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Factors Affecting Successful Implementation of Internet of Things-based Services in Facilities Management For Public Sector

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Introduction

CONCEPT OF IOTBS IN FM

- IoTbs in Public Sector is to provide real-time and remote monitoring services.
- IoTbs in FM is expected to bring the potential benefits for local government

RESEARCH QUESTIONS

RQ1: What are the determining factors for the behaviour of employees in using IoTbs?

RQ2: How does technology readiness and subjective norm impact the success of IoTbs?

RESEARCH OBJECTIVES

RO1: To identify the factors that influence the behaviour of employees in using IoTbs.

RO2: To analyse the impact of technology readiness and subjective norm on the success of IoTbs.

RESEARCH SCOPE

- Focuses on the implementation of IoTbs in FM.
- Focuses on employees who were registered as users for the IoTbs.

RESEARCH PROBLEM

Many organisations **fail to achieve the potential benefits of IoT** and **earn the returns on investments** due to **underutilisation** by **employees** (Deng & Chi, 2012; Ul-Ain, Vaia, & DeLone, 2019).

Most of previous studies have argued that **public sectors**, which have adopted IoTbs, **face internal resistance from employees** (Lin, Lee, & Lin, 2016; Moretti et al., 2019; Raj et al., 2020; Roodt & Koen, 2020; Van Looy, 2018).

UNDER-UTILI SATION

TECHNOLOGY READINESS

EMPLOYEES RESISTANCE TO USE

PEER INFLUENCE

Technology readiness is described from the perspective of **individual traits** (Parasuraman, 2000), and has been **identified as a barrier** towards the implementation of **smart initiatives in public sectors** (Schedler et al., 2017).

Peer influence plays a **vital role in promoting employees on using** new technology (Blok et al., 2015; Wang, Lin, & Li, 2018).

Employees in public organisations perceive **more barriers** to implementing new technologies than employees in private organisations (Ahmed, Qin, & Martínez, 2019).

Literature Review
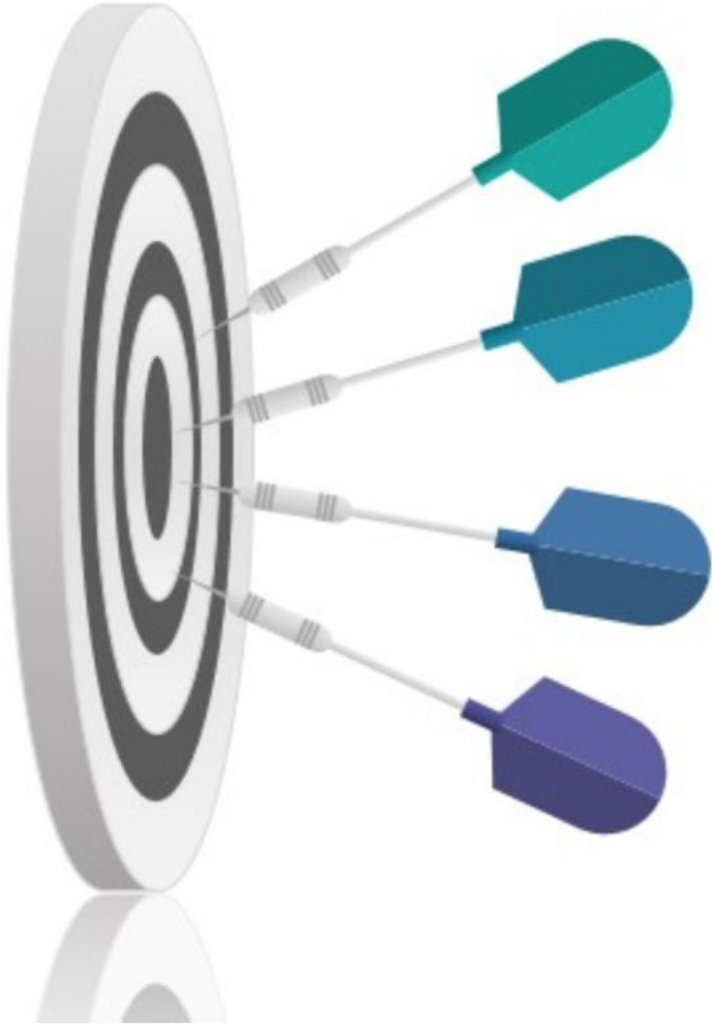
1. IoT-based applications are **still in the early stage** of development with limited options, and **only a few are being developed**.
2. Previous researches **have not given much attention to the issues concerning the implementation of IoT,** particularly on the intention to use and the actual usage of IoT.

3. Majority of researches on IoTbs focused primarily on organisation level **rather than on individual level**.
4. Previous researchers mostly focus on citizens, and there are **limited studies that focus on employees**.

5. **Lack of empirical studies on the roles of technical and human factors** in determining the success of IoT implementation.
6. The **effect of TR** on individual use behaviour is **rarely explored**.

7. Results from previous studies on the influence of **SN on behavioural intention are inconsistent**.
8. None of the existing IoT success models includes **technical and human factors in the same model**.

Model Development
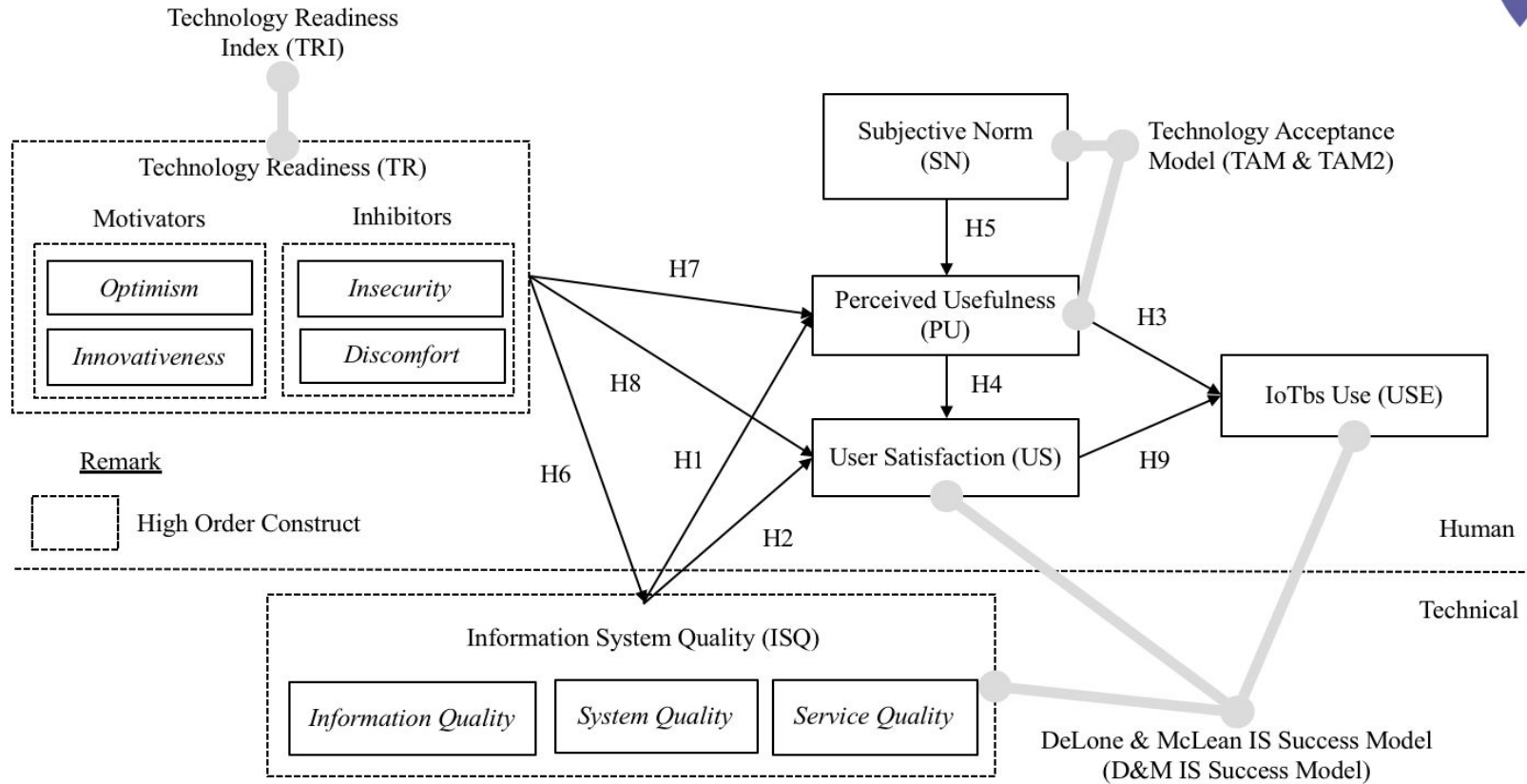
HYPOTHESES

H1: Higher ISQ leads to higher PU.
H2: Higher ISQ leads to higher US.
H3: Higher PU leads to higher IoTbs Use.
H4: Higher PU leads to higher US.
H5: Higher SN leads to higher PU.
H6: TR leads to higher ISQ.
H7: TR leads to higher PU.
H8: TR leads to higher US.
H9: Higher US leads to higher IoTbs Use.
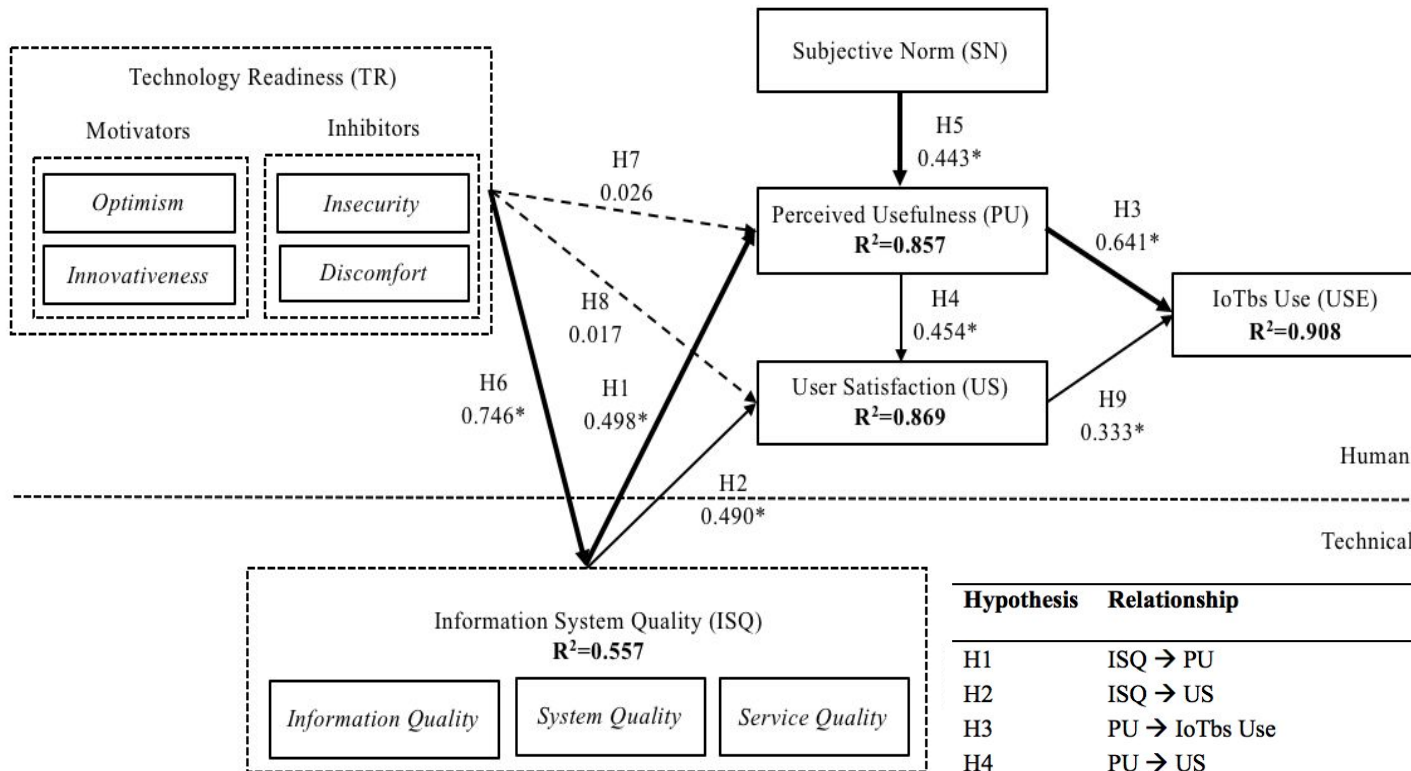
MODEL INTEGRATION JUSTIFICATION

D&M IS success model alone is **insufficient in giving a full explanation of successful IoTbs implementation** because it only considers the technical factors of IQ, SQ, and SVQ.

Research Methodology

1 LITERATURE REVIEW

POSITIVIST EPISTEMOLOGY
- The concept of IoT
- Derivation of Success Factors for the IoTbs
- Previous Work on IoTbs Success;
- Theoretical Foundation
- Existing IoT Success Model
- Knowledge Gaps

2 MODEL DEVELOPMENT

QUANTITATIVE RESEARCH DESIGN
- A better approach in studying the relationships between human and technical antecedents that influence the successful utilisation of IoTbs among employees of LAs.

3 DATA COLLECTION

A QUESTIONNAIRE (CROSS-SECTIONAL SURVEY)
- Why questionnaire? - larger sample of respondents and assure the findings' generalisability.
- Unit Analysis: Individuals
- Target respondents: LAs agencies' employees registered as IoTbs users, who never used the system.

4 DATA ANALYSIS

DATA ANALYSIS PROSES
- Data Screening & Cleaning
- Source of Bias Assessment
- Descriptive Analysis
- Measurement Model Analysis
- Structural Model Analysis

5 REPORT WRITING

ETHICAL ISSUES AND CONCERNS:
- To develop trust with their research respondents, protect them against misconduct, manage new challenging problems, and promote the research integrity.

Data Analysis and Results

STRUCTURAL MODEL ANALYSIS RESULTS (para 5.6.2)

- **Collinearity Assessment:** Multicollinearity was not present.
- **Coefficient of Determinant (R^2):** The overall model fit was good.
- **Effect Size f^2:** There was no effect of exogenous variable TR on the endogenous variable PU and US.
- **Blind folding and Predictive Relevance Q^2:** Sufficient high predictive relevance for all endogenous construct.
- **Effect Size q^2:** SN & ISQ on PU & US ☐ small effect size. 2) ISQ on PU ☐ medium effect size. 3) TR on PU & US ☐ no effect.

Hypothesis	Relationship	β	SE	t	p	CIB 5%	CIB 95%	Decision
H1	ISQ → PU	0.498	0.079	6.311	0.000*	0.364	0.628	Supported
H2	ISQ → US	0.490	0.077	6.347	0.000*	0.362	0.620	Supported
H3	PU → IoTbs Use	0.641	0.081	7.910	0.000*	0.512	0.772	Supported
H4	PU → US	0.454	0.077	5.861	0.000*	0.315	0.568	Supported
H5	SN → PU	0.443	0.091	4.877	0.000*	0.295	0.596	Supported
H6	TR → ISQ	0.746	0.035	21.154	0.000*	0.686	0.799	Supported
H7	TR → PU	0.026	0.056	0.472	0.318	-0.074	0.110	Not Supported
H8	TR → US	0.017	0.050	0.344	0.365	-0.058	0.100	Not Supported
H9	US → IoTbs Use	0.333	0.085	3.916	0.000*	0.193	0.466	Supported

Note: *$p<0.01$

PATH COEFFICIENT ANALYSIS RESULT (para 5.6.2)

Discussion and Conclusion

RESEARCH OBJECTIVES	FINDINGS

RO1: To identify the factors that influence the behaviour of employees in using IoTbs.

IS Quality
Technology Readiness
Subjective Norm
Perceived Usefulness
User Satisfaction

RO2: To analyse the impact of technology readiness and subjective norm on the success of IoTbs.

- TR leads to higher ISQ but does not lead to higher PU or US.
- Higher SN leads to higher PU.

✓ **Information System Quality (ISQ):**
ISQ is critical to gain **employees' satisfaction and to demonstrate the usefulness** of the IoTbs.

✓ **Technology Readiness (TR):**
Higher TR generally evaluate a **technology overall quality more highly.**

✓ **Subjective Norm (SN):**
Employees **influence each other's beliefs about the usefulness** of the IoTbs in FM**.**

✓ **Perceived Usefulness (PU):**
Employees were **likely to use IoTbs when they perceived IoTbs to be useful**.

✓ **User Satisfaction (US):**
Employees' **satisfaction significantly impacts their utilisation** of IoTbs.

Discussion and Conclusion

Practical Contribution: IoT initiators could understand the key factors that must be considered for IoT success and improve the national IoT policies to promote systemic IoT use across application domains. The government could use these findings as a guide to enhance the Public Sector Application Software Quality Assurance Guideline and IoT National Strategic Plan.

Malaysian Administrative Modernisation and Management Planning Unit (MAMPU), JPM:
who initiated the implementation of IoT as a strategic thrust for data-driven in Malaysian Public-Sector ICT Strategic Plan in the year 2016 to 2020.

Malaysian Communications and Multimedia Commission (MCMC) or MOSTI:
who is responsible for enhancing the National IoT Strategic Roadmap.

Ministry of Housing and Local Government:
who have identified the use of IoT as one of the main thrust under the effective communication in Local Authorities Transformation Plan.

LIMITATIONS

- **Self-reported answer:** response biases could occur because the accuracy of answers given was obtained by depending on the respondents' readiness and ability to present the right responses.
- **Cross-sectional data:** cannot directly evaluate effects over time.

FUTURE RESEARCH

Future research can further explore this research's effects in two ways: using a **qualitative** approach, or **mixed-method** approach.

Thank You