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The Impact of Information Technology on Organizational Performance: The Mediating Effect of Organizational Learning*

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Abstract

This study aims to examine OL as a potential mediating variable in the relationship between IT and organizational performance. Organizational learning (OL) has been proposed as the mechanism to accomplish this task. Existing empirical research demonstrates that OL may indeed act as a mediator for the effect of IT on organizational outcomes. Also, existing literature discusses the use of technology in the organization, and the case for OL as the key knowledge process, and the intersection between technology and OL as a knowledge-based means for improving organizational performance. Many studies use a descriptive measure of OL despite the theory suggesting that a normative measure may be more appropriate. This study aims to address these concerns in a setting by using structural equation modelling (SEM) to compare the effectiveness of descriptive and normative measures of OL as mediating variables in knowledge-intensive organizations. Survey results support OL as a mediator between IT and organizational performance in addition to normative measures of OL outperforming descriptive measures. Implications for research and practice are discussed. To test the model, we will apply (SEM) structural equation modeling in the analysis of a moment structures (AMOS) on the empirical evidence collected from 218 Pakistani CEOs and top managers.

Keywords: Information Technology, Organization Performance, Organization Learning, Resourced-Based View, Knowledge Management

JEL Classification Code: D4, L12, D2

1. Introduction

All types of organizations today rely more on data and information processing systems than ever before (Calvard,

2016; Orlikowski & Barley, 2001; Stata, 1989). Investing in information technology (IT) construction tools is seen as providing advanced decision-making skills, increasing efficiency, and better productivity (Bhatt & Grover, 2005; Tippins & Sohi, 2003). The prime example of modern firms is big data and analytics. These great new technologies are widely expected to improve organizational outcomes and, as a result, are highly invested upon. However, such investments don't always yield better organizational results. The Gartner reports that more than half of big data projects fail to deliver the expected returns on investments (Gartner, 2015.) Similarly, environmental disclosure information helps corporations in engaging stakeholders and improve their social responsibility (Nguyen, Nguyen, Nguyen, Le, & Nguyen, 2020).

Many firms' leaders and strategy researchers have agreed that the ability to successfully manage information within the firm has become critically important as it can provide a foundation for achieving competitive advantage, viewed by many as a source of value creation rather than cost. Furthermore, there are examples whereby organizations collect information which they are unable to understand,

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but regardless, they continue to use that information in their decision-making processes resulting in ill-informed decisions. “The imprudent integration of such IT systems may eventually lead to a less desirable competitive position within an industry (Tippins & Sohi, 2003). IT may then result in worse outcomes for the organization as the organization either does not fully utilize IT infrastructure or it becomes inundated with data which it is unable to effectively process. As a result, IT can become as much an impediment as an enabler of organizational performance (Calvard, 2016; Tippins & Sohi, 2003). These problems represent a major challenge for modern companies that rely heavily on IT systems for organizational decision making and performance. IT implementation challenges will be particularly important as organizations are expected to increase their confidence in the implementation of organizational data processing systems (Calvard, 2016; Stata, 1989; Tippins & Sohi, 2003).

Research into the organizational use of Information Technology observes that Information Technology structure himself is not satisfactory for modest advantage (Bhatt & Grover, 2005; Tippins & Sohi, 2003). IT infrastructure is too easily imitated by other organizations and an (Bhatt & Grover, 2005) inability to properly utilize existing resources may only increase operational overhead costs (Bhatt & Grover, 2005; Tippins & Sohi, 2003). Instead, existing research demonstrates that, when combined with organizational learning (OL), organizations must know-how, and willingness to use, these tools can be properly used in the form of IT capabilities. It suggests that OL may be a mediating variable between IT and organizational performance (Bhatt & Grover, 2005; Kane & Alavi, 2007; Real, Leal, & Roldán, 2006; Tippins & Sohi, 2003).

This study aims to examine OL as a potential mediating variable in the relationship between IT and organizational performance. OL as the key knowledge process, and the intersection between technology and OL can be utilized as a knowledge-based means of improving organizational performance. This study utilized existing measures of organizational performance, technology, and learning to survey Pakistani knowledge-intensive firms on these issues followed by a structural equation modeling analysis (SEM) to test the survey data against the proposed research questions and hypotheses. We then inferred conclusions from the survey and SEM analysis followed by a discussion of where this research fits into existing literature as well as implications for future research and practice.

This study will attempt to replicate existing findings that show that there is a direct relationship between technology and organizational performance and that OL demonstrates a mediating relationship between technology and organizational performance. This replication will empirically test these relationships for the first time in a Pakistani setting using existing SEM methodologies and survey

measurements of IT, OL, and organizational performance. They propose a novel perspective on the measurement of OL in this context which suggests an alternative measure of OL which may provide a superior accuracy. This study will compare the explanatory ability of both the existing and proposed measures to investigate the research question ‘Do normative measures of OL provide more explanatory power in mediating the relationship between organizational technology and organizational performance than descriptive measures of OL?’ Directly comparing descriptive and normative measures of OL in explaining organizational performance, this study will help illuminate an important dynamic in modern technophiles organizations as well as empirically evaluate two alternative measures of OL in this dynamic giving researchers and organizations alike an empirical foundation upon which to build better technologically capable organizations.

2. Literature Review

Even though current studies have observed the association between Information Technology and organizational performance, this investigation stream is vulnerable because of the lack of broadly recognized conceptualizations of Information technology. Moreover, the study of IT is complex by the fact that new information technology tools are continuously getting advanced. The initial research of this study is to grow a conceptualization of Information Technology in a form that will report these issues. IT competency consists of two components, IT knowledge, and IT operation. The second objective of this paper is to develop an improved understanding of how IT capability affects organizational performance. Although previous studies have intermittently examined the role of IT within the firm, it is still not clear how IT affects the exact structural processes that contribute to better organizational performance (Bharadwaj, 2000). Recent works propose that OL is one development that plays a significant role in enhancing a firm’s capabilities and competitive advantage (Grant, 1996; Hitt & Brynjolfsson, 1996; Lei, Hitt, & Bettis, 1996; Simonin, 1997) and which may help from the sensible application of IT. However, developing experimental evidence has exposed that technology does not essentially result in a competitive benefit and there is no significant direct connection between IT and performance (Hitt & Brynjolfsson, 1996; Mahmood & Soon, 1991; Powell & Dent-Micallef, 1997; Zahra & Covin, 1993). To provide a conceivable explanation for this, we draw on the resource-based view (RBV).

2.1. Resourced-based View (RBV)

Organizational strategy literature provides insight into how and why organizations may not be achieving

the desired outcomes from the application of technology. From this perspective, the resourced-based view of the firm (RBV) helps to elucidate the theoretical mechanisms that may be applied to technology in a competitive setting (Bhatt & Grover, 2005; Real et al., 2006; Tippins & Sohi, 2003). A brief overview of RBV may start with (Wernerfelt, 1984) who describes how organizations may be examined through the product side or the resource side, both of which may be considered ‘two sides of the same coin.’ The traditional product side has little concern for how the product was created and seeks only to maximize its value through market positioning while the resource side deals with how the product was created from the resources available to the firm. Werner felt it explains how most traditional economic tools have operated on the product side of the firm’s value creation. However, a resource-based view considers anything that could be thought of as a strength or weakness for a firm to be a resource that can be used to create or deny value for that firm. We customize this viewpoint to develop the notion of IT competence and propose that it contains three co-specialized resources: Information technology objects, Information Technology knowledge, and Information Technology operations. We follow with a conversation of the mechanisms of OL and subsequent link Information Technology and OL to determine how they interrelate to enhance (Teece, Pisano, & Shuen, 1997) summarize these perspectives in the strategic management literature as two types: strategizing and economizing.

2.2. RBV and Organizational Strategy

The former suggests that organizations attempt to maximize organizational value with a relatively static value proposition which is merely positioned within the market for maximum effect through the competitive forces model and the strategic conflict model. The latter, however, is based on the notion that an organization is capable of creating value in which the strategic component does not simply involve market placement but also the *process* of value creation itself. This research provides a clear picture about competing theories (e.g., value creating theory and value-destroying theory) related to the relationship between sustainability and financial performance, and RBV theory (Zhang, Khan, Lee, & Salik, 2019). The authors further describe how the perspective of value creation can be extended into the Knowledge Based View (KBV) and finally the dynamic capabilities view. Knowledge Based View is an extension of RBV in that it is not a new theory but merely one that includes knowledge as a strategic resource necessary for an organization to create value. Knowledge, in this context, may be thought of as a complementary resource to other more tangible resources; physical IT resources are necessary but may not be sufficient to create value if an organization

does not know what to do with those physical resources. The KBV thus helps to explain why organizational knowledge becomes critical in organizational value creation. Dynamic capabilities, on the other hand, discuss a ‘capability’ as the combination of both the physical resources and the knowledge of how to use them.

2.3. Competitive Resources and IT Underperformance

These various RBV perspectives suggest that the dissatisfaction with IT outcomes in the organizations may be explained through two main avenues: not having capabilities to fully exploit IT resources or cases where competitive advantage is nullified. Knowledge is a necessity for anyone to make use of any tool. As such, knowledge represents a necessity for any type of organization intending to deploy IT. However, this explanation does not satisfy all the examples. (Bhatt & Grover, 2005; Tippins & Sohi, 2003) both identify research which demonstrates that the perceived benefit of IT resources in a competitive environment can fall short of financial investment for many organizations even if they have properly deployed such tools. In these examples, despite an organization having the necessary knowledge, the organization was still unable to capitalize on it for a competitive advantage. Consequently, over and above the first requirement is that of knowledge, there must also be a competition-specific explanation for IT role in organizational performance.

2.4. Organizational Learning

The basic premise of organizational learning is that organizations exist within an environment that provides the resources for the organization’s continued survival. The environment that the organization occupies changes in the amount, type, and availability of resources over time. The rate of change may vary depending on the circumstances but change is always occurring. Organizational decisions must then align with the changing environment to enable the organizations to better cultivate resources and use them more effectively within that environment (De Geus, 1988; Fiol & Lyles, 1985).

2.5. Information Acquisition and Information Dissemination.

However, without information about the environment and how it is changing, the effectiveness of any organizational decision may be no better than chance. So, the challenge for any organization seeking long term survival is the ability to learn about the environment to make better decisions to achieve higher performance (Easterby-Smith,

Antonacopoulou, Simm, & Lyles, 2004; Fiol & Lyles, 1985; Goh, 1998, 2001; Goh, Elliott, & Quon, 2012; Lant, Milliken, & Batra, 1992; Mills & Friesen, 1992; Schein, 1992; Tsang, 1997) Where organizational knowledge is the output of the learning process. And since the environment is constantly changing, learning cannot be thought of as a one-time investment but must be enacted continuously. “The rate at which individuals and organizations learn may become the only sustainable competitive advantage, especially in knowledge-intensive industries (Ray Stata, 1989).

2.6. The Convergence of Normative and Descriptive Perspectives

Early work on organizational learning often took one of the two perspectives: the normative and the descriptive perspective. The two perspectives differed in their assumptions on the nature of learning (Argyris, 1996) The former took a normative approach towards learning, assuming that learning for learning’s sake was inherently good because it produced desirable organizational outcomes. (Goh, 1998) defines a learning organization as an organization that is capable of creating, getting, and transporting knowledge, and adapting its behavior to reflect new information and insights.

3. Research Question and Hypotheses

3.1. Research Questions

Existing research into the relationship between technology and organizational Performance leaves two main outstanding issues: lacking in-depth theoretical constructs and incomplete measurement of OL for this context. The former is necessary for an empirical investigation to argue why particular variables are pertinent and to rule out others; deeper theoretical constructs are needed to better propose, define, and interpret measurement models. In the previous study. Why organizational learning, and no other related constructs, is the key variable to measure in this context. The issue of measurement of OL, on the other hand, suggests that normative, rather than descriptive measures of OL will be a more precise measure to better discriminate patterns in data that are collected on this issue. Both issues build toward the research question and hypotheses that this study explores. The above discussion on applying technology in the organization lays the foundation for deeper investigation. The theoretical arguments provided describe the reasons why organizational learning, and no other knowledge-related variables, is the most important variable to include in an investigation of why the technological application does not always result in the desired outcomes. A simple mediation model is therefore implied, and preferred compared to a more complicated model, with OL mediating the relationship between technology and performance. Additionally, these

relationships may be more effectively quantified with the use of normative OL measures rather than descriptive OL measures. Do normative measures of OL provide more explanatory power in mediating the relationship between organizational technology and descriptive measures of OL?

3.2. Hypotheses

To examine this research question, the following testable hypotheses have been formulated;

H1: That the relationship between IT and organizational performance is mediated by organizational learning.

H2: That normative measures of OL will explain a greater degree of variance in the relationships with IT and organizational performance than descriptive measures of OL

H1 serves to ground this research in existing research contexts by replicating previous study’s results which showed statistical evidence that OL is partially mediating the relationship between IT and organizational performance (Real et al., 2006; M. J. Tippins & R. S. Sohi, 2003). H2 serves to give greater insight into organizational learning in this context which may give researchers and practitioners alike more direction for future research and recommendations for practice. We propose a conceptual model that will be used as a starting point for this study (Tippins & Sohi, 2003) as it is the most relevant and utilizes three main variables: IT competency, organizational learning, and organizational performance. This model will form the basis for this study by first replicating its findings, and second, by building upon this model with a new measurement of learning. The models will first test the direct relationship between IT and performance as well as mediating models with OL between IT and performance.

To measure the relatively abstract concept of IT competency, (Tippins & Sohi, 2003) divide IT into three main categories, each of which are measured through survey questions. IT objects, IT knowledge, and IT operations are each measured by a range of survey questions that load onto each latent variable. Then, the three categories of IT themselves load onto a single latent variable (Tippins & Sohi, 2003). Organizational learning will be measured in two flavors: descriptive and normative. Descriptive measures include information acquisition, information dissemination, information interpretation, and organizational memory. Normative measures include clarity of purpose and mission, shared interpretation, experimentation, transfer of knowledge, and team and group problem-solving. The connection of our model is that the Information Technology competency effect on firm’s performance is mediated by OL. We developed three test hypotheses representing, (a) the relationship between information technology competency and firm performance (b) The connection between Information Technology competency and OL, and (c) the relationship

between OL and firm's performance. The performance will be measured using high-level survey questions that seek people's perceptions of organizational performance. This is due to the wide variety of organization types that could be included in knowledge intensive industries which may define success in a similar manner.

As such, performance will be measured as perceptions of organizational success at an individual level, group level, and organizational level which together will load onto a latent variable that represents all levels of performance. Each of the IT, learning, and performance questions are sourced from previously published and validated survey instruments and are further described. There is a model that will be used in this study. A figure below describes the direct effects model which was created consisting of only two main variables, level of IT competency and organizational performance in addition to the control variables which model the latent variables as measured by using factor analysis. Using IBM AMOS graphical structural equation modeling (SEM) software, the structural equation models were constructed. Measured variables, as described in the survey questions, load onto the first level of latent variables (categories that make up IT competency, OL, and organizational performance, respectively) using factor analysis. Second level latent variables (IT competency, OL, and organizational performance) were calculated using the output from the first level latent variables by using the factor analysis.

4. Research Methods

4.1. Survey Structure

Survey questions were adapted for this study in the following ways (Tippins & Sohi, 2003) questions utilized the word "firm" to represent organizations. Since this study sought to survey professionals in a variety of knowledge intensive organizations, the word "firm" was replaced with the word "organization." In addition, two control variables were added (Tippins & Sohi, 2003) to control for organizational size and relative market share for competitive organizations (five-point scale). One final control question was also added to account for the number of years of experience of the respondents which was added to the survey as a numerical response question from 0-99 years. Two more text-based control questions were added to the survey to report on demographic information for reporting back to participating organizations only.

4.2. Research Methodology

The selected research population consisted of 'knowledge-intensive organizations.' Pakistan knowledge-intensive organizations were selected to put heavy emphasis on knowledge as an important resource within

the organization. According to the conference board of Pak (2013), companies in this industry are characterized by their "intensive use of high technology" and they have a "highly skilled labor force" necessary to use and exploit technological innovations. An online survey was created and sent to all available members of the participating organizations. Invitations to contribute to the survey were initiated by senior leaders of participating organizations to encourage survey participation and maintain the confidentiality and anonymity of the respondents. Reminder emails were also sent to increase response rates at each organization. Survey responses were tabulated, organized by (OL, IT competency, organizational performance, control questions) and their respective subcategories, and shown in Table 1. Intriguingly, firms having specialized and skilled CEOs experience better performance (Cheng, Li, Lin, & Chih, 2020).

Mail survey was sent to 830 CEOs in total and 227 responses were received. Later nine invalid responses were excluded due to incomplete answers. Therefore the total number of responses from all organizations was 218 completed surveys. For the purposes of the summary chart, individual category scores comprise the arithmetic mean of all survey questions for that category and individual topic scores comprise the geometric mean of all categories for that topic. The Mean, median, and standard deviation of the sample is also indicated as is the distribution of responses on the Likert scale. All survey questions were scored on a scale from 1 (strongly disagree) to 7 (strongly agree) except for the control questions for organizational size and market share which were each scored on a scale of 1-5 and the control question for years of experience which was numerical and so does not show a Likert scale distribution. A Maximum likelihood estimation was used for all models. The sample data had no missing values (data validation on the online survey ensure no missing values) and no outliers. Normality was further examined by looking at calculated values for skewness, and kurtosis for all variables confirmed no highly skewed or kurtosis input variables for factor analysis. Factor analysis model assumptions were thus met satisfactorily.

5. Results

5.1. Confirmatory Factor Analysis

Next, CFA was conducted. Construct reliability and AVE average variance were extracted and calculated for each of the latent variables. (Refer to Table 2 for details.) Following (Tabachnick & fidell, 2013) most factors demonstrated good construct reliability, at or above the 0.7 cuts-offs. In examining average variance extracted, a few latent variables were lower than the 0.5 cut-off, however, most were within a reasonable range. Tables with factor Correlations between first and second-order latent variables for all models are included. Based on these results, these factors were accepted for further analysis.

Table 1: Summary of Survey Responses

n = 218						Distribution of Likert Scale					
Category	Mean	Median	St. Dev.	1	2	3	4	5	6	7	
OL: Descriptive	4.77	4.75	0.77	0%	0%	4%	34%	43%	17%	1%	
Information Acquisition	5.35	5.42	0.99	0%	1%	1%	17%	31%	37%	13%	
Information Dissemination	4.08	4.00	1.19	0%	9%	19%	33%	23%	11%	4%	
Shared Interpretation	4.81	4.80	1.03	0%	3%	6%	31%	29%	27%	4%	
Declarative Memory	4.73	4.71	1.00	0%	1%	9%	29%	40%	17%	3%	
Procedural Memory	5.28	5.40	0.86	0%	0%	1%	21%	35%	36%	7%	
OL: Normative	5.04	5.16	0.91	0%	0%	5%	20%	39%	31%	4%	
Clarity of Purpose and Mission	5.51	5.75	0.95	0%	2%	1%	7%	29%	44%	16%	
Shared Leadership and Involvement	5.00	5.20	1.11	0%	4%	6%	21%	33%	31%	6%	
Experimentation	5.06	5.20	1.11	0%	2%	8%	16%	32%	34%	7%	
Transfer of Knowledge	4.90	5.00	1.02	0%	2%	5%	19%	42%	25%	6%	
Teamwork & Group Problem Solving	4.97	5.00	1.09	1%	2%	5%	24%	33%	29%	6%	
IT Competency	5.22	5.38	1.04	0%	1%	6%	16%	33%	34%	9%	
IT Knowledge	5.60	6.00	1.26	0%	1%	7%	10%	17%	33%	33%	
IT Operations	4.87	4.83	1.13	0%	2%	7%	25%	36%	22%	9%	
IT Objects	5.36	5.60	1.24	0%	2%	8%	14%	21%	36%	19%	
Organizational Performance	5.72	5.97	0.90	0%	0%	3%	8%	20%	50%	19%	
Individual-level	5.48	6.00	1.11	0%	1%	5%	10%	25%	43%	16%	
Group-level	5.87	6.00	0.94	0%	0%	3%	6%	11%	56%	22%	
Organizational-level	5.90	6.00	0.98	0%	0%	4%	4%	18%	41%	34%	
Control Questions											
Organizational Size	3.35	3.00	1.11	6%	14%	35%	28%	17%			
Market share	3.24	3.00	1.02	5%	16%	43%	23%	13%			
Years of Experience	4.47	3.00	5.05								

5.2. Model Fit Evaluation

The fit of the SEM model was evaluated using several statistics. These included the chi-square test statistic (χ^2 Test), the chi-square probability value (χ^2 P-value), the 'normed' chi-square statistic (χ^2 / DF) (chi-square test statistic divided by the degrees of freedom), and the root mean squared error of approximation (RMSEA). All measures were used to compare the relative performance of each of the SEM models. Chi-square p-values are often used as a starting point for evaluating SEM models. However, for models with large sample sizes a large

number of variables, chi-square tends not to be accurate and so this measure should only be taken in the context of the other measures of model fit (Tabachnick & fidell, 2013). Conversely, χ^2 / DF and RMSEA are preferable measures of fit for larger sample sizes than the chi-square test statistic (Tabachnick & fidell, 2013). A chi-square p-value of greater than 0.05 is expected for good model fit. A smaller value of chi-square divided by degrees of freedom is better where less than three shows an adequate model fit and less than two shows good model fit. (Tabachnick & fidell, 2013) also recommend that RMSEA should be less than 0.07 for a good-fitting model.

Table 2: Confirmatory Factor Analysis

Confirmatory Factor Analysis Summary Factor	Construct Reliability	Average Variance Extracted
IT Competency	0.843	0.643
IT Knowledge	0.873	0.642
IT Operations	0.852	0.501
IT Objects	0.827	0.497
Organizational Performance	0.860	0.672
Individual Level	0.904	0.763
Group Level	0.873	0.697
Organizational Level	0.899	0.690
OL: Descriptive	0.857	0.560
Information Acquisition	0.818	0.441
Information Dissemination	0.815	0.452
Shared Interpretation	0.848	0.534
Declarative Memory	0.838	0.446
Procedural Memory	0.767	0.420
OL: Normative	0.957	0.818
Clarity of Purpose and Mission	0.758	0.445
Shared Leadership & Development	0.802	0.449
Experimentation	0.816	0.473
Transfer of Knowledge	0.813	0.471
Teamwork & Group Problem Solving	0.816	0.468

Table 3: Measures of Model Fit

SEM Model	χ^2 Test	DF	χ^2 P-value	χ^2 / DF	RMSEA
Direct Effects Model	832.572	317	0.000	2.626	0.087
Independent	4136.338	351	0.000	11.784	0.223
OL: Descriptive	3156.093	1470	0.000	2.147	0.073
Independent	9078.319	1540	0.000	5.895	0.150
OL: Normative	2092.615	1066	0.000	1.963	0.067
Independent	7171.375	1128	0.000	6.358	0.157

5.3. SEM Results

Having completed the initial data analysis and confirmatory factor analysis, the hypotheses were tested by examining the overall fit of the SEM models in addition to the regression outputs. A table summarizing the overall model fit statistics is shown below (Table 3). Here it may be seen that the chi-square p-values are all significant (beyond AMOS' ability to report). Consequently, the chi-square test was not reliable for this case and cannot be used to evaluate the relative performance of the SEM models. The normed chi-square test statistic, alternatively, takes into account

the calculated degrees of freedom of the model and sample and demonstrates that the models have adequate degrees of freedom for calculating the statistical output. If degrees of freedom were too low, or model fit was poor, the χ^2 / DF statistic would be greater than 3 and this is not the case in any model analyzed. The remaining test statistics also show that all theorized models perform better than their respective independent models on χ^2 / DF and RMSEA thus warranting further analysis.

Next, each model was assessed to determine overall performance adequacy. The chi-square statistic divided by the degrees of freedom of the model (normed chi-square

statistic) showed adequate values for all the models: less than 3 for all the models, and less than 2 for the normative OL model. The RMSEA shows borderline performance for the direct effects model at close to 0.09 but adequate performance for the descriptive OL model at 0.073 and good performance for the normative OL model at 0.067. The calculated confidence Intervals for the RMSEA for the descriptive model is 0.070 to 0.076. The confidence interval for the normative model's RMSEA is 0.064 to 0.070. Thus, each model alone performs well enough to continue with further analysis. Comparing the models directly each can be ranked in ascending order of performance against both the χ^2 / DF statistic and the RMSEA statistic: direct effects model, descriptive OL model, and the normative OL model. Based on the previously discussed conventions for the measures of fit of the SEM models, only the normative OL model shows both a χ^2 / DF to be less than 2 and an RMSEA to be less than 0.07 indicating that it is the best performing model overall. Additionally, the confidence intervals of the RMSEA do not

overlap which suggests the difference in overall model fit between the descriptive and normative models is significant.

5.4. SEM Path Analysis

We conducted further evaluation of the three SEM models by examining the regression path coefficients, regression p-values, and the coefficient of determination of the organizational learning and organizational performance latent variables. A table of all the numerical values for these statistical outputs may be found in Table 4. A summary of the above statistical outputs may be found in Figures 1, 2, and 3. Each figure illustrates the high-level SEM path diagrams, standardized regression coefficients, p-values, and coefficients of determination and is discussed further below.

The mediation model with descriptive OL shows a very different picture from the direct effects model. The relationship between IT competency and organizational performance has dropped in magnitude and significance.

Table 4: SEM Path Relationships

Statistical Output	Direct Effects Model	Partial Mediation Model	
Coefficient of Determination (R ²)			
Org. Performance	0.393	0.625	0.680
Org. Learning	-	0.416	0.420
Unstandardized Regression Coefficients			
IT Competency - Org. Performance	0.579	0.198	0.136
IT Competency - Org. Learning	-	0.652	0.500
Org. Learning - Org. Performance	-	0.611	0.916
Control 1 (Org. Size) - Org. Performance	0.021	0.028	0.069
Control 2 (Market Size) - Org. Performance	-0.024	-0.014	-0.029
Standardized Regression Coefficients			
IT Competency - Org. Performance	0.626	0.205	0.139
IT Competency - Org. Learning	-	0.645	0.648
Org. Learning - Org. Performance	-	0.641	0.722
Control 1 (Org. Size) - Org. Performance	0.029	0.038	0.087
Control 2 (Market Size) - Org. Performance	-0.029	-0.017	-0.034
P-values			
IT Competency - Org. Performance	0.000	0.024	0.128
IT Competency - Org. Learning	-	0.000	0.000
Org. Learning - Org. Performance	-	0.000	0.000
Control 1 (Org. Size) - Org. Performance	0.750	0.476	0.244
Control 2 (Market Size) - Org. Performance	0.738	0.752	0.638

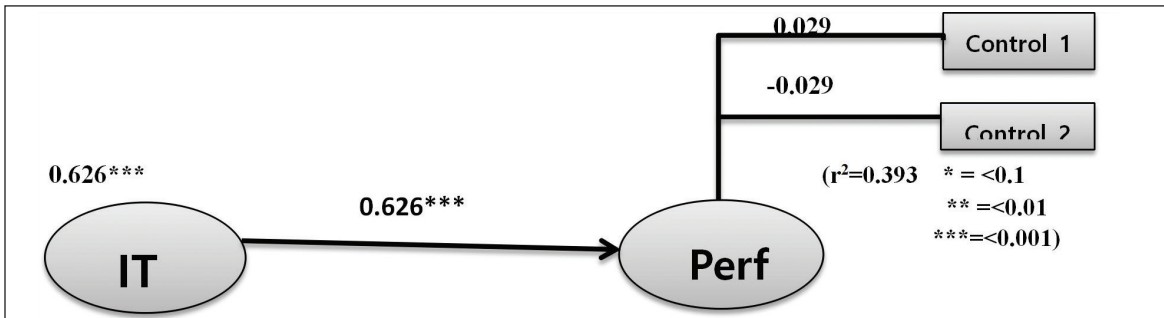


Figure 1: SEM: Direct Effect Mode

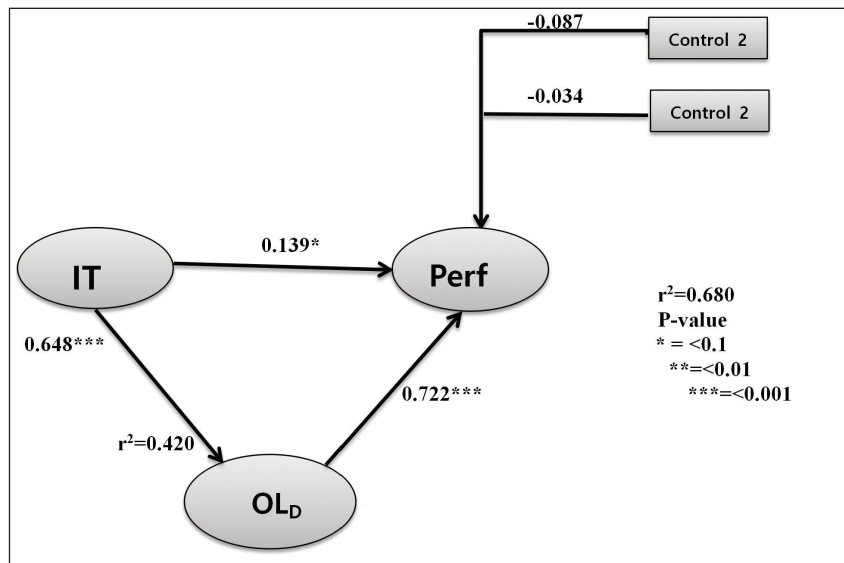


Figure 2: SEM: Mediation Model – Descriptive OL

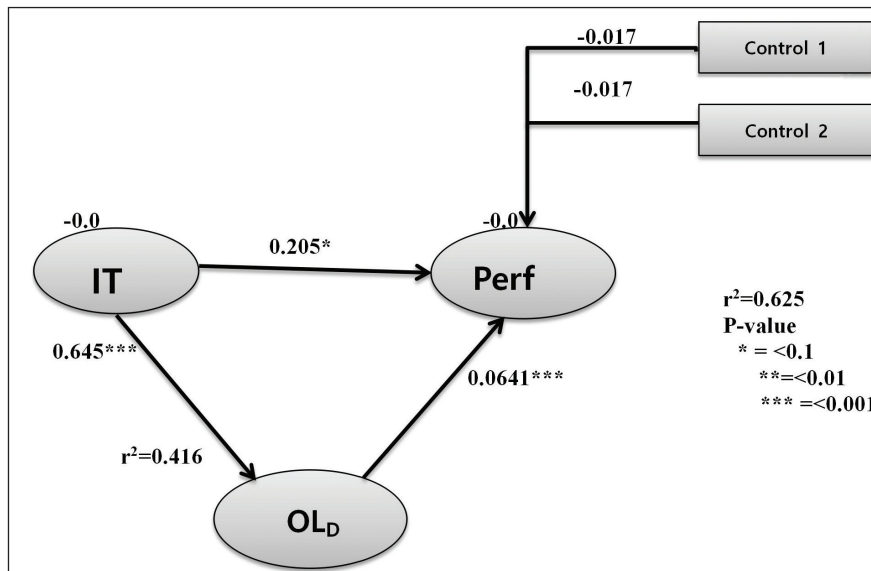


Figure 3: SEM: Mediation Model – Normative OL

The relationship between IT competency and OL is positive and statistically significant as is the relationship between OL and organizational performance. Overall, the variance explained by the descriptive OL mediation model has improved substantially from the direct effects model from approximately 0.4 to 0.6. Together, these relationships support a partial mediation model presented by previous scholars (Real et al, 2006; Tippins & Sohi, 2003). The control variables once again show small coefficients and no statistical significance. The mediation model with normative measures of OL shows the highest proportion of explained variance of all the models. Mediation is further supported by the relationship between IT competency and organizational performance dropping again in magnitude and significance, compared to the descriptive OL model, showing no level of statistical significance. There are also slightly increased coefficients between IT competency and OL, and between OL and organizational performance with both maintaining a very high level of statistical significance. The coefficient of determination for the OL variable is also higher compared to the descriptive model. However, the control variables, once again, show no significance despite their coefficients being slightly larger in this model. Thus, the normative OL model is the highest Performing model of the three models presented and supports a full mediation model which is a novel contribution to research in this area.

6. Discussion and Implications

6.1. Limitations

Our research must be observed in light of the study's limitations, more research is needed to control the applicability of these consequences to other industries. As with all cross-sectional studies, the hypotheses verified in this study signify a 'snapshot' in time. While it is probable that the situations under which the information was collected will remain fundamentally the same, there are no assurances that this will be the case. This is presently the standard policy in strategy research but is recognized to suffer from positive drawbacks finally, even though we used the SEM, clarification of assembly between the concepts should be treated with caution. Nevertheless these limits, our study makes a number of significant contributions.

6.2. Contributions to Research

Existing studies on the intersection between IT, OL, and organizational performance take the form of a computational model (Kane & Alavi, 2007), a case study (Dodgson et al, 2013), a Literature review (Roberts, 2012), and statistical analyses (Bhatt & Grover, 2005; Bolívar-Ramos, 2012; Bueno, 2010; Huang, 2011; Real et al, 2006; Sanz-Valle,

2011; Schoenmakers, 2010; Tippins & Sohi, 2003). After reviewing existing literature, I hope to complement the insights offered by these other methods of inquiry while also building upon the statistical work done in this area as well. This study seeks to contribute to existing research on applying technology to enhance organizational performance in three ways: it replicates findings from existing studies, it introduces a deeper theoretical explanation of the dynamics at hand, and it introduces a new measure for learning in this context. Our study makes a role for the RBV by supporting the perception that a firm's modest advantage and performance are a function of multifaceted unique resources that are fixed within the organization (Barney, 1991; Peteraf, 1993). Further, by presenting that the knowledge learned through organizational learning can mediate the effect of IT competence on firm performance, we provide a suggestion that the helpfulness of firm capitals varies with changes in firms' knowledge (Penrose, 1959). A second associated contribution of our research is to the developing knowledge-based concept of the firm, which suggests that knowledge is an essential source of value in structure firm capabilities (Grant, 1996.). Methodological contribution of our study is in the development and experimental validation of scales to assess IT competency and OL.

6.3. Implications for Future Research

Research in the associations among Information technology and organizational performance has shown that basic models of the firm don't easily capture real-world dynamics of the use of Information Technology in practice over time (Calvard, 2016). The importance of understanding how Information Technology affects the firms becomes more serious and can be improved and appreciated in light of the vital ratio of a capital asset that is being allocated to it (Lucas, 1999). Firm acceptance of computer-based Information Technology has become widespread as firms continue to explore for ways in which to manage information more efficiently. Many administrators, however, continue to find that simply approving a technology designed to simplify information management and sharing is often not sufficient, especially when it cannot be utilized to leverage other firm-specific competences. And, as noted by Porter, (1985). The continual process of learning what technology may offer an organization and what that means for the organization is, most likely, much more complex in reality than the simplified models examined within this study. Such a cyclical process of re-evaluation would compound over time creating the necessary conditions for complexity suggesting that these variables will interact with each other if studied longitudinally – the non-linear model of organizational technology. Due to the compounding nature of this cycle, causes and effects would be difficult to distinguish from

one another if only studied at a single point in time making attribution of performance outcomes murky. It may not be possible to fully distinguish the effect of technology and performance separately from other factors if only a cross section is captured in research. Consequently, researchers looking to further elucidate these relationships will have to contend with such complexities where more integrative and longitudinal studies may prove fruitful research opportunities. The imprudent addition of such IT organizations may ultimately lead to a less necessary competitive position in the industry. This sentiment is rebounded by (Powell and Dent, 1997) [50] who report that even though they found little evidence of a direct effect of IT on performance, 'ITs probably did decline some firms' reasonable positions.' This study provides added insights into why some firms may not be understanding benefits from investing in IT.

7. Conclusion

Organizations are increasingly relying on technology to take informed decisions and create a competitive advantage. However, this research proposes that simply possessing technology may not be enough to reap competitive rewards. Organizational learning is required to obtain the long-term knowledge necessary to satisfy the resource-based view conditions of IT as a competitive advantage. Existing research supports this view that OL mediates the relationship between IT and organizational performance. However, shortcomings of existing research in the conceptual models and the measurement of OL presented opportunities for future research. This study aids the examination of how OL interacts with IT and mediates the relationship to organizational performance using normative and descriptive measures of OL. The replication of existing research, this study shows only a weak direct relationship between IT and organizational performance and supports the mediation model of OL. This study presents novel findings in the measurement of OL in that normative OL measures perform better than descriptive measures for understanding the mediation between IT and performance. This study also provides the managers insight how to achieve better return on investment in Information technology structure, particularly in the face of ever better trust on data-based technologies, through the support of OL perspectives. Research on technology in the organization can learn from the complexities and plurality of perspectives that this study has only begun to incorporate.

References

- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, 17(1), 99-120.
- Bhatt., & Grover. (2005). Types of information technology capabilities and their role in competitive advantage: An empirical study. *Journal of Management Information Systems*, 22(2), 253-277.
- Bharadwaj, A. S. (2000). A resource-based perspective on information technology capability and firm performance. *An empirical investigation. MIS Quarterly*, 24(1), 169-196.
- Bolívar-Ramos, M. T., García-Morales, V. J., & García-Sánchez, E. (2012). Technological distinctive competencies and organizational learning: Effects on organizational innovation to improve firm performance. *Journal of Engineering and Technology Management*, 29(3), 331-357.
- Bueno, E., Aragon, J. A., Paz Salmador, M., & García, V. J. (2010). Tangible slack versus intangible resources: The influence of technology slack and tacit knowledge on the capability of organisational learning to generate innovation and performance. *International Journal of Technology Management*, 49(4), 314-337.
- Calvard, T. S. (2016). Big data, organizational learning, and sensemaking: Theorizing interpretive challenges under conditions of dynamic complexity. *Management Learning*, 47(1), 65-82.
- Cheng, T. Y., Li, Y. Q., Lin, Y. E., & Chih, H. H. (2020). Does the Fit of Managerial Ability with Firm Strategy Matters on Firm Performance. *Journal of Asian Finance, Economics, and Business*, 7(4), 9-19. <https://doi.org/10.13106/jafeb.2020.vol7.no4.9>
- De Geus, A. P. (1988). Planning as learning. *Harvard Business Review*, March/April, 70-74.
- Dodgson, M., Gann, D. M., & Phillips, N. (2013). Organizational learning and the technology of foolishness: The case of virtual worlds at IBM. *Organization Science*, 24(5), 1358-1376.
- Easterby-Smith, M., Antonacopoulou, E., Simm, D., & Lyles, M. (2004). Constructing contributions to organizational learning: Argyris and the next generation. *Management Learning*, 35(4), 371-380.
- Fiol, C. M., & Lyles, M. A. (1985). Organizational learning. *Academy of Management Review*, 10(4), 803-813.
- Gartner. (2015). Gartner Says Business Intelligence and Analytics Leaders Must Focus on Mindsets and Culture to Kick Start Advanced Analytics. Retrieved from <https://www.gartner.com/en/newsroom/press-releases/2015-09-15-gartner-says-business-intelligence-and-analytics-leaders-must-focus-on-mindsets-and-culture-to-kick-start-advanced-analytics>
- Goh, S. C. (1998). Toward a learning organization: The strategic building blocks. *SAM Advanced Management Journal*, 63, 15-22.
- Grant, R. M. (1996). Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17(S2), 109-122.
- Hitt, L. M., & Brynjolfsson, E. (1996). Productivity, business profitability, and consumer surplus: Three different measures of information technology value. *MIS Quarterly*, 20(2), 121-142.
- Huang, H. C. (2011). Technological innovation capability creation potential of open innovation: A cross-level analysis in the

- biotechnology industry. *Technology Analysis & Strategic Management*, 23(1), 49-63.
- Kane, & Alavi. (2007). Information technology and organizational learning: An investigation of exploration and exploitation processes. *Organization Science*, 18(5), 796-812.
- Lant, T. K., Milliken, F. J., & Batra, B. (1992). The role of managerial learning and interpretation in strategic persistence and reorientation: An empirical exploration. *Strategic Management Journal*, 13(8), 585-608.
- Lei, D., Hitt, M. A., & Bettis, R. (1996). Dynamic core competences through meta-learning and strategic context. *Journal of Management*, 22(4), 549-569.
- Lucas, H. C. (1999). *Information Technology and the Productivity Paradox*. New York, NY: Oxford University Press.
- Mahmood, M. A., & Soon, S. K. (1991). A comprehensive model for measuring the potential impact of information technology on organizational strategic variables. *Decision Sciences*, 22(4), 869-897.
- Mills, D. Q., & Friesen, B. (1992). The learning organization. *European Management Journal*, 10(2), 146-156.
- Nguyen, T. L. H., Nguyen, T. T. H., Nguyen, T. T. H., Le, T. H. A., & Nguyen, V. C. (2020). The Determinants of Environmental Information Disclosure in Vietnam Listed Companies. *Journal of Asian Finance, Economics and Business*, 7(2), 21-31. <https://doi.org/10.13106/jafeb.2020.vol7.no2.21>
- Orlikowski, W. J., & Barley, S. R. (2001). Technology and institutions: What can research on information technology and research on organizations learn from each other? *MIS Quarterly*, 25(2), 145-165.
- Penrose, E. T. (1959). *The Theory of the Growth of the Firm*. Oxford, UK: Oxford University Press.
- Porter, M. (1985). *Competitive Advantage*. New York, NY: Free Press.
- Powell, T. C., & Dent-Micallef, A. (1997). Information technology as competitive advantage: The role of human, business, and technology resources. *Strategic Management Journal*, 18(5), 375-405.
- Real, J. C., Leal, A., & Roldán, J. L. (2006). Information technology as a determinant of organizational learning and technological distinctive competencies. *Industrial Marketing Management*, 35(4), 505-521.
- Roberts, N., Galluch, P. S., Dinger, M., & Grover, V. (2012). Absorptive capacity and information systems research. *MIS Quarterly*, 36(2), 625-648. DOI: 10.2307/41703470
- Sampler, J. L. (1998). Redefining industry structure for the information age. *Strategic Management Journal*, 19, 343-355.
- Sanz-Valle, R., Naranjo-Valencia, J. C., Jiménez-Jiménez, D., & Perez-Caballero, L. (2011). Linking organizational learning with technical innovation and organizational culture. *Journal of Knowledge Management*, 15(6), 997-1015.
- Schoenmakers, W., & Duysters, G. (2010). The technological origins of radical inventions. *Research Policy*, 39(8), 1051-1059.
- Simonin, B. L. (1997). The importance of collaborative know-how: An empirical test of the learning organization. *Academy of Management Journal*, 40(5), 1150-1174.
- Stata, R. (1989). Organizational learning-the key to management innovation. *MIT Sloan Management Review*, 30(3), 63.
- Tabachnick, B. G., & Fidell, L. S. (2013). *Using multivariate statistics*. Boston, MA: Pearson Education.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic capabilities and strategic management. *Strategic Management Journal*, 18(7), 509-533.
- Tippins, M. J., & Sohi, R. S. (2003). IT competency and firm performance: Is organizational learning a missing link? *Strategic Management Journal*, 24(8), 745-761.
- Tsang, E. W. K. (1997). Organizational learning and the learning organization: a dichotomy between descriptive and prescriptive research. *Human Relations*, 50(1), 73-89.
- Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, 5(2), 171-180.
- Zahra, S. A., & Covin, J. G. (1993). Business strategy, technology policy and firm performance. *Strategic Management Journal*, 14(6), 451-478.
- Zhang, Y., Khan, U., Lee, S., & Salik, M. (2019). The influence of management innovation and technological innovation on organization performance. A mediating role of sustainability. *Sustainability*, 11(2), 495.