Malaysian community to change their behavior to adopt green practices (3Rs) from the perspective of persuasive technology and Maqasid al-Shariah. As a first step, Maqasid al-Shariah will raise the awareness of the urban community on waste disposal behaviors and practices according to the five essential objectives of Shariah as described by Imam al-Ghazali (d. 505 AH /1111 AD), namely the protection of faith, life, intellect, lineage and wealth. The literature supports this framework in which Maqasid al-Shariah raises awareness of the importance of municipal solid waste disposal by including important elements such as moral obligation as a khalifah towards waste management, health and safety behavioral practices, acquiring knowledge about the 3Rs, awareness of adopting the 3Rs for the future generation and moderate food consumption. Maqasid al-Shariah shape behavior for appropriate waste disposal to ensure that all activities are in line with Shariah objectives. Therefore, Maqasid al-Shariah will be integrated with persuasive technology to motivate Malaysian citizens to adopt green practices in their actual behavior. In the next step, the design of the sustainable waste disposal prototype to uncover the persuasive behavior change strategies is based on the four categories of Persuasive Design Strategies such as primary task, dialogue, system credibility, and social support. These strategies will be used with a mobile app to change the behavior of the end users through persuasion without using any kind of coercion or deception to adopt green practices. We chose this framework because it is the most commonly used model for reviewing persuasive systems to identify strategies that effectively help users achieve desired tasks and target behaviors. Therefore, designing a persuasive technology product

based on Shariah perspective can certainly help designers to develop very efficient systems that promote the Islamic community and benefit the end users. Accordingly, it is very apt to conclude that persuasive technology with mobile apps combined with Shariah perspective can provide new and amazing ways of interaction to a wide audience and encourage them to become more aware of the waste management problems.
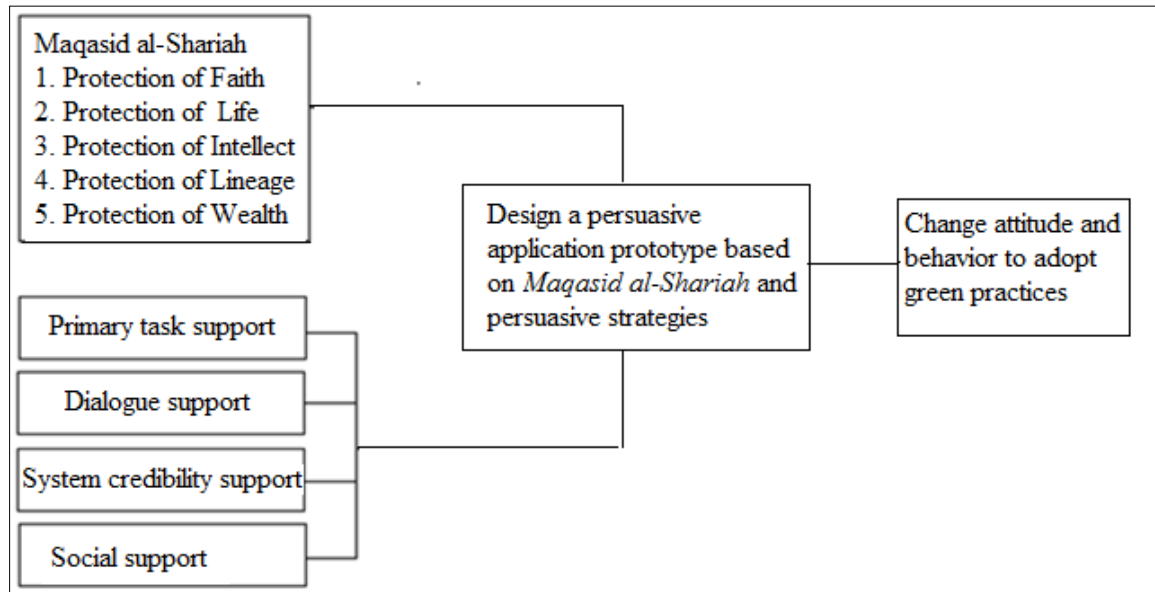

Figure 4: Proposed conceptual framework on integrated persuasive-Maqasid MSW disposal

9. Conclusion

Persuasive behavior change strategies are increasingly used in numerous areas to encourage, influence and persuade users to adjust and improve their attitudes and behaviors. Therefore, it can be said that persuasive technology can be considered as a necessity to achieve high benefits for achieving the target behavior. Islam effectively encourages Muslims to adopt positive waste disposal behavior and to take more care of their immediate surroundings. Therefore, it is necessary to use persuasive technologies such as mobile apps to encourage sustainable behavior changes towards environmentally friendly practices (reduce, reuse, recycle) in waste disposal in accordance with Shariah, as preserving the environment is an obligation for every Muslim. The outcome of this research work will be beneficial as it will increase urban community awareness on the importance of MSW disposal from the perspective of Shariah. This will further reduce risks to health and environmental problem. Plus, as the recycling rate increase, there will be increasing demand for new recycling centers leading to more job opportunities. Besides, government expenditure on waste management would be reduced.

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