Smart Community Conceptual Model for Future Digital Generation

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ABSTRACT

To date, there are many research focus on technology in smart city projects. The nucleus of smart city implementation is the people or the smart community. There are also few studies conducted, which involve smart community dimensions in smart city development. The Ernst & Young Institute Japan (EY) reports' on the lack of citizen involvement as a serious problem that needs to be resolved in order to develop citizen-friendly has drawn the attention. Thus, this paper scrutinises the concept of the smart community model to support the implementation of a smart city. This study aims to propose appropriate dimensions of the smart community model as the community involvement is important to realise the implementation of the smart city. The methodology used is a systematic text analysis, where various existing models are chosen and current literature review is synthesised. Then, the findings of this study is a proposed conceptual design of smart community to complement the smart city implementation. The three dimensions are proposed namely people, technology and innovation in a smart community model together with sub components. In the future, the study of the efficiency of smart community implementation towards society development should be a concern.

KEYWORDS: Smart Community, Smart Citizen, Smart City, Digital Nation, Information Age.

INTRODUCTION

Smart community is not a new concept in this century. It evolves in line with the development of smart city. The main idea of smart community is how cities and communities use information and communications technology (ICT) to support growth and enrich lives through enhanced and diversified economies, and solve social and infrastructure problems [1]. In Malaysia, the main objective of smart community development is to change and improve the community's lifestyle through the use of ICT technology [2]. The smart city is defined as a city that uses technology to transform its core systems to digitised systems, which can be interconnected to each other and can optimize the return from largely finite resources [3]. According to [4], people, education, learning and knowledge are central importance to smart city.

Despite the fact that the smart cities were successfully developed by countries like Japan, Australia, Europe and Spain, the engagement of the community is still lacking when in fact people or community is one of the components in smart city development. In [5] also agreed that citizens or communities are the heart of smart city projects and have often been insufficiently engaged, motivated and empowered to contribute. Thus, the existing smart community model needs to be reviewed to create another potential model for efficient implementation. Looking at the importance of smart community for future generation, this research is carried out to propose a conceptual smart community model with identifies the different sub-systems of the concept. This study will focus on smart community model which correlates with smart city execution.

To discuss further, this paper is organised into five parts. Part 2 explains the method that will be used to analyse the findings derived using the content analysis method. Part 3 clarifies the concepts of smart community and its components. Part 4 introduces the proposed Smart Community Model towards digital nation. The last part, Part 5 concludes the study with the discussion of the proposed model and future research that can be done.

RESEARCH DESIGN

The research method used was a systematic text analysis adopted from [6]. Most of the papers are from white papers, technical reports, conference proceedings and published journals. The keywords search used were "smart community" or "smart communities" or "smart citizen" or "smart people" and "smart city". Since the smart community concept is correlated and subset to smart city, the searching information also includes the smart city project. Figure 1 illustrates the research design procedure for this study. An extensive literature

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review has been conducted among 19 selected papers by determining the research area, search query strings and database. The content analysis or systematic text analysis has been chosen as a tool for analysing and interpreting literature sources.
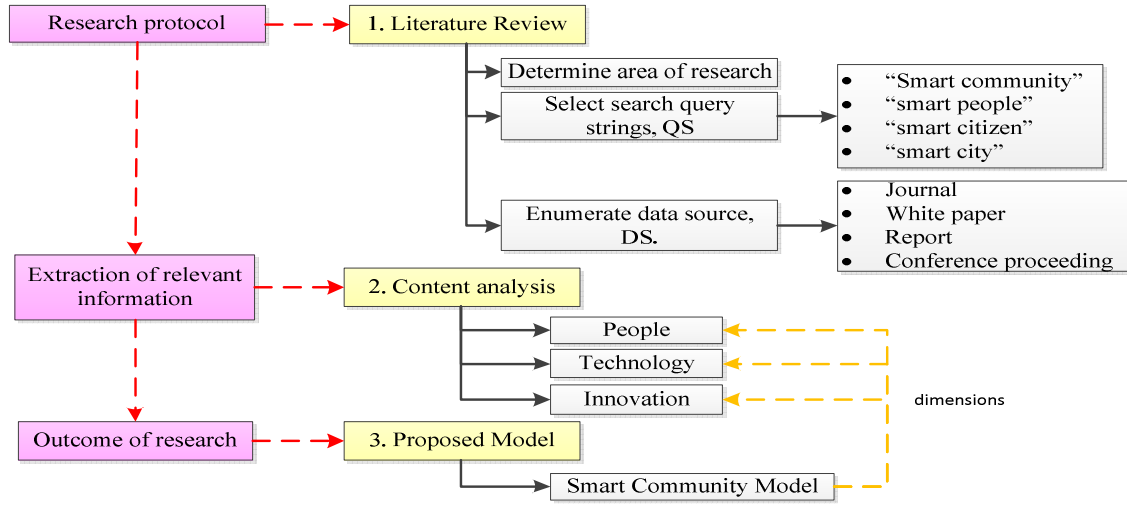

Figure 1: Research design procedure

OVERVIEW OF A SMART COMMUNITY

Many research emphasis on the development of technology towards smart city projects. They focused on saving energy that supports the green environment, ICT applications which support the communication and utilities and infrastructure which support the quality of life. However, some of the studies on smart city is actually correlated to smart community. According to [7], characteristics of a smart city is divided into six components specifically smart economy, smart people, smart governance, smart mobility, smart environment and smart living (refer Figure 2), while from[8] view, smart city is immensely valuable if eight components including smart citizens are integrated. The components are smart energy, smart buildings, smart mobility, smart technology, smart healthcare, smart infrastructure, smart governance and smart citizens. Smart people or smart citizens here means a smart community, which is a subset of the smart city concept. Without the engagement of a smart community, the smart city development may fail. Consequently, the discussion on smart community is also correlated with smart city.
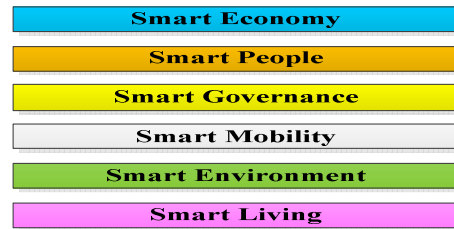

Figure 2: Smart city characteristics [7]

As a successful country with smart community technology, Japan's studies emphasise more on the technology and infrastructure development. While in Malaysia, the focus is on transforming lives with ICT applications and to educate citizens with the technology so that they could be economically competitive. These are two different views of a smart community; infrastructure technology and people. Accordingly, the definition of smart community needs to be determined in this study. Table 1 shows the various definitions that have been used to represent smart community concepts from different sources and identification of components in smart community. Smart community or smart people consist of citizens, which use ICT applications to enrich lives and economic growth. The initial components of smart community derived from definition in Table I which are ICT, quality of life, social, infrastructure, government and decision making.

In planning to set up a smart community, the appropriate components underline it need to be identified. In Malaysia, there are eight principles underpinned the smart community; bottom-up approach, enhancement of community infrastructure, content that meets local needs, role of local authorities, institutional collaboration, role of local champion, replicability, scalability and reachability and sustainability. The concept can be replicated easily from community to community by integrating these principles. In [8] listed seven components namely smart community planning, governance, health, citizenship, infrastructure, resources and dwellings.

Table 1: Definition of smart community and its components

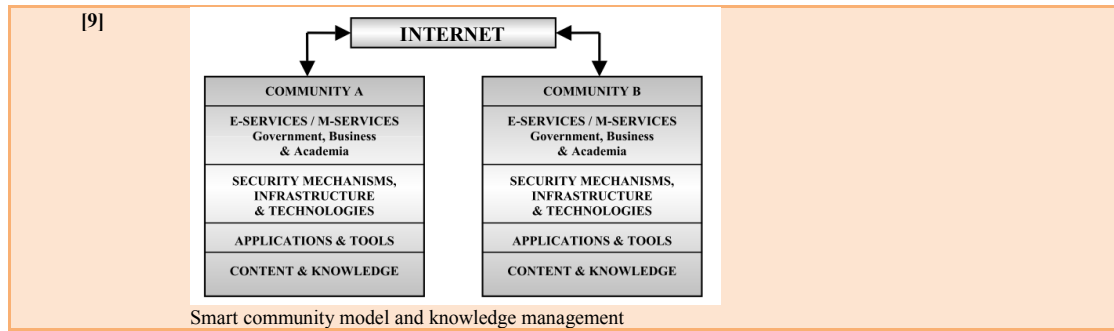| Definition	Components	Source
Smart Community explores new information and communication technology (ICT) inventions and innovations that will create jobs and economic growth as well as improve the overall quality of life.	Information, ICT, economic, quality of life	[9]
Smart community consists of citizens and businesses which have digital skills and capabilities to use current and innovative technologies, ability to access data and participate in decision making for themselves to improve growth and enrich lives.	Citizens, business, digital skills, innovative technologies, decision making.	[1]
"A smart community is a community where various next-generation technologies and advanced social systems are effectively integrated and utilized, including the efficient use of energy, utilization of heat and unused energy sources, improvement of local transportation systems and transformation of the everyday lives of citizens"	Social, energy, transportation, lives of citizens.	[10]
Smart community is an initiative partnership among community; institutions and organisations, governments, local business and private sectors towards digital economy.	Community, institutions, organisations, governments, local business, private sectors, digital economy.	[11]
"Smart communities are a collection of interdependent human-cyber-physical systems, where internet of things (IoT) represents the sensing and actuating cyber-infrastructure to estimate the state of human and physical systems and assist in adapting/changing these systems."	Cyber infrastructure, human physical system.	[12]
"A smart community is a group of citizens that work together to leverage information technologies in the creation of economic, cultural and social value or for supporting decision-making of actions which are to be implemented by the government or local authorities."	Citizens, information technology, economic, cultural, social, decision making, government.	[13]

A report by Broadband Today Alliance [1] listed three components (smart infrastructure, capacity and innovation) of smart community that are more towards a smart city project. There are ten principles and enablers for citizen engagement in smart city focus; simple (understanding and usage), reciprocal (fair and lasting relationships), participative, balanced with representative (understand benefits and limits of approaches), inclusiveness (solutions that are representative of the whole population), push approach not pull (people will come to you), online-offline balanced interventions (understand benefits and limits of different settings), privacy and rights (build trust), citizens' emotions (understand the feelings), change-enablers with city stakeholders (make the municipality a partner) and wallet-savvy (use citizens' own funds in smart ways that benefit citizens) reported by European Innovation Partnership (EIP) [14].

Japan Smart Community Alliance [10] enlisted eight technologies incorporating the smart community which is home area network technologies, energy saving technologies, transportation system, water infrastructure, information and communication technologies, urban infrastructure design, gas supply system and power system stabilisation. Again, these components are towards smart city technology rather than people engagement. The integration of ICT and energy with services in society such as electric vehicle as transportation, home ICT, agricultural, healthcare system, public administration, business and education research (e-learning, e-whiteboard) proposed by Miura [15] will make people become more intelligent and more competitive. The component of smart community proposed by [9], consists of e-services, security technologies, applications and tools and content and knowledge layers which are linked via Internet interface. The detail components of smart community are in Table 2.

Table 2: Smart community components

Author	Components of Smart Community Model
[8]	• Smart Community Planning-supporting citizen involvement in the delivery of "Smart Services • Smart Community Governance-providing a public scrutiny of municipal budgets, including providing the funding for the training and support • Smart Community Health-supporting decentralized health support workers and facilities including public health facilities. • Smart Community Citizenship-support location based electronic interaction among citizens to support participation/intervention in municipal planning and programme design processes.

	• Smart Community Infrastructure-citizens can report on issues concerning public infrastructure in an aggregated way based on location • Smart Community Resources-digital support for administrative decentralization for citizen participation in decision making. • Smart Community Dwellings-digitally enabling public land use and dwelling records in local communities.
[1]	• Smart infrastructure (connectivity, regulation and planning for digital infrastructure) • Smart capacity (digital inclusion, skills and employment, digital economic development) • Smart innovation (innovation, e-government, mobility, open data and information marketplaces, digitally enabled utilities)
[14]	Principles and enablers for citizen engagement in smart city project: • Simple-aim to facilitate understanding and usage • Reciprocal-'Give for getting' to create fair and lasting relationships • Participative, balanced with representative-Understand benefits and limits of approaches • Inclusiveness-Ensure solutions that are representative of the whole population • Push approach not pull-Go where people are instead of assuming they will come to you • Online-Offline balanced interventions-Understand benefits and limits of different settings • Conscious of privacy and rights-Build trust from the start • Conscious of citizens' emotions-Understand the feelings that flow on or under the surface • Change-enablers with city stakeholders-Make the municipality a partner • Wallet-savvy-Use citizens' own funds in smart ways that benefit citizens
[2]	 Principles of smart community in Malaysia
[10]	 Smart community incorporates state-of-the-art technologies of all fields
[15]	 The age of convergence as a society

Smart community model and knowledge management

Who is the Smart Community?

Example of stakeholders who is involved in smart community creation are local authorities or government, citizen or people, companies, industries, NGOs, universities, utilities, ICT companies, energy companies, funders, financial institutions, planners and architectures. However, it can be categorised into four main groups: people, government, industries and universities [3].

Current implementation of a Smart Community

This section will look at some of the examples of smart community projects. In Malaysia, smart community has been introduced to transform lives with ICT applications. The first smart community project was in Kemaman, one of the districts in Terengganu, a state of Malaysia. There are six flagship projects proposed; flood management system, documentary 'Malaysia's Flood Warrior, hackathon, "Pusat Internet 1Malaysia", Kemaman Innovation Centre and lifelong learning. The implementation is still in the early phase. This concept will be applied to other states in Malaysia. The components of smart community in Malaysia are ICT infrastructures, devices, applications, local champions, KPI objectives, institutions and security/data.

Japan is one of the best examples of smart community technology development in a smart city environment. Some of the The Japan's core smart community projects are in Yokohama, Kitakyushu, Keihanna and Toyota City. The research on smart community and smart city is more on technology, infrastructure and energy. Japan Business Alliance for Smart Energy Worldwide (JASE-W) has proposed a smart community applications consist of smart schools, smart houses, smart stations, smart parking and power generation which are centralised by energy management system [16].

The implementation of smart community in Japan and Malaysia differs. Japan is more on technology while Malaysia is more on people or citizens. We choose Japan as a benchmark because, Japan has started the smart city early and has a successful story. However, there is lack of smart community engagement study of Japan. So, we are trying to compare the component of smart city and smart community in order to construct the smart community model. The next section discusses on the smart community model which balances these two domains namely technology and people.

A PROPOSED SMART COMMUNITY MODEL

The collection of data from literature review conducted reveals that the three dimensions used in smart community are people, technology and innovation. The dimensions and components related to the implementation of smart community is determined based on literature review analysis as shown in Table 3.

Table 3: Conceptual relatives of smart community

Dimensions	Components	Literature
People	Quality of life	[7], [2], [5]
	Citizenship	[8], [2], [5], [7]
	Governance	[7], [2], [5], [17], [18]
	Communication	[1], [5], [18]
Technology	ICT	[15], [10], [2]
	Energy	[15], [1], [10]
	Infrastructure	[8], [9], [10], [1], [9], [2]
Innovation	Innovation	[1], [2], [7], [17]
	Mobility	[1], [5], [7], [17]
	Open data and information	[1], [2], [5],[17], [18]
	Digitally enabled utilities	[1], [5], [18]

The proposed model for smart community creation is illustrated in Figure 3. The three dimensions; technology, people and innovation are important dimensions in the creation of a smart community. Each of the dimensions has several components underpinned.
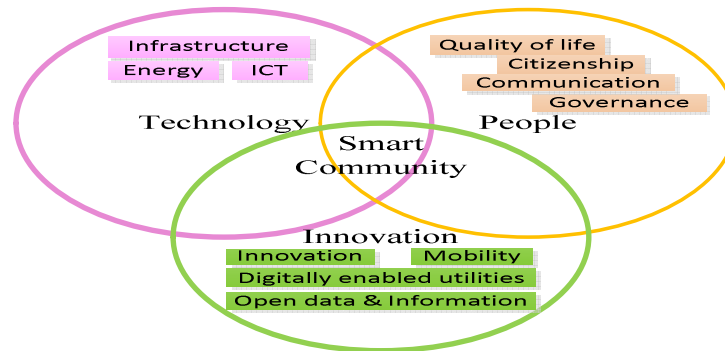

Figure 3: Smart community model

Technology Dimension

Technology is the platform that allows interaction among people in a smart community. The technology includes ICT, energy and infrastructure to develop the smart city environment. Many research has been done on these components, especially in energy saving such as the use of green technology and power saving technology for the environmental ecosystem. Japan has focused more on the energy saving development by producing a research centre. Currently, the use of mobile device together with internet technology shows the community is in the path to the engagement in a smart city project. The development of many applications in mobile technology such as in education, transportation and health educate citizen with the technology.

People Dimension

The second dimension is the people or citizen or any stakeholders engaged with the smart community existence. Together with the use of technology, it can improve the quality of life, communication and governance. The popularity of social media nowadays can be used as a channel for citizenship engagement with other stakeholders. For example, the adoption of social media namely FUPOL, a web-service used to connect the community [14]. Besides that, the latest technology, cloud computing platform for administrative management processes also can increase the engagement of citizens [5]. The community must have creativity, certain levels of education, skills and willingness to share knowledge. The governance role is to act as a mediator to monitor the implementation of smart community to succeed. They create policies, regulations and medium for collaboration and participation of citizens[13].

Innovation Dimension

The last dimension is innovation which consists of innovation application, mobility, open data and digitally enabled utilities. Innovation support people, culture and creativity through technology applications. For example, the existence of real-time system in education, health care and transportation, improving the service to citizens using digital platform. System detecting congestion hotspots for example, helps the people to move around easily and efficiently. In Barcelona, the distribution of "smart citizen kit" devices to citizens help to monitor the environmental data such as temperature, humidity, light, sound, carbon monoxide, nitrogen dioxide, nets and solar panel [18]. Another example of open data and information is the Comprehensive Knowledge Archive Network (CKAN), an open source content management system (CMS) for the storage, publication and distribution of open data [5].

DISCUSSION AND CONCLUSION

This paper has portrayed the concept of smart community engagement in the smart city project clearly. The use of ICT in various activities by community leads to the improvement in everyday life. The extensive analysis of literature review has suggested three dimensions; technology, people and innovation for important elements need to be highlighted in order to develop a smart community to be competitive. These dimensions also act as a guideline to develop the future smart community. Technology is an enabler for community to stay competitive in the future, while the smart community or smart citizen is a collaboration of various stakeholders such as authorities, researchers, schools, citizen science, communities, cities and also developers. The proposed conceptual model can be tested to the Malaysian initiative project at Kemaman. This model can be applied to

ASEAN country which has the similarity culture and people and also can be customised accordingly to the community in the specific country.

Malaysia is one of the countries on the route to develop a smart community for digital nation by the year 2020, yet the conceptual dynamics of smart community or smart people has not been highlighted totally. Citizens play and important role in nurturing the eco-system for social and economic growth. Engaging citizens in municipal seen as an approach to contribute better decisions in decision making and encourage open and participative information sharing [19].

The smart community's success depends on the acceptance of citizens to adapt and adopt the technology. The government as an authority should get community participation in the smart community projects driven by principles such as bottom-up approach, enhancement of community infrastructure, content that meets local needs, role of local authorities, institutional collaboration and role of local champions [2].

This study only looks at the concept of smart community in the smart city project and identify the appropriate dimensions in engaging the smart community in the smart city project. In the future, this study can then be extended on contribution of smart community in the development of smart city, challenges faced by smart communities in a digital age and the stakeholder analysis to identify the roles and responsibilities to make the smart community successful. The smart community proposes a model that can be extended, verified and mapped into present smart community projects. This model may be helpful to the policy makers, practitioners and industries in developing more innovative applications towards smart community implementation. Thus, we hope that our proposed model gives contribution to the body of knowledge in engaging citizens in smart community concept.

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