Durham E-Theses

Adoption Behavior for Facilities Management Information Systems at Feature Level

MA, KEI,WING

How to cite:

Use policy

Samuel Ma

Adoption Behavior for Facilities Management Information Systems at Feature Level

Abstract

Information technology adoption at the feature level is relative new and becoming a research area in the information system (IS). Features adoption is defined as a basket of information system features that can be used by a particular user to accomplish work task. Currently, information systems have multiple features so that multiple users can complete multiple tasks and accomplish specific work objectives. Their power can reveal only when their features support specific employees in completing their tasks efficiently and effectively. The integration of features, work processes and employees is critical. Moreover, bundles of new and old features with similar functions coexist in employees' tool kits. Employees can cherry-pick their favorite work settings at different points in time. This situation leads to dynamic and complex nature of technology adoption behavior at feature level. Past research that has concentrated on adoption at the system level may be less relevant, overly simple or inappropriate to explain and predict adoption behavior at the feature level.

This thesis builds upon two consecutive empirical projects and investigates forms of feature adoption behavior and their respective outcomes for individuals and organizations. It proposes feature substitution that employees substitute old features with new ones, having similar functions, is the desired form of adoption behavior because of positive outcomes attained. This thesis adopts the Expectancy Theory of Motivation, to explore the co-influence of personal experiential factors and cognitive factors on feature substitution, as goal-oriented and outcome-based behavior. Through investigating why and how specific behavior happens, the thesis has developed a theoretical framework to explain feature substitution at workplace context. Additionally, organizational factors are discovered that have a substantial indirect influence on the behavior, and therefore enrich our knowledge of the facilitating conditions. This finding becomes a guide to formulating effective organizational measures to strengthen the motivation for the behavior. Overall, this thesis reveals the key determinants of feature substitution, including experiential factors, *benefit*, personal intrinsic needs, *work goal congruence and self-esteem*, and organizational factor of self-learning environment. The service performance management approach may moderate those variables.

Adoption Behavior for Facilities Management Information Systems at Feature Level

Samuel Ma Kei Wing (Cohort 5, DBA at Fudan)

Thesis Submitted in Fulfilment of the Requirements for Doctorate in Business Administration

Durham University Business School

Durham University

2018

Table of Contents

List of Figures

List of Tables

Statement of Copyright

Chapter One: Introduction

1. Technology-enabled Business Transformation

Information technology-enabled business is becoming a market trend and norm (Bughin et al., 2013). It may include the extensive use of social technologies, advanced analytical tools to process big data, and the integration of digital and physical experience. Over the past two decades, many businesses have guessed incorrectly about a technology and the uses to which it can be put. They have paid the price with reduced market performance or, in many cases, disappearance from the scene altogether (Hamrouni, 2017, Watson, 2012). It is increasingly difficult for businesses to remain unchanged by technology disruption.

Many information technology-relevant failure cases have revealed barriers to technology adoption and negative consequences for organizations. Twitter removed its famous app for Apple Mac computers after a long and troubled history dating back to 2011. Because some Twitter trolls missed a special character, they caused crashes on iPhones, iPads and Macs, leading to millions of customer complaints (Ofir, 2018). In the early 1990s, Foxmeyer, the fifth-largest drug wholesaler in the US, implemented the enterprise resources planning system to obtain real-time information and automate and integrate its inventory systems. It invested nearly USD65M in the expectation of operational cost savings of over USD40M per annum. Due to poor planning and implementation, the company eventually invested over USD100M but saved less than USD20M per annum. It went bankrupt a few months later (Hamrouni, 2017). The TSB bank upgraded its online banking system in April 2018. Customers were locked out of their bank accounts due to bugs in the new system. This situation occurred in July and had a serious impact on the bank's reputation. The Welsh NHS suffered a cyber-attack in 2018 so that doctors could not access patients' medical records, resulting in an operational impact on the hospital network. In May 2017, British Airways faced a global IT failure that led to the cancellation of over 100 flights from Heathrow and Gatwick airports. In February 2017, Cloudbleed faced a major software bug, resulting in customers' sensitive data being leaked (Jee and Macaulay, 2018). The Internet of things (IoT), data analytics and virtual reality are three major disruptive technologies that are spreading throughout the business world (Raphael, 2018). The global IoT market may reach USD457 billion by 2020 with a 28.5%

annual growth rate. However, many IoT projects have failed because of hacking, privacy breaches, lack of integration, poor quality of the data collected and budget overruns. Data analytics has recorded a project failure rate of over 85% because of management resistance; incorrect usage based on a poor understanding of business; lack of the appropriate skills, methods and tools; and unanticipated problems beyond big data in which people and systems do not cooperate. Virtual reality was developed in the 1990s but has failed to live up to its hype because mainstream customers have never truly bought into this technology (Raphael, 2018).

All of the abovementioned technology adoption failure cases indicate that technology can be a two-edged sword that may bring benefits to a business but can simultaneously harm it. Said outcomes are depending on how users respond to those technologies. Some researchers have identified feeling of technology paradox at user level. Users might feel engagement, assimilation, efficiency, competence, freedom and control but may also experience disengagement, isolation, inefficiency, incompetence, enslavement and chaos (Mick and Fournier, 1998, Watson, 2012). A mix of those personal feelings may lead to a sense of performance uncertainty with the use of a new technology (Johnson et al., 2008). As a result, people may avoid new technology adoption and cause performance gaps between the actual and expected results from the organizational perspective.

Investigating technology adoption at user level is likely essential to affect success of information technology implementation and has been studied in subject of Information System (IS) for a period of time (Tuner et al., 2010). Apparently, past research efforts look unable to solve technology adoption problems with recent cases illustrated.

2. Workplace and Facilities Management Information Technology

Facilities management is defined as integration of place, people and process within built environment with the purpose of improving quality of life and productivity of core business (ISO, 2017). This requires multiple professional disciplines to perform multiple service processes, to operate and maintain multiple types of physical environment and to manage diverse expectation of multiple occupiers on living at the workplace environment. In past few

years, the facilities management has experienced service process transformation through disruptive information technology (JLL and UNWORK.COM, 2016, Corporate Solution Research, 2016). The service processes may include performance measurement and reporting, physical asset or environment monitoring, work order management, physical space utilization, supply chain management, operating expense management and experience tracking of occupiers. Information technology is used to automate those service processes, extract useful data and interpret them to support management decision. The power of information technology may depend on the fit between features developed by a specific technology and specific work activities in a particular work process. This is similar to the concept of task-technology fit (Goodhue and Thompson, 1995), which leads to the enhancement of individual performance as well as business goals.

Information technology has become more influential over time at both individual and organization levels (Cheng and Gibson, 2011). It is expected to improve process efficiency, staff productivity and attraction of young talents. Amongst the emergent information technologies, the Internet of things (IoT) and data analytics have become more influential in the workplace and facilities management context (Dubosq, 2018, JLL, 2017b).

The IoT has been growing rapidly in the facilities management context, particularly for complex facilities, high service standards and optimal functions at all times. The IoT is able to connect multiple property assets or even users to the Internet. Using real-time monitoring feature of IoT, facilities managers can optimize the service processes in their own working context after better understanding operating conditions or usage pattern of specific facilities (Dubosq, 2018). Some features have been used for specific facilities management functions, including asset management, physical security and workflow optimization. Regarding the asset management function, the IoT provides real-time monitoring of the operating conditions of critical facilities; immediate alerts for facilities managers if conditions exceed the desired limits; and automatic maintenance orders, generating requests for the technical team to repair anticipated problems when they are detected. One of the examples is like smart sensors that are developed to monitor running condition of building services (Finch, 2003). The smart sensors capture surface temperature and portray temperature pattern of a pump motor. Through investigating the temperature pattern, a facilities engineer may be able

to predict likelihood of the motor failure. So the facilities engineer can schedule maintenance activity for the motor in advance. This example reveals how IoT-enabled automation may improve the reliability of critical facilities and minimize interruptions of business operations.

The data analytics is another technology designed to process data collected from multiple facilities information systems and convert them into content that facilities managers can use to determine resources allocation, maintenance activities planning and ways of quality improvement. The data analytics in facilities management may include many features, for examples of standard performance dashboard, customized performance reporting, space usage pattern analysis, waste and energy consumption analysis, equipment life cycle analysis and property risk assessment. Each of them serve for specific purposes and for specific service processes. Also individual features may be used either by single or multiple facilities management staffs. For example, standard performance dashboard is used to examine and report performance gaps between desired and actual of multiple key facilities management services that may be categorized basis upon business operation criticality of those services (Price, 2004). Downtime of a building system is one of key performance measures to represent how well specific system is operated and maintained. Facilities engineers use this feature to evaluate operation risk of specific system and consider adjustment of maintenance regime. Facilities managers may use this feature to assess staff performance and maintenance service performance. They then can determine resources planning for sake of narrowing performance gaps.

Another example is energy consumption analysis that is used to track and report energy consumption for multiple facilities and at different point of time. Energy managers use it to understand consumption pattern and identify sources of energy consumption in terms of where and when. They determine what energy conservative measures should be implemented to which facilities. On the other hand, facilities managers use this feature to communicate energy management performance to the senior executives of an organization.

The above examples illustrate individual users evaluate information technology features based on proper matching of their own work agenda and activities. They do not evaluate IoT or Data Analytics as integral at their own work settings. Instead, they evaluate what specific

features of the information technology can complement to specific work activities and achieve particular work goals. New features are critical to add immediate user value. Any unused features of the information technology may represent unrealized value from user perspective (Peach, 2017).

A facilities management staff adopts a new technology but uses a feature not serving for his or her own purposes of work. Such technology adoption might become meaningless and even harmful to an organization if it decreases staff productivity or distracts the planned service processes. As mentioned, the facilities management industry is being transformed by disruptive technologies. More new features will be developed for any given technology. Incremental innovation is foreseeable, meaning that employees will evaluate new features at different points in time rather than evaluating an information technology as a whole. Therefore, understanding employees' behavior of using basket of features in a new information technology would become increasing important.

3. Research Gaps

Underutilization of new facilities management technology is still a challenge during business innovation (Ashworth and Tucker, 2017, Worldwide, 2014, Goh, 2015). This problem is further revealed when a group of facilities management academics and professionals reviewed adoption of Building Information Modeling (BIM) that has been introduced into the market for several years (Ashworth and Tucker, 2017, Tancred et al., 2012). Its maintenance management features were limitedly adopted by facilities managers.

Investigating information technology adoption behavior is not new in the IS subject. Many researchers have studied this topic for decades (Shaikh and Karjaluoto, 2015, Tuner et al., 2010). Previous theories inclusive of Theory of Reasoned Action (Fishbein, 1979), Theory of Planned Behavior (Taylor and Todd, 1995), Innovation Diffusion Theory (Rogers, 1995), Social Cognitive Theory (Bandura, 1989) and Technology Adoption Model (Davis, 1989) are used to explain and predict information technology adoption behavior. Unified Theory of Acceptance and Use of Technology (UTAUT), an integrated model is developed and empirically tested for explaining adoption of information technologies (Venkatesh et al., 2012a, Venkatesh et al.,

2003). UTAUT's explanation power of technology adoption is found higher than that of any single theory or model (Venkatesh et al., 2003). However the technology adoption theories are challenged regarding uncertainty and inconsistency in predicting technology adoption behavior for different contexts (Tuner et al., 2010). The theories adopted variance approach (Beaudry and Pinsonneault, 2005), primarily identified key determinants and their relationships with technology adoption behavior. Adding more determinants in the existing theoretical models may not improve their prediction power significantly (Tuner et al., 2010).

Moreover, the theories assume positive outcomes of technology adoption (Sanakulov and Karjaluoto, 2015, Tuner et al., 2010) and ignore potential impacts of experiential factors on technology adoption behavior. Experiential factors are found to influence specific behavior continuously from consumer behavior and job motivation perspectives (Foxall et al., 2011, Parijat and Bagga, 2014).

Another group of theories inclusive of Cognitive Appraisal Theory (Lazarus, 1991), Switching Cognitive Gears (Louis and Sutton, 1991), Technology Threat Avoidance (Liang and Xue, 2009), Expectancy Theory of Motivation Theory (Vroom, 1994) and Coping Model of User Adaptation (Beaudry and Pinsonneault, 2005) are used to investigate information technology adoption behavior. They adopted a process approach (Beaudry and Pinsonneault, 2005, Burton et al., 1992/1993), primarily studied technology sense-making process of individuals and investigated why and how employees adopt information technologies. Such theories may include personal cognitive and emotional variables and some contextual variables. The theories provide deeper insights on technology adoption behavior as key drivers or root causes of specific responses by individuals are explained. However, past studies concentrated on discovering content of adoption behavior and lacked empirical results to validate casual relationships between variables at different contexts. Their prediction and explanation power may be ambiguous.

Both groups of theories mainly attend information technology adoption at the system level. Forms of behavior at system level is relative simple, compared to that at the feature level that may have more forms and be dynamic. Forms of adoption behavior at the feature level may include trying new feature, combining old and new features with similar function and

substituting old feature with new one to complete specific tasks. Different forms of adoption behavior at feature level may result in diverse outcomes to individuals and organizations. Also they may switch into another form over time. Because of complexity and rich content of feature adoption behavior, existing technology adoption theories focused on system level adoption may be irrelevant to explain technology adoption behavior at the feature level.

Facilitating conditions (Venkatesh et al., 2012a, King and He, 2006, Venkatesh et al., 2003) were studied as integral element of organizational infrastructure existed to support use of new technology. Their influences on technology adoption are varied. Facilitating conditions did not affect personal computing utilization (Thompson et al., 1991) and had insignificant effect on actual use of information system (Limayem and Hirt, 2003). On the other hand, it was tested with direct effects on adoption of multiple information systems (Venkatesh et al., 2003). Previous research (Kim et al., 2009, Sutchlffe et al., 2010) further studied relationships between subfactors of facilitating conditions and information technology adoption. User training and management support were tested only with indirect effect on the internal auditing software adoption. Both subfactors increased perceived ease of use on a new internal audit software (Kim et al., 2009). User-center design as a part of facilitating conditions was studied. Through experimentation, it was found with positive influence on user engagement and trying e-health platform (Sutchlffe et al., 2010).

Above results reveal influences of facilitating conditions may vary in different contexts. Also investigating such influences should be at least one level down to cover subfactors of facilitating conditions. In facilities management, organization infrastructure to support use of facilities management technology may include on-line training and helpdesk support that are adopted as standard supporting tools for use of technology. However, their effectiveness on supporting adoption of specific technology was limitedly evaluated. This evaluation is even lesser for feature adoption. For example, user trainings can become much complex at the feature level. They should be customized to individual user groups for specific features. Traditional on-line trainings with one trainer and many trainees being trained at same time may become less effective.

Another organizational factor that is relevant to the facilities management context is the service performance management approach (EY's Nordic REFM Team, 2016), which examines an important contextual variable particular for growing trend of facilities management outsourcing (JLL, 2017b). As usual, staff performance targets are relevant to facilities management services that the staff performs or involves. So service performance management approach may affect performance targets defined for individuals. The performance targets may guide what and how individuals should perform. Such relationship may be limitedly examined in technology adoption context.

4. Research Questions

If facilities managers are unable to respond to technology-enabled changes, this may lead to misalignment between facilities management service performance and business requirements. When new system features are not adopted by employees for the completion of specific work tasks, they may feel disengagement in specific work settings and respond in unproductive ways (BIFM, 2014, Alexander, 2006). For example, they may not use a specific feature to complete a task if it disturbs another employee's work activities during a specific service process. Additionally, employees may duplicate their efforts by using both old and new features for a single task to satisfy their work group's objectives and their own sense of mastery for personal performance. Both of these approaches can lead to decreased productivity for individuals and work groups. As a result, the desired benefits of new technology cannot be achieved at the organizational level. Investment of the technology cannot be returned or paid back. This financial loss may continue and become worse if organizations have to invest new technology continuously following the technology wave in this industry (JLL, 2017a, JLL and UNWORK.COM, 2016). Previous information technology failure cases may further support this prediction.

Studying feature adoption behavior is far more complicated than studying adoption at the system level (Jasperson et al., 2005, Griffith, 1999, Sun, 2012). Past technology adoption research focused on the system level. Adoption behavior at the system level is too narrowed to describe feature adoption behavior. Features can appear in many forms, occur at different points in time and lead to diverse outcomes for individuals. Feature adoption behavior

includes trying new features, combining old and new features, substituting new features for old ones or innovative use of new features (Sun, 2012). Different adoption behaviors may result in positive or negative outcomes to employees and organizations. For example, in trying new system features of Integrated Workplace Management System (IWMS), a space planner may use workplace occupancy feature intermittently to update occupation of specific workplace for his convenience. This means occupancy data may not be refreshed or updated regularly. Over a while, this behavior may reduce integrity of occupancy data that a facilities manager may feel ambiguous on his performance with use of space usage data produced by the IWMS. With threats anticipated, he may have to rely on physical access record produced by access control system to understand amount of occupiers in the space at specific period. As a result, whole occupancy tracking process becomes less accurate, leading to undesired space planning with increasing occupancy cost unnecessarily. This example reveals how feature adoption behavior of an employee affect feature adoption behavior of his counterpart. Eventually, business outcomes at organization level are affected.

Another example is work order creation feature of a computerized maintenance management system (CMMS). Incremental innovation typically happens at the CMMS to increase automation and simplify work process for the sake of work efficiency or staff productivity enhancement. A technician may keep using old work order creation feature for sense of confidence on data integrity and adopt new one for satisfying manager's instruction. He indeed duplicates his own effort and repeats same task, using similar features of two different systems. This example reveals employee may feel relative comfortable to combining new and old features for completion of work task. However, his behavior reduces own productivity and cost effectiveness of maintenance management process.

Obviously, different forms of feature adoption behavior can result in diverse impacts on business results and outcomes. Understanding which behaviors having positive impacts on business can allow organizations investing right management measures to tracking and encouraging such behaviors. From an academic perspective, findings on those behaviors and associated impacts would further validate or challenge the assumption of technology adoption theories that adoption must lead to benefits at either the personal or organizational level. This assumption demands that researchers not overlook relationships between

technology adoption and outcomes of adoption that likely affect the continuous adoption of specific behavior with a positive business performance impact. *Therefore, the first research question is what are the key forms of adoption behavior at the feature level, and which of them are desirable from the organizational perspective?*

Once specific feature adoption behaviors are identified, the study further investigates determinants of feature adoption behavior, aiming to identify factors with key influences on the behavior. From an academic perspective, determinants of technology adoption at the system level have been identified and tested in the past. However, these determinants and their effects may not be exactly the same as those of adoption behavior at the feature level, for example, the outcome of adoption. Additionally, many of the determinants identified are context-specific (Tuner et al., 2010), meaning that each workplace context might have its own set of determinants pending investigation. Identifying those determinants can extend the boundaries of technology adoption theories. From a practical perspective, understanding the corresponding determinants enables system developers to design new system features with a higher level of integration into work activities by individuals. An increasing level of integration (ISO, 2017) would improve the workplace environment by increasing the workplace experience of employees that can lead to a productivity gain for a business (BIFM, 2014). *Therefore, the second research question is what are the key determinants of desired feature adoption behavior that are supported by theories?*

It is also important to investigate facilitating conditions deeply because they may significantly influence feature adoption behavior. Facilitating conditions also allow organizations to invest in effective measures to motivate feature adoption. Moreover, a facilities management-specific factor is also viewed as important to the service performance management approach (EY's Nordic REFM Team, 2016), which is one of the guiding principles for planning and performing different facilities management functions. Typically, different performance management approaches are used and likely depend on the property type, corporate culture and facilities management function. They are also tied to employees' performance goals, which are viewed as important to individuals in work settings. Currently, many business organizations have adopted standard management measures to implement new technology features without evaluating their effectiveness. Understanding the potential impacts of all

organizational factors helps reformulate effective implementation measures in different work contexts. From an academic perspective, such an understanding can narrow the research gap, as organization-relevant factors have not been examined in previous research. *Therefore, the last research question is what are the key organizational factors that influence desired feature adoption behavior, and does the type of performance management approach affect those relationships?*

5. Discovery of technology adoption behavior at the feature level

The above research questions cannot be directly answered with reference to past technology adoption research. This study adopted mixed methods research, rooted in pragmatism (Shannon-Baker, 2016), in the belief that qualitative and quantitative approaches used together in one study can complement each other to solve research questions. At first, qualitative analysis was used for an in-depth investigation of the content of feature adoption behavior, covering what such behaviors are, their associated outcomes, and why and how they occur. The first objective is to identify forms of feature adoption behavior and which ones are desirable from an organizational perspective. The second objective is to identify the determinants of specific feature adoption behavior. A single case study that represents a typical facilities management context in Hong Kong has been used to collect triangulated and real-world data regarding the usage of new system features in a specific work environment. To enable an in-depth exploration of feature adoption behavior, semistructured interviews were conducted with sampled employees. This approach allows for the collection of subjective experience related to the adoption of new system features that may reveal patterns of specific behavior as well as causes of the behavior. Interview questions were proposed following a literature review that covered potential personal, organizational and social areas. All questions also underwent peer review to improve the content validity in the facilities management context. The collected data were analyzed with a coding technique (Creswell, 2009a) and pattern analysis to identify several variables and the relationships between them. All identified variables and relationships were supported by relevant theories to obtain analytical generalization (Yin, 2014a). Then multiple hypotheses were developed for further examination.

The qualitative approach eventually led to the development of a research framework and hypotheses grounded in theories that explain specific feature adoption behavior in a specific context. Thus, this approach fundamentally addressed the research questions to a certain extent.

As a second stage, a quantitative approach was adopted to validate the identified factors and causal relationships. The first objective was to increase the degree of generalizability of the findings based on a qualitative approach. Moreover, the answer to a research question, *whether a performance management approach would result in diverse relationships between variables of feature substitution*, which cannot be addressed with a qualitative approach, should be obtainable through a quantitative approach. A survey with closed-ended questions was chosen as a key instrument for collecting real-world data (Bryman and Bell, 2011d) after consideration of its practicality and efficiency. The questionnaire was designed following a literature review and pilot test. Partial least squares-structural equation modeling (Hair et al., 2017f) was used to test the degree of relationship between variables as this method is flexible and with low constraints.

Partial least squares-structural equation modeling (PLS-SEM) validates the convergence of each variable and discriminates between them to confirm individual variables. It facilitates path analysis for the proposed research framework, conducts hypothesis testing and examines the degree of influence and statistical significance. Multigroup analysis of PLS-SEM allows a comparison of all path coefficients between two major performance management approaches: output-based and process-based.

The quantitative approach was eventually used to examine causal relationships between variables with the degree of projected influence. It revealed the predictive power of the exploratory framework developed to explain specific feature adoption behavior. Hence, the results have an increased level of generalizability.

Mixed research methods complement each other, and the qualitative and quantitative approaches tackle research questions with both content-rich and probability-validated contexts.

6. Academic and practical contributions

This project resulted in several key findings regarding feature adoption behavior that answer the research questions. All findings make a direct impact and contribution in both practical and academic aspects.

a. Practical Contribution

This is a critical aspect. Facilities management has undergone a technology-enabled business transformation. Regardless of whether disruptive technology can radically change business processes or incremental innovation can be used to improve the processes, new technology features play an important role at the operational level to keep planned activities on track. Thus, it is necessary to match employees, work activities and specific features in a timely manner. In this project, an in-depth investigation was conducted of employees' technology adoption at the feature level, which has received less attention than the system level in the FM field.

First, feature substitution is found to be an outcome-oriented or goal-driven behavior. It leads to personal and organizational benefits that support and motivate this behavior at the individual and organizational levels in the long term. On the other hand, this behavior is driven and motivated by several key elements. They include clear personal work goals, the personal value of the identity established in a work group, experienced outcomes of specific work using new system features and the perceived importance of those outcomes. They are all linked to each other and produce a motivating force for feature substitution. Organizations should adjust employees' work objectives, promote personal identity with the active adoption of new system features in new work settings and encourage adoption experience and group sharing. These management measures can all affect the feature adoption behavior of individuals at different points in time. Currently, many organizations implement standard and traditional measures when introducing new technologies. Even with incremental innovation, management measures to motivate adoption are very limited.

Second, this project also identified a key organizational factor: the self-learning environment. Few research has studied both factors in the workplace and the facilities management field, but they are emerging in disruptive technology settings, for example, Smart Cities (Cosgrave et al., 2013). Many concepts, including living laboratories, innovation districts and information marketplaces, are being explored. They all have the key element of increasing stakeholders' engagement and sense of ownership. This project revealed similar needs from employees' perspective. They expect a work environment to encourage and support practicing and learning. Furthermore, they demand involvement and respect during the design of new system features so that they can have an actual influences on specific feature design. Understanding these factors would enable organizations to re-think the necessity and ways of engaging employees when developing new system features. This approach enables effective management measures.

Third, the performance management approach, a critical workplace and facilities management element, was examined. The project revealed different associations between determinants and feature substitution according to two types of performance management: output-based and process-based. Understanding this factor allows FM organizations to employ different management measures for diverse work groups to motivate feature substitution.

Finally, the switching cost is always perceived as a key barrier to technology adoption. The findings of this project indicate that switching costs may be overestimated, especially in terms of their influence on postadoption behavior. Feature substitution is a goal-driven or outcome-based behavior that may influence employees to underrate the impact of switching cost. They are keen to invest effort and time and amend their work settings to incorporate new ones. This finding may suggest organizations not to invest too much on user-friendliness of incremental innovation on specific features. Rather, they can focus on how new features designed to align personal work goals.

b. Academic Contributions

This project uses the Expectancy Theory of Motivation (Vroom, 1994) as a theoretical foundation for examining the behavioral and motivational elements inherent to new system features adoption and replacement of old system features.

First, this theory has been adopted to study many psychological, organizational behavior and management accounting issues (Burton et al., 1992/1993). It has been extended to the IS context but is still limited to a few technologies and industries. This project expanded the boundaries of the theory into another organizational context, workplace and facilities management, and demonstrated its practical applicability in a specific context. This project discovered subfactors of facilitating conditions and integrated two organizational factors, self-learning environment and user design, into the theory to explain feature adoption behavior in the workplace environment. Additionally, this project examined a performance management approach that may have a diverse impact on associations between some variables of feature substitution that have received limited attention in both the IS and FM research. Thus, it has been added to technology adoption principles as a new organizational factor.

Second, this theory differs from other technology adoption theories that are typically studied in the facilities management and information system fields. Technology adoption theories focus primarily on cognitive and attitudinal factors to explain adoption behavior. In contrast, the Expectancy Theory of Motivation integrates experiential factors, one of the key elements in intentional behavioral research (Foxall, 2008). This project found that personally experienced outcomes of feature substitution have direct and continuous effects on that behavior. The effects can be mediated by other cognitive and attitudinal factors. Thus, this project successfully integrated cognitive, behavioral and motivational elements.

Third, feature substitution (Sun, 2012) has been mentioned but has not been intensively studied in previous technology adoption research. This project aimed for an in-depth understanding of this behavior and identified a key determinant, experienced outcome of use that is normally assumed to be constant and positive and has not been investigated in terms of how it affects specific behavior. Obviously, its effect has been overlooked. This project proved its type and degree of influence on feature substitution, an outcome-oriented

behavior. Moreover, its effects were extended to other forms of feature adoption behavior in the qualitative study. Its importance in motivating adoption behavior at the feature level should be reconsidered in the information system field.

7. Thesis Structure

This introductory chapter has provided the project overview regarding what, why and how to proceed with this study. There are three more chapters in this thesis. Chapter two is an exploratory study of employee's adoption behavior at the facilities management system feature level. This chapter contains a review of the technology adoption literature, defines research gaps, selects research methods, reviews research findings and develops hypotheses. The key aims of this chapter are to develop feature adoption behavior-related variables and to propose their relationships on the basis of a theoretical framework. Chapter three is the initial validation of the theoretical framework. It continues the discovery of new knowledge of feature adoption behavior with empirical testing. It primarily performs statistical testing of multiple hypotheses proposed in chapter two and reiterates the research questions and hypotheses for empirical testing, selection of research methods, and review and conclusion of the findings. The key aims of this chapter are to test the proposed hypotheses in a wider facilities management context. Chapter four concludes the entire study and provides a general overview, proposes new insights into feature adoption in the facilities management field, discusses the academic and practical contributions of the new insights, and proposes future research to address the limitations of the study and the conclusion of this thesis.

Chapter Two: Exploratory Study of Employees' Adoption Behavior for Information Systems at the Feature Level

1. Introduction

Investigating adoption behavior at the feature level is important in the workplace and in the facilities management field because it may benefit individuals or organizations (Clout et al., 2013). However, it can be achieved only when specific features are capable of supporting specific employees in the effective and efficient completion of work tasks. For example, smart sensors and business intelligence are technologies or information systems that have rapidly emerged (JLL, 2017a) in the workplace. Smart sensors embedded in physical assets allow facilities management staff to record the results of condition checks immediately using mobile receivers and specific features. They can also contain information regarding historical maintenance or failure records of individual assets with the use of another feature to examine an asset's physical condition and determine a maintenance strategy. As a result, repair costs and response times for maintenance services can be reduced. Business intelligence is another example of the power of data analytics with standard performance reporting features or customized reporting features. Standard reporting features enable facilities managers to analyze service performance and report situations using standard approaches in compliance with contractual requirements. Customized reporting features enable subject matter experts, such as energy specialists, to analyze facilities performance in ways that are compatible with and relevant to their work requirements and practices. As a result, they can determine the correct management actions in a timely manner.

Investment in new FM technology features, similar to other capital expenditures, is typically considered with a financial cost-benefit analysis (Caiver, 2014). However, this top-down approach cannot attain the eventual desired benefits (Keung et al., 2004), as it underestimates or overlooks employees' own interest in or motives for adoption (Coyle-Camp, 1994, Tancred et al., 2012), leading to underutilization of new features.

This chapter considers new technology feature adoption one of the fundamental problems in facilities and workplace management (Raphael, 2018, The British Institute of Facilities

Management, 2013). As mentioned in the previous chapter, three research questions are proposed:

What are the key forms of adoption behavior at the feature level, and which of them are desirable from the organizational perspective?

What are the key determinants of desired feature adoption behavior that are supported by theories?

What are the key organizational factors that influence desired feature adoption behavior, and does the type of performance management approach affect those relationships?

These questions are fundamental and critical to enriching the content of technology adoption research, which has previously focused on the system level (Jasperson et al., 2005).

This chapter addresses these questions and aims to identify a theoretical framework capable of predicting employees' adoption behavior at the feature level and in the facilities management context. This includes identifying the desired forms and key determinants of feature adoption behavior through an understanding of facilities management settings in the real world. Moreover, associations between individual determinants and specific feature adoption behavior are explored.

2. Literature Review

2.1 Theoretical background

Technology adoption is not a new research subject, and many studies exist. There are three basic theoretical themes of previous research, as summarized in Figure 1.
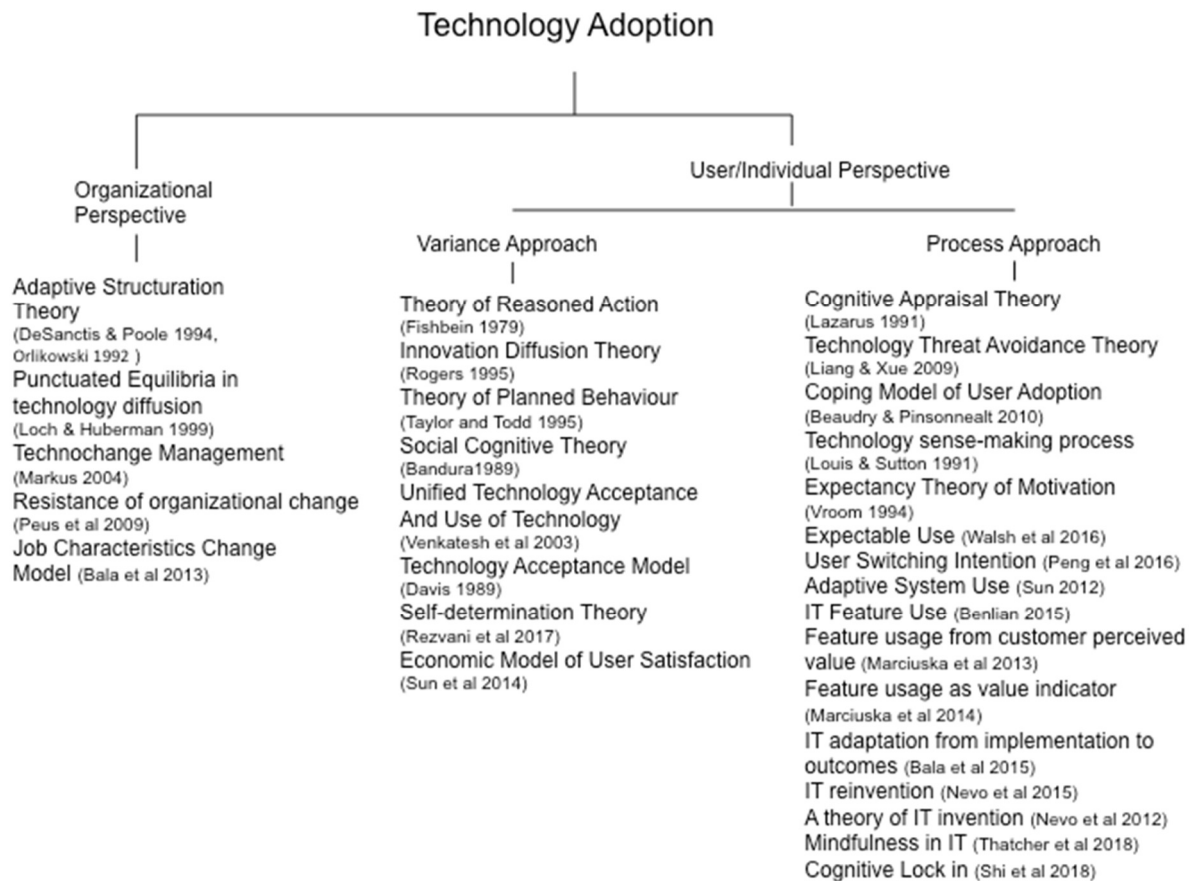
Figure 1: Summary of Technology Adoption Research

Research based on the first theme has studied technology adoption from an organizational perspective (DeSanctis and Poole, 1994, Orlikowski, 1992, Loch and Huberman, 1999). The first two studies (DeSanctis and Poole, 1994, Orlikowski, 1992) adopted the Adaptive Structuration Theory (Giddens, 1984) to explain technology adoption over time and at the work group or institutional levels. The last study (Loch and Huberman, 1999) explained the existence of punctuated equilibrium behavior based on radical technology diffusion that creates uncertainty and new characteristics that destroy a firm's competencies and upset its balance of cooperation.

On the other hand, change management research(Markus, 2004, Peus et al., 2009, Bala and Venkatesh, 2013)has investigated problems encountered during organizational change triggered by introduction of new workplace technologies. Markus (2004) found techno-

change misfit at three areas, including task and business process misfit, cultural misfit and incentive misfit. All of those misfits can cause resistance of workplace technology adoption at organization level. Peus (2009) stated new technology was one of key drivers for organizational change. It typically caused employees' resistance because of job uncertainty, loss of control, fear of failure and disruption in sense making at organization structure and procedures. To minimize said resistance has considered three factors including individual employees' differences, objective characteristic of change and implementation of change. Those three factors are relevant to employees, change processes and leadership of change. Bala (2013) has proposed Job Characteristics Change Model (JCCM) for implementation of Enterprise Resources Planning (ERP) system at business organizations. This model stated importance of understanding relationship between characteristics of job, work process and technology. Mismatch of these three factors can affect outcomes of organizational change.

Above research have indicated potential barriers of technology diffusion at organization level and limited extent at employee level. Therefore, these theories are likely inadequate to address this project's research questions directly that focus on the individual level.

Another research theme is technology adoption at the individual or personal level. These studies all agreed on the essential aspects of understanding technology use behavior (Lowry, 2002, Madritsch and May, 2009, Aguis and Angelides, 1997, Lin, 2011, Venkatesh et al., 2003) and developed frameworks to explain the determinants of technology adoption in various contexts. They can be divided into subgroups based on the theoretical approach: variance or process (Beaudry and Pinsonneault, 2005). The variance approach focuses on what factors determine individuals' technology adoption behavior. The process approach focuses on why and how individuals' decisions regarding technology adoption are affected.

2.1.1 Variance Approach

The majority of those frameworks are rooted in cognitive theories (Venkatesh et al., 2003) that study mind, beliefs, attitudes and intention of technology adoption at the user level. Representative theories include the Theory of Reasoned Action, the Theory of Planned Behavior, the Innovation Diffusion Theory and the Social Cognitive Theory (Fishbein, 1979, Ajzen, 1991, Rogers, 1995, Bandura, 1989). Recent research (Sun et al., 2014, Rezvani et al.,

2017) have adopted different theories including economic model of user satisfaction and self-determination theory to explain technology adoption behavior.

According to the Theory of Reasoned Action (TRA), behavior is caused by the intention of behavior based on determinants of attitude and subjective norms. The influence of attitude and subjective norms varies in different contexts. The Theory of Planned Behavior (TPB) identified one more determinant, perceived behavior control (PBC), in addition to those identified by the TRA. The theory explains the volitional behavior of individuals by examining their degree of control for specific behaviors. A model of PC utilization (Thompson et al., 1991) was developed and rooted in both theories for studying PC utilization behavior. The Technology Adoption Model (TAM) (Davis, 1989) is another model rooted in the TRA that is widely used to study technology adoption.

The Innovation Diffusion Theory (IDT) explains why and how new technology or ideas spread. It identifies four key elements affecting the diffusion of new technology or ideas in a social context. These elements are the technology or idea itself, communication channels, time and social systems with the involvement of different participants that can be classified by their personal innovativeness, and degree of acceptance of new ideas by individuals. The five types are innovators, early adopters, early majority, late majority and laggards. Diffusion occurs in very different ways depending on the type of participant. This theory highlights the importance of understanding technology characteristics and personal differences in terms of innovativeness. The Individual Technology Acceptance Model (ITAM) (Moore and Benhasat, 1991) was developed and rooted in IDT for the study of information technology innovation in the business corporation context.

Social Cognitive Theory (SCT) explains that people replicate others' behavior through observation. It identifies several key determinants of replicating behavior: outcome expectancy, self-efficacy and identification or social norms. This theory indicates how individuals' technology adoption behavior is affected with assessment of others' adoption behavior. The Individual IT and PC Acceptance Model (Compeau and Higgins, 1995a) was developed and rooted in SCM to explain how training in computer skills affects adoption behavior.

Economic model of user satisfaction (Sun et al., 2014) applied utility theory in economics to study user satisfaction on information systems. It has examined intensity of system use, information quality and system quality with diminishing impact on user satisfaction when either of them is increasing. Also said effect of system use on user satisfaction holds valid only under increasing degree of voluntary of use.

Leadership style was examined with effect on continuous use of ERP system through user satisfaction and perceived usefulness, and said relationship can be explained with self-determination theory (Rezvani et al., 2017). Here two leadership styles including transformation and transaction leadership were tested. Transformation leadership affects users' intrinsic motivation and transaction leadership affects extrinsic motivation of employees.

These approaches all fundamentally explain people's technology adoption behavior by examining the determinants and their influence on the intention of technology adoption or technology adoption behavior (Lee et al., 2003). Those determinants can be classified as technology-, organization- and individual-relevant. This classification aligns with other research on the organizational technology adoption process (Orlikowski, 1992), which divided the key determinants of technology adoption into human characteristics, organizational characteristics and technological characteristics. Table 1 summarizes those determinants and the findings regarding their effects on technology adoption intention or behavior.

Table 1: Summary of Key Determinants of Technology Adoption Behavior

Classification	Key Determinants	Effect	Theory	Technology Studied	Research Studies
Technology-Relevant	Perceived ease of use, Perceived usefulness, Perceived disease threats, Perceived medical errors	Direct	Technology Acceptance Model	Various Information Systems, Internet banking, Medication Administration, Medical health system, e-procurement, e-learning, Online services, Application software, Personal computers, Biometric technology	(Lee et al., 2003, Tuner et al., 2010, King and He, 2006, Im et al., 2011, Marini et al., 2009, Lin, 2011, Aboelmaged, 2010, Lee et al., 2011, Venkatesh and Morris, 2000, Parthasarathy and Bhattacherjee, 1998, Kim et al., 2009, Uzoka and Ndzinge, 2009)
	Job fit, Complexity	Direct	Model of PC Utilization	Personal Computing, Mobile procurement	(Tolman et al., 2009, Thompson et al., 1991, Bala and Venkatesh, 2013)
	Compatibility, Relative advantage, Ease of use, Result demonstrability	Direct & Indirect	Individual Technology Acceptance Model	Personal Work Station, Building Management System	(Lowry, 2002, Moore and Benhasat, 1991)
	System & Information quality	Indirect	Utility Theory	Service Information System, PBwiki	(Sun et al., 2014)
Organization-Relevant	Social factors, Facilitating Conditions	Direct	Model of PC Utilization	Personal Computing, Mobile procurement	(Tolman et al., 2009, Thompson et al., 1991)
	Leadership Style	Indirect	Self-determination theory	Enterprise Resources Planning	(Rezvani et al., 2017)
	Incentive misfit	Indirect	Techno change	Workplace technology	(Markus, 2004)
	Subjective Norms, Culture	Direct & Indirect	Technology Acceptance Model	Various Information Systems, Internet banking, Medication Administration, Medical health system, e-procurement, e-learning, Online services, Application software, Personal computers, Biometric technology	(Lee et al., 2003, Tuner et al., 2010, King and He, 2006, Im et al., 2011, Marini et al., 2009, Lin, 2011, Aboelmaged, 2010, Lee et al., 2011, Venkatesh and Morris, 2000, Parthasarathy and Bhattacherjee, 1998, Kim et al., 2009, Uzoka and Ndzinge, 2009)
	Voluntary use	Direct & Indirect	Individual IT and PC Acceptance Model	Application Software	(Compeau and Higgins, 1995a)
	Image, Visibility	Direct & Indirect	Individual Technology Acceptance Model	Personal Work Station, Building Management System	(Lowry, 2002, Moore and Benhasat, 1991)
Individual-Relevant	Affect	Direct	Model of PC Utilization	Personal Computing, Mobile procurement	(Tolman et al., 2009, Thompson et al., 1991)
	Anxiety, Self-efficacy, Personal outcome expectation	Direct & Indirect	Individual IT and PC Acceptance Model	Application Software, Personal Computers	(Compeau and Higgins, 1995a, McFarland and Hamilton, 2006)
	Attitude, Age, Gender, Prior Experience, Personal innovativeness, Perceived behavioral control, User group (Manager, Operator, Novice, General staff, Professional staff)	Direct & Indirect	Technology Acceptance Model	Various Information Systems, Internet banking, Medication Administration, Medical health system, e-procurement, e-learning, Online services, Application software, Personal computers, Biometric technology	(Lee et al., 2003, Tuner et al., 2010, King and He, 2006, Im et al., 2011, Marini et al., 2009, Lin, 2011, Aboelmaged, 2010, Lee et al., 2011, Venkatesh and Morris, 2000, Parthasarathy and Bhattacherjee, 1998, Kim et al., 2009, Uzoka and Ndzinge, 2009)

a. Individual-Relevant Factors

In table 1, individual-relevant factors may include a person's demographics and intrinsic needs, for example, age, gender, experience, self-efficacy, outcome expectancy, attitude and personal innovativeness (Venkatesh et al., 2003, Lin, 2011). These factors may have a direct or indirect effect on technology adoption. For example, the research (Compeau and Higgins, 1995b) proposes that people with a higher outcome expectancy for new technology may use the new technology more often. The outcome expectancy also increases positive personal attitudes towards new technology. With improving personal attitudes, people are more likely to adopt new technology. Demographics have a primarily indirect effect on behavioral intention, such as a moderating effect on the relationship between perceived usefulness and behavioral intention. Research (Venkatesh et al., 2003) has shown that younger men can increase the association between performance expectancy and intention of adoption. In other words, younger men anticipate the higher importance of performance expectancy in determining new technology adoption.

b. Organization-Relevant Factors

In table 1, organization-relevant factors refer to organizational settings or other people's viewpoint regarding employees' technology adoption. They include facilitating conditions, culture, voluntariness and social influence (Lippert and Volkman, 2007, Venkatesh et al., 2003). Facilitating conditions (Venkatesh et al., 2003) are the organizational and technical infrastructure available to support employees' adoption of new technology. When employees perceive a higher degree of facilitating conditions, they have a higher chance of adopting new technology. Subjective norms (Venkatesh and Morris, 2000) and image (Lowry, 2002) are similar to social influences (Venkatesh et al., 2003). People's adoption of new technology may be influenced by the expectation and viewpoint of their social group or peers. If an employee observes or knows that a peer has adopted new technology, he or she may also adopt the new technology. Voluntary use (Venkatesh et al., 2003) and culture (Lippert and Volkman, 2007) may have an indirect effect on relationships between a few key determinants and behavioral intention. Social influence may strongly affect the intention of technology adoption under a low degree of voluntariness (Venkatesh et al., 2003). Cultural subjective

norms may affect social influence and personal attitudes towards new technology. As a result, they may increase or decrease the intention of technology adoption (Lippert and Volkman, 2007). As mentioned on above sections, leadership style (Rezvani et al., 2017) may indirectly affect user satisfaction of new technology and use continuance. Incentive misfit (Markus, 2004) represents work performance management system not adjusted with proper rewards to encourage work groups or individuals using specific features of a new technology. From change management perspective, organization-relevant factors are considered and managed in order to minimize employees' fear of failure, sense of uncertainty and loss of control (Peus et al., 2009).

c. Technology-Relevant Factors

In table 1, technology-relevant factors are related to the functionality, features and user-friendliness of new technology. Individuals consider perceived usefulness, perceived ease of use, relative advantages and compatibility (Davis, 1989, Aboelmaged, 2010, Lowry, 2002). These factors may have direct effects on the behavioral intention. If employees perceive a high degree of usefulness of new technology, the likelihood that they will adopt the new technology increases (Davis, 1989). If employees perceive a high degree of ease of use of new technology, they tend to adopt the new technology. This relationship may be diminished by the use of the technology. At a later stage of technology adoption, employees attribute less importance to perceived ease of use (Aboelmaged, 2010). Examination of the relative advantages and compatibility of new technology indicate that these factors have a greater influence on the intention of new technology adoption at the introductory stage of new technology. They have less influence on the intention of technology adoption over the technology diffusion cycle (Lowry, 2002). Increasing quality of information systems either information quality or process quality (Sun et al., 2014) may affect user satisfaction on ERP at decreasing rate.

As shown in table 1, the Technology Acceptance Model (Davis, 1989) has been broadly adopted to explain and predict the use of many information systems for personal or work-related purposes. Many studies have extended the TAM framework by adding specific variables to increase its explanatory power regarding adoption behavioral intention in specific contexts. More tests have been performed to demonstrate that the TAM can improve its

degree of generalizability, and this approach has become very common in almost previous TAM research. By using the meta-analysis methodology, three studies (Lee et al., 2003, Tuner et al., 2010, King and He, 2006) systematically identified constructs of the TAM and their co-relationships in different contexts. They all stated that many researchers had tested TAM variables in various industry and technology settings, including communication systems, office systems, specialized business systems and personal systems. Those variables were found to have a varied influence on people's intention of new technology adoption depending on the specific context. The three papers also commented that the TAM is not a reliable model for explaining variance in technology adoption, especially for actual adoption, continuous use and the postadoption stage (Tuner et al., 2010). Obviously, adoption behavior at the feature level has richer content and is much more complicated than adoption behavior at the system level. Thus, previously developed nonrobust TAM constructs may be insufficient to explain adoption behavior at the feature level.

Contextual or emotional variables have been continuously created and tested to extend the boundaries of the TAM. The cultural factor (Im et al., 2011) was added to the TAM by studying consumer adoption of internet banking and MP3s. This study proved the explanatory power of the TAM and showed that in the US, people have higher effort expectancy associated with the adoption of consumer technology. The moderating effect of culture was tested between effort expectancy and behavioral intention. Nurses' adoption behavior for a medical administration system was examined, with a few emotional and industry-specific constructs identified. The constructs were attitude toward technology and exposure of medical errors (Marini et al., 2009). Adoption behavior in relation to a medical health system was also studied from the patient perspective (Lin, 2011). Industry-specific and individual-specific constructs were tested and included perceived disease threats, personal innovativeness and personal barriers. Adoption behavior for an e-procurement system was examined for different job and industry types (Aboelmaged, 2010). All of these studies focused on expanding the boundaries of the TAM through the continuous addition of theoretical constructs. The downside is that their explanatory power for technology adoption behavior was uncertain and limited. Additionally, the majority of these studies focused on behavior at the initial adoption stage and at the system level using some type of cross-sectional approach.

They were unable to prove a causal relationship between the determinants and technology adoption (Tuner et al., 2010).

Technology postadoption behavior was studied with a longitudinal approach. Gender differences were examined with different degrees of perceived usefulness and perceived ease of use of technology at different points in time (Venkatesh and Morris, 2000). Subjective norms affected the intention to adopt technology of women more than men. The results revealed that relationships between variables might be time-dependent. A study of the initial and postadoption behavior for online services (Parthasarathy and Bhattacherjee, 1998) revealed the importance of understanding why people discontinue their use of online services and thus examined continued or discontinued use. For example, negative social influence may outweigh positive social influence in affecting discontinued use, and the intention of complementary product usage may be a significant predictor of discontinued use. However, this study still limited postadoption behavior with continued or discontinued use to the system level and to a business to consumer (B to C) context, which is a different environmental context than that of facilities management in terms of the degree of rule-governed behavior or voluntary use.

The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) is an integrated model of various technology acceptance theories. The authors developed key constructs that have a direct relationship to technology acceptance behavior over time. The constructs are performance expectancy, effort expectancy, social influence and facilitating conditions. The first three factors were found to have a direct relationship with technology acceptance behavioral intention, and the fourth had a direct relationship with technology acceptance behavior. This model also extended and tested the relationship between the intention of adoption and actual adoption behavior, for which many previous TAM studies had assumed a causal relationship. Moreover, this model incorporated four key moderating factors, age, gender, experience and voluntariness of use. They represented how personal or organizational settings affect the relationships between the determinants and adoption behavior for either intention to adopt or actual adoption. The predictive power of adoption behavior of the UTAUT was shown to be much higher than that of previous technology adoption models for multiple industries and work-related technologies (Venkatesh et al.,

2003). Moreover, the authors conducted a longitudinal study of the UTAUT to examine causality between determinants and intention to adopt or actual adoption behavior. The UTAUT was further tested to explain adoption behavior for mobile Internet in Hong Kong from the consumer perspective (Venkatesh et al., 2012b). The authors extended the UTAUT by adding the constructs of price value, hedonic valuation and habit. The direct relationships of these constructs with adoption behavioral intention were tested. Additionally, those relationships may be moderated by the typical moderating factors of the UTAUT. Although the UTAUT or extended UTAUT is viewed as a reliable model to explain individual adoption behavior for new technology, both versions still concentrate on the system level, which is far simpler than the feature level (Jasperson et al., 2005).

The limitations of technology adoption models have been summarized to reveal their inapplicability to this project's research questions. The reliance of the TAM on intention-behavior consistency to examine intention of use has been questioned by many behaviorists (Foxall, 2008, Foxall and Greenley, 2006). The strength of the intention-behavior linkage may be moderated by individuals' emotional and situational factors over time, and these factors have not been comprehensively investigated by previous TAM studies. Obviously, the explanatory power of the TAM for actual technology adoption behavior was found to be relatively low (Tuner et al., 2010, King and He, 2006). The TAM approach concentrates on knowing what determinants of specific behavior are. Simply adding more variables to the TAM for empirical testing may make it less meaningful. It is important to study postadoption behavior through knowing why and how a behavior occurs. It is necessary to determine the root causes of people's adoption behavior to enrich our understanding of all the key attributes of the overall adoption process.

The majority of TAM or UTAUT studies examined technology adoption at the system level (Jasperson et al., 2005) with the assumption of positive outcomes when using the technology. As a result, they may have ignored the effect of personal outcome of adoption on adoption behavior over time. Some researchers have already challenged that assumption (Bitner, 2001, Johnson et al., 2008, Pinsonneault and Rivard, 1998). Technology can be a two-edged sword with simultaneous positive and negative impacts. Technology paradoxes lead to performance ambiguity and affect people's adoption of technology. Therefore, previous TAM studies lack

the empirical evidence to prove the relationship between people's outcome of use and technology adoption behavior.

Facilities management information systems usually have multiple features designed for different purposes and for different users, even in a single service delivery process. If an employee uses an incorrect feature to perform a specific work task, it might result in undesired output and negatively affect the next task performed by another employee in a service chain. Eventually, the individual performance outcomes or business outcomes might become negative. For example, in the computerized maintenance management system (CMMS), technicians are expected to use the maintenance work order creation and status update features to produce a maintenance work order and update the progress of the work order, respectively. Thus, technicians' performance can be measured in terms of time and quantity of work completion. Facilities managers can produce management reports using the report feature. Through analysis of the maintenance workload, facilities managers can effectively allocate resources that are part of their performance measures. If a technician simply creates a work order but does not update it, managers cannot assess the workload and handling capacity, resulting in poor forecasting of resource requirements. This example shows that a person who uses one feature but not others, as desired, obtains a negative performance outcome, even though he was perceived as adopting a new FMIS at the system level.

The example highlights the rich content and the existence of positive and negative outcomes of technology adoption at the feature level and shows that the TAM and UTAUT are not the right models to address the research questions. Adoption behavior at the feature level is more complex, dynamic and situation dependent (Sun, 2012, Parthasarathy and Bhattacherjee, 1998); therefore, another model or research framework is required.

2.1.2 Process Approach

Another research group has concentrated on people's adoption process in terms of why and how to adopt technology. Three major theories can be classified: the Cognitive Switching Theory (Louis and Sutton, 1991), Cognitive Appraisal Theory (Lazarus, 1991) and Expectancy

Theory of Motivation (Vroom, 1994). The following table 2 summarizes the studies that use a process approach:

Table 2: Adoption Process Approach

References	Variables	Relevant theories
(Beaudry and Pinsonneault, 2005)	User adoption of new IT, cognitive and behavioral efforts, outcomes	Cognitive Appraisal or coping
(Griffith, 1999)	Triggers: novel, discrepancies, deliberate initiative Feature content: abstract & concrete Feature spirit: core & tangential Viability of default setting	Cognitive Switching
(Liang and Xue, 2009)	IT threat avoidance behavior Process perspective: Anti-goal, Threat appraisal, Coping appraisal, Problem-focused coping, Emotion-focused coping, Impact on environment Variance perspective: perceived susceptibility, severity of malicious IT, perceived threat, perceived avoidability, user avoidance motivation, perceived cost, self-confidence, risk tolerance and social influence	Cognitive Appraisal or Coping
(Sun, 2012)	IT Features in use: content & spirit Triggers, Facilitating conditions, Personal innovativeness	Cognitive Switching
(Beaudry and Pinsonneault, 2010)	Initial adoption behavior, Emotion, Coping effort	Different emotion types lead to diverse coping efforts for adoption of IT
(Burton et al., 1992/1993)	Valence model, Force model, Adoption of new expert system	Expectancy Theory of Motivation
(Walsh et al., 2016)	IT culture, Expectable use, Utilization, Effective use	Theory of expectable use
(Peng et al., 2016)	IT switching intention, Transfer trust, Functional deprivation, Monetary deprivation, Network Obligation, Personal innovativeness, Gender, Age, Education, Occupation	Migration theory
(Benlian, 2015)	Computer self-efficacy, Experience with given IT feature package, Initial level of IT Feature Use, Growth rate of IT Feature Use, Task Performance	Technology diversification strategy
(Marciuska et al., 2014, Marciuska et al., 2013)	Customer perceived value, Feature usage	Value engineering
(Bala and Venkatesh, 2016)	User participation, Training effectiveness, User involvement, Management support, Perceived opportunity, Perceived threat, Perceived controllability Exploration to innovate, Exploitation, Exploration to revert, Avoidance, Change in job performance, Change in job satisfaction	Cognitive Appraisal and coping
(Nevo and Nevo, 2012, Nevo et al., 2015)	IT Adaptation, IT reinvention	Cognitive Appraisal
(Nevo and Nevo, 2012, Thatcher et al., 2018)	IT Mindfulness, IT reinvention, IT dissatisfaction, Unfaithfulness, Continuous intention, Deep structure usage, Trying to innovate	Mindfulness, IT dissatisfaction
(Kim and Kankanhalli, 2009, Shi et al., 2018)	User resistance, Perceived value, Switching benefits, Switching costs, Colleague opinion, Self-efficacy for change, Organizational support, Lock in, Trust, Inertia, Commitment, Brand loyalty	Status Quo Bias

Cognitive switching (Louis and Sutton, 1991) refers to people's tendency to routinize their behavior as habit to achieve mental effortlessness and to increase mental efficiency.

Situational or environmental changes may trigger the assessment and evaluation of the potential for behavioral switching from incumbent habits to new responses. In principle, this theory explains why and how people switch from mental effortlessness to cognitive evaluation and then back to mental effortlessness. It develops a sense-making process with stages of awareness, attention and reflection and proposes the importance of triggers at the awareness stage of the sense-making process (Louis and Sutton, 1991). This conceptual approach has been used to examine people's switching behavior for information systems at the feature level (Sun, 2012) by treating IS features as a change in people's work settings that triggers people's sense-making process. Sun developed new theoretical constructs for describing features of use behaviors and empirically tested relationships between triggers and features in use behaviors. A person may be aroused from routine situations by novelty, discrepancies or demand from others. He also developed a construct called Adaptive System Use (ASU) to describe complex adoption behavior. ASU includes trying new features, feature substitution, feature combination and feature repurposing. He empirically tested the relationship between triggers and ASU. Moreover, facilitating conditions (Venkatesh et al., 2003, McFarland and Hamilton, 2006, Limayem and Hirt, 2003) and personal innovativeness (Agarwal and Prasad, 1997) were found to have a moderating effect on the relationships between triggers and adaptive system use. The findings further demonstrated the complex nature of technology adoption behavior at the feature level compared with that at the system level. This complex nature was described by (Griffith, 1999), who developed two constructs of information system features: content and spirit. Content was abstract or concrete, and spirit was core or tangential. He also proposed relationships between constructs of information system features and constructs of cognitive-switching triggers.

Cognitive switching (Louis and Sutton, 1991) may be a possible approach to explain why and how people switch from an incumbent system feature to a new system feature, which is one of the objectives of this project. Some of the findings supported the concept that studying adoption behavior at the feature level is much more complicated than studying it at the system level. ASU is rich in content, and its antecedents are different from those of the TAM. However, very few research frameworks grounded in this theory have been developed and tested. Many constructs of the sense-making process specific to technology have not yet been discovered or tested. For example, will constructs found in technology adoption theories be

relevant in this sense-making process? What role do people's emotions play in the sense-making process? At this moment, it may be premature to adopt cognitive switching to address this project's research questions.

The Cognitive Appraisal Theory, or Coping Theory (Lazarus, 1991), from the field of psychology has been widely used in marketing literature that examined and explained stress-driven consumer behaviors, for example, in customer complaints (Stephens and Gwinner, 1998) and college examinations (Folkman and Lazarus, 1985a). This theory emphasizes the importance of the appraisal process and its effect on situational change, principally in relation to the driving reasons for people's responses. People appraise such changes as opportunities or threats to themselves, leading to personal emotions. In sum, people may avoid threats and approach opportunities for the sake of emotional stabilization and benefit maximization. People select their responses according to their personal ability to control such situations. People reappraise the actual outcome of their actions and adjust their actions accordingly. The adoption process of trigger-appraisal-emotion-response-outcomes-reappraisal has been examined in previous studies. This theory seems comprehensive in explaining people's adoption actions over time to effect situational change. FM technology can be seen as a disruptive change in facilities management processes (Belblavy et al., 2012). Some researchers (Beaudry and Pinsonneault, 2010, Beaudry and Pinsonneault, 2005, Liang and Xue, 2009, Ahuja and Thatcher, 2005) have used this theory to develop research frameworks to explain people's responses to new technology in working or living environments.

A coping strategic matrix has been proposed (Beaudry and Pinsonneault, 2005) that may explain why and how people respond to new information technology events in their workplace context. The researchers used two key constructs of the Coping Theory (Lazarus, 1991), appraisal outcomes and perceived control over a situation, to develop four quadrants in the matrix that represent four types of responses to new IT events. For example, a benefit maximization strategy was to increase one's own efficiency and effectiveness, and a disturbance handling strategy was to restore emotional stability and recover from the loss of individual efficiency. The same authors (Beaudry and Pinsonneault, 2010) conducted empirical tests on their model with a sampled population from two banks in North America. The proposed model was examined with emotion elicitation in each quadrant of the matrix.

The findings supplemented the original model with the addition of the personal emotion factor. The coping strategy matrix demonstrated a way to adopt the Coping Theory to study adoption actions during new IT events. Additionally, new IT events can be perceived as the introduction of new system features, which may be relevant to this project's objectives. However, this framework may not completely and comprehensively address this project's research questions, as it omits several constructs at the appraisal stage of the Coping Theory, for example, work goal congruence, self-esteem in the workplace (Barefield, 1983), certain key determinants of technology adoption (Venkatesh et al., 2003) and actual outcomes of adoption actions.

A theoretical model (Bala and Venkatesh, 2016) was developed to linking IT implementation and job outcomes following cognitive appraisal theory (Lazarus and Folkman, 1984) and a coping model of user adaptation (Beaudry and Pinsonneault, 2005). It proposes four types of technology adaptation behavior including exploration-to-innovate, exploitation, exploration to revert and avoidance that have enriched content of technology adaptation at system level. Various types of adaptation behavior may lead to positive or negative outcomes in term of job performance and satisfaction. This model has extended cognitive appraisal theory with consideration of IT implementation characteristics that cover experimental engagement and psychological engagement of users. Experimental engagement, including user participation and training effectiveness were tested with influences on cognitive appraisal of users. On the other hand, psychological engagement consisting of user involvement and management support were tested with direct and indirect relationship on cognitive appraisal. Rooted with similar theory, another model (Nevo et al., 2015) differentiates IT adaptation behavior and IT reinvention behavior. They both look like goal-driven behaviors that environmental changes trigger users' reaction to amend own state or environment in order to maintain and enhance likelihood on achieving their personal goals. However IT reinvention behavior may be caused by users' dissatisfaction on specific information technology but unable to reject usage (Nevo and Nevo, 2012). Two more intrinsic factors are proposed and include personal faithfulness to spirit of a technology and personal mindfulness. Users with less faithful to a technology are likely to reinvent than faithful users. Moreover, users with more mindful likely dissatisfy IT and reinvent a technology. Content of IT mindfulness and technology adoption behavior (Thatcher et al., 2018) are further expanded. Dimensions of IT mindfulness were proposed

and developed and tested with relationship with multiple types of post-adoptive use, consisting of deep structure usage and trying to innovate.

Expectable use (Walsh et al., 2016) is proposed as user's disposition or inclination to use any IT proactively and in a self-determined fashion. Thus it should be purposeful to individuals and consists of fearful use, self-indulging use, opportunity use, extensive use, self-enhancing use and socializing use. It is proposed to affect IT utilization and effective use of IT that can impact organization performance positively.

All above have enriched content of adaptation behavior, explained relationships between IT implementation characteristics and adaptation behavior and developed a key personal factor, personal mindfulness. However they all are limited to adoption behavior at system level and do not explain when and how different types of technology adaptation behavior happened. Empirical testing to prove those relationships is still lacking. They are uncertain to discover adaptation behavior at feature level as well as workplace management information system.

Information technology threat avoidance behavior (Liang and Xue, 2009) was studied on the basis of a technology threat avoidance theory. The concept is similar to that of the Coping Theory. The authors proposed relationships between appraisal, appraisal outcomes, coping strategy and outcomes. In contrast to typical technology adoption research, they focused on IT avoidance behavior.

Few research (Kim and Kankanhalli, 2009, Shi et al., 2018) investigated why people resist to technology implementation or switching consumption of technology-enabled services. Both of them have examined said rejection behavior of users or consumers based on status-quo bias theory, a bias or preference to stay at current situation. The theory states three major causes on user resistance to technology, including rational decision-making, cognitive misperception and psychological commitment. Rational decision-making is about user's assessment on relative cost and benefit on change from old to new work settings. If cost is greater than benefit for change, it leads to status quo bias, meaning users tend to keep at existing situation. The cost can be categorized into transition cost, cost incurred in adapting new technology and uncertainty cost, perceived risk associated with adaptation of new

technology. Both of them may affect users' perception on switching cost between old and new technology. Second, cognitive misperception of lose aversion explains users' value perception on losses loom larger than gain. This leads to status quo bias when users firstly evaluate new work settings with use of new technology. Third is psychological commitment that consists of sunk cost, social norms and effort to feel in control. Sunk cost is like IS habit (Duhigg, 2012) a legacy way of working with use of previous technology. High sunk cost may affect users' perception on high switching cost too, leading to status quo bias. Social norm is more about reference to colleague opinion, similar to concept of social influence that may affect users' perception on switching cost. Effort to feel in control defines users' desires on determination of own situation. This concept may be similar to self-efficacy (Moos and Azevedo, 2009) that users with feeling of lower self-efficacy may perceive higher switching cost, leading to status quo bias. A recent research (Shi et al., 2018) studied customer loyalty toward smartphone brands with integration of status quo bias theory. It has proposed cognitive lock in is an important barrier that inhibits consumers from switching into other brands because users are required to invest cognitive efforts learning and using new ICT products. Said invested effort is similar to the transition cost (Kim and Kankanhalli, 2009), leading to status quo bias. Deliberate inertia is another barrier principally grounded with status quo bias and defines consumers' intentionally persistence to maintain status quo. It is classified with low motivation to change and effect of internal condition of individuals. Consumers with high deliberate inertia may lead to increasing consumer's loyalty of existing IT products and decreasing likelihood of change to new IT products. Moreover, the deliberate inertia is personal with forces of habit, personal norms, knowledge and personal innovativeness.

Above research have focused on examining user resistance and avoidance behavior. They provide insight on why employees avoid switching from old work settings into new work settings. Likely, concept of switching cost can represent forces to keep employees using old workplace management system features. However, majority of them have not investigated technology adaptation behavior that this project aimed to understand. Likely, adaptation behavior would be richer and different in content when compared to avoidance behavior. Because of such differences, the constructs developed by above research may not be directly applicable to this project.

In sum, the Cognitive Switching Theory and Cognitive Appraisal Theory may not be proper models to address this project's research questions for the following reasons.

First, previous studies (Liang and Xue, 2009, Beaudry and Pinsonneault, 2005) rooted in the Coping Theory examined new technology at the system level rather than the feature level. Their findings on user behavior may be limited when compared to the complex nature of use at the feature level, including new feature adoption (Jasperson et al., 2005), replacing old features with other features with similar functions (Parthasarathy and Bhattacherjee, 1998), using old and new features together (Rice and Aydin, 1991) and using features in an innovative way (Ahuja and Thatcher, 2005).

Second, past use (Kim et al., 2005b) was examined in terms of its impact on continuous technology adoption, but why it has an effect has not been examined in previous research. Similarly, the Coping Theory mentions the reappraisal process triggered by outcomes of adoption actions that have not been intensively studied. Adoption behavior at the feature level likely occurs continuously and is driven by the experiential factors of individuals. Employees may combine or switch between old and new system features or replace old features with new ones over time. The behavioral combination can be far more complicated during the postadoption stage. Obviously, determinants of specific behaviors may vary and be time-dependent. Past studies rooted in the Coping Theory may not explain this behavior well.

Third, the Cognitive Switching and Cognitive Appraisal Theories are of limited use in addressing research problems related to technology adoption. There is a lack of research frameworks as well as empirical tests to demonstrate their predictive or explanatory power for technology adoption. The applicability of the proposed or developed constructs to this project's research questions is therefore uncertain.

Another research (Peng et al., 2016) used migration theory to study IT switching intention for instant messaging systems. The theory refers to Pull-Push-Mooring (PPM) framework, consisting of factors moving from one place to another place. Push forces describe negative

factors driving people away from original place. Pull forces describe positive factors attracting people to new place. Mooring factors, including life-course, spatial and culture facilitate migration decisions of individuals. Following the theory, switching intention of instant messaging is tested with several determinants that are Transfer Trust, Network of Obligation, Functional Deprivation and Monetary Deprivation. Amongst those four determinants, functional deprivation is distinctive functions and practical benefits of new IT perceived by users or consumers. Monetary deprivation refers to economic issues of new IT. They can be effort, time and cost incurred by individuals who use new IT. Both functional and monetary deprivations are relative in nature between old and new IT so push and pull forces perceived by consumers to determine switching or not for new IT. Network of obligation just like subjective norm and social influence that consumers anticipate their peers or social group expect usage of new IT by them. It has mooring effect on switching intention via functional and monetary deprivations. This framework explains consumers primarily evaluate functional value and economic impact relatively between old and new instant messaging. As a result, consumers will determine switching to new IT or not. This research has extended migration theory to subject of technology adoption. But it limits to single form of adoption behavior, switching from old to new IT. Also the determinants found are likely cognitive-centric and a lack of attitudinal and behavioral factors.

Recent research (Marciuska et al., 2013, Marciuska et al., 2014) followed value-based engineering to study technology feature usage and have tied feature usage to customer perceive value on system features that is defined as perceived benefits gained from new features. Customers likely do not use features with low value perceived by them (Marciuska et al., 2013). Feature usage also becomes a measure to reflect value of a feature perceived by users. So software developers can determine how to improve a software product (Marciuska et al., 2014). This research framework may narrow understanding of feature adoption behavior only for usage of specific features and customer perceived value on those features. It is uncertain to explain multiple forms of feature adoption behavior potentially with more determinants.

The last theory, the Expectancy Theory of Motivation (Vroom, 1994), states that individuals will behave or act in a certain way because they are motivated to select specific behavior over

others and because of what results they expect from the selected behavior. This theory contains three key concepts: expectancy, instrumentality and valence. Expectancy is the belief that one's efforts will attain the desired performance or goals. Instrumentality is the belief that one's performance will attain certain outcomes. Valence is the value that individuals place on specific outcomes. In simple terms and in work settings, employees will assess the likelihood of performance improvement or goal congruence based on specific actions or efforts. Then, they will assess the benefits attained with performance improvement or goal congruence and the importance of those benefits to themselves. If all results are perceived as positive, the employees will have very strong motivation to behave in specific ways.

This theory has been used to understand user acceptance of new information systems (Burton et al., 1992/1993, Lovata, 1987, Parijat and Bagga, 2014). These previous studies that investigate information systems adoption advocate concentrating on people's cognitive process rather than individual content of needs (Parijat and Bagga, 2014). The relationship between outcome expectancy and motivation of specific behaviors is emphasized. Information technology adoption is seen as goal-oriented and outcome-dependent behavior. This relationship is supported when investigating the adoption of expert system technology (Burton et al., 1992/1993). Users continuously evaluated the outcomes of information system adoption and assessed the likelihood that their actions would result in the desired outcomes. Thus, the valence model and force model were defined to explain technology adoption behavior. The first model concerns the attractiveness of the expert system resulting from the attractiveness of outcomes associated with system use and the likelihood of attaining those outcomes from the use of the system. The second model concerns the motivation to make maximum use of the expert system that is a product of the attractiveness of the system and the probability that a certain level of effort will result in successfully incorporating the expert system into the user job. Both models cover three key factors: the value of outcomes of use to individuals, the expected outcomes of use and the perceived effort of adopting new job settings with the use of expert systems. The authors examined the joint effects of all three factors on motivating expert system use through a desktop experiment with a group of MBA students in the US. In that study, they found that the attractiveness of the expert system was

slightly more important than the participants' effort to apply the system to their job when choosing to adopt the system.

Resent research (Benlian, 2015) studied IT feature use over time and developed a framework tied users' experience, level of initial feature use, growth of feature use and task performance. It reveals nature of change for IT feature use that may be experience-based and impact on individuals' performance outcomes. Said relationships looks congruence to the expectancy theory that IT feature use are likely experience-based and outcome-based behavior.

However, this theory does not address the research questions because it seems appropriate for explanation of outcome-based behavior that may not be related to desired feature adoption behavior.

2.1.3 Conclusion regarding research gaps

Existing technology adoption theories, including the process and variance approaches, may not perfectly fit the research aims of this study due to system-level-centric approaches, ignoring experiential factors, narrow investigation of organizational factors such as technology implementation tactics, lack of empirical studies and a narrow focus on the specific nature of a particular behavior.

Therefore, no single existing technology adoption model or theory directly addresses the research questions. It is necessary to develop a model specific to adoption behavior at the feature level that results in desired outcomes at both the individual and the organizational level.

3. Methodology

3.1 Research Design

The research design of this project contains three key components (Creswell, 2009a), philosophical worldviews, strategies of inquiry and research methods, as shown in Figure 2.

Philosophical Worldviews ←——————→ Selected Strategies of
Inquiry

Research Design

Research Methods
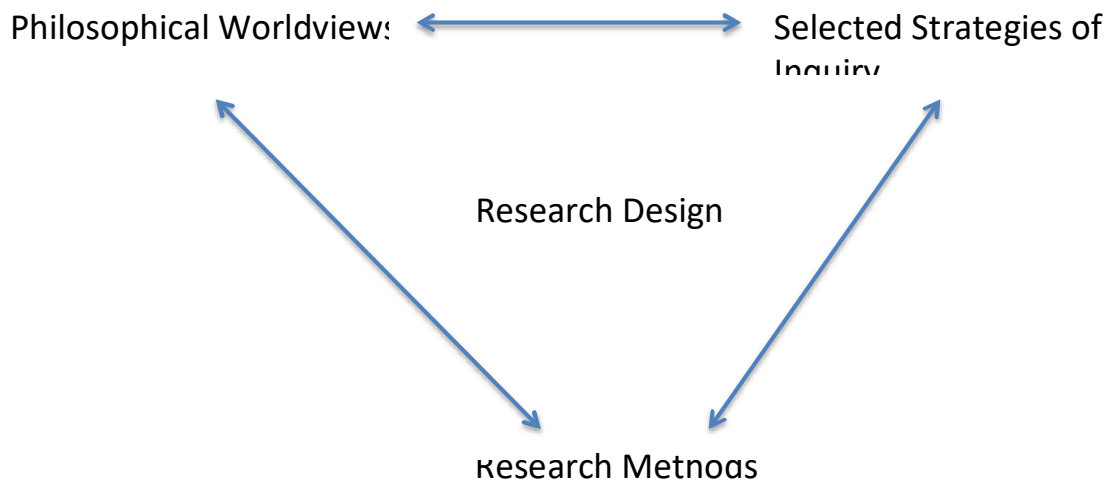
Adapted from Creswell (2009, p. 5)

Figure 2: Framework for Research Design

3.1.1 Philosophical Worldview Assumptions

A philosophical worldview (Creswell, 2009a) is similar to another term, paradigm, meaning a set of beliefs and assumptions shared by researchers in their understanding of research questions (Guba, 1990, Guba and Lincoln, 1994). Creswell (2009) stated four worldviews: postpositivism, constructivism, advocacy and participatory, and pragmatism, of which the first two are traditional and fundamental forms of research, and the last two were developed later with extended views (Creswell, 2009a).

The advocacy and participatory worldview holds that research inquiry must be intertwined with politics and a political agenda and must engage the participants in the research inquiry. It also requires the integration of the theoretical perspectives with the philosophical assumptions (Creswell, 2009b). This worldview may not align with the researcher's worldview for this project, which focuses on the individual level of analysis rather than the group level of analysis that a political agenda typically covers.

Therefore, this project reviews three fundamental forms of research, postpositivism, constructivism and pragmatism, in depth below.

a. Postpositivism

The postpositivism worldview is a deterministic philosophy in which causes probably determine effects or outcomes (Creswell, 2009b). It is reductionistic because it aims to reduce ideas into small, discrete units for testing. Knowledge can be empirically observed and objectively measured. The world is governed by law or theory, and the hypotheses that are developed can be tested and verified.

Postpositivism's ontological position is similar to that of objectivism (Bryman and Bell, 2011a) in that social phenomena and their meanings exist independent of social actors. Its epistemological position is similar to that of positivism (Bryman and Bell, 2011a) in that knowledge is obtained through gathering facts that provide the basis for laws, and such gathering must be conducted objectively. This follows deductive theory, representing a common view of the relationship between theories and research. The researchers generate hypotheses based on their understanding of the variables and theoretical consideration of the relationship between the variables, which must be subjected to empirical testing.

b. Constructivism

The constructivism worldview assumes that individuals seek an understanding of the world in which they live and work and thus assign subjective meaning to their experiences. Research based on this approach relies on the participants' views of the situation being studied (Creswell, 2009b). In this worldview, situations are complicated and cannot be studied narrowly with meanings of only a few categories, as in postpositivism. Researchers typically interrogate participants with open-ended questions to facilitate the sharing of views. The researchers also recognize that individuals' own backgrounds may shape their interpretation of the world; thus, they focus on the specific contexts in which the participants live or work (Crotty, 1998). Finally, the researchers generate or develop theories or patterns of meaning rather than beginning with a theory to address research questions.

Constructivism's ontological position is similar to that of constructionism (Bryman and Bell, 2011a) in that social phenomena and their meanings are continually being created by social actors. Its epistemological position is similar to that of interpretivism (Bryman and Bell, 2011a) in terms of its concern regarding how individuals make sense of the world around them. The researchers attempt to grasp the subjective meaning of social actions. This approach follows

that of inductive theory in that the researchers infer the implications of their findings for the theory. Simply, the research outcome is a theory.

c. Pragmatism

The pragmatism worldview arises from actions, situations and consequences rather than antecedent conditions (Creswell, 2009a). It is outcome-oriented and interested in determining the meaning of things or focusing on the product of research. It places primary importance on research questions and is based on the belief that theories can be both contextual and generalizable by analyzing their transferability to another situation. It emphasizes creating communication, shared meaning and joint actions with underlying beliefs in the complementarity of the qualitative and quantitative approaches. The advantages and disadvantages of each approach can be presented to create practical solutions to social problems (Morgan, 2007). Pragmatism is not committed to one system of philosophy and investigates the what and how based on the intended consequences (Creswell, 2009a).

Pragmatists can maintain both subjectivity in their own reflections on their research and objectivity in data collection and analysis (Morgan, 2007). They open the door to multiple methods, different worldviews and different assumptions as well as different forms of data collection and analysis (Creswell, 2009b). In addressing the connections between theory and data, pragmatists use "abduction", moving back and forth between induction and deduction (Shannon-Baker, 2016). They may convert their findings to theories and then assess the theories through action (Morgan, 2007). In other words, theories can be connected to data before or after data collection.

This study is based on pragmatism. The first reason is to avoid relying on one system of philosophy, as adoption behavior at the feature level is still unclear in the real-world context. On the one hand, it may vary depending on the participants' subjective meanings assigned to specific features used in the new workplace context. On the other hand, the participants' responses to new technology features may be traceable and observable under the conditions of disruptive technologies that are implemented in real business environments over time.

Investigating research problems in either subjective or objective ways might limit a content search for feature adoption behavior.

The second reason is the limitations of previous studies. Technology adoption theories developed in the past explain feature adoption behavior primarily at the system level. In the view of the researcher for this project, adoption behavior at the feature level should be far more complicated than that at the system level. Forms of behavior and determinants of specific behavior can be very different. For example, experiential factors (Beaudry and Pinsonneault, 2005) have been overlooked in system adoption behavior. A few other organizational factors have been studied in a limited fashion. They may be subfactors of facilitating conditions and a service performance management approach that is critical in the facilities management context (EY's Nordic REFM Team, 2016). As a result, this approach must allow flexibility to connect theories to data at different data collection stages.

3.1.2 Strategies of Inquiry

Following pragmatism, this project has adopted a mixed methods strategy (Shannon-Baker, 2016, Creswell, 2009b) in combining qualitative and quantitative approaches in a single study. The mixed methods strategy is superior to a single research method strategy. Either qualitative or quantitative analysis cannot address all research questions. Some research questions may be answered through a qualitative approach. Other questions examining causal relationships must rely on a quantitative approach. Thus, to answer all the research questions, this study relies on a mixed methods strategy. Moreover, the mixed methods strategy may neutralize or cancel the biases inherent in any single method. It also facilitates the triangulation of data sources across qualitative and quantitative methods. All of these reasons are relevant to this project, which addresses a relatively new and complicated topic in the workplace and in facilities management.

Of three different mixed methods strategies, sequential, concurrent and transformative (Creswell, 2009b), this project adopts a sequential mixed methods strategy that is relatively systematic and manageable.

First, this project begins with a qualitative analysis for exploratory purposes. It focuses on contemporary events and people's past and present behaviors for new system features captured through self-reports of interviewees. This covers forms of adoption behavior at the feature level, which may have significant positive impacts on individuals, and why and how specific behaviors occur. Interviewing participants in a specific case can allow them to share past experiences regarding the reasons for and ways of responding to new information system features in a real-world situation. Using a specific case can also provide evidence of the operational and business impacts of specific behaviors at the organizational level. Eventually, data sources can be triangulated to improve the validity of the results.

Second, the above findings can undergo quantitative analysis, such as survey methods with sampling to generalize the results and examine the theories developed. Data collected from the sampled population of the facilities management industry are analyzed quantitatively to validate feature adoption behavior, its determinants and the associations between them. Eventually, theories proposed to connect data can be confirmed.

This project formulates a two-stage research process. The first stage is qualitative analysis with the use of a case study and interviews, and the second stage is quantitative analysis with the use of a survey in a sampled population of facilities management practitioners in Hong Kong. This chapter has covered the research methods of stage one. The next chapter discusses the research methods of stage two.

3.1.3 Research Methods – Stage One

Qualitative methods were used, with open-ended questions and document review used to collect the shared experiences of individuals. Open-ended questions have been proven (Creswell, 2009a) to be good tools for collecting individuals' subjective meanings for the adoption of new system features. They enable us to understand individuals' perceptions and experiences in a real-world context, leading to intensive content analysis. Document data can provide evidence of context or the settings in which participants live or work; in addition, they support data triangulation to improve the content validity.

This project adopts a qualitative research approach, the case study (Yin, 2014b), consisting of document review and interviews as primary research inquiry methods to explore what, why and how people adopt new information system features in the facilities management context. Eventually, it develops a pattern of meanings and generates a theory.

<u>3.1.3.1 Research Case</u>

For the single case-study approach of this project, a bank was selected that implemented a new facilities information system with multiple features two years ago (Yin, 2014c) because the implementation was viewed as representative of the facilities management context and critical enough to suit the theory building.

A few years ago, the bank introduced a new facilities information management system to replace the incumbent facilities information management system for data analytics and management reporting purposes. The information system, called BI Portal, is an online data analytics tool with two main features: standard and customized performance reporting features.

The incumbent system of the bank had similar features but was not a perfect fit for new work settings; the new system was intended to improve work efficiency. Therefore, FM staffs were expected to use the new system features rather than the old ones to complete specific work tasks. The incumbent system was not removed on the first day and coexisted with the new system until the FM staffs were able to routinely master the new features. The FM staff could have adopted the new and rejected the old system, adopted the new and kept using the old system or simply rejected the new system. Moreover, the BI Portal was a comprehensive data management tool that aimed to collect facilities management data from different information systems and transform them into useful information to support management decisions. Data-driven decisions have become a common strategy of facilities management organizations (Yang et al., 2015).

This case was viewed as having an acceptable degree of representativeness of the typical facilities management context in Hong Kong, where finance and banking is one of the top four key industries (HKSAR, 2017). The bank may be the largest retail bank, with a comprehensive

range of types and many facilities, including office buildings, retail stores, data centers, trading floors, and dining and staff amenities. Such facilities are common for financial institutions. The scale of the bank facilities is large, meaning a high degree of technical complexity for facilities management. In addition, with diverse business stakeholders at the bank, the anticipated facilities requirements are wide in scope and stringent in quality.

All of the previously mentioned studies revealed that this case has strong relevance to multiple-use behavior at the feature level in the facilities management and workplace contexts.

This case is critical for theory building with the content provided. First, the KPI and operation reporting features provided a backdrop for understanding the triggers of the sense-making process (Louis and Sutton, 1991) that may affect adoption behaviors. Operational reporting may be seen as novel feature of similar systems, and KPI reporting may be seen as discrepancies or deliberative initiatives (Sun, 2012), a feature not new to users but with improved function. Second, the outcomes of specific behaviors articulated by individuals may provide evidence of the relationship between personal experiential factors and specific adoption behavior at the feature level. Third, organizational or external factors can be investigated in depth in relation to the respective effects of adoption behavior at the feature level. In the facilities management context, facilitating conditions may include user engagement with the system design (Schiffman et al., 1992), communication of change (Bhattacherjee and Sanford, 2006), training and system demonstration, guidance and professional support to facilitate self-learning (Beaudry and Pinsonneault, 2005) and temporary work settings to allow practice of the new system (Polites and Karahanna, 2013). These conditions may be used at different points in time during the technology life cycle for the sake of behavioral intervention. This case provided evidence of those measures implemented over a period of two years. Through personal interviews, we investigated how individuals perceived the effectiveness of those measures in terms of the selection of various forms of adoption behavior at the feature level.

In sum, this case provided an appropriate context and relevant samples for investigating employees' adoption behavior at the feature level.

3.1.3.2 Data Collection

a. Data Source

This project relied on two sources of evidence, document review and interviews with respondents and informants, that enable data triangulation to increase the construct validity (Yin, 2014c). Field observation was found to be irrelevant, as it may intrude on the real-world situation and lead to method bias (Yin, 2014b).

The bank established a share drive to store all project-specific documents in chronological order. The relevant documents included the design intent of the new system features, the project implementation plans and progress reviews, and documented user feedback on system usage. To confirm the data integrity, only documents with a date stamp were considered relevant evidence. The BI Portal generated use-tracking records that were referenced to confirm whether the interviewees' real usage matched their self-reported usage.

Personal interviews were used to capture the target users' behavior, attitudes and perceptions of the new information system features in comparison to the features of the old system. For the purpose of data triangulation, the interviewees' supervisors were interviewed to collect data regarding their observations of the interviewees' adoption behavior and their respective outcomes. Moreover, the global technology manager and regional performance manager were interviewed to collect data about the technology and organizational settings. The former was able to provide information regarding why the organization had developed new system features, who used the new features and when and which old features had been replaced. The latter answered questions regarding how the organization had implemented the new system features and what the organizational outcomes were.

b. Interview Questions

Semistructured interviews are adopted to collect data through a consistent line of inquiry while maintaining a fluid rather than a rigid approach (Yin, 2014d). The questions are designed to satisfy the needs of the inquiry with reference to previous studies that used a process approach to study human behavior (Louis and Sutton, 1991, Folkman and Lazarus, 1985b,

Beaudry and Pinsonneault, 2005); they are all open-ended questions that seek to determine why and how specific behavior occurred. In the meantime, "why" questions were amended to "how" as far as possible to create a friendly, nonthreatening atmosphere. Such questions can encourage opinion sharing by the respondents and improve the content validity (Yin, 2014d).

Louis and Sutton (1991) provided a set of questions relevant to personal perceptions of and attitudes and behavior toward new workplace technology during specific technology-led events over time. Although Folkman and Lazarus (1985b) did not provide a comprehensive list of questions, they highlighted the format of inquiries regarding how users respond to technology-led change and the reasons for their responses. Beaudry and Pinsonneault (2005) revealed the content of an investigation of employees' technology adoption behavior associated with anticipated benefits and harms. Their questions were then revised as follows to match the line of inquiry relevant to the user adoption process for new system features: a) What factors triggered employees' cognitive evaluation process for new system features? b) What determinants were evaluated, and how? c) What were the evaluation results, both emotional and intellectual? All three questions provide data on the determinants of specific feature adoption behavior at different stages of the employees' evaluation process. d) What were their responses? This question provides data on forms of feature adoption behavior at different points in time. e) What are the outcomes, and how did the outcomes affect people's responses? This question provides data on the actual outcomes of specific responses. All of the above questions follow the line of inquiry of this project and provide data relevant to the research questions. Full list of questions is attached in Appendix A.

Questions were also developed to avoid asking a single question more than once; thus, no why and how or what and why questions were asked at the same time. The questions were basically asked in the order of awareness, evaluation, attitude, emotion, action, outcome of action and reflection, which followed the process approach (Beaudry and Pinsonneault, 2005) of studying adoption behavior at the feature level.

3.1.3.3 Sample and Procedure

A list of interviewees who were expected users of the BI Portal was collected. In this case, the users of the BI Portal were senior management staff and subject matter experts (SMEs). The total number was approximately thirty employees in Hong Kong. Eleven of the thirty employees were finally sampled and interviewed, and their profiles are summarized in table 3.

Table 3: Summary of Interviewees' Profile

Interviewee	Job Title	Nationality	Gender	Job Nature	Supervisor of other interviewees
1	Facilities Lead	English	M	General	
2	Country FM Lead	English	F	General	Yes
3	Regional Engineering Lead	English	M	SME	
4	Regional Risk Management Lead	American	M	SME	
5	Administrator in charge	Chinese	F	General	
6	Regional H&S Lead	Chinese	M	SME	Yes
7	Country H&S Lead	Chinese	M	SME	
8	Facilities Lead	Chinese	M	General	Yes
9	Assistant Facilities Lead	Chinese	M	General	
10	Assistant Facilities Lead	Chinese	M	General	
11	Country Engineering Lead	Chinese	M	SME	

The nature and size of the sample are justified for the following reasons. First, the interviewees are all knowledge workers with a mix of ages (Uzoka and Ndzinge, 2009), gender (Venkatesh et al., 2003) and nationality (Uzoka and Ndzinge, 2009); past research has identified the effects of such workers on technology adoption in specific contexts. Following this profile, the sampled interviewees represent a targeted population to improve the content validity of the interview data collected for the study of technology adoption.

Second, owing to the nature of their jobs, these individuals may possess their own group norm (Venkatesh and Morris, 2000) and work goals that may affect their adoption behavior. Our sampled interviewees included major groups based on job nature. Then, interviewees were sampled from the senior level of each group and by convenience (Creswell, 2009a). Such sampling can avoid method bias and increase content validity. Interviewing senior-level staff first enabled the collection of their observations of subordinates' behavior and performance, which became a source of evidence to triangulate with data provided later by their subordinates. If the process had been reversed, we anticipated that junior-level interviewees

might be reluctant to share their thoughts and experience in depth, leading to respondent bias. The interviewee pool was expanded by referrals from the interviewees. When we finished each interview, we asked the interviewee to refer two colleagues to undergo the same interview, one a peer and the other a subordinate. They were asked to nominate others to avoid reflexivity bias (Yin, 2014d) that would all have convergent perceptions of the new system features.

Third, the sample size was over 30% of the target population of those who should be using the BI Portal, and the interviews were stopped when major differences in the data collected from the sampled respondents were not observed, aligning with the theoretical concept of data saturation (Bryman and Bell, 2011b).

Before the interviews, we reviewed the usage records of the interviewees so that no reflexivity bias existed regarding their existing adoption behavior at the feature level. Moreover, the majority of the interviewees confirmed their use of an incumbent system feature similar to the KPI reporting feature of the BI Portal. Thus, they were not novices in using the KPI reporting feature. Substituting new features for old features is an option in their adoption behavior.

All of the interviews were conducted in person and in the interviewees' native language (English or Cantonese) to prevent inaccurate or restricted articulation of their content due to language barriers. The interviewer rearticulated the questions if the interviewees seemed not to understand them. Moreover, the interviewer could drill down in the interviewees' answers when the information provided seemed doubtful. The interviews ended following the theoretical saturation principle (Bryman and Bell, 2011c) to ensure that sufficient information had been collected. All of the interviews were audio recorded and transcribed in the language used in the interview. Those conducted in Cantonese were transcribed in traditional Chinese and then translated into English by a third person. The interviewer reviewed the translated transcripts by listening to the recordings to ensure correct meaning and content validity. A case study database was established to capture all of the relevant documents, literature, interview recordings and interview transcripts in both Chinese and English. Research diaries were used to record the entire research process from the initial research questions to the

case study conclusions. Thus, external observers can trace the key steps in either direction from the conclusions back to the initial research questions or vice versa. These practices ensured the reliability of the case study research (Yin, 2014b).

A potential respondent bias may result from the researcher being one of the executives of the facilities management company that delivers FM services to the bank. The respondents from this company may have worried that unfavorable findings would affect their performance appraisal and thus might not have answered truthfully. This bias was considered insignificant because the researcher was not directly involved in the design and implementation of the BI Portal or the performance appraisal process of the interviewees. However, to minimize bias, the researcher provided the project objectives and a sample of the questions to each interviewee through the email that contained the interview invitation. The interviewee could then opt to participate or not.

3.1.3.4 Data Analysis

The analysis of the interview data followed the inductive approach (Yin, 2014a) and utilized the procedures of grounded theory (Strass and Corbin, 1990) as an analytic strategy that fit the exploratory case study as part of the hypothesis-generation processes to develop ideas for further study. The author (Creswell, 2009a) described the systematic steps of grounded theory that involve generating categories of information (open coding), selecting one of the categories and positioning it within a theoretical model (axial coding) and explicating a story from the interconnection of these categories (selective coding). This approach allowed the researcher to analyze the content from a broader angle and in flexible ways. It also avoided narrow views or personal presumptions from the researcher based on his own experience or understanding of certain theories.

a. Open Coding

The open coding followed an eight-step coding process (Tesch, 1990) that provided a systematic approach to eliminate investigator bias (Creswell, 2009a). The researcher read all of the interview transcripts, obtained a general sense of the information and reflected on their overall meaning.

In step two, the researcher selected one interview transcript, the shortest with full content, to codify as the starting point. The meaning of each statement was noted in the margin of the interview transcript and abbreviated to some descriptive terms as a code. Then, the researcher started to develop concepts based on those codes.

In step three, the researcher continued the coding for different interview scripts and clustered them into categories based on similar concepts. To develop theoretical categories, certain references were made to variables found in prior research that used both the variance approach (Davis, 1989, King and He, 2006, Venkatesh et al., 2003, Lee et al., 2003) and the process approach (Sun, 2012, Stam and Stanton, 2010, Beaudry and Pinsonneault, 2005, Polites and Karahanna, 2013). Such references improved the construct validity (Yin, 2014a).

In step four, the researcher remapped the categories into appropriate segments of the text and examined whether new categories and codes emerged, and in step five, the researcher reduced the list of categories by grouping them and relating them to each other. In these two steps, the researcher reviewed the categories in an attempt to understand how different categories fit together into a coherent picture (Pratt et al., 2006). To countercheck the codes, concepts and theoretical categories, we shared the code book and a few analyzed interview transcripts with the project supervisor for review.

Steps six to eight basically involved selecting the final codes and recoding the data as necessary. Ultimately, the researcher developed a content summary, or code book (Creswell, 2009a), to list the names of the interviewees, transcriptions, open codes, concepts and categories. An example extracted from the content summary is outlined in tables 4, 5 and 6.

Table 4: Example of Open Code

Interviewee	Transcription	Open Codes
Manager 1	*There are certain KPIs measured against achieving certain levels of our goals with the service satisfaction*	Performance monitoring
Manager 2	*Data back-decisions are made, so the operational data are much more important. Because the clients were quite demanding and wanted… had previously got…uh… previously had reports coming from the incumbent that were…reasonably comprehensive and had become very used to that for 5 years*	Operation critical Comprehensive reporting
Manager 3	*It's the report produced by the BI Portal, the KPI report that we then put into our feedback meeting with our client to explain our performances*	Performance monitoring
Manager 4	*The strength of the BI Portal is its ability to generate performance scores at different levels. So it is easier to track performance outcomes.*	Performance monitoring
Manager 9	*KPI reporting is critical in demonstrating if our service deliverables meet targets.*	Performance monitoring, operation critical

Table 5: Codes to Concepts

Codes	Concepts
Performance monitoring	Monitor functional performance of facilities management services, normally against service-level agreement and with key performance indicators
Comprehensive reporting	Normally refers to presentable format, data integrity and timeliness of reporting that can be used for proper presentation and support of decision making
Operation critical	Regarding relevancy and importance to operation of individual facilities services.

Through comparative analysis across the interviews and based on the commonality of concepts, this project grouped the concepts into different theoretical categories. An example is outlined in table 6.

Table 6: Concepts to Category

Concepts	Commonality	Theoretical Category
Monitor functional performance of facilities management services, normally against service-level agreement and with key performance indicators	Relevant to work goal Important to work goal	Work Goal Congruence

Normally refers to presentable format, data integrity and timeliness of reporting that can be used for proper presentation and support of decision making		
Regarding relevancy and importance to operation of individual facilities services.		

The above tables outline the process of proposing a theoretical category that is normally based on theoretical constructs from either the variance or the process approach. This example adopts one of the theoretical constructs of the Coping Theory (Lazarus, 1991). Work goal congruence is a key element at the primary appraisal stage in the cognitive appraisal process. This theory defines work goal congruence as people's perception of the relevancy and importance of new situations to their personal work goals in a specific context. Higher relevancy and importance mean a higher degree of work goal congruence.

This process was adopted to develop other theoretical categories that will be discussed in later sections.

b. Axial Coding

Next, the data were analyzed to identify the interconnection of different theoretical categories and to establish a conceptual framework (Strass and Corbin, 1990, Creswell, 2009a). Linking different theoretical categories has been referred to as the sequence of relationship (Strass and Corbin, 1990) or logical models (Yin, 2014a) and demonstrates repeated cause-effect-cause-effect patterns among the interviewees.

First, the outcomes and why they occurred under various forms of adoption behavior at the feature level were examined. Once the relationship was identified, adoption behavior with the desired and positive outcomes was selected for in-depth investigation. Second, we examined the conditions that influenced specific behavior. This examination included where when, how and why specific behavior occurred. Asking those questions ensures that the relationship between theoretical categories is deeply understood (Strass and Corbin, 1990). This project also validated the relationships between the theoretical categories by reviewing the data again and requesting feedback from selected interviewees. The primary objective

was to re-examine the data fit or misfit with the framework. If the fit was not good, we continued the pattern matching process (Yin, 2014a). To improve the internal validity, the researcher shared the matching with his supervisor for an external review.

<u>c. Selective Coding</u>

This final stage in building an exploratory framework is similar to an overarching story explaining adoption behavior at the feature level. This is a refinement process to further elaborate the relationships of the theoretical categories and any subcategories (Strass and Corbin, 1990). The relationships, if any, may be positive, negative or conflicting.

At this stage, the researcher started to examine the relationships identified by other theories, which helped create an analytical generalization of the lessons learned from the case study (Yin, 2014a, Yin, 2014c) that may extend the theoretical propositions or enable new or integrated theoretical concepts to emerge. Moreover, an exploratory framework grounded in developed and examined theories has improved external validity.

<u>3.1.4 Research Validation</u>

This section summarizes the validation techniques of this case study research as well as the qualitative analysis. The validation techniques followed those proposed by (Yin, 1994)), with tests of construct validity, internal validity, external validity and reliability at the design, data collection and analysis phases of the research. Table 7 outlines the tests in different phases to demonstrate the validity and reliability of this study.

Table 7: Summary of Validity and Reliability Tests (Amended from Yin, 2014b, Figure 2.3)

Tests	Tactic	Research Phase in which Tactic Occurs
Construct Validity	• Use multiple sources of evidence (document review, interviews) • Have sampled interviewees review exploratory framework • Use theories during coding process	Data collection Data analysis

Internal Validity	• Perform pattern matching when clustering coding • Use logic models to link categories	Data analysis
External Validity	• Use theory in the case study	Research design Data analysis
Internal Validity	• Develop code book and case study database	Data collection Data analysis

Tests of construct validity are performed to identify the correct operational measures for the concepts being studied. To test the construct validity, this project relied on multiple sources of evidence during the data collection stage to encourage convergent lines of inquiry. During the data analysis stage, published studies were cited to support operational measures that may match the concepts developed in the coding of this project, and the exploratory framework was shared with a few sampled interviewees for review.

Internal validity establishes a causal relationship. Although it is not necessary for exploratory studies (Yin, 2014c), this project attempted to establish theoretical categories through pattern matching and to use a logic model when establishing the relationships of the theoretical categories.

External validity defines the domain in which a study's findings can be generalized. This project cited previous studies using a qualitative analysis and process approach that provided a set of questions regarding why and how. The form of questions helped generalize the findings. In the data analysis stage, this project again researched theories after the exploratory framework was established. This matched the framework with existing theories and thus improved the analytical generalization.

Reliability demonstrates the operations of this study that can be repeated with the same results. This project documented the entire process from design to reporting and developed a case study database to store the data collected in different phases in a traceable way. Moreover, a code book, or content summary list, was developed to document the coding, concepts and theoretical categories that are critical to demonstrating the repeatability of this study.

4. Findings

The findings can be divided into organizational and user levels. The organizational perspective covers how the organization implemented new technology and what the organization expected at the level of diffusion (Rogers, 1995) of the new technology and the benefits gained from it. These findings are relevant to our first and third research questions regarding which forms of adoption behavior are desirable for the organization and validating individuals' perceptions of organizational influences on adoption behavior. The individual perspective covers the determinants of different forms of adoption behavior and their respective benefits or harm to individuals.

4.1 Organizational Level

The bank was found to primarily follow the typical three-stage implementation approach of new information systems: design, induction and implementation.

The design stage occurred between June 2012 and November 2013, when employees were invited to provide their own requirements for service performance tracking and reporting. Report protocols were regularly shared with the employees for comment. However, there is a lack of tracking of which comments were factored into the final design.

During the induction stage, in the first three months after the new system "went live," the bank relied on top-down communication through emails or flyers to provide an overview and update status of the implementation program of the new information system. Induction decks were prepared and shared by the central IT team to highlight the functionality of system features and the associated changes in the service process. Through WebEx or online training platforms, global and regional IT managers trained employees in how to use the new system features in new work settings. Additionally, online help desk services were provided to handle technical queries from employees regarding the use of the new system features. Depending on the individual manager, the employees were allowed to attempt new system features with

managerial encouragement and without risk of underperformance. At the end of the induction stage, user satisfaction surveys were conducted.

During the implementation stage, individuals were able to access the new system features anytime and anywhere through personal computers. The online help desk was still available, and training sessions were conducted regularly to refresh employees' knowledge and to train newcomers. The bank also adopted an online tracking tool to track actual use behavior for information system features and then revised the management measures if necessary.

The above organizational settings have physical, work-specific, temporal and social features (Polites and Karahanna, 2013) that may affect the adoption of technology. Physical features include time- and location-free access to new system features. Work-specific features include user involvement in the design stage, changes in communication (Elving, 2005), training and online help desk. Temporal features include a risk-free trial environment during a specific period. Social features include managerial encouragement and user satisfaction surveys.

There are several key objectives for adopting the BI Portal. First, the KPI reporting feature is used to track facilities management services performance against the standards. This produces standardized reports for information collected across countries and functions. This standardization is in term of data visualization, consistency and integrity. Not using this feature to report data may lead to contractual incompliance, inconsistent data interpretation and ineffective operational planning.

KPI reporting is applicable at the country level and for contractual compliance. Due to globalization, the global management team struggles to understand the situation of sixty countries. It is a reporting platform that is appropriate to integrate different systems and build real-time reporting of service performance in standard and consistent ways (Global IT manager of FM service provider).

Using incumbent systems such as 360 or the OVSC system to download data and manually generate reports with Excel lacks consistency, data accuracy and breadth of data analysis. The BI Portal is expected to narrow the gaps (Regional IT performance manager of the FM service provider).

Second, the operational reporting feature is used to carry out function-specific data analytics. This is similar to customized reporting to meet user-specific requirements for specific work tasks and functions as a result of productivity gain and efficiency at the work group level.

KPI reporting is applicable at the country level and for contractual compliance. Operational reporting is not contractually required but is only for user-specific requirements (Global IT manager of FM service provider).

The BI Portal captures incident and maintenance cases and reports the level of an incident, from local to global. Any CRE staff from the management level to the worker level are able to access the required data and examine actual performance outcomes against the client's requirements. For example, technicians or engineers can assess the failure rate of a facility and better plan for predictive maintenance. Eventually, facilities managers can manage risk effectively (Regional IT performance manager of the FM service provider).

In sum, employees are expected to substitute new system features for old ones, and KPI reporting can seriously impact organizational performance. The operational reporting feature is relatively flexible and is used primarily to satisfy the self-interest of individuals.

4.2 User Level

4.2.1 Adoption behavior at the feature level

Five forms of adoption behavior were identified, and users switched among them over the period of adoption. Three of the five forms of behavior aligned with the forms of behavior under the concept of features in use (FIU) proposed by Sun (2012), who identified four forms of feature use behavior: feature trying, feature combining, feature substituting and feature repurposing. The first three are referenced as theoretical categories of this project's findings that include Feature Trial, Feature Substitution and Feature Combination. The concept is also very similar to technology adoption behavior at system level proposed by Bala and Venkatech (2016) that includes exploration to innovate, exploitation and exploration to revert. Following their definitions, the first one is similar to feature trying. Second one is similar to feature substituting and the last one is similar to feature combining.

For the remaining two, the concept of Routine Use is similar to that of the information system (IS) habit proposed by Polites and Karahanna (2013). The concept of Feature Rejection is similar to that of the IT threat avoidance behavior (Liang and Xue, 2009) studied by Liang and Xue (2009) and technology avoidance behavior (Bala and Venkatesh, 2016). The adoption behaviors identified in this project are summarized in table 8.

Table 8: Summary of Adoption Behaviors at Feature Level

Theoretical Categories	Definition	Example of Quote

Feature Trial (23)	Add new features to one's features in use and expand the scope of features in use (Sun, 2012)	*"Trying a new feature was time consuming but allowed him to understand what the new reporting feature could tell us" (Manager 1)*
Feature Substitution (11)	Replace old IS feature with new IS feature with similar functions to complete specific work tasks (Sun, 2012)	*"Frankly, when I said no stress is involved with the BI Portal, I was surprised. I anticipated that replacing new features for old ones would help me complete difficult and time-consuming tasks in efficient ways" (Manager 8).*
Feature Combination (12)	Use new and old IS features with similar functions together to complete specific work tasks (Sun, 2012)	*"BI Portal is the only one that we give the client access to. JLL staff has access to 360, which is being developed quite aggressively for this account. We create a template with Excel to make sure we have got it right. We then… once we prove it, um… on the ground, we then get it converted into a 360 action. And then the third step is that the IT team sets up a link from the BI Portal to the 360 to present to the client in an understandable format" (Manager 3).*
Routine use (17)	Repeat specific adoption behavior continuously and automatically to complete specific tasks (Polites and Karahanna, 2013)	*They become part of working life and as one of the working habits" (Manager 8).*
Feature rejection (6)	Avoid using new IS features primarily designed for the completion of specific work tasks (Liang and Xue, 2009) (Bala and Venkatesh, 2016).	*"This is a centralized database with different reports. Managers can track individual teams' performance efficiently. This is good for reporting purposes. However, most importantly, how to interpret data and use data to support decisions for improvement will bring true benefits. At this moment, I cannot see such outcomes.. I think operation teams seldom use it. From a user perspective, they don't perceive a need to use it and are not required by others to use it. Hence, the system is a bit complicated. They do not have a strong intention to access it" (Manager 9).*

Adoption behaviors at the feature level were dynamic and switched to other forms over time. Table 9 summarizes individuals' behavior at different points in time that can be divided into three basic stages: first trial, transition and steady-state. First trial defines the time that new system features were first introduced to users at the beginning of the induction stage of the new system features mentioned in the previous section. Interviewees were still uncertain of the purpose of the new system features.

Transition defines the time that the new system features were actually available for use after a period of time. From an organizational perspective, it should occur between the induction and implementation stages and immediately after a series of training, top-down communication and practice sessions allowed for users. Interviewees gain a certain level of experience or knowledge of the new system features, regardless of whether they feel the features are good or bad, at the individual level.

Steady-state defines the time that the new system features are rolled out in the workplace. It is the implementation stage at the organizational level. Basically, the interviewees knew specific system features very well and perceived them as typical settings for their workplace. At that point in time, the system features were not revised or underwent very minor adjustments that the interviewees did not perceive as disruptive of their daily routines.

Table 9: Summary of Behavioral Switching

Interviewee	First Trial	Transition	Steady
1	Feature trial	Feature rejection	
2	Feature trial	Feature substitution	Routine use
3	Feature trial	Feature combination	Routine use
4	Feature trial	Feature substitution	
5	Feature trial	Feature substitution Feature rejection	
6	Feature trial	Feature combination	Routine use
7	Feature trial	Feature substitution	Routine use
8	Feature trial	Feature substitution	Routine Use
9	Feature trial	Feature combination Feature rejection	Routine Use
10	Feature trial	Feature substitution	Routine use
11	Feature trial	Feature substitution	

Referring to table 9, Figure 3 is proposed to indicate a possible behavioral switching sequence.
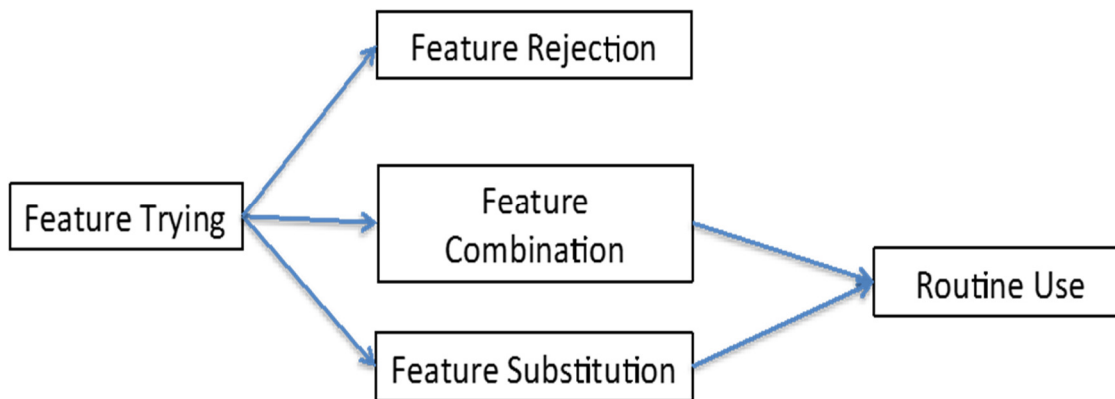
Figure 3: Possible Behavioral Switching Sequence

Figure 3 indicates that adoption behavior normally begins with feature trial during the first trial period. During the transition period, adoption behaviors become diverse: some interviewees rejected specific features, some combined new and old features and those remaining substituted new features for old ones. Those who adopted the new system features eventually maintained these forms as routine behavior.

As shown in table 9, two interviewees were found to have multiple behaviors during the transition stage because their responses were feature-specific. They rejected operating reporting features but adopted KPI reporting features. Once again, this finding demonstrates the complexity of adoption behavior at the feature level for a single technology.

a. Feature Trial

Feature trial is defined as new features added to individuals' features in use or to the basket of features available for individuals to use (Sun, 2012). This means that the scope of the features that individuals may adopt or select is expanded. Feature trial was a common behavior among all the interviewees in the first trial period, as shown in Table 9. Trying, gaining experience and retrying are common themes identified by the interviewees. The interviewees did not rely on new system features to complete specific work tasks during this initial trial stage because of performance uncertainty regarding the new system features. The example below indicates this trial-and-error behavior.

"I indeed expect similar functions that allow me to keep tracking staff performance. I will investigate what sort of report can be produced by the BI Portal …I did explore how to use it by asking Jeff. I do seldom use other work-related information systems" (Manager 9).

Testing the functionality and usefulness of new system features is the main objective of interviewees in trying new system features. Moreover, the degree of relevancy of the functions and perceived usefulness for individuals are examined, which is similar to the concept of work relevancy mentioned in the Coping Theory (Lazarus, 1991). In the induction stage, the interviewees received information regarding what the new system features were and how they could be used and incorporated into the service process. Hence, the benefits of new technology at the organizational level but not at the personal level were highlighted by the organization. To examine those functions and their relevance in terms of benefits gained at the individual level is important. Through trial, the interviewees tested the functionality of the new system features and their usefulness against what they had been told. Hence, they evaluated the actual benefits attained that are relevant at the individual level.

Another objective is to examine the personal effort required to master new work settings and new system features. This is similar to the concept of coping potential in the Coping Theory (Lazarus, 1991). When a new IS feature is introduced, it may cause disruption of routine work and revise working procedures for individuals who require individual and team learning (Edmondson et al., 2001). Most of the interviewees mentioned the effort and time required to amend their own work style to match the new work processes and to acquire the necessary skills for using the new system features. This effort is similar to the findings of past papers regarding IS habits (Polites and Karahanna, 2013, Limayem and Hirt, 2003) that examined the personal effort required when employees amended an incumbent IS habit to a new one. Moreover, such an effort was found to control personal emotion. Trying new system features may cause negative emotion for individuals when they experience performance ambiguity as an IT threat (Liang and Xue, 2009) or as lack of control over a new situation (Beaudry and Pinsonneault, 2010); personal emotion may also be strongly elicited in the initial adoption stage. The interview data of this project indicated that an emotional control effort was required to regulate such negative personal feelings, including anxiety, frustration, anger, embarrassment and discomfort.

In sum, trying new system features allows employees to examine the relevance of the functionality to their personal self-interest and to assess the personal effort demanded. Table 10 summarizes the above two key objectives with supporting examples.

Table 10: Objectives & Benefits of Feature Trial

	Concepts	Example Quotation
Objectives	Testing the functionality & usefulness of new system features relevant to them (45)	*"I indeed expect similar functions that allow me to keep tracking staff performance. I will investigate what sort of report can be produced by the BI Portal …I did explore how to use it by asking Jeff. I do seldom use other work-related information systems"* (Manager 10).
	Examining the personal effort required to master or use new features (26)	*"You know… immediate reactions, anger, frustration … then… I would typically give it a day, maybe two… and then refocus that anger into how can I make it work for me as an individual, not necessarily for the account that will be a tactic. So… if I can make it work for me as individual, then I can take those parts that are not easy and potentially sell them back to management or to enabling others and letting it be published"* (Manager 4).
Benefits	Enhance service quality and work efficiency (12)	*"All the functions I can pull out of BI Portal would help me do my job more easily… then the client is happy with JLL services"* (Manager 2).
	Stabilize personal emotion (16)	*"Although I felt confusion in the beginning, my feeling was diminished when I started knowing how to extract the required data and complete tasks. Of course, this was through exploration and evaluation of features over time"* (Manager 9).
Harm	Reduce work efficiency (12)	"*I have wasted much time to explain to them and tried to make them accept what information can actually be provided"* (Manager 6).
	Performance ambiguity or limited improvement perceived (30)	*"They can get me some information that I require from them; they find it, they give it to me, and then they move to another one. I wouldn't say that their performance has been improved"* (Manager 1).
	Personal image harmed or eroded (13)	*"I'm not able to… actually explain to the client, um… because I know what they're thinking... and I want to answer that question, but I can't"* (Manager 2).

Table 10 reveals that feature trial, like any other responses, leads to experienced personal outcomes that may benefit or harm the individuals who align with the concept of the Coping

Theory (Lazarus, 1991). The benefits include enhancing work efficiency, improving the quality of the services delivered to the client and stabilizing personal emotions. Specific work tasks were completed more quickly and easily, leading to experienced convenience of work and personal work efficiency improvement. Work done more quickly improved the response time for clients' requests, resulting in increased customer satisfaction. Feature trial allows individuals to practice and acquire knowledge. The interviewees were becoming more familiar with the new work settings and system features over the time of the trial. Hence, their feeling of anxiety diminished, which led to minimizing negative emotion and stabilizing personal emotion.

In contrast, harm to individuals may include high intensity of efforts both for problem solving and managing personal emotion, resulting in a loss of work efficiency. Some respondents also experienced work performance ambiguity during the trial; thus, they were unable to achieve their personal work goals consistently. Moreover, they felt harm to their personal identity in their own work group as they demonstrated incapability of delivering services at the expected level and handling new situations.

Feature trial behavior is viewed as temporary and may switch to other forms as actual experience is gained by individuals. From an organizational perspective, this behavior is expected to occur at the induction stage of new technology implementation. The performance ambiguity of individuals may occur and result in uncertainty regarding achieving the desired business outcomes, such as meeting key performance indicators (KPIs), improving employee satisfaction and improving financial performance.

b. Feature substitution

Feature substitution is defined as a behavior that replaces an old IS feature with a new one to complete specific work tasks; it is similar to the concept of Feature Substituting that is one of the features of use behaviors (Sun, 2012). This refers to the scope of the features replaced that individuals must adopt. As shown in table 10, feature substitution occurs in the transition stage and is one of the adoption behaviors that occur after feature trial. At this point in time, the employee begins to rely on the new IS features to complete of his or her work activities, as shown in the example below:

"They could chase when and how much was the last purchase of specific parts. Also, they were able to review the price range of the parts online. In the middle of the implementation program, many staff started using the features progressively" (Manager 10).

Interviewees with feature substitution behavior focused on learning new knowledge, amending personal working practices and influencing the organization to amend work settings, for example, by voicing out the defects of the new system features. Personal emotions, whether positive or negative, did not affect their actions and responses to the new system features. Such findings align with the concept of problem-focused effort mentioned in the Coping Theory (Lazarus and Folkman, 1984), which refers to people aiming to amend external or extrinsic conditions when they encounter disruption of their routine. All of the efforts made are listed in Table 11. Moreover, they align with the concepts of a previous technology adoption study (Wood and Moreau, 2006) that studied the influence of emotion mainly in the early stages of innovation and found that it diminishes over time as experience is gained at the personal level.

By substituting new features for old ones and amending personal work practices, employees' expectation of attaining benefits that are relevant to their personal interest in the workplace is a fundamental driving force. The experienced outcomes include personal work efficiency enhancement, improvement of the quality of work and the strengthening of professional credibility, as listed in Table 11.

Personal work efficiency enhancement means that employees can complete specific tasks with less effort or time consumed. In other words, employees can work more quickly and broadly with the new work settings. Improving the quality of work is another positive outcome that employees seek. It includes correctly reporting performance data, properly evaluating property risk across the portfolio and comprehensively tracking compliance with statutory and contractual requirements. Both of these benefits are relevant to work performance.

Personal benefits can also be related to personal image, meaning how others assess the importance of an individual in the work group (Moore and Benhasat, 1991). Employees who adopt new system features are demonstrating their competency in mastering new settings

and their own value to the team. Feature substitution allows intensive familiarization with new system features. Employees with extensive knowledge may become a champion or expert in using the new system features and may provide advice to their peers or subordinates, thus demonstrating their value to others.

Table 11: Course of Action & Outcomes of Feature Substitution

	Concepts	Example Quotation
Course of Action	Actively learn and acquire new skills (14)	"If people are driven to want to succeed, they want to win. I started to understand the report more after each month asking questions myself before having to go into it or my clients asking me questions. So I'll go away and find the answers and come back… the next month" (Manager 2).
	Amend own working style or practices (10)	"I know I won't do that after, even though I wanted to do better… we'll just move on… we'll let them figure it out later, just write that note down, just spare them work, tell somebody else and tell them to fix it" (Manager 4).
	Influence organization to adjust work settings (11)	"I'm very happy to give constructive criticism… to try to improve it" (Manager 2).
Benefits	Work efficiency enhancement (9)	"Frankly, when I said no stress is involved with the BI Portal, I was surprised. I anticipated that replacing new features for old ones would help me complete difficult and time-consuming tasks in efficient ways" (Manager 8).
	Improvement of the quality of work (8)	"I often click in this section and review data, covering self-audit status, H&S risk assessment progress and facility risk ratings produced in a combination of visual inspection document reviews. I rely on the results of this facility risk rating to understand the latest risk profile against countries. I will concentrate on those countries with higher facility risk ratings" (Manager 7).
	Strengthening of personal credibility (10)	"To be a good consultant, I have to equip myself to be able to answer every inquiry. For features related to EHS, I think we should be more frequent users than others. I am responsible for learning more and studying intensively. This is why I access it on and off. I want to be proactive and identify any incorrect issues in the system. Then, I can ask FM staff to amend it before the clients ask" (Manager 7).

Therefore, feature substitution is found to be an outcome-based behavior reinforced by positive outcomes or benefits experienced by individuals. Unlike feature trial, no negative outcomes of feature substitution were reported. This makes sense, as employees would switch to this form of behavior, which requires a high degree of trust on the system, only to achieve their expectations.

"It helps establishing system reputation eventually" (Manager 6).

From an organizational perspective, the work efficiency enhancement and quality of service performance improvement outcomes can be linked back to business outcomes that satisfy the key performance indicators and financial performance indicators. Personal credibility enhancement means that a sense of empowerment and engagement may result in employees experiencing satisfaction with the new work settings as part of the organizational goals (Nelissen and van Selm, 2008). All of these outcomes are viewed as positive contributions to organizational success.

c. Feature combination

Feature combination is defined as the behavior of combining the new and old system features that have similar functions to complete specific work tasks. This definition is similar to that of feature combination in the features of use proposed in Sun's research (Sun, 2012). This behavior occurs in the transition stage and after the trial of new features. It appears to duplicate the same actions for a single task and might be long lasting because the interviewees maintained such behavior from the transition to the implementation stage. The example below indicates this behavior and its nature of continuity.

"I may require equipment uptime results biweekly, but the system only updates data on a monthly basis. Due to misalignment with my requirements, I eventually use my own ways, such as using Excel to capture and update data" (Manager 11).

After trying new system features, the interviewees experienced harm in terms of performance ambiguity and a feeling of lacking control over the situation. At the same time, they perceived that their respective work group or senior executive had pushed them to adopt the new system features. They had no alternative but to accept the new system features to demonstrate compliance with the organizational norms or regulations. The interviewees had to rely on old work practices by using old system

features with which they were familiar because they believed in their performance. As a result, they reinvented their work process with a combination of old and new system features to complete a single task, but with different objectives.

Feature combination is found in courses of action that involve both problem-focused and emotion-focused effort (Folkman and Lazarus, 1985b). It includes learning new skills and new knowledge and amending one's individual process to combine old and new features. However, employees may have a limited influence on the organization, for example, by voicing out the defects that they find and demanding that they be rectified. This situation looks reasonable, as the interviewees did not intend to deeply use the new system features but continued to rely on old system features to complete their work. Influencing others to adjust their work settings should also be considered irrelevant and unimportant. They also must control the personal emotion resulting from perceived threats or experienced harm. Table 11 shows evidence of the identified actions.

Feature combination likely occurs when several situations coexist. First, the benefits of feature trial are both negative and positive, resulting in performance ambiguity and uncertainty. Second, the adoption of new system features is unavoidable primarily owing to the perceived mandatory settings of use. Third, old work practices with the use of the old system features are still available for the completion of specific tasks, likely with an output similar to that of the new system features. Simply, adopting the new system features aims to demonstrate process compliance that is viewed as mandatory and demands initiative (Griffith, 1999). At the same time, using the old features allows employees to feel confident that they can complete specific tasks and obtain the anticipated output.

Table 12: Course of Action and Outcomes of Feature Combination

	Concepts	Example of Quote
Course of Action	Actively learn and acquire new skills (6)	*"To support corrective maintenance services, I prefer to use Maximo, as its speed of processing is much quicker and more user-friendly. I am much more familiar with it than with the BI Portal, as the associated training is not really enough. As I mentioned before, we do not well understand the BI Portal's particular method of use. I prefer*

		Maximo rather than the BI Portal for the reason that it is quicker and my familiarity" (Manager 9).
	Amend own work style or practices (6)	*"We create a template with Excel to make sure we have got it right. We then… once we prove it, um… on the ground, we then get it converted into a 360 action. And then the third step is that the IT team sets up a link from the BI Portal to the 360 to present to the client in an understandable format" (Manager 3).*
	Control personal emotion prior to determining the way forward (3)	*"The limitations of the tool, then you know…you put the stress aside; well, I know that would be the basic approach" (Manager 6)*
Benefits	*Other people's recognition of new feature adoption (5)*	*"The FM team leads expect me to show up frequently. It is hard for me to meet their expectations with only myself for this area. Other than showing them data and results online, they cannot be aware of what I am doing" (Manager 7).*
Harm	*Limited improvement of work efficiency (6)*	*"I still have made it manually; that takes my time. So the BI Portal may not really help me" (Manager 9).*
	Feeling of disengagement in the workplace (5)	*"When the features are not really helping people's daily operation, users only act following rules. I think such system implementation is quite unsuccessful" (Manager 11).*

Feature combination is found to have a mix of positive and negative experienced outcomes at the individual level, as shown in table 12. Based on the interview data, a positive outcome is gaining other people's recognition of one's use of the new system features owing to process compliance or performance of rule-governed behavior. Negative outcomes include limited improvement or even reduction of work efficiency and a feeling of disengagement from the new work settings. The interviewees reported duplicating efforts by using similar features at the same time to complete specific tasks, leading to a reduction of personal work efficiency. When the interviewees adopted new features because they were mandatory and did not realize any benefits relevant to their personal goals, they complied in a mindless manner and felt disengagement from the work setting.

Feature combination may not result in benefits at the organizational level. It can be seen as rule-governed and threat-avoidance behavior (Liang and Xue, 2009), and employees might adopt new system features in a mindless way, such as "check the box" behavior. A potential

downside is work goal misalignment between the personal and work group levels, affecting the delivery of services and achievement of key performance indicators that are normally measured at the group level. Duplicate efforts made to complete a single task may result in an unproductive business context; this possibility is supported by the observations of an interviewee who is also a departmental manager.

"If data input is very difficult or inconvenient, more manpower is required to perform the data input. This looks unproductive from a business perspective" (Manager 11).

d. Feature rejection

Feature rejection is defined as employees stopping using a new system to complete specific work tasks for which they are responsible. This concept is similar to the technology avoidance behavior described in the Technology Avoidance Threat Theory (Liang and Xue, 2009). The theory states that employees avoid new technology by enlarging the gap between the current status and the undesired end status as well as the threats perceived. Based on the interview data, feature rejection occurred after trial of new system features when interviewees experienced harm and perceived threats. They stopped trying the new system features to minimize the threats and harm to themselves.

"As the system is experienced as unreliable, I have no choice but to produce a manual report with PowerPoint for the client's reference" (Manager 6).

Feature rejection aims to minimize the experienced harms or perceived threats during feature trial. The interviewees might experience positive or negative outcomes at different points in time. When they assigned more weight to negative outcomes than to positive ones, the adoption of new system features was perceived as harmful to them, resulting in the intention of avoidance behavior. However, this behavior occurred only when the interviewees had a certain degree of control over the situation and were able to avoid the new system features. This concept is similar to the avoidance effort mentioned in a study of customer complaint behavior (Stephens and Gwinner, 1998) grounded in the Coping Theory (Lazarus, 1991). The researchers differentiated avoidance-focused effort from emotion-focused effort, although the two might serve the same purpose of minimizing perceived threats. The former depends on an employee's degree of control over the external environment to obtain physical distance from new system features. Based on the interview data, feature rejection was found when

the interviewees had a certain degree of control over other people or even the organization. They simply tasked their subordinates with adopting the new system features to complete specific tasks for which they were originally responsible. In addition, they voiced out the defects or weaknesses of the new system features as much as possible, primarily to make excuses for not adopting them.

"They prefer to assign others to use it and get required information on behalf of them" (Manager 9).

"I am there to fly the plane. I am not there to fix it. So I'm there to lead the team and get them to do things, and they're there to … make things work and look at different buildings" (Manager 1).

From an organizational perspective, feature rejection reflects reluctance to change and absolutely confronts the organizational objectives for business transformation. This behavior should not be encouraged and should be avoided.

e. Routine use

Routine use is defined as repeated and automatic adoption behavior at the feature level. This concept is similar to the automatic and effortless behavior identified in the Cognitive Switching Theory (Louis and Sutton, 1991), which states that employees stop evaluating a situation and continue the same behavior without making a mental effort. Based on the interview data, this behavior occurs in the implementation stage and recurred repeatedly right after feature substitution or combination. The interviewees gained similar experiences or outcomes continuously with specific behavior. When certainty of results was perceived for a specific behavior, they repeated the behavior over time to complete the same tasks. Eventually, repeated behavior became automatic behavior that requires no mental effort and is consistent in nature.

"They become part of working life and one of the working habits" (Manager 8).

"For me, now, it's an essential tool, but for everything…many things I do on a daily basis, I rely on it" (Manager 2).

Routine use is an effortless behavior; thus, employees can enhance their mental efficiency (Louis and Sutton, 1991) for handling other work tasks, leading to maximizing personal work efficiency and minimizing mental stress, which can be seen as positive outcomes at the personal level. From an organizational perspective, the outcomes of routine use may depend on what form of behavior is repeated by individuals. If this behavior is feature substitution,

positive outcomes may be guaranteed. However, if it is feature combination, it may result in negative outcomes. Therefore, routine use should be encouraged, depending on the specific form of behavior.

<u>f. Summary of adoption behavior</u>

The above findings address the following research questions: *What are the key forms of adoption behavior at the feature level and in the facilities management context, and which of them are desirable from the organizational perspective?*

Five forms of adoption behavior at the feature level are identified: feature trial, feature substitution, feature combination, feature rejection and routine use. The forms of behavior switch from feature trial to different forms at the time of adoption at the individual level or in the technology implementation stage at the organizational level. Different forms of behavior have their own nature and result in diverse outcomes that can be summarized as positive or negative at the personal and organizational levels. Table 13 summarizes the key findings.

Table 13: Analysis of Five Forms of Adoption Behavior at Feature Level

Form of behavior	Nature	Outcome at individual level	Outcome at organizational level
Feature trial	Exploration and testing	Positive or Negative	Positive or Negative
Feature substitution	Goal and objective driven	Positive	Positive
Feature combination	Rule-governed	Positive or Negative	Negative
Feature rejection	Avoidance	Positive	Negative
Routine use	Automatic	Positive or Negative	Positive or Negative

Feature trial is an exploratory behavior and may result in positive or negative outcomes at individual and organization level. Feature combination is likely rule-governed behavior and results in either positive or negative outcomes at individual level. At organization level, it may cause negative outcomes, relevant to productivity loss. Feature rejection is avoidance behavior. It may result in positive feeling of individuals but surely unwanted outcomes at organization level. Routine use is automatic behavior. Depending on form of the last stage

behavior, the outcomes can vary between positive and negative. Among the five forms of adoption behavior, feature substitution is likely a desirable behavior at the organizational level because it may result in a positive impact on a company's performance in terms of staff productivity, service quality and cost-effective operation. These outcomes all align with business objectives and goals. Feature substitution is likely goal- or objective-oriented behavior that organizations may feasibly influence through proper job goal setting, performance-related rewards and enabling a positive employee experience.

At the individual level, employees gain benefits that are important to their self-interest through feature substitution. Therefore, it is likely self-governed by individual employees over the time of adoption and later converted to routine behavior. Organizations also save the time and cost of monitoring process compliance that may not be outcome-relevant.

Therefore, this project concentrated on understanding what factors determine feature substitution in the next section.

4.3 Determinants of feature substitution

This section aims to answer the following research questions: *What are the key determinants of specific feature adoption behavior, and which of them are organization-relevant?*

Based on the interview data, six factors are identified that have a direct or indirect influence on feature substitution. They are classified into two groups. The factors in the first group, work goal congruence, self-esteem, outcome experience and switching cost, have a relative direct influence on feature substitution and can be viewed as non-organization-relevant. The factors in the second group, a self-learned environment and user design, tend to have an indirect influence and are organization-relevant.

4.3.1 Non-organization-relevant Factors

Table 14 summarizes the factors with a relative direct influence on feature substitution based on the interview data.

Theoretical Categories	Definition	Concept	Example of Quote
Work Goal Congruence (25)	Functions of new features are perceived to align with personal work goals or performance objectives (Lazarus, 1991)	Track personal work and service performance in efficient ways (8)	"They can check our performance against the requirements of the MSA. I use it to track countries' or even individual buildings' performance regularly" (Manager 6).
		Report actual performance results in standard ways to suit contractual requirements (6)	"It allows standardization; it allows more consistency in reporting" (Manager 2).
		Report actual performance results in ways that suit individuals' functional requirements (6)	"Only at that stage would we have a report created. But there is really no restriction on what we have received, so we the global engineering team has identified the need for the report" (Manager 3).
		Allow access to new system features anywhere and anytime (5)	"We can use this platform to share data with others" (Manager 6).
Self-Esteem (23)	Personal value and competence and personal identity perceived by others (Cast and Burke, 2002, Barefield, 1983)	Perception of personal contribution to the work group (14)	"I have to understand more. To be a good consultant, I have to equip myself to be able to answer every inquiry. For features related to EHS, I think we should be more frequent users than others. I am responsible for learning more and studying intensively" (Manager 7).
		Perception of personal competence to complete specific tasks using the new system features (9)	"Then on the client side, they don't use it because they are still operating in the old… old model. You know… you're the service provider; you're supposed to give me… I should not have to go look for it on my own, so that's changing a mindset…uh… on both sides of the table" (Manager 4).
Benefits (27)	Actual benefits of feature substitution observed and experienced by	Work efficiency enhancement (9)	"Frankly, when I said no stress is involved with the BI Portal, I was surprised. I anticipated that replacing new features for old

	employees (Lazarus, 1991)		*ones would help me complete difficult and time-consuming tasks in efficient ways"* (Manager 8).
		Improvement of the quality of work (8)	*"I often click in this section and review data, covering self-audit status, H&S risk assessment progress and facility risk ratings produced in a combination of visual inspection document reviews. I rely on the results of this facility risk rating to understand the latest risk profile against countries. I will concentrate on those countries with higher facility risk ratings"* (Manager 7).
		Strengthening of personal credibility (10)	*"To be a good consultant, I have to equip myself to be able to answer every inquiry. For features related to EHS, I think we should be more frequent users than others. I am responsible for learning more and studying intensively. This is why I access it on and off. I want to be proactive and identify any incorrect issues in the system. Then, I can ask FM staff to amend it before the clients ask"* (Manager 7).
Switching Cost (23)	Extra time and effort perceived by individuals to substitute new features for old ones at work (Nagengast et al., 2014, Pick and Martin, 2014, Shi et al., 2018, Kim and Kankanhalli, 2009).	Time needed to access and master new system features (8)	*"This consumes over 10 minutes when your system has been already logged out. There is no choice to access it in daytime. So I tried accessing and using it during the nighttime. Later, I better understood it and found that the risk-level scores are ideal. I concentrated on locations scored as high risk. For those locations, I met the individual FM team to understand the root causes and follow-up actions"* (Manager 7).
		Effort to amend work styles and practices (15)	*"I felt it was very hard to use. Indeed, I did not know what the categories are and what data belong to which category. There was a note listing which page and section should have what data. I referred to this note and*

			mapped it with the BI Portal and tried to run it. I marked down what I am not sure about" (Manager 5).

a. Work goal congruence

In table 14, work goal congruence is defined as the degree of relevancy and importance of new system features to employees' personal work goals or performance objectives. This concept refers to the Coping Theory (Lazarus, 1991) in that people evaluate whether new situations are relevant and important to their own work goals. A higher degree of importance increases the likelihood of positive appraisal outcomes and perceived opportunities. Work goal congruence is similar to the perceived usefulness (Davis, 1989) and performance expectancy (Venkatesh et al., 2003), concepts of technology adoption theories. They both represent users' expectations of how the functions of new technology will meet their needs.

In the facilities management context, individuals must usually meet multiple performance targets that must be measurable (Price, 2004). Achieving those targets is normally tied to rewards or appreciation; thus, they become personal needs in the work context. New system features that can expedite accomplishment of these personal needs are perceived as beneficial to individuals, which motivates them to replace new features for old ones.

The interview data support the functions of new system features being appraised regarding their relevancy and importance in accomplishing specific work goals or priorities. The interviewees perceived new system features as being better than old ones when they expedited work completion in terms of quantity and quality. Thus, the new features aligned with their personal work goals, resulting in a tendency toward feature substitution. The example below demonstrates this relationship.

"Yes. Because of using it more often, I know what I can get from the system. In the first few months, I did try using it bit by bit, as I was unfamiliar with it. Now, I know the functions and how to run my required report from it. I do not consume much of my time to prepare a report. Indeed, the features are not changed significantly from the past, and I handle it better over use and time. I have to use it for report generation every month. The more I use it, faster I can pick it up. With more practice, I become more familiar and use less time to generate reports" (Manager 5).

Several functions that were appraised as work goal congruence of the new system features are summarized below.

Both the KPI and operational reporting features can improve the speed and accuracy of service performance tracking capability. The former provides standardized reporting to satisfy contractual requirements, and the latter enables customized reporting to meet the functional requirements of individuals. With increasing service performance tracking capability, facilities managers can monitor and control the quality of services to effectively meet specific standards, which is one of their personal work goals. Hence, they will probably substitute new features for old ones.

Work goal congruence is viewed as relevant and important to expedite the accomplishment of employees' performance objectives. Perceiving a high degree of work goal congruence for new system features increases the likelihood of feature substitution.

b. Self-Esteem

In table 14, self-esteem is defined as an employee's perception of other staff members' views of his or her contribution to the work group and competence in work settings. This concept is similar to that of self-esteem proposed by a previous study (Cast and Burke, 2002), which states that self-esteem is part of the identity verification process containing worth-based self-esteem, the degree to which individuals feel that they are a person of value, and efficacy-based self-esteem, the degree to which people see themselves as capable and efficacious to complete specific tasks. Both are assessed through social comparison in a personal identity verification process. This process is a match between self-relevant meaning in a specific situation and the meaning held by norms or standards. The self-esteem concept is also similar to the concept of personal identity proposed in another study (Barefield, 1983). Personal identity represents individuals' self-esteem and perceived importance to others in their own groups, which are affected by relationships with superiors and respect by peers. People behave and perform so as to maintain or improve their internal status in terms of self-confidence and perceived importance to others. In the workplace, this internal status can be reflected by an individual's job role, ranking, level of authority and work performance. Thus,

enhancing personal identity and increasing personal self-esteem are personal goals. Self-esteem also extends the concept of the social factor in technology adoption studies (Venkatesh et al., 2003) in terms of why and how social factors affect technology adoption. The interview data support the influence of self-esteem on both value-based and efficacy-based results, as shown in table 14.

When employees believe adoption of new system features can demonstrate their contribution to their work group's performance and accomplishment of the group's objectives, they perceive an increase in value-based self-esteem. Employees can demonstrate their intelligence and capability to the work group through quick and extensive adoption of new system features. They may become champions or experts of the new technology and become capable of providing advice to other group members regarding the usage of new system features. Thus, employees perceive an increase in efficacy-based self-esteem.

Increasing value-based or efficacy-based self-esteem is seen as a benefit to individuals at work (Brockner, 1989) that is important for them to gain respect as well as expert power in the work group. Employees thus are motivated to substitute new features for old ones. This concept aligns with the Sociometer Theory (Leary, 1999) in that people behave in ways that protect or enhance their self-esteem and act in ways that are believed to improve social acceptance. An example extracted from the interview data also demonstrates this relationship between self-esteem and feature substitution:

"Indeed, they may not truly know how the whole system works and were waiting for someone to guide them. This became my duty to understand the system operation, and explaining to FM staff required myself to know more. As a member of the EHS team, many FM staff may consult you on different issues. To facilitate it, I have to understand more. To be a good consultant, I have to equip myself to be able to answer every inquiry. For features related to EHS, I think we should be more frequent users than others. I am responsible for learning more and studying intensively. This is why I access it on and off. I want to be proactive and identify any incorrect issues in the system. Then, I can ask FM staff to amend it before the clients ask" (Manager G).

Enhancing self-esteem likely provides intrinsic benefits to employees in terms of increasing social acceptance. When employees perceive that adoption of new system features can protect or enhance their self-esteem, they are likely to substitute new features for old ones.

c. Benefits

Benefits are defined as actual positive outcomes observed or experienced by employees. This concept is similar to that of the experienced benefits of a specific response stated in the Coping Theory (Lazarus, 1991). These benefits are fundamentally relevant to individuals in work settings. As shown in table 13, the outcome experienced contains three subgroups: work efficiency enhancement, improvement of the quality of work and strengthening of personal credibility. Each of them was reported with direct influence on feature substitution.

Work efficiency enhancement reduces the time and effort required for individuals to complete specific tasks and thus increases personal productivity, which typically can be measured by the size of the facilities managed per person or the output of work per person in the facilities management context. It is viewed as beneficial to individuals from a personal work performance perspective. As employees realize that feature substitution can lead to increasing productivity, they may use new features rather than old ones to complete specific tasks. An example extracted from the interview data reveals this relationship:

"The strength of the BI Portal is its ability to generate performance scores at different levels. So it is easier to track performance outcomes. I often click in this section and review data, covering self-audit status, H&S risk assessment progress and facility risk ratings produced in a combination of visual inspection document reviews" (Manager 6).

Improvement of the quality of work demonstrates the work effectiveness of individuals, reflecting delivery of the correct level of services and minimizing human error at a given point in time. It is seen as beneficial to employees because of its relevance to personal work performance. Employees realize the benefits and increase their tendency to substitute new features for old ones to complete specific tasks. An example extracted from the interview data reveals this relationship:

"We implemented change to increase the experience and improve it to …I will answer the second one first; to me, it is effective, certainly yes… um…" (Manager 2).

Strengthening personal credibility improves an individual's personal identity and image in the workplace setting. Employees feel more confident in new situations when customers or colleagues value their importance to and competence in specific work groups. This is viewed as beneficial to employees because of its relevance to personal status. Employees realize the benefits that result from feature substitution. Therefore, they are likely to substitute new features for old ones. An example extracted from the interview data reveals this relationship:

"For things like compliance around the mandatory training, I would actually access that portal to be able to pull that information out, um… to… play that back to the client, or they can access it themselves, which is very helpful" (Manager B).

All of the above factors reveal positive relationships between the outcomes experienced and feature substitution.

Benefits may also have an indirect effect on feature substitution through re-evaluation of work goal congruence and self-esteem. Employees evaluate the importance of positive outcomes to work goal congruence or self-esteem. More important positive outcomes for work goal congruence mean stronger perceived benefits of new system feature adoption, leading to an increasing likelihood of feature substitution. This concept is similar to a reappraisal process stated in the Coping Theory (Folkman and Lazarus, 1985a). People refer to the behavior's outcome, reappraise the work goal congruence of the new situation and then determine their response in advance.

The interview data reveal these relationships. Enhancing work efficiency as a positive outcome was evaluated as having a high level of importance to the interviewees' work goals. The interviewees determined to substitute new features for old ones. Another positive outcome, improvement of the quality of work, was also evaluated as having a high level of importance to work goals. Thus, the interviewees decided to practice feature substitution. Last but not least, enhancing personal credibility was evaluated as having a high level of importance for protecting or enhancing self-esteem. Therefore, the interviewees substituted new features for old ones. An example extracted from the interview data demonstrates this relationship:

"It allows the… opportunity to mean we're doing… we're capturing information the same way for each account, sorry, sorry, for each country; each country is standardized, and that improves performance. And it drives people to want to succeed; they want to win" (Manager 2).

Benefits may have indirect and positive effects on feature substitution through re-evaluation of their importance to work goal congruence or self-esteem. In other words, more benefits represent more importance to perceived work goal congruence or self-esteem, resulting in an increasing likelihood of feature substitution.

d. Switching cost

Switching cost is defined as the extra time and effort that individuals believe are needed to substitute new features for old ones at work. This concept goes beyond the concepts of perceived ease of use (Davis, 1989) and effort expectancy (Venkatesh et al., 2003) stated in previous technology adoption models that concentrate on the effort required to adopt new technology but do not discuss the extra effort needed to amend incumbent IS habits (Polites and Karahanna, 2013). This concept aligns to similar factor of switching cost (Kim and Kankanhalli, 2009) that was tested with direct and indirect relationships to user resistance on new information systems following status quo bias theory. Switching cost was also found as one of personal traits in form of cognitive-lock-in and deliberate inertia to existing products or services (Shi et al., 2018). The concept also refers to some theories adopted to study switching behavior in the field of product or service marketing (Nagengast et al., 2014, Pick and Martin, 2014). In this field, switching cost refers to the monetary and nonmonetary costs faced by a customer when switching to a new product brand or service provider. Monetary cost refers to the loss of quantifiable financial resources, and nonmonetary cost refers to the psychic costs incurred in expenditures of time and effort.

In the facilities management or workplace context, substituting new features for old ones is very similar to switching products or service providers that provide similar functions. In contrast to the consumer marketing context, employees may not experience significant financial loss when substituting because the organization usually bears the finance-related impacts, for example, overtime or days off to compensate for the extra hours spent by individuals in acquiring new skills. Therefore, individual employees experience mainly nonmonetary switching costs.

New system features may be perceived as complicated compared to old ones with which interviewees have been familiar to. When employees use new system features to complete specific work tasks, they experience a longer time needed to complete an amount of work similar to that performed with the old system. The time spent may include ways to access new system features, more steps to complete specific activities and slower data download or upload speeds.

Amending work habits or practices may incur major costs from the employees' perspective. The interviewees described great mental and physical efforts required to amend old practices to new ones to complete specific tasks. They needed to amend not only the method of work but also their personal work-life style. The interviewees' efforts to plan work procedures or methods of work with the use of the new system features may be seen as dramatic changes from using the old features at the individual level. Some even arranged to perform part of their work after office hours or at night because certain new work activities, for example, generating data analytical reports, were seen as too time consuming to interrupt their other routine work in the daytime.

High switching costs are found to influence the relationship between a positive outcome and feature substitution. When employees anticipate high switching costs, they may undermine the benefits or positive outcomes gained from switching to the new features. In other words, high switching costs weaken the link between positive outcomes and feature substitution. This relationship is similar to the mooring effect of the pull-push-mooring framework, which is adopted to study why consumers switch service providers (Bansal et al., 2005) in studies that examine how high switching costs can diminish the relationship between the pull factor and switching behavior.

However, based on the interview data, high switching costs were perceived only in the early stage of adoption and became lower over the time of practice. Switching cost was reported to have only a slight effect on feature substitution, which typically occurs in a later stage of adoption. Evidence is shown below:

"I felt it was very hard to use. Indeed, I did not know what the categories are and what data belong to which category. To me, it is very difficult to search the data. There was a note listing which page and section should have what data. I referred to this note and mapped it with the BI Portal and tried to run it. I consumed a lot of time studying what I need to do and how to search the data. I marked down what I am not sure about. To attend training, I learned where and how I could search the required data in the BI Portal. Indeed, the features are not changed significantly from the past, and I handle it better over use and time. I have to use it for report generation every month. The more I use it, the faster I can pick it up. With more practice, I become more familiar and use less time to generate reports" (Manager 5).

High switching costs may have a negative effect on the relationship between positive outcomes and feature substitution, but this effect may become weaker over the time of

feature substitution. Figure 4 illustrates the relationships identified between non-organizational factors and feature substitution.
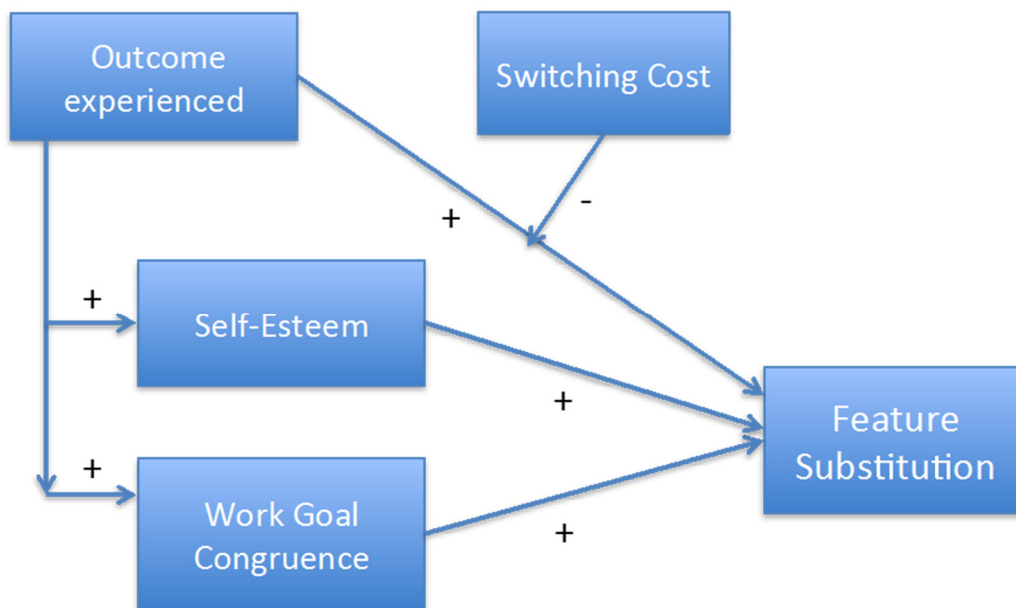

Figure 4: Relationships between Non-organizational Factors and Feature Substitution

Work goal congruence, self-esteem and benefits individually have positive and direct influences on feature substitution. Benefits also have positive and indirect influences on feature substitution through self-esteem and work goal congruence. In other words, word goal congruence and self-esteem may have mediating effects on the relationship between benefits and feature substitution. Switching cost has a direct and negative influence on the relationship between benefits and feature substitution. In other words, it may have a moderating effect on the relationship between benefits and feature substitution.

4.3.2 Organization-relevant factors

The interview data support two organization-relevant factors: self-learning environment and user design. They align with the concept of facilitating conditions (Venkatesh et al., 2003) in that organizational and technical infrastructure exist to support the use of technology. Table 15 reveals evidence of the findings.

Table 15: Summary of Organizational Factors

Factor	Concept	Example of Quote
Self-learning environment (40)	Environment to facilitate interactive learning (14)	"*With performance managers… um… Ramesh actually is the name… of the person I'm thinking of. Um… and some training sessions in place? Um… briefing notes, guidance notes, uh…and we have a technology team now so that… queries can be… Somebody can help with their input or anything like that. Um…and then just having… much more clarity of who owns which… owns which bit. So that we can escalate issues*" (Manager 2).
	Asking immediate supervisors or peers to advise on use of new system features for specific operations (8)	"*I got help from the staff of other departments. My supervisor guided in me how to use it. Also, the India IT team helps us to tackle system issues*" (Manager 7). "*Um… and if that is from the top, if you get it being used by global, regional and country leadership, and everything we do, then we… we must be seen as the early adopters*" (Manager 2).
	Environment allows risk-free practice in the work context (18)	"*He gave me a link and let me try using it. For features related to EHS, I think we should be more frequent users than others. I am responsible for learning more and studying intensively. When FM services were just go live, I was not so rushed to use the features. Indeed, we were allowed a buffer to pick up the operation*" (Manager 7).
User Design (30)	Lack of understanding and addressing their needs (15)	"*I am sure that it wasn't ever properly thought through a business case. Just a very fact, we identify the need for… actually, we didn't… we identified where the KPI reporting wasn't giving us what we needed, and then the BI team said, we will configure the other type of report that will give you what's needed*" (Manager 3).
	Increasing their influence on system design (5)	"*They may think that is good enough, but not really for the regional or global level. We are at operation level and expect more details. If they can consult end users or us, I think the user interface and reporting format will be much better and more presentable…Lack of consultation. They should not ignore the client's feedback and opinions, particularly for CRE staff at the country level*" (Manager 6).
	Importance of demonstrating users' opinions being considered in system design (10)	"*Engineers may have different ways to analyze data from that of financial staff. Therefore, the system should be more flexible. As senior management, they should assess if the system is really functioning, or people have resistance to change, or aged people can't catch up quickly. Maybe some staff still have resistance to change that the management can observe through system usage*" (Manager 11).

a. Self-learning environment

A self-learning environment is defined as a real work environment that enables employees to self-regulate their own learning behavior and practice new system features in a risk-free manner. This concept is similar to a few theoretical concepts (Wan et al., 2012, Cosgrave et al., 2013, Garcia-Guzman et al., 2013) in the field of management. The first study mentions that "learning" is a self-regulated and interactive behavior of trial and practice. The second and third studies mention the living laboratory concept, which defines a real-world testing ground for new ideas and technologies. A concept of encouraging and managing innovativeness allows employees to examine and experience different work settings without fearing risk exposure.

First, self-regulated learning is supported by interactive learning and the availability of advice from peers or senior management. The interviewees reported that traditional classroom or online "Webex" trainings, which primarily use a one-way approach, did not support interactive learning. The interviewees expected guidance and an online manual and experience sharing forum; they preferred acquiring knowledge on demand and on a case-by-case basis. They followed their own learning pace in terms of time, speed and style rather than a restricted framework to push data and information to them. The content of training should include why new features exist, what they do and how they work. It is best to articulate their relevance and importance to individuals while providing instruction in the method of use.

During learning, the interviewees encountered problems with new system features that were operation-relevant. They preferred to seek advice not only from system developers but also from their managers or peers who were familiar with facilities operation and had gained experience in integrating the new system features into operations. The reason is that managers and peers understood the requirements and challenges of the service processes better than the system developers did. Encountering problems without a timely resolution became a perceived barrier and discouraged the interviewees' learning.

Second, practicing new features in work settings may induce errors and performance ambiguity, resulting in personal performance gaps observed by others. The interviewees worried about practicing new system features in their own work settings if their performance results were affected. They expected a performance buffer to be allowed during the practice period, when they were not yet sure they could achieve consistent results with feature substitution. Such an arrangement can encourage the practice of new system features.

The self-learning environment is critical to enable individuals' experiential learning so that employees can experience the actual outcome of specific behavior. As mentioned in section 4.3.1.c, benefits may have a significant and direct effect on feature substitution. The self-learning environment provides opportunities for employees to experience positive outcomes, leading to feature substitution. The below example demonstrates such a relationship:

"To understand the features, you have to concentrate on it for a period of time. As there are various types of job order, you have to walk through them in detail and wait for a system update. If data are not being updated, you may redo it by creating a work order. The more work orders you make, the percentage of outstanding work orders increases, and the completion rate looks low. Then, people may perceive that you underperformed. People now may relax a bit when gaining more experience of usage of the BI Portal. In the early beginning, I could not really trust this system. Working over time, I think other teams have known me better, and they, including myself, have understood the BI Portal more in depth. I am also experienced in what data are collected and how useful they are. I started feeling control over the BI Portal. Eventually, I realized I could use it better" (Manager 7).

The self-learning environment should be important not only in the induction stage, allowing feature trial but also in the implementation stage, when employees require a consistent positive experience when deciding to substitute new features for old ones. This is a type of experiential learning through which employees gain positive experience with actual outcomes.

b. User Design

User design is a defined work environment that enables new system users to make decisions regarding the design of new systems to be owned or used by them. This concept refers to Carr's concept of user design (Carr, 1997), in which he proposed the importance of user involvement in the decision making related to the creation of a human learning system. He mentioned several methodologies: ethnography, cooperative design and action research-based user design. All of them encourage user involvement by meeting user requirements

and encouraging users to attend workshops or focus groups, give postusage feedback and even participate in experiments. More importantly, users not only provide opinions but also have the right to make decisions regarding the new system design. Several studies (Gunther et al., 2001, Vredenburg et al., 2002, Sutchlffe et al., 2010) have adopted user-centered design when developing new technologies and proposed the importance of empowering users and stakeholders in the decision-making process, which enhances their engagement with the motivation for new technology adoption.

User design is not commonly adopted in information system design. Users or stakeholders are still not empowered to make decisions when a new information system is developed (Goodacre, 2013). Users do not truly influence system design even when they will use the system in the future. Based on the interview data, the system design was found to lack an understanding of the users' work needs or practices. Thus, the new system features were experienced as incompatible and as not addressing the users' needs. Increased involvement and consultation of users in the system design stage were requested. Thus, specific user needs can be shared in advance. Most importantly, the interviewees expected that their opinions and comments would be heard by others and truly considered in the development or revision of system features. However, they did not gain such a result. As usual, they were asked for comments but did not find that those comments were considered in the design stage. They felt disappointed when they saw the end products.

User design is a process to engage and empower users in the design stage. On the one hand, system developers can acquire the bottom line of user requirements that helps optimize the design of new system features and avoid overdesign. On the other hand, the design process becomes much more visible to users, who can monitor the actual acceptance of their opinions of the system design. Users may understand the functions of new system features and their relevance to work goals. If necessary, they can influence the design as early as possible. Thus, an effective user design can lead to a perceived high degree of work goal congruence, resulting in an increasing likelihood of feature substitution. The interview data supported this finding, as shown by the example below:

"Understanding that there was an avenue to get to the actual people who work with a tool, who understand the tool… and that they also… that they were taking my recommendation under consideration, and actually seeing those recommendations come up in the actual reports" (Manager 4).

User design has an indirect influence on feature substitution through work goal congruence. This means that user design has a positive effect on work goal congruence. When users are highly involved in the design of new system features, they likely perceive a high degree of work goal congruence.

However, user design looks more relevant to radical change of an information system that demands value-based engineering (Marciuska et al., 2013) for key functions of the system. In post-adoption stage, re-design of a feature tends to be incremental that might not be worthwhile to adopt user design approach. Simply said, user design may have practical meaning when study initial adoption of new system rather than individual feature adoption at post adoption stage. So this factor has been removed from our framework.

4.3.3 Integrated framework for adoption of Feature Substitution

Feature substitution has been found to be a goal-driven and outcome-based behavior. Actual outcomes experienced by employees may have dominant effects on feature substitution. These effects may be caused by their importance to individuals regarding work goal congruence and self-esteem, as proposed by the previous section In the workplace context, job roles commonly define specific work goals and individual performance targets that are normally tied to the service-level agreement or a performance pledge to measure the performance of multiple services at the work group level. Employees expect that actual outcomes will be tied to their work goals and perceived contribution to the work group. Testing the causal relationships between outcome experienced and perceptions of personal beliefs, work goal congruence and self-esteem, and between outcome experienced and feature substitution, is viewed as increasingly important. Therefore, adjusting individuals' performance targets and advocating personal contributions to organizational change in terms of disruptive technology may be effective measures to motivate feature substitution.

The qualitative analysis proposed several relationships between outcome experienced, work goal congruence, self-esteem, switching cost and feature substitution. They align with the Expectancy Theory of Motivation (Vroom, 1994) for the following reasons.

First, feature substitution is likely outcome-oriented behavior in which employees are willing to invest their own effort or time to incorporate new system features into their work once they experience and value benefits at the individual level.

Second, the relationships between work goal congruence or self-esteem and benefits are similar to those proposed in the valence concept, or part of the valence model (Burton et al., 1992/1993), which demonstrated the attractiveness of new system features. Simply, both work goal congruence and self-esteem are key beliefs or objectives through which employees aim to achieve in the work environment. Actual outcomes closely aligned with those objectives are perceived as important, which is similar to the valence concept.

Third, relationships between feature substitution and benefits reflect the motivational force of the Expectancy Theory of Motivation (Burton et al., 1992/1993). On the one hand, the outcome experienced may have a direct effect on feature substitution, following the expectancy concept. On the other hand, the outcome experienced may have an indirect effect on feature substitution, likely through two mediators (Hair et al., 2017d): work goal congruence and self-esteem. The indirect effect is similar to the combination of valence and expectancy that is equivalent to a motivational force (Burton et al., 1992/1993).

Finally, switching cost represents time and effort made for feature substitution so that employees can successfully incorporate new system features into their own work settings. Its effect on the relationship between benefits and feature substitution is similar to aspects of the force model (Burton et al., 1992/1993) and the expectancy concept. A high switching cost means a reduced likelihood of the successful incorporation of new system features into individuals' own work settings, leading to decreasing expectations of a positive outcome.

Several limitations of the Expectancy Theory of Motivation are considered. It is limited to the rational aspect of human behavior (Leon and Wahba, 1975), and such a limitation is believed not to affect the results because feature substitution is likely driven by personal goals and objectives, with minuscule effects of personal emotion; this finding is similar to the findings of some technology adoption studies (Venkatesh et al., 2003, Wood and Moreau, 2006) that emotion, affect or anxiety may have a minor effect on technology adoption behavior in the

postadoption stage. Another limitation is that the concept of instrumentality and expectancy (Leon and Wahba, 1975) is not always clear. In the work context, expectancy may refer to the likelihood of performance outcomes resulting from effort, and instrumentality may refer to the likelihood of rewards or incentives resulting from performance outcomes. However, it is difficult to achieve clearly defined outcomes and rewards in any circumstances. For example, employees' feature substitution may result in work efficiency maximization that appears to be a performance outcome of the effort made. They perceive high worth for work efficiency maximization whether or not they receive material rewards, which is normally described as instrumentality. Eventually, they are motivated to substitute new features for old ones due to work performance improvement. It seems unnecessary to separate these two concepts in this research framework, as in the research framework developed for adoption of the expert system (Burton et al., 1992/1993).

Therefore, the research framework of feature substitution is grounded in the Expectancy Theory (Vroom, 1994). The research framework is extended with the incorporation of two organizational factors that are critical in workplace technology settings. The proposed framework may explain only a specific context, similar to this case study, which limits its explanatory power. Several hypotheses are developed for this integrated framework and are tested in the next project.

4.3.4 Development of Research hypotheses

a. Valence Effect

The valence effect is defined as employees' perceived importance of the outcome of feature substitution compared to their personal objectives in the work environment (Burton et al., 1992/1993). Employees appraise work goal congruence and self-esteem as primary objectives to be achieved in the work environment (Lazarus, 1991). The benefits of feature substitution may include work efficiency maximization, improvement of the quality of work and personal image enhancement. The first two are likely relevant to work goal congruence. Employees may compare the benefits gained to their personal work goals. Increasing work efficiency with feature substitution means a stronger perception of the work goal congruence of the new system features, leading to an increasing perceived value of benefits. This relationship is similar to that of the improvement of the quality of work. Following the valence concept,

employees understand the importance of the benefits gained when the benefits increase the perceived work goal congruence of the new system features.

Enhancing personal image as a benefit is relevant to personal self-esteem because it is about how others expect and perceive an individual's contribution or competence. Employees expect increased levels of self-esteem at work as one of their personal goals (Barefield, 1983). Enhancing personal image in a work group may increase personal self-esteem and be seen as congruent with personal goals. Thus, the benefits gained may increase personal self-esteem, leading to an increase in the importance of enhancing personal image as a benefit. This also follows the valence concept.

The valence effect likely explains the findings regarding the relationship between benefits and work goal congruence or self-esteem. Employees evaluate the benefits gained from feature substitution and compare them to their personal goals and objectives, including work goal congruence or personal self-esteem. Employees' perceived outcomes are highly positive, and the valence when they appraise positive outcomes will increase their perceived work goal congruence or self-esteem. The valence effect demonstrates the relationship between positive outcome and work goal congruence or personal self-esteem. Therefore, two **hypotheses** are formulated in the research framework.

H1a: A high degree of benefits gained by employees increases the perceived work goal congruence of new system features.

H1b: A high degree of benefits gained by employees increases personal self-esteem.

b. Expectancy Effect

The expectancy effect (Vroom, 1994) is defined as the likelihood of goal achievement or benefits gained due to feature substitution. It is also the likelihood that an effort will be made to incorporate new system features into individuals' work settings (Burton et al., 1992/1993).

Relationship between benefits and feature substitution

The qualitative analysis proposed that an outcome experienced with a direct effect on feature substitution may cause extra effort and significant uncertainty in an individual's work settings. Employees who experience this effect strongly expect to achieve benefits to compensate for

the perceived cost and risk (Al-Gahtani and King, 1999). This finding is supported by consistent personal experience with the benefits of adoption. In other words, employees expect a high likelihood of benefits when they decide to practice feature substitution.

This relationship may be similar to the relationship between performance expectancy and technology adoption stated in the UTAUT (Venkatesh et al., 2003). When employees perceive increasing performance improvement with the use of new technology, they are likely to adopt the new features.

Testing the causal relationship between benefits and feature substitution may extend our understanding of technology adoption by confirming the relationship between experiential factors and behavior following the Expectancy Theory. Furthermore, the strength of the direct relationship can be compared to another link, benefits-work goal congruence or self-esteem-feature substitution, as an indirect relationship between benefits and feature substitution. The indirect relationship may represent the motivational force of the Expectancy Theory of Motivation. Motivation is defined as the maximization of feature substitution caused by the joint effects of expectancy and valence (Vroom, 1994, Burton et al., 1992/1993). Therefore, the **second hypothesis** is formulated as follows:

H2: The outcome of experiencing increasing benefits increases the likelihood of feature substitution

Relationship between work goal congruence and feature substitution

Employees expect work goal congruence when substituting new features for old ones. In contrast to benefits, this refers to the likelihood of personal goal or objective alignment being perceived when adopting new system features. In workplace management settings, every job position has measurable performance targets specified by the key performance indicators (KPIs), which are normally tied to business goals at the organizational level. Those personal KPIs may affect performance results, leading to salary increments, performance bonuses and promotions. Employees evaluate the functions of new system features and how they affect their performance targets, depending on the new work settings. Employees may expect the adoption of the new system features to support the accomplishment of their work goals or performance targets. A higher level of expectancy means feature substitution likely leads to

proper matching between the feature functions and personal performance targets, reflecting a high degree of work goal congruence. Thus, a high degree of work goal congruence of the new system features will increase the likelihood of feature substitution. This also explains the positive relationship between work goal congruence and feature substitution found in the project. Therefore, the **third hypothesis** is formulated.

H3: A high degree of perceived work goal congruence increases the likelihood of feature substitution.

Relationship between self-esteem and feature substitution

Self-esteem at work may not have been tested in previous technology adoption studies and may expand the content of personal goals in the workplace and go beyond work performance targets. Additionally, it expands the concept of social influence that is normally incorporated into technology adoption models.

In the work context, employees likely expect social recognition for how they behave (Clagett, 1995) because of ego involvement. Employees possess a pervasive drive to maintain significant interpersonal relationships. Through the self-esteem system, a monitor of social acceptance evolves so that employees avoid social devaluation and rejection (Leary, 1999). From another perspective, employees undergo an identity verification process in the workplace (Cast and Burke, 2002) to evaluate the degree to which colleagues or customers view them as capable, similar to the concept of efficacy-based self-esteem. At the same time, the process evaluates the value contribution of individuals in a work group, similar to the concept of value-based self-esteem. Identity verification is a match of self-relevant meaning in the workplace with the meaning inherent in the identity standards. If the meanings do not match, the self-verification process is interrupted and leads to employees' actions of supporting or avoiding feelings of dissociation. Stronger self-esteem increases positive self-image and the likelihood of counteracting negative feedback. The above theories reveal that personal self-esteem can lead to a specific response or behavior that is expected to counteract mismatching between self-relevant meaning and identity standards.

Following other technology acceptance theories, social influence (Venkatesh et al., 2003) and personal image (Rogers, 1995) are examined owing to their direct influences on the intention

of technology adoption. Self-esteem goes beyond both concepts to a deeper level of employees' personal value system, especially regarding how they perceive their own importance and how others value them in the workplace context (Barefield, 1983). It can refer to formal authority designated by the organization or informal power possessed by individuals through their contribution and others' perception of their competence (Cast and Burke, 2002). Enhancing employees' self-esteem may increase job satisfaction as an aspect of personal work objectives.

New system features are normally perceived as a disruption of routine operations that may result in a change in the power structure; thus, employees may have to re-evaluate their self-meaning in the work group and counteract any dissociation. They may expect the adoption of new system features to enhance their own identity, with increasing self-esteem. As a result, employees are likely to replace old system features with new ones. This explains the positive relationship between self-esteem and feature substitution found in this project. Following the Expectancy Theory, employees expect the adoption of new system features to increase their personal self-esteem and thus will likely practice feature substitution. **The forth hypothesis** is formulated as follows:

H4: A perception of increasing self-esteem by employees increases the likelihood of feature substitution.

Relationship between high switching cost and feature substitution

The expectancy effect also explains the effect of switching cost on the link between positive outcome and feature substitution; that is, high switching cost may reduce the positive relationship between benefits and feature substitution. This also refers to the force model of the expert system adoption (Burton et al., 1992/1993) in which employees expect the successful incorporation of new features and personal work settings to result from the personal effort made. Switching cost is about the time and effort made for feature substitution. A higher switching cost means more personal effort and time are required to substitute new features for old ones. In other words, a high switching cost reduces the likelihood of the successful incorporation of new system features into work settings. When employees anticipate a decreased likelihood of successful incorporation, they may decrease their expectation of the benefits gained from feature substitution. Thus, a high switching cost

likely has a negative effect on the relationship between positive outcome and feature substitution based on the expectancy concept.

This effect of high switching cost is also proven in the context of repurchasing behavior. High switching cost affects the relationship between customer satisfaction and repurchase behavior. In the postacceptance model of IS continuance (Bhattacherjee, 2001b), employees will confirm or disconfirm the benefits of technology adoption by comparing the expected and actual outcomes. When the outcomes are confirmed, they feel satisfaction and continue the IS adoption. This demonstrates that high switching costs may also affect the relationship between IS satisfaction and continuance of adoption behavior. Therefore, the **fifth hypothesis** is formulated.

H5: Switching cost has a negative moderating effect on the relationship between benefits and feature substitution. A higher switching cost reduces the effect of benefits on feature substitution.

c. Motivation

Motivation is defined as the maximization of feature substitution caused by the joint effects of expectancy and valence (Vroom, 1994, Burton et al., 1992/1993). In other words, motivation is a product of expectancy and valence. Following the proposed integrated framework for this project, the relationship between benefits and work goal congruence or between benefits and self-esteem represents the valence effect. The relationship links of work goal congruence-feature substitution or self-esteem-feature substitution represent the expectancy effect. Thus, the motivation effect may be observed when benefits affect feature substitution through work goal congruence or self-esteem, which act as mediators (Hair et al., 2017d).

This mediating relationship is supported by the interview data. The interviewees gained benefits when substituting new system features for old ones. These benefits were perceived to be important for the personal goals, including work goals or personal identity, that interviewees expected to attain by using the new system features. Thus, the benefits or outcomes experienced may become key motivators of feature substitution due to its strong

linkage with personal goals in the workplace. It is critical to examine this relationship because it is fundamentally different from many technology adoption theories that mainly advocate the expectancy effect on technology adoption. It demonstrates the criticality of actual benefits attained or outcome experienced in relation to specific behavior. Therefore, the **sixth hypothesis** is formulated as follows:

H6: Benefits increase feature substitution through the mediating effects of work goal congruence or self-esteem.

d. Influences of organizational factors

Two key organizational factors are integrated into the research framework grounded in the Expectancy Theory to increase its predictive power.

Relationship between self-learning environment and benefits

The self-learning environment is not new to organizations for facilitating the implementation of new workplace or facilities management technologies. However, its extent may be limited to a few specific measures, typically self-induction training or an online help desk. Self-induction training is typically an online platform through which employees can access training manuals and guidelines to acquire knowledge of the usage of multiple system features. New employees are normally required to access the platform as part of the staff induction program. The online help desk is used to provide on-demand advice when employees experience problems with usage. Both measures appear ineffective to motivate feature substitution or adoption behavior at the feature level. The first measure is normally seen as a "check the box" exercise, and employees perceive it as lacking relevancy. In addition, employees may find that the answers are not operation-centric and not useful.

The qualitative analysis found that a self-learning environment is capable of motivating self-regulated training of individuals. It can play an active role in driving feature substitution. Technology champions or role models may increase the comfort level of employees in substituting new features for old ones because employees are able to seek operation-relevant advice regarding the use of new system features. Providing a risk-free environment for employees to practice new system features in work settings may decrease the sense of performance ambiguity (Bitner, 2001) related to the new system features. Simply, employees

accept that they must perform their work at the desired levels. No punishment or penalties for their performance occur during the specified period. Employees anticipate that using new system features will be harmless and may result in potential opportunities; thus, they are more likely to actively practice them, leading to successful feature substitution. From an organizational perspective, reducing personal performance targets may increase the risk of degrading service performance outcomes and may result in a negative impact on business operations. Unless FM organizations can evaluate and manage this risk in advance, they may hesitate to take such an approach. Therefore, testing the causal relationship between the self-learning environment and the benefits of use may prove the effectiveness of this measure. Organizations can justify the investment and risks that result from a self-learning environment.

The self-learning environment enables and encourages employees to acquire the necessary skills and to practice new system features in a self-regulated manner that is similar to the concept of self-regulated learning (Wan et al., 2012), which showed that better leaning outcomes result when employees can actively select their own learning strategies. This self-regulation behavior is a feature of the Social Cognitive Theory (Bandura, 1989), which states that people monitor and adjust their own behaviors in pursuit of personal goals. Testing of self-regulated learning also showed a positive impact on measures of training performance for computer skills (Compeau and Higgins, 1995a).

The above theory explains the relationship between the self-learning environment and the benefits gained. The self-learning environment includes interactive training, an accessible online user manual and IT help desk, leadership support, and risk-free practice of the new system features in the facilities management setting. Self-regulated learning is also promoted in the design of new workplaces that have a highly mobile workforce and advocate employee engagement (BIFM, 2014, JLL and UNWORK.COM, 2016). It provides space for employees to try new system features and gain positive experience through learning and practice and in a risk-free environment. Employees can experience the positive outcomes of feature substitution through self-regulated learning. A higher level of benefits gained increases the likelihood of feature substitution by individuals.

Therefore, the **seventh hypothesis** is formulated

H7: A self-learning environment likely increases likelihood of the benefits experienced or gained by employees.

To summarize these seven hypotheses, the research framework of feature substitution is illustrated in Figure 5.
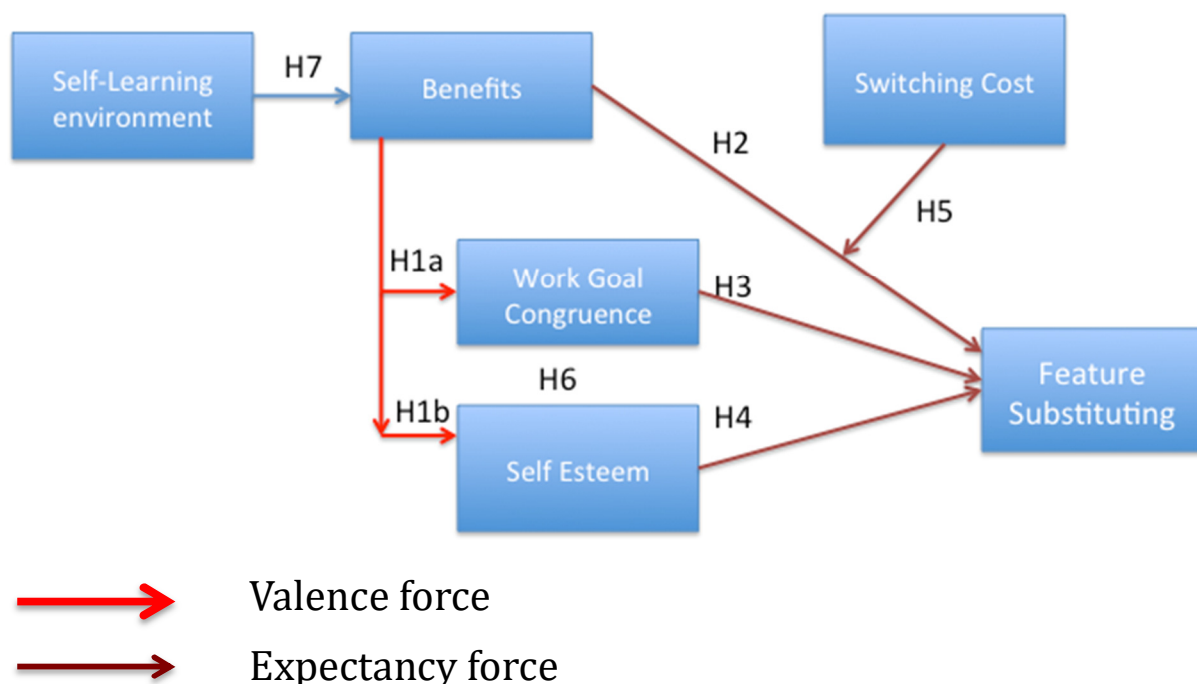

Figure 5: Integrated Framework of Feature Substitution

This research framework is very different from that of previous technology adoption research models, including the TAM (Davis, 1989) and the UTAUT (Venkatesh et al., 2003), in two aspects. First, it emphasizes the importance of experiential factors. The TAM and UTAUT mention prior experience or past use as one of the determinants of information system adoption (Taylor and Todd, 1995, Karahanna et al., 1999, Kay and Thomas, 1995). However, both factors normally refer to longevity or intensity of use and indicate a lack of understanding of outcome-based behavior. Second, we introduce intrinsic personal factors, work goal congruence and self-esteem to enrich the existing technology acceptance models with a deeper understanding of why people adopt new technology. Therefore, this framework

may better explain technology adoption behavior at the feature level, which is more complicated and dynamic than adoption behavior at the system level.

Benefits are likely a key factor in determining feature substitution. This relationship is supported by the concepts of valence and expectancy effects from the Expectancy Theory (Vroom, 1994). Underpinning this theory is the perception of the likely consequences of specific behavior. Individuals will predict what the outcomes of their actions may be and how they should behave to achieve the desired outcomes.

Few organizational factors are added that are relevant to the workplace or facilities management context. The self-learning environment provides favorable conditions for individuals' self-regulated learning. Employees can gain experience and positive outcomes in a risk-free environment. User design empowers employees to make decisions regarding the functionality and method of use of new system features. With such involvement, they can set outcome expectations in advance and improve their perceived work goal congruence.

4.4 Conclusion

The findings of this project answer three research questions and develop an integrated framework of feature substitution grounded in the Expectancy Theory of Motivation (Vroom, 1994). Feature substitution is an outcome-based behavior with benefits gained from the perspectives of both employees and organizations. Several determinants, including person-related and organization-related factors, are found to have direct or indirect influences on feature substitution.

This framework may enrich the Expectancy Theory of Motivation, which primarily explains individuals' work behavior and focuses on utilitarianism to maximize employees' advantages, satisfy their self-interest and avoid negative consequences (Parijat and Bagga, 2014). Using this theory to investigate technology adoption behavior at the feature level is rare (Burton et al., 1992/1993). Only a few studies have adopted the Expectancy Theory to investigate the adoption of a decision support system, and always at the system level. Several proposed hypotheses can be empirically tested to confirm the causal relationships and generalizability

of the theory. Organizational factors are defined beyond the concept of facilitating conditions and studied more in depth than in previous technology adoption studies (Venkatesh et al., 2003).

Multiple forms of adoption behavior at the feature level are identified. They may switch over the period of new system features use. A specific form of adoption behavior may result in diverse outcomes at both the individual and organizational level. Feature substitution may result in benefits at the individual and organizational level and should be seen as desirable behavior in comparison to other behaviors from the organizational perspective. The benefits attained at the individual level may significantly affect feature substitution as an outcome-based behavior. It is also a goal-driven behavior, driven by personal work goals that may contain perceived work goal congruence and personal self-esteem, which are fundamental personal work beliefs. Increasing these personal beliefs will increase the likelihood of feature substitution.

Feature substitution may require intense switching cost. Switching cost is likely a demotivator for feature substitution because it may offset the effect of positive outcomes on feature substitution. Thus, reducing switching cost may become a priority to motivate feature substitution.

Organizations should consider the effectiveness of various facilitating conditions and organizational measures. Developing and maintaining a self-learning environment to support self-regulated learning and risk-free practice may allow employees to gain positive experience with the new system features. Promoting a user-design culture that empowers employees to affect the design of new system features will likely increase employees' perception of work goal congruence and thus lead to feature substitution.

There are still several limitations of this project in addressing the research questions. First, the resultant framework is exploratory in nature. The findings are limited by a specific research approach and context. The degree of generalizability of the findings is relatively low. The key factors identified should be subjected to empirical testing.

Second, testing causal effects between variables can serve to improve the level of generalizability and result in multiple managerial implications. The relationships between organizational factors and feature substitution should be examined so that organizations can understand their strength and then prioritize management measures to motivate employees to adopt the new system features continuously and consistently; this approach may ensure the success of organizational transformation (Orlikowski, 1996).

Third, the qualitative analysis has not addressed the last research question regarding the effects of a performance management approach, an essential subject in the workplace or facilities management context. This approach can be outcome-based or prescriptive (EY's Nordic REFM Team, 2016). The first type measures the final results of service delivery, meaning what services are delivered and at what level. The second type measures the activities performed or resources allocated for service delivery, meaning how services are delivered. This performance management approach cascades down to personal job objectives or work goals. Different approaches may result in the diverse nature of the work goals established. An outcome-based performance management approach may generate result-oriented goals for individuals, and a perspective-based approach may lead to process compliance-oriented goals for individuals. Different work goals set may affect personal goals in work settings with the new system features. Using new system features can be perceived as rule-driven if use is mandatory or as output-driven if voluntary use is allowed. Indeed, voluntary use is examined as one of the key factors in the moderating effects of some variables on technology adoption (Venkatesh et al., 2003).

Understanding whether the performance management approach affects the determinants of feature substitution is becoming important in the facilities management context because facilities management (FM) outsourcing has been widespread for many developed or emerging countries. The performance management approach is one of the critical factors in measuring the success of FM outsourcing and determining ways to govern the contractual relationship between customers and suppliers (EY's Nordic REFM Team, 2016). Investigating the impacts of the performance management approach on feature substitution allows organizations to select proper implementation measures for new system features in accordance with different contractual performance approaches.

Therefore, it is important to examine whether different performance management approaches influence the causal relationships between the determinants and feature substitution.

Chapter Three – Validation of Integrated Framework of Adoption of Feature Substitution

1. Introduction

This project further builds the content of feature adoption behavior based on the findings of the previous chapter, which developed an exploratory framework to predict feature substitution, a preferred behavior at both the individual and organizational level, and its key determinants from the individual perspective. In the previous chapter, a prominent pattern of feature adoption behavior was identified. The findings suggest five forms of feature adoption behavior: feature trial, feature combination, feature substitution, feature rejection and routine use. Among these five, feature substitution is a desirable behavior from the organizational perspective because of its absolute positive impacts on business performance.

The research identified seven key determinants of feature substitution: benefits, work goal congruence, self-esteem, switching cost, self-learning environment and user design. The first five are personal experiential or cognitive factors. The last two are organizational factors. Moreover, the research discovered that the Expectancy Theory of Motivation (Vroom, 1994) may be able to explain the relationship between feature substitution and personal experiential or cognitive factors. However, the previous chapter did not examine the causal relationships between narrowed context and smaller sample size. For the third research question, the type of performance management approach has not yet been assessed and tested. A subquestion is identified that requires further examination of whether the performance management approach affects the relationships between variables.

Considering the limitations of the previous chapter, this chapter rephrases the outstanding three research questions as follows:

What are the key determinants of feature substitution and the degree of association between those factors?

How do strong organization-relevant factors affect feature substitution?

Does the performance management approach affect the key determinants and their relationships with feature substitution?

To answer the above questions, this project aims to examine the validity of each variable and test the causal relationship between the variables. This examination is intended to investigate the predictive power of the research framework for feature substitution and its potential differences based on a variety of performance management approaches in the workplace or facilities management context.

As mentioned in the section on research methods in chapter two, this project uses a mixed methods approach (Shannon-Baker, 2016). A quantitative analysis is adopted for empirical testing of the eight hypotheses identified for feature substitution in the previous chapter. They are listed below.

H1a: A high degree of benefits gained by employees increases the perceived work goal congruence of new system features.

H1b: A high degree of benefits gained by employees increases personal self-esteem.

H2: Benefits gained by employees increase the likelihood of feature substitution.

H3: A high degree of perceived work goal congruence increases the likelihood of substituting new features for old ones.

H4: A perception of increasing self-esteem by employees increases the likelihood of feature substitution

H5: Switching cost has a negative moderating effect on the relationship between benefits and feature substitution. A higher switching cost reduces the effect of benefits on feature substitution.

H6: Benefits gained by employees increase feature substitution through the mediating effects of work goal congruence or self-esteem.

H7: A self-learning environment likely increases the benefits gained by employees.

This project adopted a survey with a closed-ended questionnaire to collect data from a sampled population while considering the efficiency and convenience of data collection methods in the facilities management context. The data analysis primarily refers to partial least squares-structural equation modeling (PLS-SEM) (Hair et al., 2017f). SmartPLS software (Ringle et al., 2015) was used for the path analysis of the proposed research framework. The

path analysis provides data to test the hypotheses statistically. It also reveals the strength of the relationships between the variables and the explanatory power of the dependent variables. The results provide evidence in response to the first two research questions. Furthermore, this project used features of Multigroup Analysis (MCA) in SmartPLS to examine whether different performance management approaches would cause significant differences in the explanatory power of feature substitution and its determinants. This addressed the last research question.

2. Methodology

The previous chapter stated philosophical worldview assumptions and strategies of inquiry and justified the mixed methods approach adopted for the study as a whole. This chapter is a second part of the integral project and adopts quantitative analysis to validate the findings of the first part described in chapter two.

2.1 Research Methods

Field experiments were considered unsuitable for this project owing to the limited control of independent variables in real-life settings (Bryman and Bell, 2011a). A facilities management service process can contain multiple FM staff members and activities. Introducing a new system feature may impact the performance of multiple work activities by multiple FM staff members. More importantly, the output of each work step by each individual affects the performance of others downstream in the service process. The steps may also be time-dependent and sequential. Developing experiments that can manipulate multiple independent variables at different points in time is difficult. For example, it is difficult to manipulate a performance management approach that is typically contractually related. It is also difficult to manipulate personal characteristics, including the level of personal self-esteem, as the researcher is unable to classify FM staff based on their level of personal self-esteem in advance. Therefore, in field experiments, it may not be possible to collect a full set of data that are relevant to all of the independent variables.

This project adopts closed-ended, self-completion questionnaires to survey the sampled population because of the advantages of simplicity, convenience and light bias due to the interviewer effect (Bryman and Bell, 2011e). The questionnaire is self-administered by the respondents and thus easier and less expensive to administer. Unlike structured interviews, self-completion questionnaires can avoid the interviewer effect, which may be a potential issue for this project and will be discussed in a later section.

On the downside, closed-ended questionnaires must be designed carefully with clear, precise and relevant questions for the respondents. Therefore, a questionnaire must be developed systematically, and the data collected must be analyzed comprehensively (Bryman and Bell, 2011e). This is critical for proper data collection procedures, as shown below.

2.1.1 Data Collection

Data collection consists of questionnaire design, population and sampling and combating bias in the survey for the sake of reliability and measurement validity (Flower, 2015) integrated with specified data collection procedures.

2.1.1.1 Data Collection Procedures

The procedures began with the survey and questionnaire design. Measurements of individual variables were developed based on the relevant literature. As a preliminary test of the reliability and content validity of the measurements, a pilot study with a preliminary version of the questionnaire was distributed to total twenty facilities management staffs through email and the respondents were randomly selected from three different job groups of employees, including subject matter expert, general management staffs and service delivery staffs. The first group consists of subject matter experts who are responsible for advisory support and managing special program for specific work-stream. Second group is operation managers or supervisors who are responsible for managing daily services delivery and client relationships. The last group contains operatives and staffs to perform facilities services such as maintenance, cleaning and help desk. Staffs between different job groups may have diverse education and training background that may interpret questions differently. They were asked to complete the questionnaires and return them by email. The researcher then contacted each respondent by phone to obtain feedback regarding the content of the questionnaire and

the ease of responding to it. That is, content validity was assessed qualitatively. Additionally, a reliability test was conducted to quantitatively examine the questionnaire design. The questionnaire design was refined to improve its reliability and validity.

The final questionnaires were sent to target population with all 1,100 facilities management staffs worked in JLL Hong Kong through on-line survey platform (Qualtrics), email or hard copy. Staffs with email accounts can use Qualtrics to answer questionnaires. However they are feasible to ask the researcher providing softcopy of questionnaires if unable to access online survey platform. They then can answer questionnaires and return them via emails. Staffs without email accounts were distributed with hard copy of questionnaires.

Each respondent received a copy of the questionnaire through only one of the three distribution methods. This method was chosen to avoid duplicate responses by a single respondent that might dilute the results. All data collected through the online survey were extracted and converted into an Excel file in a standard template that also consolidated the data collected through email or internal mail. The data were manually inserted into the standard template by the researcher. To obtain a peer review of any error made during data entry, the researcher asked a colleague to match the data inserted from a batch of the respective questionnaires. In the last step, data cleansing was performed (Pallant, 2013b) to manage missing or unreasonable data in the data pool.

Eventually, 245 questionnaires were received for data screening and cleansing. After, final sample size is 220 and the respondent's profile is summarized in Table 18.

2.1.1.2 Measurements and questionnaire development

As mentioned, the closed-ended questionnaire should be precise, simple and relevant to the respondents. The questionnaire is designed in two parts to collect the salient data from the respondents. The first part is relevant to the objectives of this project and follows the research framework established in the previous chapter. This means that questions are asked first regarding the determinant with the anticipated highest degree of salience for feature substitution and then in order. This approach is intended to manage the question-order effect and reduce the respondent's bias (Bryman and Bell, 2011e).

The second part concerns the respondent's demographics and use experience of specific system features adopted. The most important demographic data is under which performance management approach the individual worked. The performance management approach could be outcome-based, prescriptive or both. As mentioned, it was tested for diverse effects on the variables of feature substitution. Respondents were asked about their use experience to confirm that they were part of the target population that had gained a certain level of use experience for specific features and thus were not in the feature trial stage. Respondents with use experience of less than one month were excluded.

The design of the first part of the questionnaire is critical to ensure content and construct validity (Pallant, 2013b). Content validity refers to the adequacy with which a measure or scale samples the intended domain of content. First, using measures and scales from previous studies can increase the content validity. Second, requesting feedback from the sampled respondents on the questionnaire can improve the content validity.

All measurement items are adopted from previous research for the variables feature substitution, positive outcome, work goal congruence, self-esteem, switching cost, self-learning environment and user design identified in the previous chapter.

a. Feature substitution

Feature substitution was identified as a desirable technology adoption behavior at the feature level in the qualitative study. In the quantitative study, a 1-7 Likert-type scale and 3 items were derived from a previous study (Sun, 2012); the items were "I substituted features that I used before", "I replaced old features with new ones" and "I used similar features in place of the features at hand". They were measured on a scale of 1, totally disagree, to 7, totally agree.

b. Work goal congruence

Work goal congruence was identified as one of the key determinants of feature substitution in the qualitative study. In the quantitative study, a 1-7 Likert-type scale and 4 items were derived from the measurement of outcome expectation (Compeau and Higgins, 1995a), which is divided into performance outcome expectation and personal outcome expectation.

Work goal congruence was related to performance outcome expectation with 6 items. Two of the six, "I will be better organized" and "I will be less reliant on clerical staff", were irrelevant to this project regarding the function of specific features. The remaining 4 items were "increase the effectiveness of my job", "spend less time on routine job tasks", "increase the quality of output for the same amount of effort" and "meet job requirements or performance target". They were measured on a scale of 1, totally disagree, to 7, totally agree.

c. Self-esteem

Self-esteem was identified as one of the key determinants of feature substitution in the qualitative study. In the quantitative study, a 1-7 Likert-type scale and 12 items were derived from the Self-Worth Scale and Self-Efficacy Scale (Cast and Burke, 2002). The Self-Worth Scale has a total of 7 items that were adopted in this project. The Self-Efficacy Scale has a total of 9 items, half of which were used. Four items, "I feel that I am being pushed in my life", "I feel helpless to deal with the problems of life", "There is little I can do to change important things in my life" and "I feel useless at all time", are omitted because they are too broad and not specific enough to new system features adoption. Eventually, 12 items were retained to measure self-esteem, such as "My coworkers perceived me as competent", "I felt more prestige than those who do not use new system features", "a person of worth", "thought I am no good at", "no way I can solve the problems", "as able to do work as most other people" and "confident to work". They were measured on a scale of 1, totally disagree, to 7, totally agree.

d. Benefits

Benefits gained were found to be an important determinant of feature substitution in the qualitative study. They were divided into personal performance-relevant and personal identity-relevant benefits. In the quantitative study, a 1-7 Likert-type scale and 10 items were derived from the measurement of outcome expectation (Beaudry and Pinsonneault, 2005, Compeau and Higgins, 1995a), which is relevant to both personal performance and identity. One item, "less reliant on clerical support", of the 11 items was removed because of its irrelevancy. The remaining 10 items were rephrased to represent actual rather than expected outcomes. Some examples are "my job effectiveness increased", "quality of work improved", "received material reward", "needs are met", "be seen as competent", "received

recognition", and "be seen as expert to master new system features". All of them were measured on a scale of 1, totally disagree, to 7, totally agree.

<u>e. Switching cost</u>

Switching cost was found to have a moderating effect on the relationship between positive outcome and feature substitution in the qualitative study. In the quantitative study, a 1-7 Likert-type scale and 6 items were derived from a study (Shin and Kim, 2008) that developed measures for switching barriers and switching cost, with 3 items for each. Some examples are "difficult for me to use", "complicated for me to switch from old to new", "takes many effort switching from old to new", and "hassle to switch from old to new". The items were adjusted to make them specific to new system features rather than to the new mobile service providers studied in the previous paper. All of them were measured on a scale of 1, totally disagree, to 7, totally agree.

<u>f. Self-learning environment</u>

The self-learning environment was found to be an important organizational factor affecting positive outcomes in the qualitative study. In the quantitative study, a 1-7 Likert-type scale and 8items were derived from a study on the adoption of personal computing (Compeau and Higgins, 1995b, Igbaria et al., 1997, Moore and Benhasat, 1991) that had a total of 10 items for the measurement of two organizational factors, management support and computing support, for learning computing skills. For management support, there were two items, "provide good access to hardware" and "provide good access to software". They were combined into one item to fit the technology setting of this project. Computing support had a similar situation with two items, one for hardware and another for software. They were also combined to fit the technology setting. Eventually, there were 8 items to measure the self-learning environment, such as "necessary resources to support self-learning new features", "specific person to assist in problem solving", "guidance available", "special instruction or manuals available", "support from supervisors" and "accessibility of management support". They were all measured on a scale of 1, totally disagree, to 7, totally agree.

A pilot survey using nonprobability convenience sampling (Flower, 2015) was conducted. The pilot survey had two purposes. First, it collected the respondents' feedback on all measurement items, including their interpretation of the content of the questions and their specifications. Second, we conducted a preliminary reliability test based on the data collected in the pilot study. The results were referenced to revise the questionnaire to improve its reliability and content validity.

The questionnaires were emailed to twenty facilities management staff who were easily accessible by the researcher. The respondents included a mix of specialists, managers and operatives of different types and at different levels of FM staff. All the respondents returned the completed questionnaires with all of the data. Preliminary reliability tests were conducted with SPSS for all measurements. The majority of the items showed acceptable reliability, ranging from 0.8 to 0.95. Only one factor, self-esteem, was found to have a relatively low Cronbach's alpha of less than 0.5, reflecting an unacceptable reliability of measurement. Three items likely caused the low reliability: "number of good qualities", "have more respect for myself" and "inclined to feel that I am a failure". In the respondents' feedback for those three items, most of them considered the items irrelevant to the adoption of new features and hard to interpret. The items were removed one by one to retest reliability. Eventually, the Cronbach's alpha reached 0.85, within an acceptable range. Owing to the feedback received and the reliability testing, those three items were removed from the measurement of self-esteem.

To double-check the content validity of the measurement items, selected sections of the revised questionnaire were randomly shared with five previous respondents. They reconfirmed their understanding of those sections of the questionnaire. Sharing the questionnaire in sections avoids respondent bias, meaning previous respondents may habitually provide the same comment on different iterations of the questionnaire. Eventually, the questionnaire was prepared with the final measurements shown in Table 16.

Table 16: List of Final Measurements

Variable	Measurement
Feature substitution (Sun, 2012)	FS1: I substituted features that I used before FS2: I replaced old features with new ones FS3: I used similar features in place of the features at hand
Work goal congruence (Compeau and Higgins, 1995a)	WG1: Increase my work effectiveness WG2: Spend less time on routine job tasks WG3: Increase quality of output for the same amount of effort WG4: Meet all job requirements or performance targets
Self-esteem (Cast and Burke, 2002)	SE1: My coworkers perceived me as competent SE2: I felt more prestige than those who do not use new features SE3: I felt I am a person of worth, at least on an equal basis with others SE4: I thought I am no good at all SE5: I felt I do not have much to be proud of SE6: I had a little control over the new work settings SE7: There was no way I could solve the problems encountered with the use of new system features SE8: I was as able to master the new work settings as most other people SE9: I was confident to work with the use of new system features
Benefits (Beaudry and Pinsonneault, 2005, Compeau and Higgins, 1995a)	PO1: My job effectiveness increased PO2: Less time and effort spent on routine job tasks PO3: Quality of work improved with the same amount of effort PO4: I got material rewards and incentives PO5: I was satisfied with the new system features PO6: My needs were met or satisfied PO7: My coworkers perceived me as competent PO8: My coworkers perceived me as contributing to the team PO9: I got recognition or appreciation from others PO10: People saw me as expert to master the new system features
Switching cost (Shin and Kim, 2008)	SC1: Difficult for me to use new system features SC2: Complicated for me to switch from incumbent system features to new ones SC3: Took a lot of time to get information on why and how to use new system features SC4: Took a lot of effort to switch from the incumbent system features to new ones SC5: Took a lot of time to switch from the incumbent system features to new ones

	SC6: In general, it was a hassle to switch from the incumbent system features to new ones
Self-learning environment (Compeau and Higgins, 1995b, Igbaria et al., 1997, Moore and Benhasat, 1991)	SL1: I had the necessary resources to self-learn new system features SL2: A specific person/group was available for assistance with new system features difficulties SL3: Guidance was available to me in selection of new system features suitable to new work settings SL4: Specialized instruction concerning new system features was available to me SL5: My supervisors always supported and encouraged use of new system features for job-related work SL6: Management provided good access to new system features when people needed them

In addition of above questions to measure six key factors, this project added six more questions regarding demography of respondents. Final sample questionnaire is attached in Appendix B.

2.1.2 Population and Sampling

The target population was 1,100 facilities management staff working in the integrated facilities management business line of Jones Lang LaSalle Ltd. (JLL) in Hong Kong. This population is seen as representative of the facilities management context in the mature market (Lomas, 1999, Moore and Finch, 2004) because workplace and facilities management is normally perceived as one of the important functions of corporate organizations (Facilities Management Asia, 2011). Moreover, the ways of implementing new technology are believed to be relatively typical.

JLL is one of the major FM outsourcing service providers worldwide and has a strong presence in Hong Kong for managing multiple types of facilities in different industrial sectors, including finance, IT, education, retail and food services, and transportation. Those sectors contribute a major portion of business activities, with more than 60% of the total employment in Hong Kong (Labour Department, 2017). The performance management approach may vary based on the facilities management outsourcing generation (EY's Nordic REFM Team, 2016). Thus, the wider industrial sectors cover the majority of performance management approaches,

which typically consist of business outcome-based contracts, performance output-based contracts or FM activity-based contracts.

JLL has taken disruptive technology (JLL and UNWORK.COM, 2016) as one of its key business strategies (JLL, 2017a). Transforming employees to enable them to work in a new era of business operation has become a business priority. Technology advancement in the delivery of FM services should not be strange to JLL employees, who should have gained sufficient experience in new technology adoption as part of their work life (Goh, 2015, JLL, 2017b). The survey results could have direct managerial implications for JLL.

Finally, the data were more accessible and could be validated by the researcher, who had worked at JLL for ten years and had gained insight into previously introduced new facilities management technologies implemented and associated with organizational measures. This connection helped the researcher explain the possible causes of the survey results and expand the content of this study. The questionnaires could be effectively distributed to and received from the target population through an internal network, thus saving cost and effort.

However, the respondents might have anticipated the internal influences on the researcher and tended to answer questions with a purpose because of the interviewer effect (Bryman and Bell, 2011e). Using a self-completion questionnaire likely minimizes that effect, and personal identity was untraceable in the returned questionnaires, with no staff names or identity stated. These data collection methods should enable the researcher to avoid these effects and reduce potential bias.

Stratified random sampling as a type of probability sampling (Bryman and Bell, 2011d) was adopted for this project to reduce the bias resulting from an improper sample frame (Flower, 2015) and increase the level of generalizability. Moreover, the sample frame was clearly specified for three facilities management work groups to ensure that data were collected from the respective groups and to minimize sampling error. As mentioned above, one of the research questions is to identify how the performance management approach affects the adoption of new system features. Therefore, the three work groups were classified according to the performance management approach of the Facilities Management Contract (FMC)

between JLL and its clients. The performance management approach is outcome-based, process-based or both. In Hong Kong, the division of the target population was 40%:20%:40% between outcome-based, process-based and both, respectively.

A sample size of approximately 200 was designed to facilitate partial least squares structural equation modeling (Hair et al., 2017f). Considering the potential nonresponse rate and the likelihood of unsuitable members of the sample owing to limited use experience with specific features, a total of 300 sample cases were allowed. Random sampling was performed for the three work groups based on the abovementioned split. Thus, 120 samples per group were selected for outcome-based FMC and a mix of process-based and outcome-based methods. Sixty samples per group were selected for process-based analysis.

The survey was conducted between September and December 2016 using an online survey platform (Qualtrics) for the sampled respondents with email accounts. This platform was used to the greatest possible extent to ensure ease of data collection and analysis. For the sampled respondents without internal email accounts, hard copies were distributed. They were all asked to fill out the forms without stating any personal identity to reduce the researcher's effect on their responses.

2.1.3 Minimizing bias and errors in the Survey

Survey methodology normally has two types of error: one is associated with who answers, and the other is associated with the answers. Those errors can result from random sampling and bias (Flower, 2015).

Regarding the error associated with who answers, the sampling error is random variation from the true characteristics of the population. This stems solely from the fact that the data are collected from a sample rather than from every single member of the population. Bias means that in some systematic way, the people responding to a survey are different from the target population as a whole. This project implemented a few measures to minimize this error and bias in the survey design.

The first measure was to clearly define a sample frame with the relevant work groups, which are from three key performance management approaches in the facilities management context, and to determine the sample size of each work group according to the portion of the respective population. Moreover, proportional stratified samples can produce lower sampling error than simple random samples (Fowler, 2015).

Second, random sampling was conducted for each work group independent of age, gender and job role. Based on the literature, the personal profile may affect technology adoption and lead to potential bias resulting from the selection of a specific profile.

The third measure was to increase the response rate by designing a short, clear questionnaire. During the pilot study, the respondents commented on the simplicity and ease of response of the questionnaire design. It could normally be completed within ten minutes for total twelve questions.

Fourth, we evaluated the nonresponse rate. This measure enabled us to understand the possible causes of unanswered questions, if any, that might be different ways for the target population to answer the survey questions, leading to nonresponse bias.

The size and design of the probability sample, together with the distribution of what is being estimated, determine the size of sampling errors (Fowler, 2015). This project increased the sample size as far as was practical to reduce sampling errors and to link it to a data analysis plan, an appropriate approach to data analysis that is discussed in the next section.

Errors associated with answers can be a result of either bias or an invalid measurement (Flower, 2015). This project implemented a pretest and conducted a pilot study to identify misunderstanding and inadequate content of the questions. The self-completion questionnaire without personal identification avoids the interviewer's influence and distorted answers from the respondents. Moreover, some questions were designed with reverse-scored items to reduce single rating problems.

Validity problems such as sampling error occur randomly (Flower, 2015) but can describe the relationship between an answer and some measure of the true score. To increase validity, all measurement scales developed for this project were based on measurements found in the literature. Moreover, validity tests were performed on the data collected for this project; they are discussed in detail in the next section.

2.2 Data Analysis and Validation

This study adopted the partial least squares structural equation modeling approach (PLS-SEM) for multivariate analysis, involving the application of statistical methods that simultaneously analyze multiple variables (Hair et al., 2017c). PLS-SEM is primarily used to develop theories in exploratory research by focusing on explaining variance in the dependent variables when examining the model. This approach allows the exploration of the measurement model and structural model and how the latent variables are related to each other. The project considered three common statistical tools: SPSS, PLS-SEM and covariance-based SEM. SPSS is useful for data screening, descriptive statistics and plots. However, its reliability and validity tests may not be as comprehensive as those of SEM, for example, AVE, composite reliability and weight, with indicators of each measurement model being calculated with a simple mean (Pallant, 2013b). Regression analysis in SPSS can predict the scores of dependent variables from the scores of a number of independent variables as well as correlations between variables that may serve the purpose of hypothesis testing. However, this demands stringent data requirements, including normal distribution and sample size. SPSS cannot display multiple relationships between all the variables in one diagram and thus increase the complication of understanding the causal relationships, for which structural modeling (Hair et al., 2017f) is much powerful. In this project, SPSS was used for data screening, reliability testing and factor analysis for the initial testing of the reliability and validity of the individual measurement models.

This project adopted structural equation modeling (SEM) as a key data analytical tool after consideration of its characteristics. This tool provides a path model that can visually display the relationships of the hypotheses and variables. Thus, validation of the research framework and variance explanation for feature substitution can be illustrated in one diagram. The tool

can enable theory testing and confirmation if the sample size is large enough. Moreover, it performs additional analysis, for example, a multigroup analysis that can be used to identify differences in the relationships between variables resulting from multiple groups of data (Hair et al., 2017e). This study investigated how various performance management approaches affect the relationship between the variables of feature substitution. These approaches can be viewed as multiple groups and studied with multigroup analysis.

Between covariance SEM and PLS-SEM (Hair et al., 2017f), this project selected PLS-SEM because it works efficiently with a small sample size and makes practically no assumptions about the underlying data, for example, normally distributed data (Cassel et al., 1999). As an empirical test of this study, this approach provided reasonable statistical power without distributional assumptions. PLS-SEM is good enough to predict constructs or identify key "driver" constructs (Hair et al., 2017c); for example, for this project, it validated multiple measurement models and key determinants of feature substitution.

This project used SmartPLS (version 3.0) to perform path modeling with latent variables using the partial least squares-structural equation modeling (PLS-SEM) method. The model estimation delivers empirical measures of the relationships between the indicators and the constructs (measurement models) and between the constructs (structural models). The empirical measures enable us to compare theoretically established measurement and structural models with reality, as represented by the sample data (Hair et al., 2017a).

2.2.1 Measurement Model Evaluation

2.2.1.1 Reflective Measurement Model

There are two primary types of measurement model: formative measurement models and reflective measurement models (Hair et al., 2017g). Reflective measures represent the effects of an underlying construct, with causality occurring from the construct to its measures. Formative measures are based on the assumption that causal indicators form the construct by means of linear combination. Specifying the measurement model depends on the construct conceptualization and objectives of a study.

This study adopted reflective measurement models that are appropriate to test theories with respect to each variable (Hair et al., 2017g) extracted from multiple previous studies. First, causal priority occurs from the construct to the indicators (Diamantopoulos and Winklhofer, 2001). Second, the indicators are a consequence of the specific variable (Rossiter, 2002). Third, all items of the individual variables are interchangeable such that individual indicator items can be omitted without changing the meaning of the construct (Jarvis et al., 2003).

All of the reflective measurement models tested in this study are multiple-item measures that generally increase reliability and enable the removal of measurement error. Additionally, no sum score approach is adopted in the analysis to avoid substantial parameter biases and affect the statistical power of PLS-SEM (Hair et al., 2017g).

2.2.1.2 Reliability and Validity of Measurement

Reflective measurement models were initially assessed using SPSS, including an internal consistency reliability test and factor analysis (Pallant, 2013b). Internal consistency reliability, *Cronbach's alpha,* provides an estimate of reliability based on the intercorrelations of the observed indicator variables. However, the alpha may be a conservative measure of internal consistency because all the indicators are assumed to be equally reliable; thus, it is generally sensitive to the number of items. This study also refers to composite reliability (CR) calculated by PLS-SEM (Hair et al., 2017a). CR provides a measurement of reliability that accounts for the outer loadings of each indicator and tends to overestimate the internal consistency. Therefore, true reliability is believed to lie between them, with values between 0.7 and 0.95.

Factor analysis, including exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) as a "data reduction" technique, is used to summarize the data into a smaller set of factors or components that is manageable for further data analysis. It is used to test the validity of the measurement models. Principal component analysis is used to explore the number of factors that can underlie relationships between the variables. The results were compared to the proposed measurement models for identified gaps, if any. Moreover, factor analysis was used to reveal any common-method bias (Mackenzie and Podsakoff, 2012) resulting from questions that might be difficult or that respondents were less motivated to answer. This bias can significantly affect construct validity and reliability. If a single factor

emerges in an unrotated factor solution, it indicates the presence of common method bias. Finally, factor rotation was used to produce the pattern matrix for the factors identified. This project adopted orthogonal factor solution for easier interpretation (Tabachnik and Fidell, 2013). This factor solution may assume that underlying constructs are independent, which may not be correct. However, it should not impact the results significantly, as this is a preliminary test. PLS-SEM has been further used to test the reliability and validity of the measurement models.

Convergent validity is the extent to which a measure correlates positively with alternative measures of the same construct (Hair et al., 2017a). To evaluate convergent validity, this study referred to indicator reliability and average variance extracted (AVE); indicator reliability is the size of outer loading, and AVE is the grand mean value of the squared loadings of the indicators associated with the construct. In this study, outer loading is considered close enough or acceptable when the value is over 0.7 (Hair et al., 2017a), and an AVE value of 0.5 or above explained a substantial part of each indicator's variance (Hair et al., 2017a).

Discriminant validity is the extent to which a construct is truly distinct from other constructs by empirical standards (Hair et al., 2017a). This study adopted three measures for testing discriminant validity: cross-loading, the Fornell-Larcker criterion and the Heterotrait-monotrait ratio (HTMT). In the first measure, an indicator's outer loading on the associated construct should be greater than any of its cross-loadings on other constructs. Second, the Fornell-Larcker criterion compares the square root of the AVE values with the latent variable correlations (Hair et al., 2017a); the square root of each construct's AVE should be greater than its highest correlation with any other construct. Third, the heterotrait-monotrait ratio (HTMT) is the mean of all correlations of indicators across constructs measuring different constructs relative to the mean of the average correlations of indicators measuring the same construct. This study adopted a threshold of 0.9 as the HTMT value. A measurement above this threshold represents a lack of discriminant validity (Henseler et al., 2015). Additionally, this study uses PLS-SEM bootstrapping to derive a distribution of the HTMT statistic in the name of the bootstrap confidence interval. A confidence interval with a value of 1 indicates a lack of discriminant validity. Table 17 summarizes the tested reliability and validity of the reflective measurement models.

Table 17: Evaluation Criteria - Measurement Models

Scope	Criteria	Threshold
Reliability	Cronbach's alpha	>0.7
	Composite reliability	>0.7 and < 0.95
Convergent Validity	Indicator loading	>0.7
	Average Variance Extracted	>0.5
Discriminant Validity	Cross-loading	An indicator's outer loading on the associated construct should be greater than any of its cross-loadings on other constructs
	Fornell-Larcker Criterion (Cross-construct)	The square root of each construct's AVE should be greater than its highest correlation with any other construct
	Heterotrait-monotrait ratio	Ratio < 0.9 and HTMT confidence interval does not include 1

2.2.2 Structural Model Evaluation

Assessment of the structural model is used to determine the model's capability to predict one or more variables (Hair et al., 2017b). This study evaluates the structural model according to certain criteria (Hair et al., 2017b): collinearity, structural model path coefficient, significance and relevance of the structural model relationships, coefficient of determination (R-square value), effect size (f-square value), and blindfolding and predictive relevance (Q-square value).

The tolerance value or VIF is used to assess collinearity that represents predictor variables that are highly correlated with each other, likely leading to problematic interpretation. This study considers collinearity not critical if the VIF value is less than 5.

Path coefficients represent hypothesized relationships among variables. The relevance and significance of path coefficients should be assessed. This study tested the hypotheses developed by the qualitative study in terms of strength and significance. The testing employed a bootstrapping technique to calculate the p values for each path to assess the significance of

the path estimates. To evaluate multiple mediating effects caused by work goal congruence or self-esteem, specific indirect effects and statistical significance had to be calculated manually using the SmartPLS bootstrapping results. The manual methods followed the methods stated in the PLS-SEM (Hair et al., 2017d). Moreover, the mediating analysis procedure stated in Exhibit 7.5, page 233, of the PLS-SEM (Hair et al., 2017d) was followed to classify mediation or nonmediation.

This study considered the path coefficient substantial when it was above +0.2 or below –0.2 (Chin, 1998b) and assumed a significance level of 5% for hypothesis testing (Hair et al., 2017b). This measurement was applicable to both the direct and indirect effects that are relevant to examine the mediating effects.

The coefficient of determination (R-square value) is a measure of the model's predictive power and is calculated as the squared correlation between the actual and predicted values of a specific variable. It represents the combined effects of independent variables on a dependent variable. The R-square adjusted value is-modified according to the number of independent variables relative to the sample size and avoids bias towards a complex model. This study adopts an R-square adjusted value that represents substantial, moderate or weak predictive power at values of 0.75, 0.5 and 0.25, respectively (Hair et al., 2017b).

Effect size (f-square value) is used to evaluate whether the omission of a single independent variable has a substantial impact on the dependent variable. It is critical to examine effect size when investigating moderating effect (Hair et al., 2017d); thus, this study examined the significance of the moderating effect of switching cost on the relationship of positive outcome and feature substitution. The interaction term concept was added to facilitate the inclusion of a moderator variable in the PLS path model (Hair et al., 2017d). To develop an interaction term for moderating effect analysis, this study adopted a two-stage approach because it yielded a high level of statistical power compared with other approaches, including product indicator and orthogonalizing approaches. This study considered independent variables to have a small, medium or large effect when the value is 0.02, 0.15, or 0.35, respectively. Moreover, the moderating effect was considered small, medium or large for effect sizes of 0.005, 0.01 or 0.025, respectively (Hair et al., 2017b).

Blindfolding and predictive relevance (Q-square value) of SmartPLS were used to identify the model's predictive relevance. This study adopted cross-validated redundancy to calculate the Q-square value because it includes the key element, scores of the antecedent variables and target-dependent variables to predict the eliminated data points (Hair et al., 2017b). The model's predictive relevance for dependent variables was confirmed when the Q-square value was greater than zero (Hair et al., 2017b).

2.2.3 Multigroup Analysis

Multigroup analysis (PLS-MGA) was incorporated into SmartPLS to test whether the path coefficients were different between two groups of the sampled populations. The two performance management approach groups (outcome-based and process-based) were compared using the PLS-MGA and nonparametric variance test for two groups because the nonparametric test allows flexibility in the distribution of the data set, and the data of this study may not be normally distributed. If t-statistics were equal to or greater than 1.96, this study considered the difference of the path coefficient significant (Afthanorhan et al., 2014).

3. Results

In total, 245 questionnaires were received, and no errors were found. Twenty-five questionnaires were answered by respondents with less than one month of experience with specific facilities management system features. As mentioned before, their responses were possibly irrelevant to this study and thus were excluded.

Missing values for individual variables seemed insignificant. None of the questionnaires had missing data for more than 3% of the total items. Missing data were found for only one or two items per variable. This study chose the "mean replacement" approach for missing values to maintain a larger sample size. As a result, a total of 220 cases were used for statistical data analysis, which was more than the expected sample size of 200 cases and with a response rate of more than 70%, which is higher than the rate for the usual postuse survey for new facilities conducted within this company. The nonresponse bias was therefore minimized.

Regarding the respondent profile shown in table 17, the respondents were representative of the intended target population and met the requirements of the performance management contracting (PMC) approach. The proportion of the sample cases was similar to that of the population division between the three work groups. Therefore, the sample size was sufficient to represent the target population and enable data analysis through PLS-SEM (Hair et al., 2017f).

Moreover, the number of respondents among the three major roles was very similar, and respondent bias due to job roles was minimized. Table 18 summarizes the respondent profile.

Table 18: Summary of Respondent Profile

Profile	Value	Number of Sample	% of Total
Performance Management	Outcome-based	86	39%
	Process-based	59	27%
	Mix of Outcome- and Process-based	75	34%
Job Role	Subject Matter Expert	66	30%
	Services Delivery	77	35%
	General Management	77	35%

3.1 Reliability and Validity of Measurement Models

3.1.1 Preliminary analysis

Preliminary analysis using SPSS found that all Cronbach's alphas of the individual measurement models were over 0.7, thus passing the reliability test of the measurement models. The results of factor analysis supported the validity of all the measurement models. A total of thirty eight items were subjected to principal component analysis (PCA) using SPSS version 24. First, the data were checked for suitability for factor analysis. The Kaiser-Meyer-Olkin value was 0.689, exceeding the recommended value of 0.6; Bartlett's test of sphericity showed statistical significance; and inspection of the correlation matrix revealed the presence of many coefficients of 0.3 and above (Pallant, 2013a). All of the above findings support the

factorability of the correlation of the matrix. Second, PCA revealed the presence of seven components with eigenvalues exceeding 1. The seven components explained a total of 82% of the variance. The components also included indicators similar to our specified measurement models except for gaps found in measuring self-esteem, with some indicators forming separate components. This may have resulted from two forms of self-esteem being measured. One is value-based, and the other is efficacy-based (Cast and Burke, 2002). It may be too early to conclude that two separate components exist for the factor of self-esteem based on this anticipated minor gap. The proposed measurement models should still be considered acceptable and were further tested under PLS-SEM. Finally, no single factor was found in PCA in the unrotated mode. Therefore, no common-method bias existed.

PLS-SEM was adopted to further test the reliability and validity of the measurement models with three criteria: reliability, convergent validity and discriminant validity. Tables 19 and 20 provide evidence to support the reliability and validity tests of the measurement models.

Table 19: Composite Reliability, AVE and Item Loading from PLS-SEM

Latent variable	Cronbach's alpha	Average Variance Extracted (AVE)	Item	Loading
Feature substitution (FS)	0.84	0.76	FS1	0.889
			FS2	0.877
			FS3	0.850
Benefits (PO)	0.94	0.68	PO1*	0.571
			PO2	0.715
			PO3	0.766
			PO4	0.742
			PO5	0.848
			PO6	0.875
			PO7	0.824
			PO8	0.906
			PO9	0.894
			PO10	0.837
Work goal congruence (WG)	0.93	0.82	WG1	0.936
			WG2	0.904
			WG3	0.914
			WG4	0.866
Self-esteem (SE)	0.88	0.59	SE1	0.778
			SE2	0.809
			SE3	0.876
			SE4*	0.691
			SE5*	0.674
			SE6*	0.674
			SE7*	0.657
			SE8	0.769
			SE9*	0.682
Switching Cost (SC)	0.95	0.83	SC1	0.902
			SC2	0.920
			SC3	0.874
			SC4	0.934
			SC5	0.894

			SC6	0.935
Self-learning environment (SL)	0.90	0.67	SL1	0.716
			SL2	0.824
			SL3	0.879
			SL4	0.882
			SL5	0.742
			SL6	0.883

* denotes items with lower loading (<0.7) that may be considered an insignificant effect on specific variables.

Table 20: Cross-construct Matrix

	FS	PO	WG	SE	SC	SL
FS	0.872					
PO	0.632	0.825				
WG	0.642	0.672	0.905			
SE	0.635	0.705	0.749	0.767		
SC	-0.558	-0.492	-0.528	-0.544	0.91	
SL	0.569	0.516	0.497	0.547	-0.466	0.82

3.1.2 Reliability

Reliability tests were performed twice. The first was for measurement models with all proposed indicators, as shown in table 19. The results of the first test revealed that all Cronbach's alpha values were over 0.7. However, some item loadings were below 0.7, including PO1, SE4, SE5, SE6, SE7 and SE9. PO1 was removed after consideration of its low loading and the similarity of its measurement to other indicators. Among the measurements of self-esteem, SE6 and SE7 were removed as both of them had the lowest indicator loadings and considering that SE4, SE5 and SE9 had similar measurement to SE6 and SE7. Regarding the findings of the preliminary tests, PCA revealed that self-esteem might be divided into two components, value-based and efficacy-based. However, the low indicator loadings of self-esteem were not specific to the efficacy-relevant component. Thus, separating self-esteem into two measurement models might not be theoretically supported. Eventually, self-esteem was treated as a single factor.

After those items were removed, a second set of reliability and validity tests were conducted with PLS. The results revealed all of the variables of feature adoption: feature substitution (alpha=0.842, CR=0.905), benefits (alpha=0.941, CR=0.95), work goal congruence

133

(alpha=0.926, CR=0.948), self-esteem (alpha=0.880, CR=0.908), switching cost (alpha=0.959, CR=0.967), self-learning environment (alpha=0.901, CR=0.925) and user design (alpha=0.958, CR=0.964). For switching cost and user design, the composite reliability was slightly over the desired limit (>0.95), which may represent potential common method bias (Hair et al., 2017a). However, the results of the factor analysis in section 3.1.1 revealed minimized common-method bias. With the second tests, only two items, SE4 and SE5, still had a loading marginally below 0.7. They were considered to have no significant impact on internal consistency reliability. The results provide sufficient proof of the reliability of the measurement models.

3.1.3 Validity

Table 19 highlights that all AVEs exceeded 0.5, which indicated sufficient convergent validity (each latent variable explains more than 50% of the indicator variance on average). Item reliability also supported convergent reliability with a majority of loading over 0.7.

Table 20 highlights that all of the variables have sufficient discriminant validity and that the square root of each variable's AVE is greater than its highest correlation with any other variable. The cross-loading matrix from PLS also reveals that each variable has its respective indicators with loadings higher than the cross-loadings at other variables. Finally, the heterotrait-monotrait ratio was checked for two values, the sample mean and confidence interval, with lower and upper bounds of 2.5% and 97.5%, respectively. The sample means of all variables are below 0.9, and neither of the confidence intervals included the value 1.

All of these results supported the convergent and discriminant validity of the measurement models.

3.2 Structural Model Evaluation

Structural model evaluation was used to assess the causal relationship between variables and examine the hypotheses.

3.2.1 Assessment of Structural Model

The PLS algorithm of SmartPLS calculated the VIF values to assess collinearity between the dependent and independent variables. The values ranged between 1 and 2.9, below the upper limit of 5. These results indicated that collinearity was not critical in the structural model and thus minimized problematic interpretation between variables.

The PLS structural model assessed the causal relationships between variables with the coefficient of determination of dependent variables, effect size and prediction relevance. First, the statistical significance of the model was assessed. The PLS algorithm was conducted to calculate the coefficient of determination (R-square adjusted value). The self-learning environment was predictive of the outcome experienced with an R-square adjusted value of 0.495. Outcome experience was predictive of work goal congruence with an R-square adjusted value of 0.332. Benefit was predictive of self-esteem with an R-square adjusted value of 0.45. As the focal points of this study, the three key variables, work goal congruence, self-esteem and benefit, had an explained variance for feature substitution with an R-square adjusted value of 0.543. Following the criteria set for the coefficient of determinants in table 20, the relationships of the structural model are considered moderate.

Second, the effect sizes were evaluated by comparing the amount of variance when a predictor was either included in or excluded from the model; thus, f-square values were generated for predictors of feature substitution. The results of effect size estimation revealed that benefit (f-square=0.1) and work goal congruence (f-square=0.07) have a medium to small effect on feature substitution. Self-esteem (f-square=0.01) has a small effect on feature substitution. Hence, the moderating effect of switching cost (f-square=0.004) has a medium to small effect on the relationship between positive outcome and feature substitution.

Third, the blindfolding procedure of SmartPLS was conducted to calculate predictive relevance (Q-square value), which reflects how well the observed values are reproduced by the model and its parameter estimates. The results confirmed the predictive relevance of each dependent variable: feature substitution (0.472), work goal congruence (0.638), self-esteem (0.446) and benefit (0.56), as all of them were above zero.

3.2.2 Hypotheses Testing

The model derived from the qualitative analysis in the previous chapter had a total of eight hypotheses that focused on the determinants of feature substitution. Each structural path represents a hypothesis. The hypotheses were tested using the bootstrapping sampling technique to calculate each path coefficient and assess their statistical significance. The results are shown in table 21.

Table 21: Significance Testing Results of the Structural Model Path Coefficient

Variables	Path Coefficient	p-Values	Significance (p< 0.05)
H1a: Benefit -> Work Goal Congruence	0.579	0.000	Yes
H1b: Benefit -> Self-Esteem	0.672	0.000	Yes
H2: Benefit -> Feature Substitution	0.293	0.000	Yes
H3: Work goal congruence -> Feature Substitution	0.282	0.007	Yes
H4: Self esteem -> Feature Substitution	0.121	0.149	No
H7: Self-learning Environment -> Benefit	0.705	0.000	Yes

H1a (A high degree of benefits gained by employees increases the perceived work goal congruence of new system features) is accepted. The results reveal a substantial positive association between positive outcome and work goal congruence (path coefficient = 0.579, p<0.05). This means that when higher level of benefit is attained by employees, they perceive a higher work goal congruence of the new system features.

H1b (A high degree of benefits gained by employees increases personal self-esteem) is accepted. The results reveal a substantial positive association between positive outcomes and self-esteem (path coefficient = 0.672, p<0.05). This means that when higher level of benefit is attained by employees, they perceive a higher level of personal self-esteem.

H2 (Benefits gained increase the likelihood of feature substitution) is accepted. The results reveal that benefit gained may have a substantial association with feature substitution (path coefficient = 0.293, p<0.05). This means that when employees gain or experience benefits, they have a higher likelihood of practicing feature substitution.

H3 (Perceived work goal congruence increases feature substitution) is accepted. The results reveal a substantial positive association between work goal congruence and feature substitution (path coefficient = 0.282, p<0.05). This means that when employees perceive a higher level of work goal congruence, they are more likely to practice feature substitution.

H4 (Perceived self-esteem increases the likelihood of feature substitution) is rejected. The results reveal a weak positive association between self-esteem and feature substitution. This association also has a low level of statistical significance (path coefficient = 0.121, p>0.05). Although the relationship is relatively weak, a direct association between self-esteem and feature substitution may still exist. The statistical nonsignificance may result from the sample size of the specific population group. Such an effect will be explored later in a multigroup analysis.

H7 (A self-learning environment likely increases the benefits gained from feature substitution) is accepted. The results reveal a substantial positive association between the self-learning environment and positive outcomes experienced by employees (path coefficient = 0.705, p<0.05). This means that when a strong self-learning environment exists in the workplace, employees experience a higher likelihood of positive outcomes.

The remaining two hypotheses, H5 and H6, were tested with PLS Mediator and Moderator Analysis (Hair et al., 2017d). Hypothesis (H5) was tested for the moderating effect of switching cost, and hypothesis (H6) was tested for the mediating effects of work goal congruence and self-esteem.

a. Testing of Moderating Effect

The test of the moderator variable, switching cost (SC), indicated that it was reliable and valid, as described in section 3.2.1. The size of the moderating effect was examined with the interaction term (PO*SC). The effect size (f-square) was 0.004 and reflected a change in the R-square value when the interaction term was included in or excluded from the PLS path model. The results revealed a small moderating effect (Hair et al., 2017d). Following the path diagram with SC and the interaction term, the interaction term had a negative effect (-0.04),

whereas the simple effect of benefit (PO) on feature substitution (FS) was 0.293. Jointly, these results suggest that the relationship between PO and FS is 0.293 for an average level of switching cost. For higher levels of SC, the relationship between PO and FS decreased by the size of the interaction term (0.293-0.04 = 0.253). In contrast, for lower levels of SC, the relationship between PO and FS became 0.296+0.04 = 0.334. The PLS bootstrapping procedure further provided a p value of 0.353 for the path linking interaction term and FS. Thus, the moderating effect was statistically insignificant, with p>0.05.

Considering the strength and significance of the effect, *H5 (A high switching cost has a negative moderating effect on the relationship between positive outcome and feature substitution) is rejected.*

b. Testing of Mediating Effects

PLS bootstrapping provided results to facilitate mediation analysis. The indirect effect of benefits (PO) on feature substitution (FS) was 0.244, below a p value of 0.000. This result revealed indirect effects that were quite substantial but were statistically significant (Hair et al., 2017d). The significance of the direct effect from PO to FS was then incorporated for further analysis. As shown in table 21, the direct effect was substantial and statistically significant (0.293, p<<0.05). The mediation analysis procedure of the PLS-SEM (Hair et al., 2017d) showed that the relationship between PO and FS is likely complementary mediation and that the indirect effect and direct effect are both significant and point in the same direction.

However, the indirect effects between PO and FS could be divided into two paths via work goal congruence (WG) or self-esteem (SE). The indirect effect via work goal congruence was 0.17 with a p value of 0.03, which was statistically significant at p<<0.05. The indirect effect via self-esteem was 0.07 with a p value of 0.14, which was statistically insignificant at p>>0.05. Following the mediation analysis procedure (Hair et al., 2017d), the relationship between PO and FS is complementary mediation via WG. Because PO's direct effect is significant, but the indirect effect on FS via SE is not, the relationship is likely only direct nonmediation.

As a result, *H6 (Benefits gained increase the likelihood of feature substitution through the mediators of work goal congruence and self-esteem) is partly supported.* The mediating effect may exist through work goal congruence rather than self-esteem.

In sum, seven hypotheses (H1 consists of two subhypotheses) were tested. Four hypotheses, H1, H2, H3 and H7 are accepted. H6 is partly accepted and two hypotheses, H4 and H5, are rejected.

3.2.3 Multigroup Analysis: Performance Management Approach

To investigate whether feature substitution diverges between employees working under different management and measurement approaches to FM services performance (performance management), two subsamples were used. One was the work group (Group 1) under the outcome-based performance management approach, which measures the output or outcome of facilities management services, meaning what the results are. Another is the work group (Group 2) under the process-based performance management approach, which measures the input, resources and procedural compliance of facilities management services, meaning how the services are performed. Parametric and nonparametric tests were performed to compare the differences in path coefficients as well as the t-values for the individual paths. Table 22 summarizes the test results.

Table 22: Test Results of Multigroup Analysis

	Difference (Outcome-based vs Process-based)	
Welch-Satterthwait Test (Nonparametric)	Path coefficient	t-value
Benefits -> Work Goal Congruence	0.14	1.13
Benefits -> Self-Esteem	0.29	1.92
Benefits -> Feature Substitution	0.10	0.77
Work Goal Congruence -> Feature Substitution	0.57	3.18
Self-Esteem -> Feature Substitution	0.60	3.88
Self-learning Environment -> Benefits	0.08	0.97

As shown in table 22, the nonparametric test revealed significant differences in the path coefficients for the relationship between work goal congruence and feature substitution (WG -> FS), the relationship between self-esteem and feature substitution (SE -> FS) and the relationship between benefits and self-esteem (PO -> SE), as they all had t-values close to or

over 1.96. Further comparison was performed of the indirect effects between benefits and feature substitution to determine whether work goal congruence is a mediator. The results reveal an insignificant difference in the indirect effect (path coefficient diff = 0.16, t-value diff = 1.24), as the t-values are below 1.96.

Therefore, the performance management approach likely moderates (Afthanorhan et al., 2014) the relationships between work goal congruence and feature substitution, between self-esteem and feature substitution, and between benefits and self-esteem. Referring to the rejection of hypothesis H4, the PLS-MGA reveals the significance of self-esteem to feature substitution in a specific performance management group. For example, the path coefficient between self-esteem and feature substitution is 0.51 with a p value of 0.000 for the process-based performance management group. In other words, H4 (Perceived self-esteem increases feature substitution) is accepted as statistically significant (p value<<0.05) for a specific performance management approach. This may reflect the fact that self-esteem is viewed as much more important for the adoption of feature substitution when employees work under a process-based performance management approach.

4. Discussion & Conclusion

This chapter has answered three research questions. This study examined the degree of influence of personal experiential and cognitive factors and organizational factors on feature substitution. The performance contracting approach was also examined to identify its effect on certain determinants of feature substitution.

First, benefit gained is the key determinant of feature substitution based on total effect (path coefficient over 0.5) and a combination of direct and indirect effects. The direct effect may represent the expectancy effect, and the indirect effect may represent the motivational force stated in the Expectancy Theory of Motivation (Vroom, 1994). This theory explains the joint influences of benefits gained, work goal congruence and self-esteem on feature substitution better than previous technology adoption theories. It emphasizes the importance of

employees' perceptions of the usefulness and user-friendliness of new technology (Davis, 1989), as such perceptions lead to an increased likelihood of technology adoption. However, these perceptions tend to be limited by cognitive factors. The Expectancy Theory of Motivation explains how the correlation between employees' experiential and cognitive factors leads to feature substitution. First, employees attain positive experience and strengthen their expectations of positive results when substituting new features for old ones. Next, employees evaluate the benefits attained against personal goals, including work goals and self-esteem in the work environment. A high degree of relevancy between them means that those benefits are more important to specific employees. Additionally, employees believe that using new system features will support their achievement of personal goals and increase their expectations for the results of feature substitution.

Experience-based predictors of change in IT feature use over time were examined with association of growth trajectory parameters of IT feature use that may affect task performance of individuals (Benlian, 2015). Personal computer self-efficacy and use experience of given features affected initial usage and rate of increase on usage of IT features. Moreover, initial usage and increase rate of usage both affected perceived usefulness for IT features over time. The initial usage and increase rate affected task performance as well. The findings have supported personal use experience on specific features is one of important factors to determine level of feature adoption behavior and ongoing expectation on the features. Feature usage may affect individuals' perception on specific features and work performance. Experiential engagements are also found as one of key IT implementation characteristics (Bala and Venkatesh, 2016). They may affect cognitive appraisal on new information technology, leading to various forms of technology adoption behavior with associated job outcomes attained at user level. Both research did not tie up job outcome and use experience. This project has discovered actual and positive outcomes are part of users' experience able to affect functional and symbolic value expectation (Marciuska et al., 2013) and adoption of new system features.

The qualitative analysis found that work goal congruence is a personal intrinsic belief or expectation that new system features are capable of supporting employees' work goal

achievements. It may have a direct relationship with feature substitution, meaning that higher expectancy would lead to a higher likelihood of feature substitution. Moreover, the benefits gained by individuals have a positive association with work goal congruence. This association represents the importance of actual performance outcomes to individuals and may depend on how well they align with specific work goals. The quantitative analysis further examined these relationships and found that they have a substantial degree of relevance and statistical significance. The effect of work goal congruence should not be viewed as a stand-alone effect. Instead, it is one of the key mediators of the effect of benefits gained from feature substitution. With the identification of this relationship, it is critical to closely tie outcomes, whether material or symbolic, to personal work goals or performance targets that can be pre-agreed for specific job roles or activities. For example, the standardized reporting features of the BI Portal should generate a contractual required service performance report in a timely and accurate manner, showing the results of all key performance indicators (KPI) so that the facilities managers can explain what the results are and the reasons for them to the client. Accordingly, one of the performance targets for facilities managers is reporting the KPI results in a timely and error-free manner. When facilities managers use the new standardized reporting features and find that the report format and content are easily interpreted and reported, they perceive the benefits for improving their own work efficiency and quality of work. The benefits are assessed as relevant and important to the accomplishment of performance targets. As a result, facilities managers are motivated to adopt feature substitution.

The more strongly outcomes of acts and performance targets can be tied together in work settings, the more employees will perceive the increasing valence of benefits. Through the repeated use of new system features and the presence of specific benefits, employees may be more certain of the benefits gained with the use of new system features. Eventually, they are motivated to adopt feature substitution.

Self-esteem has been found to be another personal expectation and had positive associations with feature substitution in the qualitative analysis. Similar to work goal congruence, benefits gained are associated with self-esteem. This finding reflects that employees may aim to enhance their own personal identity within their social or work groups. Personal identity is

perceived as important because it is tied to personal self-esteem as well as identity verification in a social group. Thus, employees evaluate to what extent feature substitution leads to the improvement of personal identity. They are motivated to substitute new features for old ones if these outcomes are likely to be attained. The quantitative analysis examined the degree of the mediating effect of self-esteem, which appeared substantial. However, the finding was statistically insignificant and might have been caused by personal factors (Parijat and Bagga, 2014) or environmental factor, such as the performance management approach. Past research also supported such subjective differences among user groups (Kim et al., 2009); for example, one study found that the internal auditor may not be as sensitive to social influence or group norms as the general staff. The qualitative analysis found individual differences in perceiving the importance of self-esteem or personal identity. Some respondents mentioned that adoption of the new system features would make them look good. Others did not mention the effect of self-esteem much. Furthermore, the quantitative analysis examined whether the performance management approach moderated the relationship between self-esteem and feature substitution. Self-esteem is likely an important factor, subject to further testing and investigation.

Work goal congruence and self-esteem are both seen as personal beliefs and with goal-relevance. From value-based engineering perspective(Marciuska et al., 2014, Marciuska et al., 2013), they would be key criteria for users to assess value of new system features, similar to concept of customer perceived value. Users may perceive high value if functions of new system features are evaluated with high complement to accomplish specific work goals as well as enhancement of personal identity at the work group. Expectable use (Walsh et al., 2016) defines user's disposition or inclination to use IT proactively and for specific purposes. For examples, self-indulging use is to satisfy personal needs on power and prestige. Opportunity use is to fulfill needs of efficiency improvement on personal job or task. Socializing use is to satisfy affiliation needs on exchanging information within social group and keeping touch with each other. All those personal needs are relevant to work goal congruence and self-esteem. Users expect new system features capable to fulfill the needs during feature adoption. IT switching behavior (Peng et al., 2016) for instant messaging is found with associations of functional deprivation and network of obligation. They both are considered in users' cognitive appraisal process on new IT services. Functional deprivation is assessed as

practical and technical benefits users perceived for new IT services when they do not have usage experience. It represents solely users' expectation on new IT services for fulfilling functional needs, similar to concept of work goal congruence. Network of obligation is about opinion and expectation of other people that are important to an employee within his social network. If people with strong influence expect the employee to adopt new technology, the employee will increase his intention to switch from old to new technology. Network of obligation may be relevant to concept of self-esteem and reveals intrinsic motivation of an employee to act with reasons of how important people view him or her.

The literatures support work goal congruence and self-esteem are important for employees to evaluate when facing new information system features at workplace. Also feature adoption or switching behavior is likely goal-driven and purposeful. It is similar to post-implementation change behaviors towards information technology (Nevo et al., 2015) that include IT adaptation and IT reinvention. To maintain specific behavior for long term requires specific or new personal goals pursuit at workplace. IT adaptation is that user responds to a technology implementation by changing his or her usage in order to increase ability to attain specified or given goals. IT reinvention may be triggered with dissatisfaction on desired functions of a technology implementation (Nevo and Nevo, 2012) and so user changes on implemented information technology or ways of usage in order to pursuit new goals.

The qualitative analysis found an effect of switching cost, which refers to the effort and time required for employees to amend their incumbent work habits to new work practices with the use of the new system features. It may not have a direct effect on feature substitution but may adversely affect the relationship between outcome experienced and feature substitution. This means that a higher switching cost may offset the positive associations between actual outcomes and feature substitution. Employees calculate the costs and benefits of substituting new features for old ones to determine whether to adopt the new features. However, the influence of switching cost was reported to be weaker when the respondents entered the second stage of adoption after trying the new system features. The quantitative analysis examined the moderating effect of switching cost and also demonstrated a weaker relationship as well as statistical nonsignificance. This finding may be similar to the effect of effort expectancy, which is a typical determinant of technology

adoption in many previous studies (Venkatesh et al., 2003). Its effect may be minimized over the period of adoption. This finding provides further evidence that feature substitution is a goal-driven or outcome-based behavior. Once employees experience the benefits gained and are goal-aligned with the adoption of new system features, they act without much calculation of the effort required. In other words, employees drive themselves to specific outcomes and discount the switching cost of feature switching.

Switching cost is discussed in subject of information technology adoption (Kim and Kankanhalli, 2009, Shi et al., 2018). It is part of personal cognitive appraisal and rational decision making on new information technology implementation that people's preference for maintaining current status and situation (Kim and Kankanhalli, 2009). Employees see switching out of current status as costs and threats that can offset benefit gained for switching into new status. Greater costs than benefits lead to status quo bias that employees may resist to switching out of current status. This project has found a factor of switching cost for feature adoption that is similar to factors leading to status quo bias (Kim and Kankanhalli, 2009). Learning effort on new system features is similar to transition costs that are short term and immediate cost to facilitate transitioning between current and new situation. Work performance uncertainty is perceived as risk when switching from current to new system features. This is similar to factor of uncertainty costs that represent psychological uncertainty or perception of risk associated with new situation. Employees' sense of uncertainty often happen during organizational transformation (Battilana and Casciaro, 2013, Peus et al., 2009) that may be caused by threatened employees' work goals, loss of control on own works, fear of failure at new work settings and disruptions in sense making on new business process or structure. All those uncertainties may lead to employees' resistance on change or transformation.

Last, efforts to amend previous way of working under existing system features are like sunk cost as a sub-factor of psychological commitment that represents employees' stickiness on current working situation. To amend previous way of working can also be explained with concept of cognitive lock in (Shi et al., 2018) that is an important barrier, inhibiting consumers from switching out of existing brand because they have invested a lot of resources and efforts on use of specific IT products or services. Using current IT products would become automatic

and intuitive that free up mental efforts of users or consumers. Users would see adoption of new IT products, demanding heavy information processing and mental efforts. So lock in effect may cause strong sense of personal preference on current IT products. In this project, employees perceived difficulties to amend existing work settings one of components of switching cost. They have tendency to maintain at work settings with use of previous system features.

This project has found moderating effect of switching cost on relationship between benefit and feature substitution. However the effect looks minimized over time of feature adoption. Above literatures may support this finding. First, perceived transition cost and performance uncertainty (Kim and Kankanhalli, 2009) may be reducing when users get familiar to new system features with more benefits attained and increasing level of mastery on them. Second, cognitive lock in effect (Shi et al., 2018) may be stronger at initial adoption stage or feature trial. As personal preference, users tend to maintain existing work settings and avoid investing heavy mental efforts on evaluating and learning skills for new system features. Feature substitution is type of post-adoption behavior that users have been triggered to evaluate new system features with cognitive appraisal and use experience. With continuous evaluation effort made on new system features, cognitive lock in effect on existing work settings should reduce and so users may perceive decreased effect of switching cost.

The second research question concerns how organizational factors affect feature substitution. Both the qualitative and the quantitative study identified a key factor of self-learning environment that affects the determinants of feature substitution.

The qualitative analysis identified the self-learning environment, a work environment that allows employees to practice the new system features. It creates a risk-free and supportive environment for employees to practice and use the new system features in a real-life work environment. A self-learning environment aims to encourage employees to use new system features in their specific work settings. Sufficient guidance and on-demand support are required to enable employees' self-regulated behavior. Additionally, employees do not worry about performance ambiguity if the new system features are not used properly. Through practice, they can better master the new system features and gain benefits or positive

outcomes. As a result, employees' adoption behavior can be reinforced with personal positive experience.

The self-learning environment likely has a positive association with the outcome experienced and benefits gained by individuals. The quantitative analysis also examined such a relationship and its statistical significance. The self-learning environment may be a subfactor of facilitating conditions, but its effect on technology adoption appears to be different. Facilitating conditions (Venkatesh et al., 2003) have a direct and positive association with technology adoption. However, the self-learning environment has an indirect effect on feature substitution through outcome experienced. This finding reveals that the prime objective of the self-learning environment is to allow employees to gain a positive experience of adoption that motivates feature substitution.

Recent research (Thatcher et al., 2018, Rezvani et al., 2017) have supported this project's findings on self-learning environment. Self-learning environment is to facilitate employees' self-regulated behavior that is voluntary, cognition and self-regulation of attention towards specific features. Nature of this behavior may be explained by IT mindfulness (Thatcher et al., 2018) that a user focuses on the present, pay attention to details, exhibit willingness to consider other users and express genuine interest in investigating IT features and failures. Dimensions of IT mindfulness include alertness to distinction, awareness of multiple perspectives, openness to novelty and orientation in present. Users are practicing new system features at their own work settings and in voluntary basis. They would attend details of specific features, keep openness on new ways of working and discover potential and value of the features that all align to some dimensions of IT mindfulness. IT mindfulness is tested with direct effects on technology adoption behaviors, consisting of deep structure usage and trying to innovate. Both of them are non-automatic behavior and driven by sense-making process. This nature is applicable to feature substitution. Employee's self-regulated learning requires strong IT mindfulness to understand and testify new system features, resulting in increasing likelihood of feature substitution.

To facilitate self-learning, one of criteria found in this project is leadership support. Employees expect their direct managers or senior leaders at respective work-streams or business lines

able to provide immediate opinions and advisory on tackling challenges encountered for use of new system features. In another word, the leaders have to adopt and understand new system features at specific work settings. This type of leadership style is like transformation leadership (Rezvani et al., 2017) that are characterized by individuals who have power to influence attitude and behavior of sub-ordinates through inspirational motivation, intellectual stimulation and individual consideration. Managers with transformation leadership are examined able to influence employee's perceived usefulness and satisfaction of new ERP system, leading to continuance use. That relationship has supported this project's finding. Employees are motivated to self-regulated learning by managers with similar leadership and experience benefits attained during practicing new system features at own workplace, resulting in increasing likelihood of feature substitution.

As mentioned on previous paragraph, perceived performance uncertainty (Kim and Kankanhalli, 2009, Peus et al., 2009) can inhibit technology adoption behavior of individuals. This project has found employee's self-learning may be enabled with risk-free environment that employees can avoid loss or penalty due to work performance gaps existed during practicing new system features.

The last research question was also addressed. Two performance management approaches, outcome-based and process-based, were tested. The outcome-based management approach relies on objective and result-oriented performance management measures to evaluate facilities management service performance. It focuses on what is delivered. The process-based management approach tends to be resource- and work activity-dependent and focuses on how services are delivered.

The quantitative analysis examined the performance management approach, outcome-based and process-based, and found significant differences in the relationships between the key determinants (benefits, work goal congruence and self-esteem) and feature substitution. The process-based performance management group is more likely to anticipate the importance of perceived self-esteem in the adoption of feature substitution than the outcome-based performance management group. In contrast, the outcome-based performance management group is more likely to anticipate the importance of work goal congruence in the adoption of

feature substitution than the process-based performance management group. The results support the importance of alignment between group performance and individual performance in a work group. The work group that uses the outcome-based performance management approach may perceive a higher importance of work goal congruence than the group that uses the process-based performance management approach. Employees are more likely to substitute new features for old ones when they believe the new features will support them in achieving personal performance targets and performing tasks at the desired level. The work group that uses the process-based performance management approach may be more likely to perceive the importance of self-esteem and its relationship with the experienced outcome of adoption. They tend to adopt new system features if their usage can demonstrate their competency in handling new situations to others.

In the field of business process performance management, the business process must be tied to employees' work activities, including target management, performance monitoring, resource management and process interface management (Balaban et al., 2011). Target management is discussed here and includes functional subtargets at different stages that are relevant to work activities and their output at different points of the business process. Managing the alignment between prime targets and subtargets is essential to ensure successful business processes. In a single facilities management process, there are multiple functions for which multiple FM staff members are accountable. Each function is responsible for specific work activities at a specific stage of the process. To achieve the business targets of the process, FM staff in their respective functional units are assigned subtargets that measure output or resources consumed. The subtargets achieved or not achieved by specific functional units or FM staff impact the possibilities of subtargets being achieved by others. These impacts cascade within the FM process. This reveals that target management is important to sustain the success of the FM process. Industrial surveys (Buckingham and Ashley, 2015) have revealed that an improper performance management approach drives neither employee engagement nor high performance.

FM organizations should pay attention to the performance target management of individuals when implementing new system features in workplace settings. Establishing proper personal

performance targets tied to business process targets allows employees to clearly relate their personal goals to the functions of the new system features. When they understand the relevance and importance of the new system features to their goals and experience the desired outcomes after use, they are more likely to substitute new features for old ones.

As an example of a new system feature for reporting building defects during regular inspections, technicians can use mobile phone apps to record building defects and upload the information to databases. They no longer need to record defects found during inspections on paper and then input them manually into the database through a laptop. Using new system features can expedite defect rectification processes and reduce repair times. At the technician level, they can minimize duplication of effort in data input and enable inspections to be completed quickly. An FM organization may specify an inspection cycle time from the commencement of the inspection to all defects being updated in the system if the technician's performance is measured with an outcome-based approach. If the technician's performance is measured with a process-based approach, the FM organization may track the inspection route against the time when defects are updated in the database to confirm whether the technician records and uploads defects immediately after they are found or afterward.

In sum, this project has addressed the research questions regarding facilities management technology adoption at the feature level. The next chapter discusses the academic and industrial contributions and the limitations of this project.

Chapter Four: Summary and Conclusion

1. Introduction

Facilities management or workplace technology is becoming a key corporate real estate trend (JLL, 2017b) globally. On the one hand, organizations expect new technology to streamline their business processes, increase staff productivity and achieve operational excellence through automation and digitization. On the other hand, employees feel uncertainty about disruptive technology in terms of performance, job security, loss of human contact and unsatisfactory experience in new work settings (Watson, 2012). As a result, employees may feel disengagement and a reduced sense of well-being. They hesitate to completely integrate new technology into their own work setting. The technology wave has been driving business transformation, but the utilization problem may become a counterforce that limits the success of the transformation and even thwarts efforts to develop and implement new technology.

The underutilization problem can be viewed as more serious at the feature level of new technology. Disruptive technology is built with multiple features to enable specific work activities and job functions in a value chain. The business process may be successfully transformed only if the features and activities are well matched to achieve the desired performance outcomes. This involves behavioral changes of multiple parties or staff members that can be far more complicated than utilization at the system level, which may be articulated as adoption or not. The complex nature of adoption behavior at the feature level can take multiple forms and involve switching between those forms at different points in time. Therefore, feature adoption behavior should be dynamic and rich in content.

The majority of the previous research focuses on employees' adoption of technology at the system level but not at the feature level. Therefore, the underutilization problem at the feature level has received little attention. Due to differences in their nature and assumptions, past theories or research models may not perfectly fit this purpose. This gap drives the effort

to gain new insights into the subject of technology adoption at the feature level. Accordingly, investigating employees' feature adoption in the workplace and facilities management contexts makes sense for business organizations as well as the facilities management industry. This thesis has narrowed the research gap and provided managerial implications in the workplace and facilities management contexts.

2. New insights into feature adoption in the workplace

This thesis revealed five forms of feature adoption behavior for the workplace and facilities management technology, and they switch over time. They include feature trial, feature combination, feature substitution, routine use and feature rejection. Some of them are congruent with Sun's proposed theoretical categories (Sun, 2012), but this thesis has investigated their content in depth. Feature trial is a common behavior in the initial stage, when employees try to master new work settings and examine the outcomes, either positive or negative, for individuals. Afterward, employees may switch to different forms of behavior, normally including feature combination, substitution or rejection. The behavior change is determined primarily by the outcomes observed and experienced by employees. On the one hand, when employees evaluate the outcomes of a trial as harm or loss and have a high degree of autonomy to decide whether to use new system features, they will likely avoid using new system features or reject them. On the other hand, feature combination may occur when employees experience performance ambiguity during the trial and practice period and are unlikely to avoid using the new system features in a work setting. Feature substitution is a behavior that is likely to be sustained, with continuous benefits gained by individuals. It is goal-directed and outcome-driven behavior through which employees may self-regulate to strive for goal achievement in new work settings. The above three behaviors can be viewed as interim behavior that is subject to employees' continuous evaluation of outcomes and experience. Finally, routine use is a "business as usual" behavior through which employees repeat specific behavior without much cognitive evaluation for the sake of mental efficiency.

Among the five forms of feature adoption behavior, this thesis revealed benefits gained by individuals and organizations that are tied to each other when employees adopt feature substitution. This can be viewed as desirable behavior by employees and from an

organizational perspective when new technology and the associated features are implemented. This thesis further investigated why and how to determine feature substitution behavior to identify the key determinants of the behavior and their relationships. It revealed two key personal beliefs that employees possess in the workplace that are relevant to their evaluation of new technology at the feature level. They are work goal congruence and self-esteem. Employees are motivated to work primarily for personal work goal accomplishment and social recognition, with the results of demonstrating their value and competence to their specific work groups. Both results are important to individuals, who can achieve material and symbolic rewards in the workplace. Employees evaluate how well new features enable or support the completion of specific work tasks, what results are attained by the completion of specific work tasks and the importance of those results compared to their own personal beliefs. The determinants of feature substitution are likely joint effects of benefits actually gained, the perceived work goal congruence of the new system features and personal self-esteem at work. For three of them, the benefits gained are likely the prime drivers. Employees will not adopt feature substitution if they cannot gain or experience benefits for themselves at work, such as work efficiency maximization, improvement of the quality of work and improvement of personal identity.

This thesis introduced the concept of switching cost, which is normally used in marketing research, to technology adoption research. Switching cost incorporates a certain level of pull-push effects (Bansal et al., 2005), with the weakness of old work settings representing the push force and the attractiveness of new work settings representing the pull force. Thus, switching cost is seen as a relative effect when evaluating old and new system features. This is unlike the concepts of effort expectancy (Venkatesh et al., 2003) or perceived ease of use (Davis, 1989), which have commonly been adopted in previous technology adoption research. Both concepts tend to focus on new technology rather than old technology, and these studies therefore seem to underestimate the situation of switching between varied forms of feature adoption behavior. Switching cost is found to have a moderating effect on the association between benefits and feature substitution, although it may not be significant. This finding is different from those of most technology adoption research, as it advocates the direct effects of perceived ease of use or effort expectancy on adoption behavior.

This thesis adopts the Expectancy Theory of Motivation (Vroom, 1994), a process theory that is widely used to assess employees' cognitive process and its effect on motivation at work or in an organizational context (Parijat and Bagga, 2014), to explain the causal relationships between the key determinants and feature substitution. The mixed method research strategy empirically validated the congruence between the thesis findings and the concept of the Expectancy Theory, which is operationalized with certain limitations to answer the research questions in the real-world context (Parijat and Bagga, 2014).

Finally, this thesis discovered that the self-learning environment, and performance management approach may be key organizational factors with indirect influences on feature substitution. The self-learning environment facilitates and promotes self-regulated behavior because employees can learn and practice new work settings in a time-free, place-free and risk-free environment. This approach may enable employees to gain positive experience and benefits over the period of using the new system features to complete their work tasks. As a result, they are motivated to adopt feature substitution to attain specific benefits.

The service performance management approach is a critical and common facility or workplace management tactic. It is divided into two main approaches: process-based and outcome-based. The process-based management approach prescribes the resources requirements and methodology of work through which FM organizations can have a higher degree of control over business processes. Personal job performance is normally measured based on how well those requirements and methods are satisfied. This approach is rule-driven and process compliance-relevant. The outcome-based management approach mainly specifies the expected outcomes of business processes. FM organizations aim to maximize management efficiency and empower employees to control business processes. All measurements are result-oriented and outcome-based because employees clearly know what to deliver. This thesis discovered that the service performance management approach may moderate the relationships between the key determinants and feature substitution. Employees working under the outcome-based management approach are more likely to anticipate the importance of work goal congruence and its mediating effect than employees working under the process-based management approach. In contrast, employees working under the

process-based management approach are more likely to anticipate the importance of self-esteem and its mediating effect than employees working under the outcome-based management approach.

3. Theoretical contributions

The new insights discovered in this thesis have several theoretical implications. First, the existing technology adoption theories, with the assumptions of adoption at the system level and positive outcomes of adoption, may be limited in explaining technology adoption behavior at the feature level, which is viewed as much more important in terms of practical business implications. As usual, new technology is designed with multiple features to fit specific work requirements, leading to business performance impact. Research that studied feature-level adoption (Sun, 2012, Griffith, 1999) proposed multiple forms of adoption behavior at the feature level but has yet to investigate the associated outcomes of such actions, whether positive or negative. This thesis discovered five forms of feature adoption behavior: feature trial, feature combination, feature substitution, feature rejection and routine use. Three of these forms are mentioned in previous research (Sun, 2012), but this thesis adds knowledge of how those multiple forms of behavior switch to different forms over the period of adoption by individuals. This switching is likely dependent on experienced or observed personal outcomes of the behavior. Those outcomes are also discovered to be beneficial or harmful to individuals and organizations, thus revealing that the assumption of positive outcomes for technology adoption is incorrect. Employees then accept the outcomes of specific actions as personal experience and reconsider their response at the next stage, which aligns with the reappraisal process of the Coping Theory (Lazarus and Folkman, 1984) and some continuous technology adoption studies (Bhattacherjee, 2001a, Kim and Malhotra, 2005a, Kim et al., 2005b) grounded in the Expectation-Confirmation Theory (Oliver, 1993) and other technology adoption theories (Davis, 1989). The findings are important for technology adoption research, especially for understanding postadoption behavior (Jasperson et al., 2005). Multiple forms of behavior can be switched over different points in time and can lead to varied outcomes, including benefits or harm to individuals or organizations. This knowledge can enable more accurate prediction of a specific form of feature adoption behavior, resulting in more persistent positive outcomes for organizations.

The thesis revealed that feature substitution as only a form of feature adoption behavior can lead to benefits for both employees and corporations. As a result, it is desirable behavior that should be encouraged in a work setting. Feature substitution is also a goal-oriented or outcome-based behavior, and the benefits gained are likely key determinants of feature substitution. The benefits gained support individuals' expectation of accomplishing specific personal goals when they adopt new features and reject old ones. This thesis further revealed the benefits gained at the individual level, covering the maximization of personal work efficiency, improvement of the quality of work and improvement of personal identity within a work group. Those benefits are all considered important to employees because each of them aligns with personal objectives or work beliefs such as work goal congruence and self-esteem. As a result, this thesis highlighted the necessity of studying adoption behavior at the feature level and incorporating experiential factors into future technology adoption research to avoid underestimation of how personal experience and beliefs co-influence adoption behavior.

Second, the theoretical framework incorporates slightly different factors than typical technology adoption theories, which emphasize perceived ease of use, perceived usefulness or social influence. It first integrated two primary personal work beliefs, work goal congruence and self-esteem (Folkman and Lazarus, 1985a, Barefield, 1983), which are fundamental elements when employees evaluate their work environment and job setting. Most determinants identified in previous studies depend on individuals' perception of technology characteristics for examples of relative advantages and perceived ease of use and on environmental characteristics for examples of social influence and facilitating conditions. Discussions of how such perceptions develop for individuals are limited. This thesis revealed the importance of personal work beliefs and values that are the cause of how specific situations are perceived by individuals. Work goal congruence and self-esteem are revealed to be intrinsic and fundamental needs that guide employees' evaluation of new system features. Especially in terms of self-esteem at work, this thesis explored how the personal identity verification process (Cast and Burke, 2002) can support explanations of feature adoption behavior in the workplace context. Eventually, this thesis discovered the mediating effects of both factors on the relationship between benefits gained and feature substitution.

It highlighted the importance of understanding the fundamental principles of employees' cognitive processes, which can narrow the current research gap in the technology adoption literature by continuously finding and testing new factors (King and He, 2006). The findings represent the root causes of technology adoption and provide important insight into how to predict employees' behavior in different situations. The degree of generalizability of the theoretical model might increase but is subject to confirmatory tests.

Moreover, this thesis enriched the content related to facilitating conditions, which are normally considered single and generic factors in studies of technology adoption. Both the qualitative and quantitative analysis examined two potential subfactors, self-learning environment and user design, that can indirectly affect feature substitution. Facilitating conditions (Venkatesh et al., 2003) have a direct and positive association with technology adoption behavior. They might affect not actual use but the intention of continuous technology adoption, as shown in another study (Limayem and Hirt, 2003). These discrepancies regarding the effects of facilitating conditions are not yet clear. One reason may be a lack of understanding of the cognitive process of individuals, which has been supplemented by this thesis. The self-learning environment provides a risk-free and personal work-life-compatible environment to encourage and enable the practice of new system features in personal work settings so that employees can realize and experience the benefits gained. User design is another process that engages and empowers employees in the design of new system features that may be used in the future. Thus, employees can understand in advance what the new system features are and how these features can support their personal goals in new work settings. This leads to a high degree of work goal congruence in the appraisal of new system features. The findings are important for enriching the content related to facilitating conditions. Subfactors of facilitating conditions are discovered to affect employees' cognitive processes in different ways. Those factors and their effects constitute an extension of the boundaries of specific theories.

Finally, the boundaries of the Expectancy Theory of Motivation have been expanded (Parijat and Bagga, 2014). There is some doubt of its practical applicability because the Expectancy Theory is slightly complicated, consciousness-focused and person-specific. In terms of complication, it may not be possible or may be difficult to calculate quantitative measures of

valence, instrumentality and expectancy. This thesis is not a theory confirmation study and thus has not developed any new measurement models to test the validity of those three elements. Instead, the qualitative analysis developed a theoretical framework grounded in the Expectancy Theory to explain outcome-based behavior in a way that past technology adoption theories cannot due to a lack of experiential factors. The quantitative analysis empirically tested the relationships grounded in the theory. Thus, most of the relationships were found to be significant.

The Expectancy Theory is consciousness-focused and thus is appropriate to explain behavior resulting from employees' cognitive processes. This thesis provides evidence that feature substitution is a goal-driven and outcome-based behavior that is closely interlinked with the evaluation of likely benefits to be attained from specific behavior and the importance of those benefits to individuals. The theory may also be person-specific, meaning that individual differences can lead to diverse behavior even in the same context. This thesis does not broadly examine the effect of individual differences. It discussed one such issue regarding personal performance objectives that are tied to the service performance management approach at the organizational or work group level. The results shed light on the existence of individual differences and their effects on specific behavior and their association with other factors.

On the one hand, the Expectancy Theory of Motivation may be suitable for the explanation of feature adoption behavior that is outcome-based, consciousness-focused and person-specific. On the other hand, this thesis demonstrated the practical application of the theory in addressing research questions in the workplace context.

4. Practical Contributions

The results of this thesis provide practical contributions in several areas regarding the formulation of effective management measures that may motivate the desired technology adoption at the feature level and support the success of business transformation.

First, the self-learning environment has a key influence on the benefits gained, which are a key determinant of feature substitution. This thesis revealed that a risk-free and work-life-compatible environment is important for employees to practice new system features in a real-life work context and attain the associated benefits. Currently, organizations may not clearly plan and define a risk-free environment. Sometimes, they may allow transition periods of a few months while employees are trained and practice new system features. Individuals' low performance may be tolerated, depending on the management style of the specific manager. At a fast working pace, employees are expected to deliver properly with new work settings after the transition period has passed. This approach may cause undesirable behavior such as feature rejection or feature combination if employees are still uncertain about the harm or benefits of adoption. To develop a risk-free environment, organizations may have to specify a penalty-free period during which employees' performance in the use of the new system features should not be penalized in any form. It should be a formalized approach that is accepted by all direct managers. This approach aims to minimize and underweight negative experience against the positive experience gained during the initial adoption stage. Considering the potential negative impacts on normal business performance that result from repeated working errors, organizations may have to budget extra staff time to detect and rectify errors in due course.

A work-life-compatible environment means that organizational support resources should be made available to employees on an on-demand and timely basis. This approach advocates personal self-regulated behavior for learning and acquiring necessary knowledge (Wan et al., 2012). Current classroom or online trainings with a "one too many" approach likely cannot serve this purpose given the nature of knowledge push. Organizations normally have shared drives and online help desks where employees can access the relevant guidelines, handbooks or advice regarding the use of specific features. However, the qualitative analysis found that employees tend to accept interactive training and real-work practice, immediately supported by advisers who are preferably their immediate supervisors or peers. They can access the required information for examples of guidance, manuals and training materials through shared drives during their preferred time period. When they use specific features and encounter difficulties, they can connect with the appropriate advisers for problem solving.

The problems may not be limited to technical issues related to new system features and may extend to the application of the new system features to specific work activities, which may require facilities management expertise. Therefore, employees tend to seek support from their coworkers or seniors. The use experiences of peers or superior are viewed as proven cases of adoption that employees consider relevant and convincing. Organizations should consider technology championship or "training the trainer" to develop dedicated managers or operators with knowledge of the new system features in specific work settings. They can become coaches of their peers or subordinates.

Second, this thesis revealed the importance of work goal congruence and self-esteem in the work context. Both factors are viewed as important beliefs or personal goals in the context of technology adoption at the feature level. The actual outcome of use is compared with those personal beliefs. Higher alignment between them means an increased value of the specific outcome of use perceived by individuals. This strengthens employees' motivation to attain those outcomes. If feature substitution is perceived as facilitating the outcomes achieved, then employees will be motivated to perform such behavior. Currently, organizations may not tie specific rewards or performance outcomes to personal targets in new work settings. A new work process is in place, but it may lack the associated new personal targets or performance outcome measures. As a result, employees feel performance ambiguity (Mick and Fournier, 1998) and be reluctant to rely on the new system features. Following the findings of this this thesis, organizations should consider revisiting performance management both at the business process level and at the individual work performance level. Prior to the implementation of new system features, performance targets and the associated measurements of service processes and individual employees' respective functions should be aligned. Eventually, an employee's performance targets, measurement methods, respective outcomes and rewards can be tied together. This may lead to an increased tendency of specific behavior.

Finally, the business process performance management approach was examined in this thesis. The measurement and tracking of service process performance through key performance indicators (KPI) is a key subject in the facilities management context. Achieving performance

scores at the desired level may result in monetary or nonmonetary rewards for specific work groups. Typically, there are two common performance measurement approaches: outcome-based and process-based. As mentioned in the previous paragraph, business process performance targets or measures may be tied to personal performance targets or measures, leading to specific behaviors. This thesis examined different service performance management approaches that may result in diverse effects on feature substitution at the personal level. A process-based performance management approach may cause employees to perceive the importance of personal self-esteem rather than that of an outcome-based performance management approach. They may expect symbolic outcomes, such as professional image or competent persons, to result from feature substitution. The outcome-based performance management approach likely arouses employees' attention to work goal congruence, another personal work value. The employees expect material improvement of their work, including work efficiency maximization or improvement of the quality of work.

Changing the service performance management approach may involve structural and contractual changes that are not simple in a facilities management work setting. However, organizations can develop outcome measures or rewards that are perceived as important by employees in work groups with a specific performance management approach. This increases the likelihood of feature substitution for those work groups.

5. Limitations and future research

This thesis has three key limitations: the degree of generalizability, the ambiguity of the mediating effect of self-esteem on feature substitution and a limited investigation of the effect of individual differences.

The qualitative analysis adopted a single case study. Although this case is representative of the facilities management context in Hong Kong, the technology setting is specific to a single technology and specific data analytical features. The quantitative analysis extended the sample population to respondents from multiple cases and with diverse technology settings. The data still came from a single business entity with a specific organizational culture and corporate vision that may shape the nature of its business objectives. This organization

positions itself as a "PropTech" company through which real estate services are driven and enabled by new technologies. Thus, its business goals are technology-relevant (JLL, 2017a). As mentioned, the nature of business goals can affect personal targets that may affect specific behavior. Therefore, this thesis may be limited to specific business goals or a specific company nature. The degree of generalizability is insufficient. The structural models and measurement models are subject to further testing with an expanded sample population from different companies with different business goals.

Self-esteem was found to be an important concept for workplace technology settings and feature adoption behavior in this thesis. The qualitative analysis provided evidence, but the sample size was limited. The results of the quantitative analysis revealed that its mediating effect is considerable but statistically nonsignificant. With multigroup analysis, a performance management approach was discovered to affect personal beliefs or values. Employees under a process-based management approach may experience a stronger and statistically significant mediating effect of self-esteem. However, a similar test for another performance management group is still not significant. To examine these differences in self-esteem, the sample size of the outcome-based performance management group must be expanded. Moreover, the self-verification process (Cast and Burke, 2002) in the work group is complex and dynamic. This thesis adopted self-verification of role identities by employees to increase value-based and efficacy-based self-esteem as a principle of evaluation of new system features. Improved personal identity in a work group is perceived as a benefit gained. However, this thesis did not investigate how negative emotions are elicited and become overwhelming when the self-verification process is persistently disrupted. This may result in behavioral switching from feature substitution to other behaviors, although the qualitative analysis did not reveal such switching. As a result, self-esteem is an important factor that should be further investigated in terms of how it affects switching between various forms of feature adoption behavior.

The study of individual differences is limited in this thesis. Many research have studied people demographics as control variables or their moderating effects on technology adoption (Rezvani et al., 2017, Peng et al., 2016, Venkatesh et al., 2003). Employee's demographics are typically seen as control variables in empirical testing. They include age, gender, education,

occupation, experience and personal innovativeness. Age, gender and experience may moderate relationships between cognitive factors and technology adoption in UTAUT (Venkatesh et al., 2012a). They all are tested as control variables with insignificant effects on switching intention for mobile instant messaging application (Peng et al., 2016) and ERP system adoption (Rezvani et al., 2017). Consumer deliberate inertia on existing technology services (Shi et al., 2018) may be driven by individual differences, consumer habit, education and personal innovativeness. This reflects people's demographics may affect their resistance on new technology. Organizational change literature (Bourne, 2015) also mentions generational diversity may result in diverse perception on organization change that may be triggered by disruptive technology.

Individual differences or user's demographics might affect this project's findings. However, they were not tested as control variables in this project with few initial reasons. First, finding might not have significant practical contribution. Employees working in facilities management industry have diverse background and demographics. It is hard to formulate and implement behavioral intervention measures customized at personal level for an IT implementation even if individual differences are found with effects on feature substitution. Second is about potential on distinguished findings from previous research that have examined effect of demographics a lot. It may not be necessary or academic impactful to examine effects of demographics at workplace technology settings. Last, the sample size that may not be sufficient to represent the necessary population (Chin, 1998a) at specific demographics.

This project has eventually discovered the Expectancy Theory of Motivation able to explain feature substitution behavior. However this theory advocates the importance of person-specific factors, and effect of individual differences. This thesis has also discovered work group differences that may be relevant to personal performance objectives, leading to diverse level of feature substitution. Considering potential practical and academic contribution, it makes more sense to examine individual differences at work group level and their effect on feature substitution. One example of individual differences that should be studied is job type (Kim et al., 2009, Bitner, 2001) or job characteristics (Bala and Venkatesh, 2013) at the workplace and facilities management context, which consists of multiple professional disciplines and various staff levels ranging from operatives to executive management.

Employees come from different backgrounds, and their work setting may shape their response to new system features.

6. Conclusion

This thesis addresses the problem of underutilization of new technology in the workplace and facilities management context through investigation at the feature and employee levels. Using mixed method research (Shannon-Baker, 2016), several research questions are addressed. This thesis discovers multiple forms of technology adoption behavior at the feature level and specific forms of behavior and their outcomes at work and in business. It then proposes feature substitution as a desirable behavior from an organizational perspective and identifies the key determinants through understanding employees' cognitive process. Table 23 summarizes research questions, findings and future research.

Table 23: Summary of Research Findings

Research Questions	Findings	Future Research
What are key types of feature adoption behavior and which of them are desired behavior from organization perspective?	1. Five types of feature adoption behavior consist of feature trial, feature combination, feature substitution, feature rejection and routine use. 2. Feature substitution behavior is desired adoption behavior from organization perspective	1. Degree of generalization is insufficient 2. Structural models and measurement models of varied forms of feature adoption behavior are subject to further testing with expanded sample population
What are key determinants of desired feature adoption behavior and with support theories?	1. Key determinants include work goal congruence, self-esteem and benefits gained. 2. Expectancy theory of motivation (Vroom, 1994) is used to explain relationships.	1. Effect of self-esteem on switching between different forms of feature adoption behavior will be further explored. 2. Effect of Individual differences on feature adoption behavior will be further explored
What are key organizational factors with influence on desired feature adoption behavior?	1. Organizational factor includes self-learning environment	
Whether type of performance management	1. Performance management approach would affect those relationships	

| approach would affect those relationships? | 2. Under outcome-based management approach, employees anticipate importance of mediating effect of work goal congruence | |
| | 3. Under process-based management approach, employees anticipate importance of mediating effect of self-esteem | |

Feature substitution is likely a goal-oriented and outcome-based behavior in which alignment between the benefits of adoption and personal beliefs regarding the accomplishment of work goals and self-esteem at work are perceived as motivational forces. Benefits are actual outcomes observed and experienced by individuals and should be viewed as important when employees compare them to their personal intrinsic needs or wants. This concept is also discovered to align with the Expectancy Theory of Motivation. Based on the findings, organizations should understand employees' job settings and intrinsic needs in the workplace in relation to the use of new system features. This should not be a typical technology implementation exercise. Rather, it should be a process to integrate technology, people and processes.

Facilitating conditions are an organizational measure to support technology adoption. They must go beyond that level and be investigated in depth with consideration of their importance in behavioral intervention. Typical technology implementation measures may not be effective without knowledge of key drivers of employees' technology adoption. This thesis reveals a factor of the self-learning environment, that may regulate employees' experience and intrinsic needs, leading to an increased likelihood of feature substitution. The findings provide guidelines for organizations when they develop and implement new technology or incremental innovation with new features added to existing systems. First, organizations must empower employees or users in designing new system features to increase perceived customization by individuals. Second, they should provide a time-free, place-free and risk-free work environment for employees to practice using new system features to complete their work tasks. Employees should be able to observe and experience the benefits to individuals after using the new system features and replacing old features with new ones.

The performance management approach is a key management issue in the workplace and facilities management context. Differences in the management approach are found to impact the evaluation process of individuals. Employees working under an outcome-based performance management approach may find that accomplishment of work performance targets is important, and they may expect the benefits of adoption to be highly relevant to work performance. In contrast, employees working under a process-based performance management approach may find that increasing self-esteem is important and may expect benefits that are relevant to personal identity. Based on this finding, organizations should consider different personal performance targets as well as different types of reward for employees under different performance management approaches.

This thesis shares potential theoretical and practical contributions based on its findings. Technology adoption in the work context is not a new subject. This thesis provides new insights into that subject. On the theoretical side, it extends the boundaries of the Expectancy Theory of Motivation by providing insight into the concept of self-esteem at work and facilitating conditions. On the practical side, three organizational factors and their content discussed in this thesis allow organizations to improve their existing management measures and likely improve their effectiveness to support the implementation of new system features in a specific workplace context.

The limitations of this thesis are identified and should be converted into future research topics. One concerns self-esteem at work and its effect on switching between different forms of feature adoption behavior. It may bring significant academic and practical contributions to the workplace context with close interaction between individuals and work groups.

References

ABOELMAGED, M. G. 2010. Predicting e-procurement adoption in a developing country. *Industrial Management & Data Systems,* 110**,** 392-414.

AFTHANORHAN, A., NAZIM, A. & AHMAD, S. 2014. A Parametric Approach to Partial Least Square Structural Equation Modeling of Multigroup Analysis (PLS-MGA). *International Journal of Economics, Commerce and Management* II**,** 1 - 15.

AGARWAL, R. & PRASAD, J. 1997. The Role of Innovation Characteristics and Perceived Voluntariness in the Acceptance of Information Technologies. *Decision Sciences,* 28**,** 557-581.

AGUIS, H. W. & ANGELIDES, M. C. 1997. Desktop video conferencing in the organisation. *Information & Management,* 31**,** 291-302.

AHUJA, M. K. & THATCHER, J. B. 2005. Moving Beyond Intentions and Toward The Theory of Trying: Effect of Work Environment and Gender on Post-Adoption Information Technology Use. *MIS Quarterly,* 29**,** 427-459.

AJZEN, I. 1991. The Theory of Planned Behavior. *Organizational Behavior and Human Decision Processes,* 50**,** 179-211.

AL-GAHTANI, S. S. & KING, M. 1999. Attitudes, satisfaction and usage: factors contributing to each in the acceptance of information technology. *Behavior & Information Technology,* 18**,** 277-297.

ALEXANDER, K. 2006. The application of usability concepts in the built environment. *Journal of Facilities Management,* 4**,** 262-270.

ASHWORTH, S. & TUCKER, M. 2017. FM Awareness of Building Information Modelling (BIM). First ed.: BIFM

Zhaw Institute of Facility Management

Liverpool John Moores University

BALA, H. & VENKATESH, V. 2013. Changes in Employees' Job Characteristics During an Enterprise System Implementation: A Latent Growth Modeling Perspective *MIS Quarterly,* 37**,** 1113-1140.

BALA, H. & VENKATESH, V. 2016. Adaptation to Information Technology: A Holistic Nomological Network from Implementation to Job Outcomes. *Management Science* 62**,** 156 - 179.

BALABAN, N., BELIC, K. & GUDELJ, M. 2011. Business Process Performance Management: Theoretical and Methodological Approach and Implementation *Management Information Systems,* 6**,** 003-009.

BANDURA, A. 1989. Human agency in social cognitive theory. *American Psychologist,* 44**,** 1175-1184.

BANSAL, H. S., TAYLOR, S. F. & JAMES, Y. S. 2005. "Migrating" to New Service Providers: Torward a Unifying Framework of Consumers' Switching Behaviors *Journal of the Academy of Marketing Science,* 33**,** 96-115.

BAREFIELD, R. F. 1983. Self-esteem in the workplace. *Journal (American Water Works Association),* 75**,** 600-603.

BATTILANA, J. & CASCIARO, T. 2013. Overcoming Resistance to Organizational Change: Strong Ties and Affective Cooptation *Management Science,* 59**,** 819-836.

BEAUDRY, A. & PINSONNEAULT, A. 2005. Understanding User Responses to Information Technology: A Coping Model of User Adaptation. *MIS Quarterly,* 29**,** 483-524.

BEAUDRY, A. & PINSONNEAULT, A. 2010. The Other Side of Acceptance: Studying the Direct and Indirect Effects of Emotions on Information Technology Use. *MIS Quarterly,* 34**,** 689-710.

BELBLAVY, M., MASELLI, I. & MARTELLUCCI, E. 2012. Workplace Innovation and Technological Change. *CEPS Special Report, Thinking adhead for Europe.* Centre for European Policy Studies.

BENLIAN, A. 2015. IT Feature Use over Time and its Impact on Individual Task Performance *Journal of the Assocation for Information Systems,* 16**,** 144-173.

BHATTACHERJEE, A. 2001a. An empirical analysis of the antecedents of electronic commerce service continuance. *Decision Support Systems,* 32**,** 201-214.

BHATTACHERJEE, A. 2001b. Understanding Information Systems Continuance: An Expectation-Confirmation Model. *MIS Quarterly,* 25**,** 351-370.

BHATTACHERJEE, A. & SANFORD, C. 2006. Influence Processes For Information Technology Acceptance: An Elaboration Likelihood Model. *MIS Quarterly,* 30**,** 805-825.

BIFM. 2014. *Worker wellbeing key to productivity* [Online]. UK: British Institute of Facilities Management Available: http://www.fm-world.co.uk/news/fm-industry-news/worker-wellbeing-key-to-productivity/?utm_source=Adestra&utm_medium=email&utm_term= [Accessed 10 April 2014].

BITNER, M. J. 2001. Service and technology: opportunities and paradoxes. *Managing Service Quality,* 11**,** 375-379.

BOURNE, B. 2015. Phenomenological Study of Generational Response to Organizational Change. *Journal of Managerial Issues,* 27**,** 141-159.

BROCKNER, J. 1989. Self-Esteem at Work. *The Academy of Management Executive (1987-1989),* 3**,** 334-336.

BRYMAN, A. & BELL, E. 2011a. Business research strategies. *Business Research Methods.* New York: Oxford University Press.

BRYMAN, A. & BELL, E. 2011b. Interviewing in qualitative research. *Business Research Methods.* 3rd ed. US: Oxford University Press.

BRYMAN, A. & BELL, E. 2011c. The nature of qualitative research. *Business Research Methods.* Third ed. New York: Oxford University Press Inc.

BRYMAN, A. & BELL, E. 2011d. Sampling. *Business Research Methods.* US: Oxford University Press Inc.

BRYMAN, A. & BELL, E. 2011e. Self-completion questionnaires. *Business Research Methods.* Third ed. United States: Oxford University Press Inc.

BUCKINGHAM, M. & ASHLEY, G. 2015. *Reinventing Performance Management* [Online]. US: Harvard Available: https://hbr.org/2015/04/reinventing-performance-management [Accessed 1 September 2018].

BUGHIN, J., CHUI, M. & MANYIKA, J. 2013. Ten IT-enabled business trends for the decade ahead. *Mckinsey Quarterly, May.* Mckinsey Global Institute.

BURTON, F. G., CHEN, Y.-N., GROVER, V. & STEWART, K. A. 1992/1993. An Application of Expectancy Theory for Assessing User Motivation to Utilitze an Expert System *Journal of Management Information Systems,* 9**,** 183-198.

CAIVER, L. 2014. *Is BIM starting to give users a competitive advantage?* [Online]. UK: Workplace Law Group. Available: http://www.workplacelaw.net/services/blogs/51390/is-bim-starting-to-give-users-a-competitive-advantage [Accessed 22 April 2014].

CARR, A. A. 1997. User-Design in the Creation of Human Learning Systems. *Educational Technology Research and Development,* 45**,** 5-22.

CASSEL, J. W., HACKL, P. & WESTLUND, A. H. 1999. Robustness of partial least squares method for estimating latent variable quality structures. *Journal of Applied Statistics* 26**,** 435-446.

CAST, A. D. & BURKE, P. J. 2002. A Theory of Self-Esteem. *Social Forces,* 80**,** 1041-1068.

CHENG, L.-C. V. & GIBSON, M. L. 2011. A technology-centric framework for investigating business operations. *Information Management & Data Systems,* 111**,** 509-530.

CHIN, W. W. 1998a. Commentary: Issues and Opinion on Structural Equation Modeling. *MIS Quarterly,* 22**,** vii-xvi.

CHIN, W. W. 1998b. The Partial Least Squares Approach for Structural Equation Modeling *Modern Methods for Business Research.* Mahwah, New Jersey: Lawrence Erlbaum Associates, Inc.

CLAGETT, A. F. 1995. Relations of Attitudes to Self-Systems and Ego-Involvements in Normative Reference Groups. *International Review of Modern Sociology,* 25**,** 65-80.

CLOUT, I., CHAMBERS, P., DAVIES, G., FITZPATRICK, K., GURD, J., LEIGH, P., MINOCHA, A., MITCHELL, M., READ, M., SHARP, D. & TATE, D. 2013. The Future of FM: Emerging trends. *FM leaders forum.* Hertfordshire Bishop's Stortford British Institute of Facilities Management.

COMPEAU, D. R. & HIGGINS, C. A. 1995a. Application of Social Cognitive Theory to Training for Computer Skills. *Information Systems Research,* 6**,** 118-143.

COMPEAU, D. R. & HIGGINS, C. A. 1995b. Computer Self-Efficacy: Development of a Measure and Initial Test. *MIS Quarterly,* 19**,** 189-211.

CORPORATE SOLUTION RESEARCH 2016. Top Ten Global CRE Trends for 2016. Europe: JLL

COSGRAVE, E., ARBUTHONOT, K. & TRYFONAS, T. 2013. Living Labs, Innovation Districts, Information Marketplaces: A System Approach for Smart Cities. *Procedia Computer Science,* 16**,** 668-677.

COYLE-CAMP, E. M. 1994. IT Facilities Management "Why Companies Are Losing Their Competitive Edge. *Facilities,* 12**,** 8-12.

CRESWELL, J. W. 2009a. *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches,* London, United Kingdom, SAGE Publications Ltd.

CRESWELL, J. W. 2009b. The Selection of a Research Design. *Research Design Qualitative, Quantitative and Mixed Methods Approaches* third ed.: SAGE.

CROTTY, M. 1998. *The foundations of social research: Meaning and perspective in the research process,* London, SAGE.

DAVIS, F. D. 1989. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly,* 13**,** 319-340.

DESANCTIS, G. & POOLE, M. S. 1994. Capturing the Complexity in Advanced Technology Use: Adaptive Structuration Theory. *Organization Science,* 5**,** 121-147.

DIAMANTOPOULOS, A. & WINKLHOFER, H. M. 2001. Index construction with formative indicators: An alternative to scale development. *Journal of Marketing Research,* 38**,** 269-277.

DUBOSQ, B. 2018. *How Retail Health Clinics Can Use IoT for Effective Facilities Management* [Online]. blog.srvicechannel.info. Available: https://blog.servicechannel.info/retail-healthcaare-iot-facilities-management [Accessed 29 July 2018].

DUHIGG, C. 2012. *The Power of Habit: Why we do what we do and how to change,* Great Britain, Random House Books.

EDMONDSON, A. C., BOHMER, R. M. & PISANO, G. P. 2001. Disrupted Routines: Team Learning and New Technology Implementation in Hospitals. *Administrative Science Quarterly,* 46**,** 685-716.

ELVING, W. J. L. 2005. The role of communication in organisational change. *Corporate Communications: An International Journal,* 10**,** 129-138.

EY'S NORDIC REFM TEAM 2016. Does your workplace outsourcing create value beyond savings? A point of view on the future of real estate and facilities management EY Advisory Services.

FACILITIES MANAGEMENT ASIA. Facilities Management: Challenges and Developments. Facilities Management Asia 2011, 27-28 July 2011 2011 Prince Hotel & Residence Kuala Lumpur Malaysia.

FINCH, E. 2003. The untethered facilities manager. *Facilities,* 21**,** 126-133.

FISHBEIN, M. 1979. A theory of reasoned action: Some applications and implications. *Nebraska Symposium on Motivation,* 27**,** 65-116.

FLOWER, F. J. 2015. Types of Error in Surveys. *In:* CENTER FOR SURVEY RESEARCH, U. O. M. B. (ed.) *Survey Research Methods.* Fifth ed. Boston: SAGE.

FOLKMAN, S. & LAZARUS, R. S. 1985a. If It Changes It Must Be a Process: Study of Emotion and Coping During Three Stages of a College Examination. *Journal of Personality and Social Psychology,* 48**,** 150-170.

FOLKMAN, S. & LAZARUS, R. S. 1985b. Ways of Coping. *In:* CALIFORNIA, U. O. (ed.). San Francisco.

FOWLER, F. J. 2015. Sampling. *Survey Research Methods.* US: SAGE.

FOXALL, G. R. 2008. Intentional Behavioursm Revisited. *Behavior and Philosophy,* 36**,** 113-155.

FOXALL, G. R. & GREENLEY, G. E. 2006. Predicting and Explaining Responses to Consumer Envrionments: An Empirical Test and Theoretical Extension of the Behavioural Perspective Model. *The Service Industries Journal* 20**,** 39-63.

FOXALL, G. R., OLIVEIRA-CASTRO, J. M., JAMES, V. K. & SCHREZENMAIER, T. C. 2011. Consumer Behaviour Analysis: I. The Behavioural Perspective Model. *Management Online Review* [Online]. Available: http://www.morexpertise.com/view.php?id=70.

GARCIA-GUZMAN, J., FERNANDEZ DEL CARPIO, A., DE AMESCUA, A. & VELASCO, M. 2013. A process reference model for managing living labs for ICT innovation: A proposal based on ISO/IEC 15504. *Computer Standards & Interfaces,* 36**,** 33-41.

GIDDENS, A. 1984. The Constitution of Society: Outline of the Theory of Structuration. Cambridge, UK: Polity Press.

GOH, C. 2015. *Data and analytics in corporate real estate: do you have the right talent?* [Online]. Singapore: JLL. Available: http://www.jllapsites.com/research/data-and-analytics-in-corporate-real-estate-do-you... [Accessed 22 July 2015].

GOODACRE, L. 2013. *FM innovation "not about IT or price"* [Online]. British Institute of Facilities Management. Available: http://www.fm-world.co.uk/news/fm-industry-news/fm-innov... [Accessed 19 April 2013].

GOODHUE, D. L. & THOMPSON, R. L. 1995. Task-Technology Fit and Individual Performance *MIS Quarterly,* 19**,** 213-236.

GRIFFITH, T. L. 1999. Technology Features as Triggers for Sensemaking. *The Academy of Management Review,* 24**,** 472-488.

GUBA, E. G. 1990. *The alternative paradigm dialog,* Newbury Park, Sage.

GUBA, E. G. & LINCOLN, Y. S. 1994. Competing paradigms in qualitative research. *In:* DENZIN, N. K. & LINCOLN, Y. S. (eds.) *Handbook of Qualitative Research.* London: SAGE.

GUNTHER, R., JANIS, J. & BUTLIER, S. 2001. *The UCD Decision Matrix: How, when and where to sell user-centered design into the Development Cycle* [Online]. Available: http://www.ovostudios.com/upa2001/ [Accessed 15 January 2016.

HAIR, J. F., HULT, G. T. M., RINGLE, C. M. & SARSTEDT, M. 2017a. Assessing PLS-SEM Results Part I: Evaluation of Reflective Measurement Models. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM).* 2nd ed. US: SAGE.

HAIR, J. F., HULT, G. T. M., RINGLE, C. M. & SARSTEDT, M. 2017b. Assessing PLS-SEM Results Part III- Evaluatioin of the Structural Model *A Primer on Partial Least Squares Structuring Equation Modeling (PLS-SEM).* US: SAGE.

HAIR, J. F., HULT, G. T. M., RINGLE, C. M. & SARSTEDT, M. 2017c. An Introduction to Structural Equation Modeling *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM).* US: SAGE Publications, Inc.

HAIR, J. F., HULT, G. T. M., RINGLE, C. M. & SARSTEDT, M. 2017d. Mediator and Moderator Analysis. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM).* US: SAGE.

HAIR, J. F., HULT, G. T. M., RINGLE, C. M. & SARSTEDT, M. 2017e. Outlook on Advanced Methods. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM).* second ed. UK: SAGE Publications, Inc.

HAIR, J. F., HULT, G. T. M., RINGLE, C. M. & SARSTEDT, M. 2017f. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, SAGE.

HAIR, J. F., HULT, G. T. M., RINGLE, C. M. & SARSTEDT, M. 2017g. Specifying the Path Model and Examining Data. *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM).* Second ed. US: SAGE Publications, Inc.

HAMROUNI, W. 2017. *5 of the Biggest Information Technology Failures and Scares* [Online]. exoplatform. Available: https://www.exoplatform.com/blog/2017/08/01/5-of-the-biggest-information-technology-failures-and-scares [Accessed 28 July 2018].

HENSELER, J., RINGLE, C. M. & SARSTEDT, M. 2015. A new criterion for assessing discriminat validity in variance-based structural equation modeling *Journal of the Academy of Marketing Science,* 43**,** 115-135.

HKSAR 2017. Hong Kong Monthly Digest of Statistics : The Four Key Industries and Other Selected Industries in the Hong Kong Economy. *In:* DEPARTMENT, C. A. S. (ed.). HK: HKSAR.

IGBARIA, M., ZINATELLI, N., CRAGG, P. & CAVAYE, A. L. M. 1997. Personal Computing Acceptance Factors in Small Firms: A Structual Equation Model. *MIS Quarterly,* 21**,** 279-305.

IM, I., HONG, S. & KANG, M. S. 2011. An international comparison of technology adoption: Testing the UTAUT model. *Information & Management,* 48**,** 1-8.

ISO 2017. International Standard *Facilities Managemet - Vocabulary.* Switzerland: ISO copyright office

JARVIS, C. B., MACKENZIE, S. B. & PODSAKOFF, P. M. 2003. A critical review of construct indicators and measurement model misspecification in marketing and consumer research. *Journal of Consumer Research,* 30**,** 199-218.

JASPERSON, J. S., CARTER, P. E. & ZMUD, R. W. 2005. A Comprehensive Conceptualization of Post-Adoptive Behaviors Associated with Information Technology Enabled Work Systems. *MIS Quarterly,* 29**,** 525-557.

JEE, C. & MACAULAY, T. 2018. *Top software failures in recent history* [Online]. ComputerWorldUK. Available: https:///www.computerworlduk.com/galleries/infrastructure/top-software-failures-recent-history-3599618/ [Accessed 28 July 2018].

JLL 2017a. Future of Work: Where ambition thrives. United States.

JLL 2017b. JLL 10 Trends for CRE 2017. United States: JLL.

JLL & UNWORK.COM 2016. Workspace Reworked, Ride the wave of tech driven change US.

JOHNSON, D. S., BARDHI, F. & DUNN, D. T. 2008. Understanding How Technology Paradoxes Affect Customer Satisfaction with Self-Service Technology: The Role of Performance Ambiguity and Trust in Technology. *Psychology & Marketing,* 25**,** 416-443.

KARAHANNA, E., STRAUB, D. W. & CHERVANY, N. L. 1999. Information Technology Adoption Across Time: A Cross-Sectional Comparison of Pre-Adoption and Post-Adoption Beliefs. *MIS Quarterly,* 23**,** 183-213.

KAY, J. & THOMAS, R. C. 1995. Studying Long Term System Use. *Communications of the ACM,* 38**,** 61-69.

KEUNG, J., JEFFREY, R. & KITCHENHAM, B. The Challenge of introducing a new software cost estimation technology into a small software organization. Australian Software Engineering Conference, 2004. IEEE Computer Society Press, 52-59.

KIM, H.-J., MANNINO, M. & NIESCHWIETZ, R. J. 2009. Information technology acceptance in the internal audit profession: Impact of technology features and complexity. *International Journal of Accounting Information Systems,* 10**,** 214-228.

KIM, H.-W. & KANKANHALLI, A. 2009. Investigating User Resistance to Information Systems Implementation: A Status Quo Bias Perspective *MIS Quarterly,* 33**,** 567-582.

KIM, S. S. & MALHOTRA, N. K. 2005a. A Longitudinal Model of Continued Is Use: An Integrative View of Four Mechanisms Underlying Postadoption Phenomena. *Management Science,* 51**,** 741-755.

KIM, S. S., MALHOTRA, N. K. & NARASIMHAN, S. 2005b. Research Note: Two Competing Perspectives on Automatic Use: A Theoretical and Empirical Comparison. *Information Systems research,* 16**,** 418-432.

KING, W. R. & HE, J. 2006. A meta-analysis of the technology acceptance model. *Information & Management,* 43**,** 740-755.

LABOUR DEPARTMENT 2017. Hong Kong The Facts Employment May ed. Hong Kong: HK SAR.

LAZARUS, R. S. 1991. Cognition and Motivation in Emotion. *American Psychologist,* 46**,** 352-367.

LAZARUS, R. S. & FOLKMAN, S. 1984. *Stress, Appraisal, and Coping,* New York, Springer Publishing Company.

LEARY, M. R. 1999. Making Sense of Self-Esteem. *Current Directions in Psychological Science,* 8**,** 32-35.

LEE, Y., KOZAR, K. A. & LARSEN, K. R. T. 2003. The Technology Acceptance Model: Past, Present, and Future. *Communications of the Association for Information Systems,* 12**,** 752-780.

LEE, Y.-H., HSIEH, Y.-C. & HSU, C.-N. 2011. Adding Innovation Diffusion Theory to the Technology Acceptance Model: Supporting Employees' Intentions to use E-Learning Systems. *Journal of Educational Technology & Society,* 14**,** 124-137.

LEON, R. & WAHBA, M. A. 1975. Expectancy Theory as a Predictor of Work Motivation, Effort Expenditure, and Job Performance *The Academy of Management Journal* 18**,** 520-537.

LIANG, H. & XUE, Y. 2009. Avoidance of Information Technology Threats: A Theoretical Perspective. *MIS Quarterly,* 33**,** 71-90.

LIMAYEM, M. & HIRT, S. G. 2003. Force of Habit and Information Systems Usage: Theory and Initial Validation. *Journal of the Association for Information Systems,* 4**,** 65-97.

LIN, S.-P. 2011. Determinants of adoption of Mobile Healthcare Service. *International Journal of Mobile Communications,* 9**,** 298-315.

LIPPERT, S. K. & VOLKMAN, J. A. 2007. Cultural Effects on Technology Performance and Utilization: A Comparison of U.S. and Canadian Users. *Journal of Global Information Management* 15**,** 56-90.

LOCH, C. H. & HUBERMAN, B. A. 1999. A Punctuated-Equilibrium Model of Technology Diffusion. *Management Science,* 45**,** 160-177.

LOMAS, D. W. 1999. Facilities management development in Hong Kong. *Facilities,* 17**,** 470-475.

LOUIS, M. R. & SUTTON, R. I. 1991. Switching cognitive gears: From habits of mind to active thinking *Human Relations,* 44**,** 55-76.

LOVATA, L. M. 1987. Behavioral Theories Relating to the Design of Information Systems. *MIS Quarterly,* 11**,** 147-149.

LOWRY, G. 2002. Modelling user acceptance of building management systems. *Automation in Construction,* 11**,** 695-705.

MACKENZIE, S. B. & PODSAKOFF, P. M. 2012. Common Method Bias in Marketing: Causes, Mechanisms and Procedural Remedies. *Journal of Retailing,* 88**,** 542-555.

MADRITSCH, T. & MAY, M. 2009. Successful IT implementation in facility management *Facilities,* 27**,** 429-444.

MARCIUSKA, S., GENCEL, C. & ABRAHAMSSON, P. 2013. Exploring How Feature Usage Relates to Customer Perceived Value: A Case Study in A Startup Company. *International Conference of Software Business.* Springer.

MARCIUSKA, S., GENCEL, C. & ABRAHAMSSON, P. 2014. Feature Usage As a Value Indicator for Decision Making *23rd Australian Software Engineering Conference* IEEE.

MARINI, S. D., HASMAN, A. & HUIJER, H. A.-S. 2009. Information technology for medication administration:assessing bedside readiness among nurses in Lebanon. *International Journal of Evidence-Based Healthcare,* 7**,** 49-58.

MARKUS, M. L. 2004. Technochange management: using IT to drive organizational change. *Journal of Information Technology,* 19**,** 4-20.

MCFARLAND, D. J. & HAMILTON, D. 2006. Adding contextual specificity to the technology acceptance model. *Computers in Human Behavior,* 22**,** 427-447.

MICK, D. G. & FOURNIER, S. 1998. Paradoxes of Technology: Consumer Cognizance, Emotions, and Coping Strategies. *Journal of Consumer Research,* 25**,** 123-143.

MOORE, G. C. & BENHASAT, I. 1991. Development of an Instrument to Measure the Perceptions of Adoptiong an Information Technology Innovation. *Information Systems research,* 2**,** 192-222.

MOORE, M. & FINCH, E. 2004. Facilities management in South East Asia. *Facilities,* 22**,** 259-270.

MOOS, D. C. & AZEVEDO, R. 2009. Learning with Computer-Based Learning Environments: A Literature Review of Computer Self-Efficacy. *Review of Educational Research,* 79**,** 576-600.

MORGAN, D. 2007. Paradigms lost and pragmatism regained: Methodological implications of combining qualitative and quantitative methods. *Journal of Mixed Methods Research,* 1**,** 48-76.

NAGENGAST, L., EVANSCHITZKY, H., BLUT, M. & RUDOLPH, T. 2014. New Insights in the Moderating Effect of Switching Costs on the Satisfaction-Repurchase Behavior Link. *Journal of Retailing,* 3**,** 408-427.

NELISSEN, P. & VAN SELM, M. 2008. Surviving organizational change: how management communication helps balance mixed feelings. *Corporate Communications: An International Journal,* 13**,** 306-318.

NEVO, S. & NEVO, D. 2012. Dissatisfaction Does Not Mean Rejection: A Theory of Reinvention of Applicable Technologies by Mindful and Unfaithful Users. *In:* IEEE (ed.) *45th Hawaii International Conference on System Sciences* IEEE.

NEVO, S., NEVO, D. & PINSONNEAULT, A. 2015. Differentiating Post-Implementation Change Behaviors Towards Information Technology. *48th Hawaii International Conference on System Sciences.* IEEE.

OFIR, E. 2018. *9 System Failure to Kick Off 2018* [Online]. CloudEndure. Available: https://www.cloudendure.com/blog/2018-q1-system-failures [Accessed 28 July 2018].

OLIVER, R. L. 1993. Cognitive, Affective, and Attribute Bases of the Satisfaction Response. *Journal of Consumer Research,* 20**,** 418-430.

ORLIKOWSKI, W. J. 1992. The Duality of Technology: Rethinking the Concept of Technology in Organizations. *Organization Science,* 3.

ORLIKOWSKI, W. J. 1996. Improvising Organizational Transformation Over Time: A Situated Change Perspective. *Information Systems Research,* 7**,** 63-92.

PALLANT, J. 2013a. Preliminary Analyses. *SPSS Survival Manual.* UK: McGraw Hill.

PALLANT, J. 2013b. *SPSS Survival Manual,* US, McGraw Hill.

PARIJAT, P. & BAGGA, S. 2014. Victor Vroom's Expectancy Theory of Motivation - An Evaluation *International Research Journal of Business and Management - IRJBM,* VII**,** 1 - 8.

PARTHASARATHY, M. & BHATTACHERJEE, A. 1998. Understanding Post-Adoption Behavior in the Context of Online Services. *Information Systems research,* 9.

PEACH, M. 2017. *Feature Adoption 101 - Product, Measurement, & Aceleration* [Online]. NC: Pendo. Available: https://blog.pendo.io/2017/07/11/feature-adoption-101-promotion-measurement-acceleration/.

PENG, X., ZHAO, Y. & ZHU, Q. 2016. Investigating user switching intention for mobile instant messaging application: Taking WeChat as an example. *Computers in Human Behavior,* 64**,** 206-216.

PEUS, C., FREY, D., GERKHARDT, M., FISCHER, P. & TRAUT-MATTAUSCH, E. 2009. Leading and Managing Organizational Change Initiatives. *Management Revue,* 20.

PICK, D. & MARTIN, E. 2014. Buyers' perceived switching costs and switching: a meta-analytic assessment of their antecedents. *Journal of Academic Marketing Science* 42**,** 186 - 204.

PINSONNEAULT, A. & RIVARD, S. 1998. The Impact of Information Technologies on Managerial Work: From the Productivity Paradox to Icarus Paradix? *MIS Quarterly,* 22**,** 287-312.

POLITES, G. L. & KARAHANNA, E. 2013. THE EMBEDDEDNESS OF INFORMATION HABITS IN ORGANIZATIONAL AND INDIVIDUAL LEVEL ROUTINES: DEVELOPMENT AND DISRUPTION. *MIS Quarterly,* 37**,** 221-246.

PRATT, M. G., ROCKMANN, K. W. & KAUFMANN, J. B. 2006. Constructing Professional Identity: The Role of Work and Identity Learning Cycles in the Customization of Identity Among Medical Residents. *Academy of Management Journal,* 49**,** 235-262.

PRICE, I. 2004. Business critical FM. *Facilities,* 22**,** 353-358.

RAPHAEL, R. 2018. *Rise and Fall of Tech Innovation: 2018 Technology Failures* [Online]. Business2Community.com. Available: https://www.business2community.com/tech-gadgets/rise-and-fall-of-tech-innovation-2018-technology-failures-02085595 [Accessed 29 July 2018].

REZVANI, A., KHOSRAVI, P. & DONG, L. 2017. Motivating users toward continued usage of information systems: Self-determination theory perspective *Computers in Human Behavior,* 76**,** 263-275.

RICE, R. E. & AYDIN, C. 1991. Attitudes Toward New Organizational Technology: Network Proximity as a Mechanism for Social Informatioin Processing. *Administrative Science Quarterly,* 36**,** 219-224.

RINGLE, C. M., WENDE, S. & BECKER, J. M. 2015. SmartPLS 3. 3 ed.

ROGERS, E. M. 1995. Diffustion of Innovations. Fourth ed. New York: The Free Press.

ROSSITER, J. R. 2002. The C-OAR-SE procedure for scale development in marketing. *International Journal of Research in Marketing* 19**,** 305-335.

SANAKULOV, N. & KARJALUOTO, H. 2015. Consumer adoption of mobile technologies:a literature review. *International Journal of Mobile Communications,* 13**,** 244-273.

SCHIFFMAN, S. J., MEILE, L. C. & IGBARIA, M. 1992. An examination of end user types. *Information & Management,* 22**,** 207-215.

SHAIKH, A. A. & KARJALUOTO, H. 2015. Making the most of information technology & system usage: A literature review, framework and future research agenda. *Computers in Human Behavior,* 49**,** 541-566.

SHANNON-BAKER, P. 2016. Making Paradigms Meaningful in Mixed Methods Research. *Journal of Mixed Methods Research,* 10**,** 319-334.

SHI, X., LIN, Z., LIU, J. & HUI, Y. K. 2018. Consumer loyalty toward smartphone brands: The determining roles of deliberate inertia and cognitive lock in. *Information & Management,* 55**,** 866-876.

SHIN, D.-H. & KIM, W.-Y. 2008. Forecasting customer switching intention in mobile services: An exploratory study of predictive factors in mobile number portability. *Technological Forecasting and Social Change,* 75**,** 854-874.

STAM, K. R. & STANTON, J. M. 2010. Events, emotions, and technology: examining acceptance of workplace technology changes. *Information Technology & People,* 23**,** 23-53.

STEPHENS, N. & GWINNER, K. P. 1998. Why Don't Some People Complain? A Cognitive-Emotive Process Model of Consumer Complaint Behavior. *Journal of the Academy of Marketing Science,* 26**,** 172-189.

STRASS, A. & CORBIN, J. M. 1990. *Basics of Qualitative Research: Grounded Theory Procedure and Techniques,* Newbury Park, CA, SAGE.

SUN, H. 2012. Understanding User Revisions When Using Information System Features: Adaptive System Use and Triggers. *MIS Quarterly,* 36**,** 453-478.

SUN, H., FANG, Y. & HSIEH, J. J. P.-A. 2014. Consuming information systems: An economic model of user satisfaction. *Decision Support Systems,* 57**,** 188-199.

SUTCHLFFE, A., THEW, S., DE BRUIJN, O., BUCHAN, I., JARVIS, P., MCNAUGHT, J. & PROCTER, R. 2010. User engagement by user-centred design in e-Health. *Philosophical Transactions: Mathematical, Physical and Engineering Sciences,* 368**,** 4209-4224.

TABACHNIK, B. G. & FIDELL, L. S. 2013. *Using multivariate statistics,* Boston, Pearson Education.

TANCRED, G., ROWLAND, D., CLOUT, I., CLARK, J., DOVE, P., FARMAN, R., KING, R., KYLE, M., MANNING, R., OLIVER, N., READ, M., SHAH, S., STODDART, C., WALPOLE, J. & BROWN, A. 2012. BIM and FM: Bridging the gap for success. *FM Leaders Forum.* Hertfordshire Bishop's Stortford: British Institute of Facilities Maangement

TAYLOR, S. & TODD, P. 1995. Assessing IT Usage: The Role of Prior Experience. *MIS Quarterly,* 19**,** 561-570.

TESCH, R. 1990. *Qualitative Research: Analysis types and software tools,* New York, Falmer.

THATCHER, J. B., WRIGHT, R. T., SUN, H., ZAGENCZYK, T. J. & KLEIN, R. 2018. Mindfulness in Information Technology Use: Definitions, Distinctions, and a New Measure *MIS Quarterly,* 42**,** 831-847.

THE BRITISH INSTITUTE OF FACILITIES MANAGEMENT. 2013. *FM sector 'to transform in the next decade'* [Online]. United Kingdom: British Institute of Facilities Management Available: Thesis_Final12Nov(afterminorad19April).docx [Accessed 9 December 2013].

THOMPSON, R. L., HIGGINS, C. A. & HOWELL, J. M. 1991. Personal Computing:Toward a Conceptual Model of Utilization. *MIS Quarterly,* 15**,** 125-143.

TOLMAN, A., MATINMIKKO, T., MOTTONEN, V., TULLA, K. & VAHA, P. 2009. The benefits and obstacles of mobile technology in FM service procurement. *Facilities,* 27**,** 445-456.

TUNER, M., KITCHENHAM, B., BRERETON, P., CHARTERS, S. & BUDGEN, D. 2010. Does the technology acceptance model predict actual use? A systematic literature review. *Information and Software Technology,* 52**,** 463-479.

UZOKA, F.-M. E. & NDZINGE, T. 2009. Empirical Analysis of Biometric technology adoption and acceptance in Botswana. *The Journal of Systems and Software* 82**,** 1550-1564.

VENKATESH, V. & MORRIS, M. G. 2000. Why Don't Men Ever Stop to Ask for Directions? Gender, Social Influence and Their Role in Technology Acceptance and Usage Behaviour. *MIS Quarterly,* 24**,** 115-139.

VENKATESH, V., MORRIS, M. G., DAVIS, G. B. & DAVIS, F. D. 2003. User Acceptance of Information Technology: Toward a Unified View. *MIS Quarterly,* 27**,** 425-478.

VENKATESH, V., THONG, J. Y. L. & XU, X. 2012a. Consumer Acceptance and Use of Informatino Technology:Extending the Unified Theory of Acceptance and Use of Technology. *MIS Quarterly,* 36**,** 157-178.

VENKATESH, V., THONG, J. Y. L. & XU, X. 2012b. Consumer Acceptance and Use of Information Technology: Extending the Unified Technology of Acceptance and Use of Technology. *MIS Quarterly,* 36**,** 157-178.

VREDENBURG, K., MAO, J.-Y., SMITH, P. W. & CAREY, T. 2002. A Survey of User-Centered Design Practice. *Conference on Human Factors in Computing Systems,* 4**,** 471-478.

VROOM, V. H. 1994. Work and Motivation *In:* KINDLE (ed.) 1st ed.

WALSH, I., GETTLE-SUMMA, M. & KALIKA, M. 2016. Expectable use: An important facet of IT usage *Journal of Strategic Information Systems,* 25**,** 177-210.

WAN, Z., COMPEAU, D. R. & HAGGERTY, N. 2012. The Effects of Self-Regulated Learning Processes on E-Learning Outcomes in Organizational Settings. *Journal of Management Information Systems,* 29**,** 307-339.

WATSON, J. 2012. Agent of Change "The future of technology disruption in business". *The Economist* [Online], March 20. Available: http://www.managementthinking.eiu.com/agent-of-change.html [Accessed 5 July 2013].

WOOD, S. L. & MOREAU, C. P. 2006. From Fear to Loathing? How Emotion Influences the Evaluation and Early Use of Innovations. *Journal of Marketing,* 70**,** 44-57.

WORLDWIDE, R. 2014. What can a Facilities Manager expect from Building Information Modeling? [Accessed 23 April].

YANG, H., SUTHERLAND, S., BRESLAU, B. & CARROLL, T. 2015. Elevate to excellence, Global Corporate Real Estate Trends 2015. *In:* SOLUTIONS, J. C. (ed.) *JLL's Global Corporate Real Estate Survey.* USA: JLL.

YIN, R. K. 1994. Discovering the Future of the Case Study Method in Evaluation Research. *Evaluation Practice,* 15**,** 283-290.

YIN, R. K. 2014a. Analyzing Case Study Evidence *Case Study Research: Design and Methods.* USA: SAGE.

YIN, R. K. 2014b. *Case Study Research: Design and Methods,* USA, SAGE.

YIN, R. K. 2014c. Designing Case Studies. *Case Study Research: Design and Methods.* 5th ed. USA: SAGE.

YIN, R. K. 2014d. Preparing to Collect Case Study Evidence *Case Study Research: Design and Methods.* 5th ed. USA: SAGE.

Appendix A: Interview Questions – Qualitative Analysis

What is your position and job role?

How long have you been in this organization?

What are your primary work goals or performance targets?

What "workflows" are you usually involved in? What information system features are normally used to facilitate the workflows? Why do you use them?

What is troublesome about them?

When and how were you aware of the "BI Portal"?

What features does it have? Which features did you get attended at first, and why?

What is different about those features compared to the incumbent features in relation to your work context?

What were your concerns about the introduction of the "BI Portal" features to your work context? How do you evaluate them?

How did you see the new features increasing or decreasing some of your job-related stress when they were introduced?

Who are the people or parties directly responsible for the introduction or implementation of the "BI Portal"? What are your feelings about them (blame or credit)?

How did those features affect your own emotions and relationships with others?

In what ways and why do you have to cope with "BI Portal" features (may be in conjunction with the use of other systems' features)?

How well did your coping action meet your expected outcomes? What were your responses then?

How have these changed over time since you started adopting or avoiding the features of the BI Portal? Why?

- Evaluation of features
- Job-related stress
- Emotion
- Coping with or adoption of the system features
- Outcomes of coping/adoption

How often do you use individual features?

Does the BI Portal benefit your organization? What are the benefits?

Based on your experience, what has the organization done to help staff members use the BI Portal?

If the BI Portal is reintroduced, what measures (management intervention and system improvements) should be implemented to encourage adoption? Why?

Based on your understanding, please comment on why users do not use or extensively use features of the BI Portal?

What is your opinion on the usage of the BI Portal by your subordinates? What is their feedback that you learned?

Any change of their performance after using the BI Portal?

Can you please name two subordinates (one is a frequent user and the other is an infrequent user) for me to interview further?

Appendix B: Questionnaire – Quantitative Analysis

Dear Sirs,

This survey is to study your perceptions and responses for features or functionality of facilities management information systems (FMIS) or application software. The FMIS may include RED, BI portal, 360, MyFacility, OneView Service Center, JDEdward, UMIS, Maximo, Ariba, Microsoft Project or Microsoft Office. The features may include planned maintenance schedules, self-service request, cost or work request tracking, standardized or customized reports, compliance tracking, space planning and management, move planning, lease analysis, RFP analysis and so on.

Please be informed that your responses in this survey will be used for academic or industry research purposes. Look forward to receiving your reply then.

A. Personal Information

1. Name of IFM accou [   ]

2. Industry Sector (please tick the box that can describe your job nature):

Banking /Finance	☐
Education	☐
Manufacturing/Industrial	☐
Information Technology	
NGO/Government	
Others	

3. Outsourcing Performance Measurement Model (client-JLL)

Output based
(e.g. response time, equipment uptime,
level of cleanliness, customer satisfaction)

Activity/Prescriptive based
(e.g. frequency of work, duration of work,
man-hours)

4. Job Nature (please tick the box that can describe your job nature):

Subject Matter Expert (e.g. Engineering, Supply Chain, Health & Safety)	☐
Service Delivery (e.g. Cleaning, Maintenance, Help desk, Front desk)	☐

General Management □
(e.g. Client relationship management, Account
management Operation management)

**5. Please select information systems or related features that you responded to in this survey
(you may select one or more)**

BI portal/Tableau or related features □

RED or related features □

OVSC help desk or related features □

JDE or related features □

360 or related features □

UMIS or related features □

Maximo or related features □

Others, please state □

6. How long are you aware of above features?

Totally new □
Less than one month □
Above one month to three months □
Above three months to six months □
Over six months □

B. Switching Behavior of FMIS features

For below items, please answer each question and bubble the scale better representing your
thoughts or experience (1 is totally disagreed, 7 is totally agreed).

7. Please state your current response or behavior for the new system features

	1	2	3	4	5	6	7
-I substituted features that I used before	□	□	□	□	□	□	□
-I replaced old features with new ones	□	□	□	□	□	□	□
-I used similar features in place of the features at hand	□	□	□	□	□	□	□

8. At time you tried (if you now stop using new system features) or use new system features, you considered

	1	2	3	4	5	6	7
-It is difficult for me to use new system features	☐	☐	☐	☐	☐	☐	☐
-It would be complicated for me to switch from incumbent system features to new ones	☐	☐	☐	☐	☐	☐	☐
-It takes a lot of time to get information on why and how to use new system features	☐	☐	☐	☐	☐	☐	☐
-It would take a lot of effort switching from incumbent system features to new ones	☐	☐	☐	☐	☐	☐	☐
-It would take a lot of time switching from incumbent system features to new ones	☐	☐	☐	☐	☐	☐	☐
-In general, it would be a hassle switching from incumbent system features to new ones	☐	☐	☐	☐	☐	☐	☐

9. At time you tried (if you now stop using new system features) or use new system features, you considered

	1	2	3	4	5	6	7
-They will increase effectiveness of my job	☐	☐	☐	☐	☐	☐	☐
-They will spend less time on routine job tasks	☐	☐	☐	☐	☐	☐	☐
-They will increase quality of output for same amount of effort	☐	☐	☐	☐	☐	☐	☐
-They will allow me to meet job requirement or performance target	☐	☐	☐	☐	☐	☐	☐

10. At time you tried (if you now stop using new system features) or use new system features, you considered

	1	2	3	4	5	6	7
-My coworkers perceived me as competent	☐	☐	☐	☐	☐	☐	☐
-I felt more prestige than those who do not use new features	☐	☐	☐	☐	☐	☐	☐
-I felt I am person of worth, at least on an equal basis with others	☐	☐	☐	☐	☐	☐	☐
-I thought I am no good at all	☐	☐	☐	☐	☐	☐	☐
-I felt I do not have much to proud of	☐	☐	☐	☐	☐	☐	☐
-I had little control over the new work settings	☐	☐	☐	☐	☐	☐	☐
-There was no way I can solve the problems encountered with use of new system features	☐	☐	☐	☐	☐	☐	☐
-I was able to master new work settings as most other people	☐	☐	☐	☐	☐	☐	☐
-I was confident to work with use of new system features	☐	☐	☐	☐	☐	☐	☐

11. Please state outcomes you experienced after you tried or use new system features

	1	2	3	4	5	6	7
-My job effectiveness increased	☐	☐	☐	☐	☐	☐	☐
-Less time and effort to spend on routine job tasks	☐	☐	☐	☐	☐	☐	☐
-Quality of work improved with same amount of effort	☐	☐	☐	☐	☐	☐	☐
-I got materialized reward and incentives	☐	☐	☐	☐	☐	☐	☐
-I was satisfied with new system features	☐	☐	☐	☐	☐	☐	☐
-My needs were met or satisfied	☐	☐	☐	☐	☐	☐	☐
-My negative emotions or unpleasant feelings were minimized	☐	☐	☐	☐	☐	☐	☐
-My coworkers perceived me as competent	☐	☐	☐	☐	☐	☐	☐
-My coworkers perceived me with contribution to the team	☐	☐	☐	☐	☐	☐	☐
-I got recognition or appreciation from others	☐	☐	☐	☐	☐	☐	☐
-People saw me as expert to master for new system features	☐	☐	☐	☐	☐	☐	☐

12. Please state organizational supports are important for you to try or use new system features

	1	2	3	4	5	6	7
-I had necessary resources to self-learn new system features	☐	☐	☐	☐	☐	☐	☐
-I had control over trying and learning new system features	☐	☐	☐	☐	☐	☐	☐
-Trying or leaning new system features fit well with the way I like to try or work	☐	☐	☐	☐	☐	☐	☐
-A specific person (a group) was available for assistance with new system features difficulties	☐	☐	☐	☐	☐	☐	☐
-Guidance was available to me in the selection of system features (new and existing) suitable to new work settings	☐	☐	☐	☐	☐	☐	☐
-Specialized instruction concerning new system features was available to me	☐	☐	☐	☐	☐	☐	☐
-Your supervisors always support and encourage use of new system features for job related work	☐	☐	☐	☐	☐	☐	☐
-Management provided good access to new system features when people need them	☐	☐	☐	☐	☐	☐	☐