Considerations Prior Adoption of Design Thinking for Project Management

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Abstract

Design Thinking as one of the approaches to collaborative identification and solving a problem has been highly recognized by practitioners and academics in providing potential value in enhancing innovative results for products, services, or strategies and is vastly recommended to be applied in Project Management. However, none of the empirical studies explores factors that influence Design Thinking adoption in the projects. This study covers this gap and explores several predictors that influence the adoption of Design Thinking in projects. With Diffusion of Innovation as the theoretical basis, data were collected from 106 project managers in Indonesia who are experienced in implementing Design Thinking in their projects. The findings suggest that innovation's perceived relative advantage, observability, and complexity significantly influence the adoption of Design Thinking. Contrary to finding in existing literature, perceived compatibility and trialability of Design Thinking have no influence on the adoption in the project. The education and tenure of the project manager are also found to do not moderate perceived complexity association towards the adoption of Design Thinking. This study contributes to organizations determining and developing strategies to maximize the use of Design Thinking in projects, thus increasing the chances of success in innovation projects.

Keywords
Design Thinking, Project Management, Diffusion of Innovation, Innovation Adoption, Satisfaction

1. Introduction

Innovation is crucial for business growth and sustainability. Nowadays, many organizations encourage innovation at all levels, signifying that everyone should look at what they do and ask how they can iterate and innovate, even on a small scale. A majority of the businesses that get effective growth have added innovation in their business. Some are popular for their innovative products and others for their innovative services. As organizations emerge from the COVID-19 crisis to face tremendous economic uncertainty, the need for unconventional thinking is urgently needed for progressing innovation. Many companies view the value of game-changing ideas delivered through projects as innovation vehicles for products or services and business process innovation and business models. They choose the project management method as the primary approach to solving their problems (Huff 2016). Yet, many projects failed to achieve their objectives. Several studies identified severe problems across a broad cross-section of industries where many projects failed (Bloch et al. 2012; Geneca 2017; I.B.M. 2008; KPMG 2010; Logica 2008). The most commonly stated causes were a lack of clarity in the project's purpose, a lack of support from stakeholders, and inadequate planning. A recent survey conducted by Project Management Institute (PMI) found consistent reasons the project failed. The top five reasons include changes in organization priorities and project objectives, inaccurate requirement gathering, impaired vision or goal, and inadequate or insufficient communication (PMI 2018). All of these reasons stem from a failure to understand the real needs of project users and stakeholders.

Design Thinking has been around for decades as a technique for developing innovative strategies. Design Thinking describes a mindset or way of thinking backed up by techniques, procedures, and tools (Engberts and Borgman 2018). It helps organizations for innovation and transformation (Brown 2009), get a competitive edge (Martin 2009), focus on customers (Kumar and Whitney 2007), and make better decisions (Liedtka 2015). While no extensive research has been conducted to determine how many businesses have adopted it, Schmiedgen et al. (2015) found that numerous organizations of all sizes and across all industrial sectors used Design Thinking. Many organizations see Design

Thinking as a new paradigm in solving problems in various sectors such as Business, Information Technology, Education, and Medicine (Dorst 2011). Mahmoud-Jouini et al. (2016) identified three extents of Design Thinking used in project management: creative and explorative activity, planning and managing the stakeholders, and strategic organizational process. They also studied the contribution of Design Thinking in overcoming the limitations of project management in managing innovation projects and concluded that Design Thinking is fundamentally able to assist project managers during the exploration stage, managing stakeholders, and developing strategic organizations.

Challenges will always be there for adopting new paradigms for innovation projects — likewise, Design Thinking in many fields. In general, problems in adopting Design Thinking are around understanding about Design Thinking, the feasibility of its benefits, the complexity of the process, nature of iteration and experimentation, and compatibility against existing practices or cultural resistance (Carlgren et al. 2014; Christensen and Nielsen 2019; Hassi and Laakso 2011; Holzle and Rhinow 2019; Huff 2016; Kleinsmann et al. 2017; Kröper et al. 2010; Lafley and Martin 2013). Many studies have also reported that demographic characteristics, including tenure and education, play a role in innovation adoption. For example, Daft (2001) and Damanpour and Schneider (2008) found that an individual's tenure is associated with managing the adoption of complex innovations. Several studies have also identified education level is positively related to acceptance of the new products (Fuerst and Cheney 1982; Howard and Smith 1986; Igbaria et al. 1989; Igbaria and Parasuraman 1989). However, none of the studies above assessed Design Thinking adoption in a project management context. The desire to understand how society accepts or rejects innovation prompted Rogers to develop the Diffusion of Innovation theory (DOI) in 1962. It was regarded as one of the most significant ideas in sociology, and it has been used to numerous breakthroughs and inventions in several fields to assess their dissemination within the surrounding social system (Rogers 2003). Any idea, practice, or entity perceived as new by an individual or group of people can be viewed as an innovation (Rogers 1983). To him, diffusion is "the process by which an innovation is communicated through certain channels over time among members of the social system." (Rogers 2003, p.11). According to Rogers, there are five innovation characteristics entranced to predict the adoption of innovation, including relative advantage, complexity, compatibility, observability, and trialability at the persuasion stage. While being individually distinct from each other, these five attributes are interlinked.

Many studies have exercised the adoption of innovation in various fields using DoI's innovation characteristics (Pankratz et al. 2002; Pichlak 2016; Richardson 2011). Most of them come across different findings explaining the relationship between innovation characteristics and innovation adoption. Not all innovation characteristics are significantly related to its adoption, e.g., the relative advantage, compatibility, complexity, trialability, observability. Yet the empirical study in assessing the factors which affect the adoption of innovation methods such as Design Thinking by the project manager in managing the project is almost none. Prior to adopting Design Thinking in a project management context, the project manager's consideration is worth exploring. Based on the above discussion in previous literature, there was sufficient evidence that this topic is far from being clearly defined. There are still many unsettled arguments regarding the topic being questioned. Potential predictors that influence the adoption of Design Thinking in the project are still required to be explored. Furthermore, adequate quantitative measures need to clarify the extent of their correlation. Understanding the Design Thinking characteristics and adopter's demographic characteristics in influencing the adoption of Design Thinking in a project management setting would be valuable information for an organization.

1.1 Objectives

Innovation can be a process that includes capabilities or methods that are fundamentally dissimilar and higher to industry standards (Pikkel et al. 2013). Design Thinking is associated with ways or strategies to innovate products and services in a business and social context (Brown 2008; Kees 2012). Design Thinking can be considered a new method, process, and practice for some organizations (Roger 2003). Hence, refer to Rogers' definition, Design Thinking is a form of innovation. As the challenges to adopting Design Thinking in organizations, as previously mentioned, are related to the characteristics of innovation described by Roger. Therefore, we propose to assess the adoption of Design Thinking in the project management context using the DOI theory.

This study aims to identify the adoption of Design Thinking in projects and explore factors influencing the project manager to adopt this innovation approach. In this study, we develop a few research questions to fulfill those objectives: What is the current usage ratio of the Design Thinking and Project Management method? What are the potential predictors of the project manager to adopt Design Thinking? And how significant are those predictors that determine the project manager's decision in adopting Design Thinking in projects? Using DOI theory, this study

proposes to assess factors that influence the project manager's adoption of Design Thinking as an innovation tool through two aspects: (1) Characteristic of Innovation and (2) Characteristic of the project manager.

2. Literature Review

2.1 Design Thinking Adoption by Project Managers

Some studies viewed innovation adoption as a process that aims at the assimilation of a process, practices, or product that is new to the adopters (Damanpour and Wischnevsky 2006; Kimberly and Evanisko 1981; Walker 2008). Some prior studies also identified two major stages of the assimilation process: initiation and implementation (Nystrom et al. 2002; Zaltman et al. 1973). Rogers, in his famous DOI work, explained the adoption of a particular innovation as "the process through which an organization passes from first knowledge of an innovation to forming an attitude towards the innovation, to a decision to adopt or reject, to implementation of the new idea" (Rogers 1983, p.21). Rogers's DOI defined five innovation characteristics to predict innovation adoption: relative advantage, complexity, compatibility, observability, and trialability.

Many previous studies have defined adoption from the perspective of usage, implementation, utilization, or satisfaction as the dependent variable for measuring success in the I.T. sector (DeLone and McLean 1992, 2003; Montazemi 1988; Raymond 1990). In this opportunity, our study uses satisfaction as the dependent variable to measure the adoption of the Design Thinking approach, practice, or process in a project. We have at least two reasons for choosing satisfaction as the dependent variable in this study. The first is because many studies have used satisfaction in measuring the success of adopting technology, process, or method as a strategy for innovation measure (DeLone and McLean 1992, 2003; Liu and Guo 2008; Mahmood et al. 2000; Zviran and Ehrlich 2003) and metric for a post-implementation in m-services (Park et al. 2011). Second, satisfaction self-explains the effect of using a certain object; thus, it has a high degree of logical validity. If users admit that they like a certain product, it is almost hard to negate the success of a system itself.

2.2 Innovation Characteristics

Relative Advantage

Relative advantage is associated with the scale of the perceived benefits of innovation relative to others. According to Rogers (2003), this level of relative advantage is often seen from social prestige, economic, or other relevant perspectives. Each innovation has special characteristics that provide different perceptions of benefits for different potential adopters, depending on which traits and qualities are most important to them. Furthermore, Rogers emphasized reducing uncertainty in the adoption of an innovation. When deciding to accept or reject an innovation, both organizations and individuals tend to pursue information in the first place for reducing uncertainty about this relative advantage. They need to ascertain how better the new idea, method, approach is compared to existing innovations or practices. Sometimes this is the first thing a potential adopter takes into consideration. Thus, Rogers suggests that the perceived relative advantage of an innovation is positively influencing the adoption.

Introduction and use of Design Thinking for a certain community may not happen in a short time. In the context of dynamic project management, it allows the Project manager and other stakeholders to have different perceptions of this approach. Understanding the needs of project users better and precisely capturing stakeholder requirements are common challenges for the project manager. Project managers also need a method or tool for creative problem-solving in managing project constraints such as scope, schedule, cost, and quality. Design Thinking offers benefits for project managers to tackle these challenges. However, like the decision-making process in general in a project context, before deciding to use Design Thinking, a project manager needs to know the relative benefits compared to other approaches. Thus, the author assumes that the project managers' perceived relative advantage of Design Thinking influences them in accepting Design Thinking in the projects. Therefore, we assume this perceived relative advantage also influences them in accepting Design Thinking in their projects.

H1: Project Managers' Perceived Relative Advantage of Design Thinking positively affects their adoption in the project.

Compatibility

Compatibility relates to the capacity of two entities to work together. Tornatzky and Klein (1982) point out an innovation's compatibility with the tasks or duties and experiences of potential workers or users have been the most extensively investigated aspect of the fit between innovation and organization. Compatibility is defined as how

innovation is apparent to be well-suited with the prospective innovation adopters' principles, experience, and interest or needs (Rogers 2003). Ideas that are more compatible with individual conditions are perceived as less ambiguous. This helps the individual feel more familiar with the idea. Within the community, innovation can be considered whether or not it is compatible with society's culture, personal needs, and existing practices. Rogers argued that perceived compatibility is certainly associated with the adoption of innovation.

In project management, there are many considerations for the project manager to decide whether a method or tool is acceptable or not. This is related to the project's ultimate goal for the stakeholders' satisfaction. Based on the author's previous experiences, a project manager will assess whether a method or tool meets their needs to support the achievement of project goals or not. The decision to accept a particular project tool is often associated with the project manager's way of working. Therefore, we suspect that the compatibility aspect is important for project managers to adopt Design Thinking.

H2: Project Managers' Perceived Compatibility of Design Thinking positively affects their adoption in the project.

Complexity

Complexity describes the logical challenges associated with any attempt to understand innovation, such as the difference between complexity between low versus high technology innovations or as simple as ordinary versus science-based innovation (Drucker 1985; Gopalakrishnan and Damanpour 1994; Pelz 1985). It can also be viewed as how difficult innovation is perceived to be understood and used, as defined by Rogers (2003). Although sometimes the effect is not as significant for some types of innovation as for the perception of compatibility or benefits, it becomes an important determinant or even barrier for some other innovation adoptions. Each individual has different perceptions in this regard, and while research evidence is not completely convincing, Rogers suggests the innovation's perceived complexity negatively influences the adoption for the adopters. Other studies also found that innovations that are perceived as simple to use by key players tend more easily accepted (Grilli and Lomas 1994; Marshall 1990; Meyer and Goes 1988).

Naturally, humans want convenience. Likewise, in a project context that is normally quite complex, a project manager does not want unnecessary burdens caused by the complexity of using certain methodologies or tools. Therefore, this research suspects that the Design Thinking level of complexity will negatively affect the project manager's decision to adopt.

H3: Project Managers' Perceived Complexity of Design Thinking negatively affects their adoption in the project.

Trialability

As the fourth attribute, trialability can be viewed as the degree to which a particular innovation can be tested and evaluated on a limited basis before the adopter fully uses it in a specific context (Rogers 2003). In a particular context, innovation becomes more challenging to accept. Rogers further adds that it will be more difficult for a new idea or innovation to be accepted by individuals if it cannot be divided into several parts to be experimented with. Individuals sometimes need to try new ideas or innovations to give meaning to innovation and find out how it works in certain situations. Hence, Rogers suggests that the characteristics of the perceived trialability of innovation can positively influence the decision to adopt the innovation itself.

In project management, the project manager may have a range of flexibility to trial a new solution or approach for attaining the project's objectives, especially in the early development phase. Based on the learning insights upon the experimentation, a project manager will conclude whether to use the solution, methods, or tools. Thus, we predict that perceived trialability will positively influence project managers to adopt Design Thinking.

H4: Project Managers' Perceived Trialability of Design Thinking positively affects their adoption in the project.

Observability

Observability is self-explanatory and is related to witnessing efforts. According to Rogers (2003), observability is defined as how visible the innovation outcomes are. Not all new ideas or ways of working are easy to observe and communicate with others. There are challenges for someone to observe and explain to others in certain situations. In the context of information and communication technology, Richardson (2011) describes this attribute as visibility in which others can see those technologies. The easier the technology is to observe, the easier it is for users to accept it. Additionally, Rogers (2003) suggests this predictor positively influences adoption.

In the context of innovative projects, a recent study by Huff (2016) identified challenges for project managers to adopt a new approach centered on the availability of evidence from such innovations or new approaches. When the evidence of a new approach or method is visible to them, they are likely to adopt it. There is plenty of evidence to show how Design Thinking benefits projects. However, its visibility may vary among the project managers. Hence, observability, viewed as visibility of the results or benefits of innovation, determines how the project manager adopts it. Therefore,

H5: Project Managers' Perceived Observability of Design Thinking positively affects their adoption in the project.

2.3 Project Manager Characteristic

Role of Education Between Perceived Complexity of Innovation and Its Adoption

Adopting innovation involves information searching and processing efforts before the decision is made. The beginning of the innovation process is "an information-seeking and information-processing activity, where an individual is motivated to reduce uncertainty about the advantages and disadvantages of an innovation" (Rogers 2003, p. 172). This information gathering and processing effort may be instant or take some time to allow the individual to accept certain innovations. Nevertheless, it implies that the accumulative individual's knowledge will play an important role in adopting or accepting the innovation.

The acceptance of new ideas is stimulated and inspired by educational outcomes. It plays an essential role in helping to recognize the desire and need to innovate and prepare environmental conditions that support its implementation. A study indicates that greater cognitive abilities are usually found in more educated managers to help them manage information processing associated with complex changes or dealing with innovation (Young et al. 2001). Acceptance or adoption of complex forms of innovation involves a greater sense of uncertainty than simple innovations, and with a higher level of education and capacity in more educated managers, we expect this to assist them in facilitating acceptance of new ideas, practices, or complex forms of innovation. Therefore, this study proposes the following hypothesis:

H6: Project Managers' education moderates the relationship between Perceived Complexity and the adoption of Design Thinking in the project.

Dynamics Between Tenure and Innovation Adoption

It is well known among researchers that a manager's tenure and age negatively influence changes in organizations and the acceptance rate of innovation. Huber et al. (1993) found that leaders or managers who have long experience in the organization have been reported and understood that they accept current conditions and routines to have a higher commitment to the company. Therefore, it is pretty difficult for them to change their practices. Correspondingly, leaders and managers who are new to their positions bring new and fresh perspectives to make it easier to accept changes and new forms of innovation (Hambrick and Mason 1984; Huber et al. 1993). The researchers added that managers with longer tenure are understood to be more likely to accept existing rules and practices in the organization and thus are less likely to accept innovation or change. Hence, our study proposes the following hypothesis:

H7: Project Managers' tenure moderates the relationship between Perceived Complexity and the adoption of Design Thinking in the project.

Having reviewed theoretical constructs drawing from the DOI theory, the author proposes the model presenting relationships among identified variables as shown in figure 1.

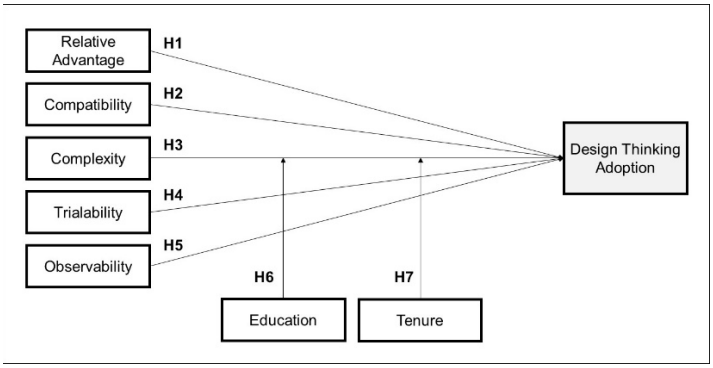

Figure 1. Theoretical Framework

3. Methods

The research uses a correlational study to investigate and describe relationships between variables. A survey was used as a research strategy to answer the research objectives by collecting information from or about the project managers under the natural setting and minimal intrusion by the researcher (Fink 2003; Sekaran and Bougie 2016). The researcher chose the individual project manager as the unit of analysis to understand how they adopt Design Thinking in the projects. This study only processed observational data from project managers who reported experience in implementing Design Thinking in project management. Considering the research project timeline, we chose cross-sectional or one-shot sampling.

The study's population comprises all Indonesian professionals and employees in many industries who claim themself to be project managers. The sampling frame of this research is those project managers who identified on the LinkedIn page. In total, approximately 124,000 individuals are found during people's search in LinkedIn, claiming they had a role as project manager (LinkedIn 2021). Through purposive or judgemental sampling, the project managers are selected as much as possible to represent various industries and geographies. The primary data sources are the individual project manager from various industries and geographies collected through an online survey using self-administered questionnaires via Microsoft Form. The questionnaire link is sent through the individual contact via LinkedIn message.

This study used factor analysis for the construct validity test and Cronbach's Alpha scores for the reliability test. Before making inferences from the regression analysis, a series of tests to assess multivariate assumptions were conducted, including normality, linearity, homoscedasticity, and multicollinearity.

4. Data Collection

Using an online form, identified project managers were requested to indicate their level of agreement about the statements around the adoption of the Design Thinking based on DOI posited by Rogers (2003). The first part of the questionnaire covered the use of Design Thinking in the project and contained items that sought to measure while the remainder focused on demographic and project characteristic information. To minimize the differences in respondents' perceptions about Design Thinking, the questionnaire was opened by providing a brief explanation of the concept of Design Thinking and its application in the context of project management.

The questionnaire items for Design Thinking adoption are represented by "satisfaction" using a four-point Likert scale, where 1: indicated "strongly disagree" and 4: indicated "strongly agree." The items are adopted from the previous study done by Lee and Chung (2009), which investigated the adoption of mobile banking based on Rogers's DOI. The innovation characteristic measurements were mainly adapted from a study done by Richardson (2011), which investigates factors influencing teachers' decisions to adopt a specific set of I.C.T. skills. The relative advantage was obtained by calculating the mean of the project manager's responses to eight items in the survey. Respectively, perceived compatibility, complexity, and observability were measured through three (3), four (4), and four (4) items. Trialability is measured using four items (Atkinson 2007; Pankratz et al. 2002; Richardson 2011).

All collected questionnaires were checked for completeness. A total of 137 responses were gathered, and 109 project managers reported having experience using Design Thinking in their projects. SPSS version 21 was used for statistical analysis after data coding and editing. We were finally left with 106 usable samples for analysis as three samples were outlier detected using Mahalanobis distance.

5. Results and Discussion

5.1 Design Thinking and Project Management Usage

Interestingly, we found that approximately 80% (109 out of 137) of project managers stated that they have experience implementing design thinking from the collected data. We also found that 53.3% of project managers used Hybrid, 10.9% Agile, 35.8% Waterfall project management approaches. This profile is quite different from the PMI research in 2018. PMI survey found that a traditional predictive Project Management methodology, the so-called Waterfall approach, still dominantly occupies the highest usage of around 44%, followed by the Agile method of 30%, the

Hybrid approach of 23%, and 4% used "other" methods (PMI 2018). There was so much shift that Agile methods have been used in conjunction with Waterfall.

Table 1. Demographic information of the project managers (N=106)

Demography Variable	Category	Number of Respondents	Valid Percentage (%)
Industry	Banking	37	34.9
	Telecommunication	21	19.8
	Information Technology & Services	14	13.2
	Financial Services	8	7.5
	Education Management	5	4.7
	Computer Software	5	4.7
	Construction	4	3.8
	Oil, Gas & Energy	3	2.8
	Retail	2	1.9
	Government Administration	1	0.9
	Government Relations	1	0.9
	Higher Education	1	0.9
	Computer Hardware	1	0.9
	Automotive	1	0.9
	Other	2	1.9
Number of Project Using Design Thinking	1-4 projects	89	84.0
	5-9 projects	11	10.4
	10 projects or more	6	5.7
Tenure	2 years or less	33	31.1
	2–4 years	18	17.0
	5–9 years	24	22.6
	10–14 years	12	11.3
	15 years or more	19	17.9
Education	Undergraduate	77	72.6
	Postgraduate	29	27.4

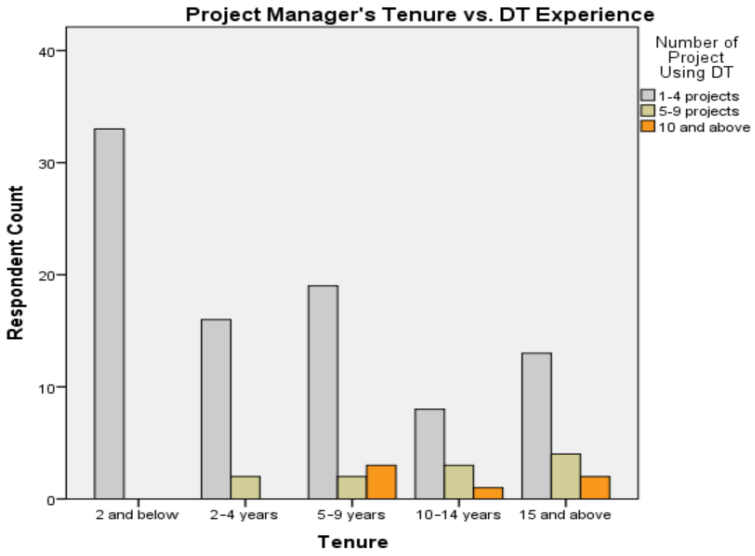

Figure 2. Project Manager's tenure versus Design Thinking experience

The demographic characteristics of the project managers are depicted in Table 1, where all of the respondents (N=106) have experience in applying Design Thinking in their projects. Most of the respondents were early experienced project managers in Design Thinking from the services industry with undergraduate educational backgrounds. Approximately 84.0% of project managers were identified to have implemented the Design Thinking approach between 1-4 projects which is considered a less experienced project manager in using Design Thinking. The top three project manager's industries came from Banking (34.5%), Telecommunication (19.8%), and Information Technology & Services (13.2%). Furthermore, 72.6% are undergraduates, while 27.4% are postgraduates with varying tenure as project managers, as shown in Table 1. We also found many project managers with longer tenures who were less experienced at using Design Thinking, i.e., 1-4 projects. However, the longer their tenure, the more experience they have in using Design Thinking practices, as shown in Figure 2.

5.2 Factor Analysis and Reliability of Measurement Scale

We validated the factor analysis based on the Kaiser-Meyer-Olkin (K.M.O.) Measure of Sampling Adequacy and Bartlett Test of Sphericity. Using internal consistency, the reliability of measurement scales in the study was then tested based on Cronbach's Alpha analysis. We obtained the values of K.M.O. were lying between 0.624 to 0.796, which is appropriate, while Bartlett's Test of Sphericity was significant ($P<0.05$). It suggests that factor analysis can be conducted (Kaiser 1974). Based on the value of factor loadings, we decided to retain the items. Some authors have suggested different cutoff values varying from 0.35 to 0.50 (Hair et al. 2010). A loading factor of 0.50 or more is recommended to consider it as significant. However, in this study, we retained two items with loading less than 0.50, considering that they load on their construct. The first one is "Using Design Thinking enables me to accomplish tasks more quickly." with 0.463 of the factor loading, and the second item is "Using Design Thinking fits into my needs." with factor loading equal to 0.454. Respectively load on its construct, namely "Relative Advantage" and "Compatibility".

To determine that the items used to measure the constructs are reliable, Hair et al. (2010) and Nunnally and Bernstein (1994) recommend the value should be greater than 0.60. The reliability coefficient of all independent variables varies between 0.650 to 0.832. Therefore, all items are reliable.

5.3 Multivariate Assumptions Analysis

Before making inferences from the regression analysis, a series of tests to assess multivariate assumptions were conducted, including normality, linearity, homoscedasticity, and multicollinearity. A normal Predicted Probability (P-P) plot of regression standardized residual confirms that the dependent variable is normally distributed since the residual dependent variable points approximately lie on a line without drastic deviations. Homoscedasticity assumes that the residual variance is homogeneous across the level of predicted values. Using a scatterplot of the residuals, we conclude the homoscedasticity test of the data is fine. No obvious pattern was observed as the data points are distributed below and above zero on the X-axis equally to the left and right of zero on the Y-axis.

Linearity assumption considers that a linear relationship between predictor and response variable should be demonstrated. We conclude that there is a linear relationship between the dependent variable and all the predictors. Based on the linearity test in ANOVA, all Sig. Values of Deviation from Linearity are greater than 0.05. Hence, we conclude a linear relationship between all predictors and the dependent variable. Multicollinearity assumes that the predictor variables do not correlate with each other. We tested it using the Variance Inflation Factor (V.I.F.) and its Tolerance in this study. The analyzed data did not suffer from a multicollinearity problem since all V.I.F. values were less than 10 while the Tolerance values were more than 0.10.

5.4 Regression Analysis

The value of change in R^2 and F from the multiple linear regression outcome was used to test the fitness model obtained. The result of the multiple regression model is shown in Table 2. As explained in the hypothesis development, the dependent variable is the satisfaction of Design Thinking used as a substitute measure for adopting Design Thinking. A model is considered appropriate if the value of change in the F is above 10 and the R^2 value is close to 1 (Field 2008). The regression model gives the F statistic of 17.937 ($p<0.05$), indicating the model's goodness of fit.

The regression analysis outcome confirms that three factors significantly affect Design Thinking adoption: relative advantage, complexity, and observability (i.e., $p<0.05$). The direction of the Unstandardized Coefficients of B was aligned with the hypothesis statements. Hence, we accept hypotheses H1, H3, and H5. However, the other independent variables, compatibility and trialability, are found to have an insignificant effect on the adoption of Design Thinking. That implies hypotheses H2 and H4 to be rejected. Further, R^2 0.473 indicates that the model explains 47.3% of Design Thinking adoption. Regression results are depicted in Tables 2 and 3.

Table 2. Summary of the model

Model Name	R	R^2	Adjusted R^2	F Change	Sig. F Change
1	0.688	0.473	0.446	17.937	0.000

Table 3. Regression results

Model 1: Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std Error	Beta		
(Constant)	1.951	0.551		3.539	0.001
Relative Advantage	0.250	0.103	0.255	2.430	0.017
Compatibility	0.056	0.106	0.056	0.530	0.597
Complexity	-0.213	0.102	-0.220	-2.089	0.039
Trialability	-0.029	0.095	-0.027	-0.302	0.764
Observability	0.256	0.105	0.286	2.441	0.016

New factors (project manager's education and tenure) were added to the model to test the interaction effect of the moderating variables using hierarchical regression analysis. Field (2008) states that if a new component is added, there will be a change in the R^2 value, while for accepting that a variable is considered a moderator, the change in R^2 should be more than 3% (Wen et al. 2005).

Table 4. Moderation effect of project manager's education

Model Name	R	R^2	Adjusted R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.579[a]	.335	.329	.819	.335	52.397	1	104	.000
2	.584[b]	.340	.328	.820	.005	0.852	1	103	.358
3	.594[c]	.353	.334	.816	.013	1.978	1	102	.163

a. Predictors: Constant, ZComplexity
b. Predictors: Constant, ZComplexity, Education
c. Predictors: Constant, ZComplexity, Education, ZComplexityEducation

Table 4 model 3 shows an increase of 5.4% in the R^2 when education was added to the relationship between complexity and satisfaction equation. The R^2 value was changed from 0.335 to 0.353 when the equation added the moderating variable. However, since the Sig. F Change is not significant; this implies that project managers' education does not moderate the relationship between the project manager's perceived complexity of innovation and the adoption of Design Thinking in the project. Therefore, hypothesis H6 is rejected.

Table 5. Moderation effect of project manager's tenure

Model Name	R	R^2	Adjusted R^2	Std. Error of the Estimate	Change Statistics				
					R^2 Change	F Change	df1	df2	Sig. F Change
1	.579[a]	.335	.329	.819	.335	52.397	1	104	.000
2	.579[b]	.335	.322	.823	.000	0.009	1	103	.924
3	.583[c]	.340	.320	.825	.004	0.683	1	102	.410

a. Predictors: Constant, ZComplexity
b. Predictors: Constant, ZComplexity, ZTenure
c. Predictors: Constant, ZComplexity, ZTenure, ZComplexityTenure

Accordingly, from model 3 in Table 5, we can see that the Sig. F Change for moderation effect of project manager's tenure is not significant. This implies that project managers' tenure does not moderate the relationship between the project manager's perceived complexity of innovation and the adoption of Design Thinking in the project. Therefore, hypothesis H7 is rejected.

5.5 Discussion

Although not the only approach used in projects, the Agile approach is increasingly accepted by project managers in Indonesia. This can be seen from the high ratio of the Hybrid approach. The Hybrid project management approach where Agile is being used in conjunction with the Waterfall approach was dominantly used by project managers. They shared 53.3%: 35.8%: 10.9% consecutively for the Hybrid, Waterfall, and Agile approaches. While we identified approximately 80% of project managers stated that they have experience implementing Design Thinking in the project, the mean value of the satisfaction variable is equal to 3.18 (max. 4.00 indicates strongly agree). These numbers show that Design Thinking was used widely in projects, and most project managers were satisfied with using it.

The adoption of Design Thinking in the project is positively influenced by Project managers' perception of innovation's relative advantage ($t=2.430$, $p\leq 0.05$), thus supporting H1. This result aligns with some prior studies' findings in other forms of innovation adoption (Khalifa and Shen 2008; Luarn and Lin 2005; Lu et al. 2003; Nor and Pearson 2007). Higuchi and Nakano (2017) found that Design Thinking improves project management performance. Project managers adopted Design Thinking into the project as they perceived the benefit of Design Thinking. Most of the respondents admitted the benefit of Design Thinking that enhances the effectiveness of the project. They used Design Thinking, especially during formulating organizational strategies, conceptualizing initiatives, project justification (making a Business Case), and project planning.

Hypothesis H2, that is, Project Managers' Perceived Compatibility of Design Thinking positively affects their adoption in the project, is not supported ($t= 0.530$, $p=0.597$). Approximately 15% of project managers perceived compatibility does not affect the Design Thinking adoption, as they responded to the item "Using Design Thinking is compatible with all aspects of my work in the project." as disagree and strongly disagree. Rogers (2003) stated that the compatibility factor is related to the potential adopter's perception of innovation in terms of values, experiences, and needs. It was expected that when project managers perceive Design Thinking as aligned with how they deliver project tasks or objectives and that it fits their needs, they are more likely to adopt it. However, this is not the case for Design Thinking adoption. This finding contradicts the results of previous studies on the adoption of another form of innovation. (Koenig-Lewis et al. 2010; Lin 2011). These researchers have found that the perception of innovation compatibility is a positive predictor affecting mobile banking adoption. As suggested by Kröper et al. (2010), the design process and structure motivation for successful and optimal change depend on the characteristics of the performed task. When project managers think that Design Thinking practice is such a technical task, they may consider it not their task. The project manager's role and responsibility cover managerial aspects of the project.

Acceptance of innovation is also claimed to depend on the ties of interaction with the community or its members (Rogers and Kincaid 1981). The use of a new major approach or method in projects relies on the acceptance of other stakeholders. When project managers face the challenge of acceptance by other stakeholders in using a significantly new approach or method, this can affect how they judge the compatibility of the approach in their new project. However, more often than not, the selection of project supporting tools or methods such as Design Thinking is not specifically regulated by end-users or key stakeholders. These could be the reasons that the project manager does not consider the compatibility factor in the adoption of Design Thinking. Unfortunately, to date, a similar study on Design Thinking adoption in the project is not available, and we could not compare specifically the supporting reason for it.

The adoption of Design Thinking in the project is also negatively influenced by Project managers' perception of innovation's complexity ($t= -2.089$, $p\leq 0.05$), thus supporting H3. This is aligned with the verdicts of some prior studies in other fields (Jahangir and Begum 2008; Luarn and Lin 2005). The complexity factor is associated with the perception of how difficult it is to understand and use a particular innovation—the less intricate innovation, the more innovations to be adopted. Managing project tasks is well known as a complex task and sometimes overwhelming for project managers. Thus, complexity in understanding and implementing Design Thinking practices remains a significant factor for most project managers in adopting it.

Perceived trialability is observed to have an insignificant effect on the adoption of Design Thinking in the context of project management ($t= -0.302$, $p= 0.764$). Thus, we reject H4. This finding is consistent with other research results in the other context of innovation adoption, such as P.C. and phone banking (Kolodinsky et al. 2004). The nature of

project management is minimizing any changes in the defined project plan, especially in the Waterfall or traditional project management approach. We found that up to 89% of respondents admitted that they usually use a traditional or hybrid approach. Applying the Design Thinking practices through a trial seems not feasible for most project managers, especially in the traditional project management approach. Hence, it does not significantly determine their decision in utilizing the Design Thinking approach within projects.

Hypothesis H5, that is, Project Managers' Perceived Observability of Design Thinking positively affects their adoption in the project, is supported ($t= 2.441$, $p\leq 0.05$). In the context of project management, the observability factor can be viewed as the ability to see the useful and valuable results practiced by other project managers or project teams as a better way of determining stakeholder requirements or solving any project issues. From the project manager's perspective, Design Thinking offers a variety of benefits in delivering their tasks. It also tells that it is not difficult for most project managers to find other project managers or project teams in the same or other project practicing Design Thinking while observing the direct benefits from implementing it.

Project managers' education and tenure do not moderate the relationship between perceived complexity and the adoption of Design Thinking in the project since adding these moderating variables into the equation does not significantly change the F value, thus not supporting H6 and H7. These results contradict some past studies' findings in other forms of innovation adoption (Damanpour and Schneider 2008; Kearney et al. 2000). The higher level of project manager's education is expected to have a better capability in gathering information and give more foundation to absorb knowledge, understanding the complex process of any innovation. Lee et al. (2005) concluded that educated managers would likely use complex and various methods in solving a problem or making a decision. However, in project management, the level of project managers' education does not differentiate their perception of Design Thinking. The reason for this is not clear; however, looking at the educational background of the project managers in this study, where almost all of them have had undergraduate education, this may be the reason their level of education provides sufficient knowledge to deal with the complexities of Design Thinking.

Two-thirds of the respondents in this study have project experience of more than 2 years. It is long enough for them to gather lessons learned and experience handling any complex project situation. Thus, it gives them a better foundation and capability to deal with complexity. This could be why the project manager's tenure becomes not significant in determining the adoption of Design Thinking.

6. Conclusion

Several conclusions can be obtained from the study: (1) While the hybrid project management approach is most commonly used, the Agile approach is starting to gain a place in project management, (2) The application of Design Thinking has been widely recognized and used by project managers as approximately 80% of the project managers reported had experiences and most of them are satisfied in using it, (3) Project Managers' perceived relative advantage and observability of Design Thinking positively affects their adoption in the project, while Project Managers' perceived complexity of Design Thinking negatively affects their adoption in the project, (4) Project Managers' perceived compatibility and trialability of Design Thinking have no significant influence to the adoption in the project, and (5) Project Managers' education and tenure do not moderate the relationship between perceived complexity and the adoption of Design Thinking in the project. Considering the unavailability of the empirical study exploring factors that influence Design Thinking adoption in the project, this finding can initiate further research by introducing more independent variables.

Nowadays, as the challenge and complexity of the project are more and more increasing, while the key success of the project is mainly determined by the accuracy of the project manager in translating key stakeholder requirements and expectations, one of the skills that support this capability is to understand and capturing stakeholder requirements or needs properly. This skill is the first step and a crucial part of the Design Thinking process. Design Thinking as an approach to collaborative identification and solving a problem has been highly recognized by practitioners and academics. It provides potential value in enhancing innovative results for products, services, or strategies and is highly recommended to be applied in Project Management. To increase project success through more efficient task delivery, the project manager's knowledge and skills on Design Thinking become important aspects for individual and business organizations.

Understanding the finding in this study that perceived relative advantage, observability, and complexity become significant factors that influence the adoption of Design Thinking in the project, we recommend any organization to increase awareness and knowledge on Design Thinking towards the project managers by providing an introduction

and enabling programs such as formal training session or workshop. The more successful demonstration of the project manager in using Design Thinking feasible to others will help the acceptance and adoption of this useful approach.

To enhance this study, we suggest introducing more predictors that determine the adoption factors such as project managers' risk perception, creativity, familiarity, and other project characteristics such as project size, etc. Due to the scarcity of existing studies on this topic, we also recommend conducting empirical studies on a preselected project management methodology such as the Agile method, which has been widely used recently and targeting more specific industries to measure the effectiveness and benefits of Design Thinking that project management context. It will help promote the adoption and utilization of Design Thinking in project-based organizations and upsurge the participation of educational institutions in enabling project managers and practitioners in this field.

References

Atkinson, N., Developing a Questionnaire to Measure Perceived Attributes of eHealth Innovations, *American Journal of Health Behavior*, vol. 31, no. 6, pp. 612-621, 2007.

Bloch, M., Blumberg, S., and Laartz, J., Delivering large-scale I.T. projects on time, on budget, and on value, Available: https://www.mckinsey.com/business-functions/mckinsey-digital/our-insights/delivering-large-scale-it-projects-on-time-on-budget-and-on-value, Accessed on January 16, 2021.

Brown, T., *Design Thinking*, Harvard Business Review, 2008.

Brown, T., *Change by Design: How design thinking transforms organizations and inspires innovation*, HarperCollins, New York, 2009.

Carlgren, L., Elmquist, M., & Rauth, I., Exploring the use of Design Thinking in larger organizations: Towards a research agenda, *Swedish Design Research Journal*, vol. 1, no. 14, 2014.

Christensen P.R. & Nielsen, S.L., The Beauty of Design Thinking – Is there a Small Beast in the Box, *The Design Journal*, vol. 22, no. 1, pp. 147-161, 2019.

Daft, RL., *Organization Theory and Design*, South-Western College Publishing, Ohio, 2001.

Damanpour, P. and Schneider, M., *Characteristics of Innovation and Innovation Adoption in Public Organizations: Assessing the Role of Managers*, Oxford University Press, England, 2008.

Damanpour, F., and J. Wischnevsky, D., Research on organizational innovation: Distinguishing innovation-generating from innovation-adopting organizations, *Journal of Engineering and Technology Management*, vol. 23, pp. 269–91, 2006.

DeLone, W. and McLean, E., Information systems success: the quest for the dependent variable, *Information Systems Research*, vol. 3, no. 1, pp. 60-95, 1992.

DeLone, W. and McLean, E., The DeLone and McLean Model of Information Systems Success: A Ten-Year Update, *Journal of Management Information Systems*, vol. 19, no. 4, pp. 9–30, 2003.

Dorst, K., The core of design thinking and its application, *Design Studies*, vol. 32, no. 6, 2011.

Drucker, P.F., *The discipline of innovation*, Harvard Business Review, vol. 63, no. 3, pp. 67–72, 1985.

Engberts, F. & Borgman, H.P., Application of Design Thinking for Service Innovation: Current Practices, Expectations and Adoption Barriers, *Proceedings of the 51st Hawaii International Conference on System Sciences*, pp. 1611-1620, Hawai, January 3, 2018.

Field, A., Multiple regressions using SSPS/PASW, Research methods in psychology: Multiple regressions, module C8057, University of Sussex, Brighton, Available: http://www.statisticshell.com/ocd/pff, Accessed on July 10, 2021.

Fink, A. (2003). *The Survey Kit, 2nd ed.*, Sage, California, 2003.

Fuerst, W. and Cheney, P., Factors Affecting the Perceived Utilization of Computer-Based Decision Support Systems in the Oil Industry, *Decision Science*, vol. 13, no. 4, pp. 554-569, 1982.

Geneca, Why up to 75% of Software Projects Will Fail, Available: https://www.geneca.com/why-up-to-75-of-software-projects-will-fail/, Accessed on February 14, 2021.

Gopalakrishnan, S. and Damanpour, F., Patterns of generation and adoption of innovations in organizations: Contingency models of innovation attributes, *Journal of Engineering and Technology Management*, vol. 11, pp. 95–116, 1994.

Grilli, R. and Lomas, J., Evaluating the Message: The Relationship between Compliance Rate and the Subject of a Practice Guideline, *Medical Care*, vol. 32, no. 3, pp. 202–13, 1994.

Hair, J., Black, W., Babin, B. and Anderson, R., *Multivariate data analysis, 7th edition*, Prentice-Hall, New Jersey, 2010.

Hambrick, D.C. and Mason, P.A., Upper echelons: The organization as a reflection of its top managers, *Academy of Management Review*, vol. 9, pp. 193–206, 1984.

Hassi, L. and Laakso, M., Conceptions of design thinking in the design and management discourses: open questions and possible directions for research. In Roozenburg, NFM., Chen, LL. and Stappers, PJ (Ed.), How expert designers express shape and shape operations. *Proceedings of IASDR*, 2011.

Higuchi, M.M. and Nakano, D.N., Agile Design: A combined model based on Design Thinking and Agile Methodologies for digital games project. *Revista de Gestão e Projetos – GeP*, vol. 8, no. 2, 2017.

Holzle, K. and Rhinow, H., The Dilemmas of Design Thinking in Innovation Projects, *Project Management Journal*, vol. 50, pp. 418–430, 2019.

Howard, G. S., and Smith, R. D., Computer anxiety in management: Myth or reality?, *Communications of the A.C.M.*, vol. 29, pp. 611-615, 1986.

Huber, G.P., Kathleen, M.S., Miller, C.C. and William, M.G., Understanding and predicting organizational change. In G. P. Huber and W. H. Glick (Eds.), *Organizational change and redesign*, pp. 215–65, Oxford Univ. Press, New York, 1993.

Huff, A.S., Project Innovation: Evidence-Informed, Open, Effectual, and Subjective, *Project Management Journal*, vol. 47, no. 2, 2016.

I.B.M., Making change work, Available: http://www-935.ibm.com/services/us/gbs/bus/pdf/gbe03100-usen-03-making-change-work.pdf, Accessed on February 14, 2021,

Igbaria, M. and Parasuraman, S., A path analytic study of individual characteristics, Computer anxiety and attitudes toward microcomputers, *Journal of Management*, vol. 15, no. 3), pp. 373-388, 1989.

Igbaria, M., Pavri, F. and Huff, S., Microcomputer application: An empirical look at usage, *Information Management*, vol. 16, no. 4, pp. 187-196, 1989.

Jeon, B.N., Han, K.S. and Lee, M.J., Determining factors for the adoption of e-business: The case of S.M.E.s in Korea, *Applied Economics*, vol. 38, no. 16, pp. 1905-1916, 2006.

Kearney, R.C., Feldman, B.M. and Scavo, C.P.F., Reinventing government: City manager attitudes and actions, *Public Administration Review*, vol. 60, no. 6, pp. 535–47, 2000.

Kees, D., *Frame Innovation: Create new thinking by design*, M.I.T. Press., Massachusetts, 2012

Khalifa, M. and Shen, N. K., Explaining the adoption of transactional B2C mobile commerce, *Journal of Enterprise Information Management*, vol. 21, no. 2, pp. 110-124, 2008.

Kimberly, J.R. and Evanisko, M.J., Organizational innovation: The influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations, *Academy of Management Journal*, vol. 24, pp. 679–713, 1981.

Kleinsmann, M., Valkenburg, R. & Sluijs, J., Capturing the value of design thinking in different innovation practices, *International Journal of Design*, vol. 11, no.2, pp. 25-40, 2017.

Koenig-Lewis, N., Palmer, A. and Moll, A., Predicting young consumers' take up of mobile banking services, *International Journal of Bank Marketing*, vol. 28, no. 5, pp. 410-432, 2010.

Kolodinsky, J. M., Hogarth, J. M. and Hilgert, M. A., The adoption of electronic banking technologies by U.S. consumers, *International Journal of Bank Marketing*, vol. 22, no. 4, pp. 238-259, 2004.

KPMG Project Management Survey 2010, Available: http://www.kpmg.com/NZ/en/IssuesAndInsights/ArticlesPublications/Pages/project-management-survey-2010.aspx, Accessed on February 13, 2021.

Kröper, M. et al., Interrelations between Motivation, Creativity and Emotions in Design Thinking Processes: An Empirical Study Based on Regulatory Focus Theory, *In Proceedings of the 1st International Conference on Design Creativity (ICDC2010)*, Kobe, Japan, 2010.

Kumar, V. and Whitney, P., Daily life, not markets: Customer-centered Design, *Journal Business Strategy*, vol. 28, no. 4, pp. 46–58, 2007.

Lafley, A.G. and Martin, R.L., *Playing to win: how strategy really works*, Harvard Business Press, Massachusetts, 2013.

Lee, K.C. and Chung, N., Understanding factors affecting trust in and satisfaction with mobile banking in Korea: A modified DeLone and McLean's model perspective, *Interacting with Computers*, vol. 21, no. 5/6, pp. 385-392, 2009.

Lee, S.H., Wong, P.K. and Chong, C.L., Human and social capital explanations for R&D outcome, *IEEE Transactions on Engineering Management*, vol. 52, pp. 59–68, 2005.

Liedtka, J., Learning to use design thinking tools for successful innovation, *Strategy and Leadership*, vol. 39, no. 5, pp. 13–19, 2011.

Lin, H.F., An empirical investigation of mobile banking adoption: the effect of innovation attributes and knowledge-based trust, *International Journal of Information Management*, vol. 31, no. 3, pp. 252-260, 2011.

LinkedIn, People Search: Project Manager, Available: www.linkedin.com, Accessed on July 30, 2021.

Liu, C.T. and Guo, Y. M., Validating the End-User Computing Satisfaction Instrument for Online Shopping Systems, *Journal of Organizational and End User Computing*, vol. 20, no. 4, pp. 74-96, 2008.

Logica, Failing business process change projects substantially impact financial performance of U.K. business, Available: http://www.logica.co.uk/we-are-logica/media-centre/news/2008/failing-business-process-change-projects-substantially-impact-financial-performance-of-european-bus/, Accessed on July 15, 2021.

Lu, J., C. S. Yu, C. Liu, and J. E. Yao, Technology acceptance model for wireless internet, *Internet Research: Electronics Networking Applications and Policy*, vol. 13, no. 3, pp. 206-222, 2003.

Luarn, P. and H-H. Lin., Toward an understanding of the behavioral intention to use mobile banking, *Computers in Human Behavior*, vol. 21, no. 6, pp. 873-891, 2005.

Mahmood, M.A., Burn, J. and Jacquez, C., Variables affecting information technology end-use satisfaction: a meta-analysis of the empirical literature, *International Journal of Human-Computer Studies*, vol. 52, no. 5, pp. 751-771, 2000.

Mahmoud-Jouini, SB., Midler C. and Silberzahn, P., *Contributions of Design Thinking to Project Management in an Innovation Context*, Wiley Online Library, 2016.

Marshall, J.G., Diffusion of Innovation Theory and End-User Searching, *Library & Information Science Research*, vol. 6, no. 1, pp. 55–69, 1990.

Martin, R.L., *The design of business: Why design thinking is the next competitive advantage*, Harvard Business Press, 2009.

Meyer, A.D. and J.B. Goes., Organizational Assimilation of Innovations: A Multi-Level Contextual Analysis, *Academy of Management Review*, vol. 31, pp. 897–923, 1988.

Montazemi, A.R., Factors affecting information satisfaction in the context of the small business environment, *M.I.S. Quarterly*, vol. 12, no. 2, pp. 239-256, 1988.

Nor, K. M. and J. M. Pearson, The influence of trust on internet banking acceptance, *Journal of Internet Banking and Commerce*, vol. 12, no. 2, 2007.

Nunnally, J. C. and Bernstein, I. H., *Psychometric theory*, McGraw-Hill, New York, 1994.

Nystrom, P.C., Ramamurthy, K. and Wilson, AL., Organizational context, climate and innovativeness: Adoption of imaging technology, *Journal of Engineering Technology Management*, vol. 19, pp. 221–47, 2002.

Pankratz, M., Hallfors, D. and Cho, H., Measuring perceptions of innovation adoption: the diffusion of a federal drug prevention policy, *Health Education Research*, vol. 17, no. 3, pp. 315-326, 2002.

Park, J., Snell, W., Ha, S. and Chung, TL., Consumer's post-adoption of m-services: interest in future m-services based on consumer evaluations of current m-services, *Journal of Electronic Commerce Research*, vol. 12, no. 3, pp. 165-175, 2011.

Pelz, D.C., Innovation complexity and the sequence of innovating stages, *Knowledge: Creation, Diffusion, Utilization*, vol. 6, no. 3, pp. 261–91, 1985.

Pichlak, M., The innovation adoption process: A multidimensional approach, *Journal of Management & Organization*, vol. 22, no. 4, pp. 476-494, 2016.

Pikkel, R., Quinn, B. and Walters, H., Ten Type of Innovation: The discipline of building breakthroughs, John Wiley & Sons, Inc., New Jersey, 2013

Project Management Institute, PMI's Pulse of The Profession®: Success In Disruptive Time. Available: www.pmi.org/-/media/pmi/documents/public/pdf/learning/thought-leadership/pulse/pulse-of-the-profession-2018.pdf, Accessed on July 30, 2021.

Raymond, L., End-user computing in the small business context – foundations and directions for research, *Data Base*, vol. 20, no. 4, pp. 20-26, 1990.

Richardson, J.W., Technology adoption in Cambodia: Measuring factors impacting adoption rates, *Journal of International Development*, vol. 23, no. 5, pp. 697–710, 2011.

Rogers, E.M., *Diffusion of innovations (3rd ed.)*, Free Press of Glencoe, New York, 1983.

Rogers, E.M., *Diffusion of innovations (5th ed.)*, Free press, New York, 2003.

Rogers, E.M. and Kincaid, D.L., *Communication Networks: Toward a New Paradigm for Research*, Free Press, New York, 1981.

Schmiedgen, J., Rhinow, H., Köppen, E. and Meinel, C., *Parts without a whole?: The current state of design thinking practice in organizations*, Technische Berichte Nr. 97 des Hasso-Plattner-Instituts für Softwaresystemtechnik an der Universität Potsdam, Berlin, 2015.

Sekaran, U. and Bougie, R., *Research Methods for Business: A Skill-building Approach (7th ed.)*, John Wiley & Sons, United Kingdom, 2016.

Tornatzky, L. G. & Klein, K, J., Innovation characteristics and innovation adoption implementation: A meta-analysis of findings, *IEEE Transactions of Engineering Management*, vol. 29, pp. 28-45, 1982.

Walker, R.M., An empirical evaluation of innovation types and organizational and environmental characteristics: Towards a configuration approach, *Journal of Public Administration Research and Theory*, vol. 18, no. 4, pp. 591–615, 2008.

Wen, Z., Hau, K. and Chang, C., A comparison of moderator and mediator and their applications, *Acta Psychological Sanica*, vol. 37, no. 2, pp. 268–274, 2005.

Young, Gary J., Charns, M.P. and Shortell, M.S., Top manager and network effects on the adoption of innovative management practices: A study of TQM in a public hospital system, *Strategic Management Journal*, vol. 22, pp. 935–51, 2001.

Zaltman, G., Duncan, R. and Holbek, J., *Innovations and Organizations*, Wiley, New York, 1973.

Zviran, M. and Z. Erlich., Measuring I.S. User Satisfaction: Review and Implications, *Communications of the Association for Information Systems*, vol. 12, no. 5, pp. 81-103, 2003.

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