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SMART CITY READINESS BASED ON TECHNOLOGY- ORGANIZATION-ENVIRONMENT (TOE) FRAMEWORK :A CASE STUDY IN MELAKA

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OUTLINE OF THE PRESENTATION

RESEARCH BACKGROUND

GLOBAL

- Globalization, urbanization, and industrialization were perceived as three primary factors that added to human culture in the 21st century (Lee, J., Hancock, M.G., and Hu, M., 2014).

- The rapid urbanization that has occurred in the last decades has resulted in numerous urban issues such as congestion, noise, protection and natural resource degradation.

- In the global context, smart cities are used as one of the approaches to resolve urbanisation issues and improving the quality of life of society.

MALAYSIA

- On 23 September 2019, the Ministry of Housing and Local Government unveiled the Malaysia Smart City Framework (MSCF) 2018, which will act as a framework for local governments throughout the country to transform cities into smart cities.

- Malaysia Smart City Framework aims to tackle urban problems and challenges in order to achieve three main pillars of a sustainable economy, a stable environment and a better quality of life. The seven main components of Malaysia's smart city are:
  i. Smart Economy
  ii. Smart Living
  iii. Smart Environment
  iv. Smart People
  v. Smart Government
  vi. Smart Mobility; and
  vii. Smart Digital Infrastructure

PROBLEM STATEMENT

The rapid urbanization that has taken place in recent decades has led to numerous urban issues, such as congestion, pollution, health and the depletion of natural resources.

- **Smart cities are used as one of the strategies in the global sense to address urbanization problems and enhance societies' quality of life.**

- **Smart City is seen as a new approach to urban management and growth to make Malaysia's cities more sustainable and viable.**

- **In Malaysia, the need to develop Smart City can be attributed to the following:**
  - **i. Tackling urban challenges resulting from rapid urbanisation**
  - **ii. To meet national and global agendas**
  - **iii. To adopt new global development trends**
  - **iv. To promote digital economy**
  - **v. To put Malaysian cities to be on par with other cities worldwide**

RESEARCH OBJECTIVES

01 To investigate the technological, organization and environmental readiness factors.

02 To understand the challenges faced in developing Malacca Smart City.

RESEARCH QUESTION

01 What are the factors that influence the development of Malacca Smart City?

02 What are the challenges faced in developing Malacca Smart City?


LITERATURE REVIEW
SMART CITY

SMART CITY DEFINITIONS

1. The city is smart when investment in human and social capital and in traditional (transport) and digital (ICT) connectivity networks promotes sustainable economic development and a high quality of life through participatory governance and wise management of natural resources. **Caragliu et al. (2009)**

2. A city that succeeds well in the economy, environment, governance, mobility, climate and lives in a forward-looking way, based on a smart mix of self-determination, self-reliance and knowledge of citizens' endowments and activities. **Giffinger et al. (2007)**

3. The smart city idea also involves the use of information and communication technology (ICT) on the role of human capital / education, social and emotional capital and environmental issues. **Lombardi et al. (2012)**

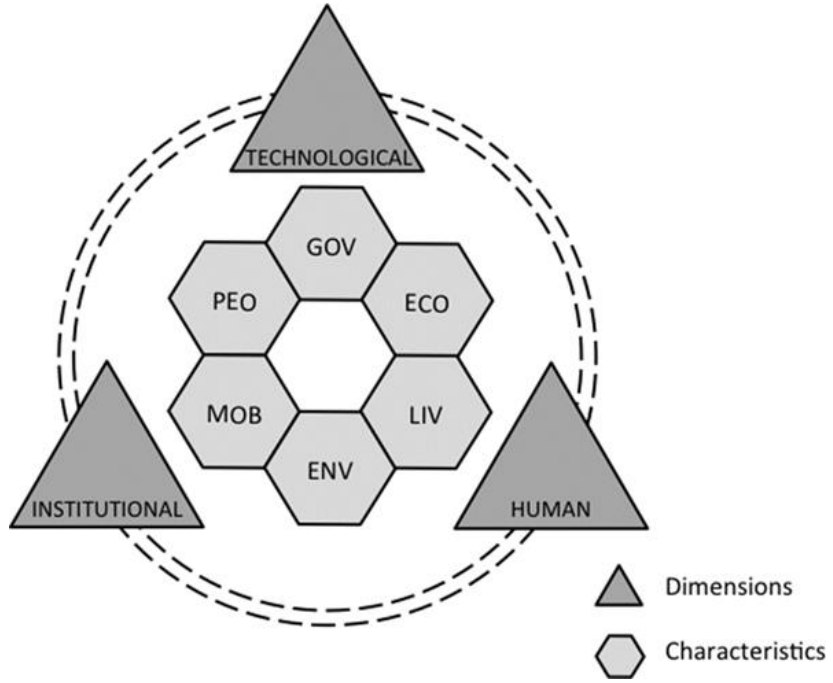
4. Smart City is a well-performing city with six "smart" characteristics in a forward-looking way, founded on the "smart" combination of self-decisive, autonomous and aware civic endowments and activities. **www.smart-cities.eu(2014)**

Dimensions and conceptual relatives of a Smart City (Nam and Pardo, 2011)

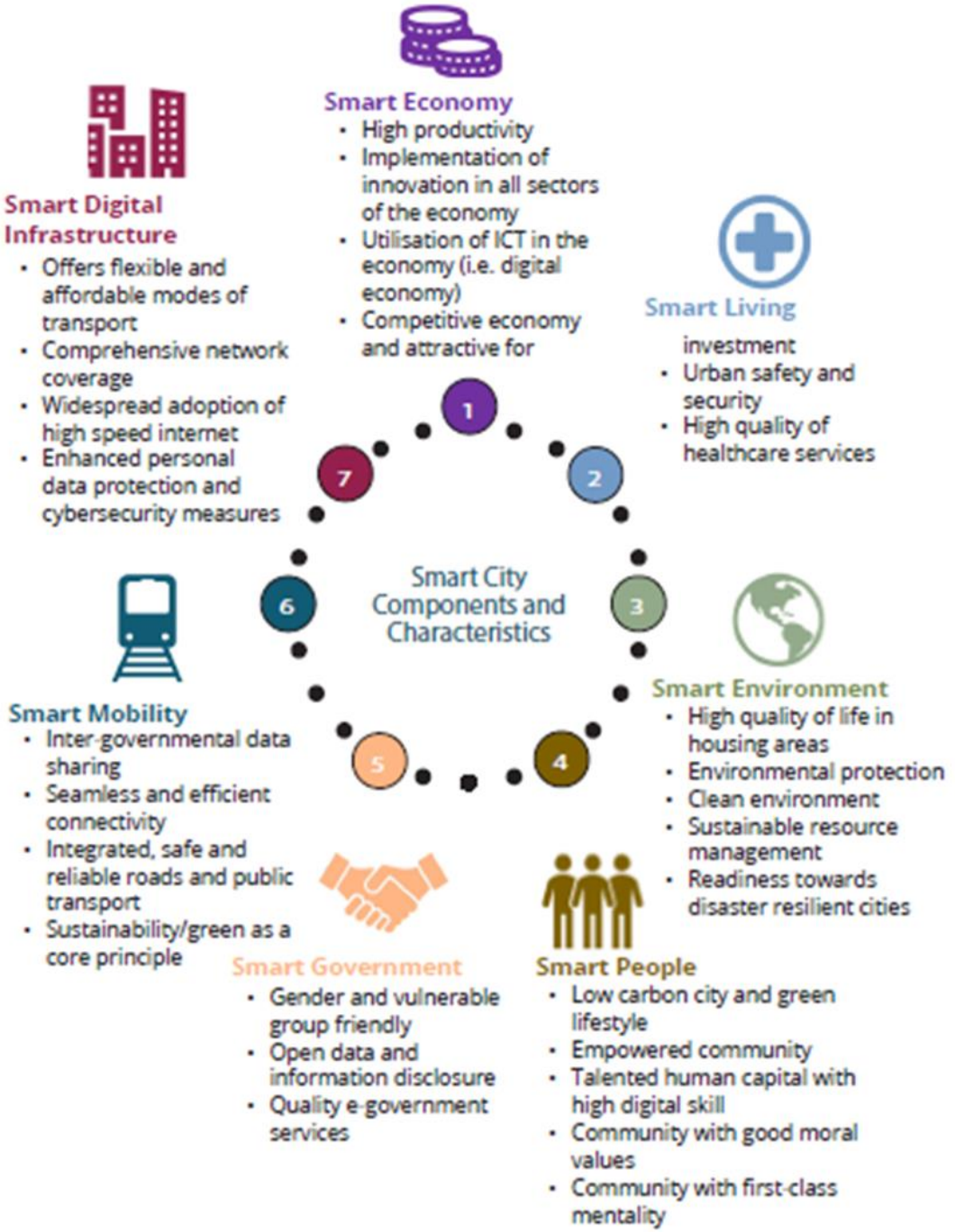
Dimensions	Concept	Factors
Technological	Digital city	Physical infrastructure
	Intelligent city	Smart technologies
	Ubiquitous city	Mobile technologies
	Wired city	Virtual technologies
	Hybrid city	Digital technologies
	Information city	
Human	Creative city	Human infrastructure
	Learning city	Social capital
	Humane city	
	Knowledge city	
Institutional	Smart community	Governance
	Smart growth	Policy
		Regulations

Smart city characteristics (Giffinger et al., 2007; Caragliu et al., 2011; Vanolo,2014)

Characteristic	Theory	Feature
Smart Economy	Regional Competitiveness	Entrepreneurialism, Innovation, International integration
Smart People	Human and Social Capital	Flexibility, Creativity, Tolerance, Qualification level
Smart Governance	Participation	Transparency, participation in decision-making, quality of political strategies
Smart Mobility	Transport and ICT Economics	Accessibility, ICT availability, modern and sustainable transport systems
Smart Environment	Natural Resources	Sustainable resource management, Natural attractiveness, Lack of Pollution
Smart Living	Quality of Life	Educational, Cultural and Health facilities, Safety, Housing, Social Cohesion, Tourist attractions



Three dimensions and six characteristics of a smart city (Carlo F Capra et al. 2016)



MALAYSIAN SMART CITY

The Malaysia Smart City Framework (MSCF) is a national framework that serves as a guide and reference to local authorities as city managers, state governments, federal ministries and agencies, industry players, academics and other stakeholders in Malaysia 's comprehensive planning and growth of smart cities in line with current developments.

Smart Cities initiative that has been started in Malaysia such as:

SELANGOR

Smart Selangor to turn Selangor into a smart state by 2025

PUTRAJAYA

Putrajaya's vision is to transform itself from a Garden City into a Green City by 2025

MELAKA

Smart metering for electricity monitoring.
Smart City Advisory Council to make Melaka as one of the Smart City in Malaysia in 2030.

PENANG

Smart City Blueprint for Penang by year 2022.

CONCEPTUAL FRAMEWORK

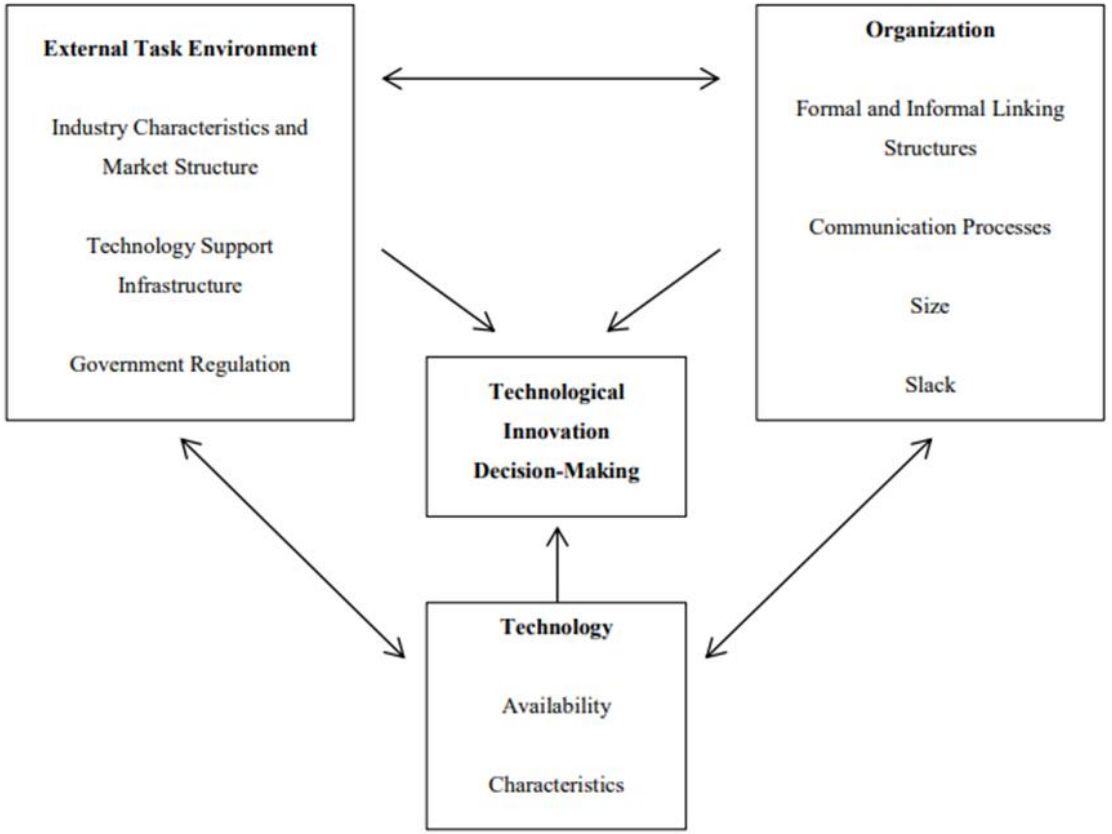
TECHNOLOGICAL READINESS

ORGANIZATIONAL READINESS

ENVIRONMENTAL READINESS

MELAKA SMART CITY DEVELOPMENT

TOE FRAMEWORK



Based on Tornatzky and Fleischer's (1990) The Context of Technological Innovation

- Louis Tornatzky and Mitchell Fleischer (1990) have developed a decision-making structure for technical innovation that describes the influence of technology, organization and the external task environment while incorporating new technological developments in the decision-making process.
- These three parts consider both intrinsic and motivating reasons for modern technical progress to be implemented (Borgman et al., 2013).
- Every other part of the TOE framework has its own effect on the decision-making phase of technical advancement, but these can also be interrelated. For example, one element within the external task environment will influence the process of communication within the organization, and so on.

TOE FRAMEWORK

Dimension	Definition
Technology	Technology dimension focuses on how the structure, quality, and characteristics of technology can influence the process of adopting an innovation.
Organization	Organizational dimensions include several organizational attributes (such as structure, culture, objectives, size, quality of resources, and decision-making mechanisms) that can facilitate or hinder the adoption of a new innovation.
Environment	Environmental dimension represents all external parties of organization, such as competitors, suppliers, customers, government and communities that determine the needs of an innovation, the ability to provide resources and facilitate an innovation, and the ability to implement the innovation.

RESEARCH METHODOLOGY

Interpretism	Research paradigm	**Objective of the study:** To understand and interpret the respondents' perspectives on the awareness and implementation of Smart City and also the challenges faced during implementation and systems thinking traits
Qualitative method • Data collected through interviews, document analysis and observation	Research method	
1. Participants' selection: Individuals and officers working in Malacca State Government Agencies **2. Case study:** Melaka **3. Sampling size:** 6 individuals **4. Characteristic:** Top management, managers, and officers related to the implementation and policies in Melaka	Qualitative research design	**Interview question design** Section 1 : Background (2Qs) Section 2 : Smart city awareness (2Qs) Section 3 : Technology awareness (4Qs) Section 4 : Organizational readiness (4Qs) Section 5 : Environmental readiness (3Qs)
	Interview question design	
	Interview duration	**30 minutes to 45 minutes**
	Data collection	**Method of Collection** : Interviews
1. Thematic analysis **2. Coding**	Data analysis	

FINDINGS AND DATA ANALYSIS

SUMMARY OF THE FINDINGS

SMART CITY AWARENESS

Coding	Subthemes	Theme
• City that embrace technology • Smart infrastructure • Smart facilities • Shared information • Improved operations	**Definition of smart city**	**Smart city awareness**

SUMMARY OF THE FINDINGS

TECHNOLOGY READINESS

Coding	Subthemes	Theme
• improve lifestyle of citizen. • "Should be maximum used in Smart City" • "Functional option of technologies" • "Should be Smart infrastructure and facilities" • intelligence system approach	**How technology being used**	**Technology readiness**
• "Big data analytics." • "IoT, Big Data, 5G Technology and Robotics • "Security and healthy" • "Smart building" • "Big data system and IoT."	**Types of technology /IR 4.0 technology**	
• Low acceptance level • Cost • Capabilities	**Challenges in developing smart city**	
• Government support • Promote awareness • Capacity building	**Steps to encounter the challenges**	

SUMMARY OF THE FINDINGS

ORGANIZATIONAL READINESS

Coding	Subthemes	Theme
• Clear administrative structure • Stakeholder involvement • Smart governance • Leadership support	**Organizational structure**	**Organizational readiness**
• Partnership • Integration	**Business structure**	
• Private funding • Allocation from federal	**Funding mechanism**	

SUMMARY OF THE FINDINGS

ENVIRONMENTAL READINESS

Coding	Subthemes	Theme
• Melaka Initiative • Green technology application	**Government support**	**Environmental readiness**
• minimal • manageable	**Environment impact**	
• Value added • Improved quality of life	**Socio-economic impact**	

DISCUSSION

THEME	FINDINGS
Technological Readiness	• The challenge faced, mainly because of the cost of the development and the upgrading of the infrastructure based on the Smart City requirement such as high speed connectivity and the data servers or one stop data centre to make Big Data and IoT usable in the future. • The cost of infrastructure and capacity building and promoting awareness • Steps must be initiated in terms of capital budgeting supported from the government especially from the state government and federal government also. • The NGO also can be included to take part in the initiative to help the Smart City successful. • The department and agencies also have to start adopting new norms and trying to simplify job routine using IoT, introduce basic system to integrate data and info for all department, integrate smart system such as Smart Map, Smart Street lighting, Smart CCTV and promote to all of the staff about the awareness and benefits of Smart City.

DISCUSSION

THEME	FINDINGS
Organizational Readiness	• Need to involve all parts of stakeholders and explain to all level of organization about the Smart City so that the initiative taken easily to be executed. • Can be managed in terms of funding by the involvement from the Public Private Partnership (PPP) and Private Finance Initiative (PFI) . • Allocating specific budget and propose project funding by the federal government in the Malaysian Rolling Plan Projects budget proposal from the federal agencies such as Ministry of Housing and Local Government. • Knowledge transfer and the readiness of others to implement it by cross organization.

DISCUSSION

THEME	FINDINGS
Environmental Readiness	• Minimization of environmental effects due to the development in the Malacca state using Smart City concepts • Not all of the department adopt the policies yet because the policies still under revision and finalization by the State Planning Unit until now especially when the exchange of Political surroundings and leaders in Malacca in the early 2020

LIMITATION AND SUGGESTIONS FOR FUTURE RESEARCH

LIMITATION

- All planned interview session through face to face meet has been postponed in due to the Movement Con trol (MCO), pandemic Covid-19.

SUGGESTIONS FOR FUTURE

- Smart city readiness model that proposed in this study is based on three main factors, namely technology, organisation, and environment. Then, a number of variables are proposed to assess these three main factors.
- Future research may be able to evaluate other local or state governments to find other variables not discussed in this study because each organization has different cultures and problems, so each organization definitely has different variables used to measure readiness
- Future research should also aim to get more decision-makers as a result, because they have the power to vote on the smart city idea being implemented.




CONTRIBUTION OF THE FINDINGS

1. The results of this research will bridge the theoretical gap associated with the smart city readiness model that is still rarely discussed in Malaysia, especially for local or state government.

2. The TOE Framework model has been widely used to measure readiness to adopt a complex innovation, but nobody has yet discussed it in the context of smart cities in Malaysia.

3. The results of this study can therefore add the observed evidence relating to the use of TOE Framework in smart city adoption.

4. This study can help the Malaysian state government assess or measure their readiness to adopt the concept of smart city.

5. The results of the readiness assessment will then give an idea of their current condition and ability, so that they can know if their current resources and ability make them ready to adopt the concept of smart city.

6. Through understanding their own potential, we expect the state and local government not to be rash in making decisions and really planning to embrace the idea of smart city, so its implementation can continue smoothly and with success.

CONCLUSION

1. Instrumentation and Control, Connectivity, Integration, Data Management as well as Security and Privacy, to evaluate Technological Readiness.

2. Top Management Support, IT Professional Support and Viable Budget and Funding Strategy are variables to evaluate Organizational Readiness

3. Internet Technology Knowledge, Engagement and Participation, Partnership and Collaboration are variables used to assess Environmental Readiness

4. There is a significant effect between the three aspects of readiness with the intention of adopting the concept of smart city in Malacca

THANK YOU