

Modeling IT Value based on Meta-Analysis

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Abstract—Over the last two decades, research about IT value has been done. The main purpose of IT values research is to determine how IT investment gives impact and value to organization performance. Because of vital role and function of IT, the organization required to understand how IT could create business value. Therefore, an understanding of IT value is needed. Systematic literature review in meta-analysis is required to determine the relationship between IT resources, organization capabilities, organization core competencies, and organization performances. The research was conducted on 53 publications which generate the classification matrix components that have an impact on organization performance. Hypothesis testing results that organization has the best performance on financial, efficiency, and other performance through external capability and core competence. So, indirect effect model is better than direct effect model in explaining IT value.

Keywords—IT value, the impact of IT, IT resources, organization capabilities, organization core competencies, organization performances, systematic literature review, meta-analysis.

I. INTRODUCTION

Recent research on IT value gives various results on organization performance [1][2]. Research results in IT value mentioned that there is the indirect impact on organization performance through organization capability [5][7][8][9]. This concept is known as "IT-enabled organization capability". Therefore, IT resource holds a very important role in determining organization capability that can create value and profit for the organization performance [3][7][10]. Besides, the research result also states that indirect effect of IT resource on organization performance is influenced by the organization core competence because it can help an organization to coordinate and integrate the skills and proprietary technologies [19]. Michael Porter (1986) explained that the core competence can make companies that run the same business different from their competitors. This difference makes the companies achieve the goals that have been set [20][21][22]. These indicate that without IT, the organization will not be able to use their capabilities and core competencies to run the activities and achieve organization performance. It opens an opportunity and new challenges for the organization to synergize and collaborate IT with capabilities and core competencies since it is not easy to integrate it.

Furthermore, although the research of IT value significantly evolved over last few years, there are still limitations founded in uncovering IT components which could give IT value on the organization and how mechanism and the right model of IT for an organization. Therefore, a meta-analysis is conducted to answer the main problems as follows:

- A. How are the concept and the components of IT value creation for the organization?
- B. What organization capabilities and core competencies that can maximize IT resources?
- C. What organization performances that can be created by IT?
- D. What areas can potentially be identified for further research?

II. RELATED WORKS AND RESEARCH MODEL

A. Related works

The research questions in IT value are how IT investments contribute and what IT components contribute to organization performance [11]. It triggers researchers to shift the direction of the research focus from the direct effect to what mechanism of IT contribute to organization performance. Furthermore, how their collaboration and synergies to create business value for the organization. Through this perspective, the researchers in this area have used approach based on process, where IT resources do not directly impact on improving organization performance, but through IT capabilities [12] and IT core competencies [26][27] such as operational capabilities or use of IT, IT personal competence, collaboration capabilities/systems integration, and IT management capabilities [6][7][13][14], exclusiveness of the core competence, added value creations of the core competencies, cost reductions of the core competence, productivity enhancement of the core competence, uniqueness, extendibility [28][29]. This research was developed based on the research result of Liang (2010) [8] by adding organization core competence as new mediator & increasing the number of IT value publications from 2010 to 2016. Therefore, in this meta-analysis, this study will identify and classify components of IT value model: (i) IT resources, (ii) Organization capabilities, (iii) Organization core competencies and (iv) Organization performances.

B. Research Model

Fig. 1 shows how IT value model effect on organization performances. There are two effects, i.e., the direct and the indirect. Effect of IT resources on organization performances without mediator is the direct effect, while the effect of IT resources through organization capabilities and core competencies as the mediator that bridge IT resources with organization performances called the indirect effect.

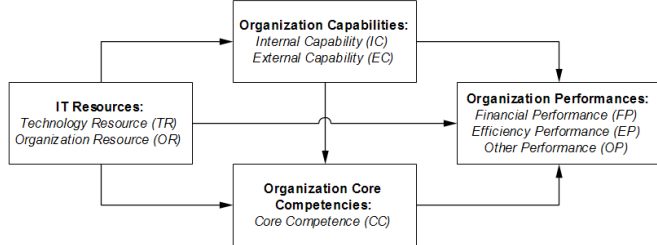


Fig. 1. Research Model

In this systematic literature review, an investigation of IT value on the organization is conducted, both private sector, and public sector. IT resources are examined not only by focusing on IT investment financially, but also by including non-financial, such as IT assets, IT infrastructure, human resources, and IT management. The coverage of unit analysis are also expanded, i.e., other performances that are popular to define a successful in improving organization performance, such as quality data/information and quality service [4][15][16][17] [18]. This study collects publications that are relevant in the database of research journals covered by Scopus, Science Direct, JSTOR and Elsevier. Multiple keywords are used in this study: “IT value”, “value of IT”, “IT impact”, “IT resources”, “IT investment”, “organization capabilities”, “organization core competence”, and “organization performance”. Finally, this process results 53 relevant publications.

III. METHODOLOGY

This research uses systematic literature review as the methodology and meta-analysis to process the data. A systematic literature review is used to determine the dimension of research model components, identify and analysis the variables collected from various publications or previous research. Statistic tests used in this meta-analysis sourced from Rosenthal [25], Hunter and Schmidt [23], and Hedges and Olkin [24]. The average plot of product moment correlation r is used as the data basis of meta-analysis (from correlations value on 53 publications), Combined Fisher's Z-score and Fail-safe N (Nfs) as the determiner whether the null hypothesis is accepted or not. The total effect size indicates the effect independent variables on the dependent variables. There are 3 effect groups of the total effect size suggested by Cohen (1997) i.e., in sequence, low effect when $(r) > 0.1$, medium effect when $(r) > 0.3$, and high effect when $(r) > 0.5$. Nfs indicates the number of publications that would be required to nullify the effect. In 95 percent confidential, the significant tolerance level of Nfs is $> 5*k+10$, where k is the total number of research in each pairwise relationship [25].

IV. RESULT

A. Grouping of variable's dimensions

Journal publications were collected within the period of last 15 years from the top international journals in the area of the information system and information technology.

1. Organization performances

Organization performances are grouped into three, namely financial, efficiency, and other performance (e.g. intangible performance such as satisfaction, innovation, market share).

TABLE I. GROUPING OF ORGANIZATION PERFORMANCE'S DIMENSIONS

Dimensions	Indicators	References	
<i>Financial Performance</i>			
Financial Indicator	ROE	[31]	
	Growth	[43], [27], [51], [53],[71], [59]	
	GDP	[37]	
	ROI	[39],[51], [48], [77],[71]	
	Sales Revenue	[48], [53]	
	ROA	[74], [7], [76], [9]	
	Net Margin	[7]	
Profitable and Benefit	Profitable	[30], [32], [34], [39], [40], [48],[51], [53], [77], [9],[71], [59]	
	<i>Efficiency Performance</i>		
Cost Efficiency	Cost Efficiency, Cost Reduction	[6], [78],[68], [73], [76], [70], [28]	
	Process Efficiency	Production Effectiveness	[40], [50], [73], [52], [28]
		Operasional Efficiency	[65], [39]
	Time Efficiency	[71],[45],[71]	
<i>Other Performance</i>			
Market	Market Share, Market Value, Market Development	[31], [39], [44], [48],[71]	
	Quality	Tobin's Q	[31], [32], [34], [78], [7], [42], [72], [29]
Innovative	Innovative Orientation	[35]	
	R&D, Patents,	[78]	
	Modified products & New Products	[48], [61], [7]	
Satisfaction	Customer Statisfaction	[4],[45],[68], [76], [52]	
	Strategic	Strategic Benefit	[65]
Risk	Treynor Rasio	[67]	
Relationship	Customer Relationship	[77], [69]	

2. Organization capabilities

Organization capabilities are grouped into two, namely internal capability and external capability. The Internal capability is the ability to utilize the organization's resources to improve internal controls capabilities, strengthen cooperation between the internal organization, and the capacity of the system and development (managing internal IT relationship, managing internal organization capability, and IT planning and management). The external capability is the ability to adapt to the outside environment of organization, cooperate and share information with the organization partners to meet customer needs and face competitors in the market (external relationship)

TABLE II. GROUPING OF ORGANIZATION CAPABILITIES DIMENSION

Dimensions	Indicators	References
<i>Internal Capabilities</i>		
Managing Internal IT Relationship	IT Operations/Use Capability	[41], [39], [9],[45]
	System Integration, Collaboration	[55]
	Data/Information Sharing	[52], [50], [76]
	Technology Sensing & Responding	[46], [49]
Managing Internal Organization Capability	Knowledge Capability	[43], [54]
	Human Resource Capability	[7], [9]
IT Planning and Management	Intrapreneurship Culture	[44]
	IT Management Capability	[52], [39], [54]
	IT Strategy Planning Capability	[39], [73], [54], [58]
	IT Flexibility	[50], [76]
	Knowledge Management Capability	[51], [52], [74], [75]
<i>External Capabilities</i>		
External Relationship Management	Customer or Supply Side Capability	[41], [52], [48], [72],[45], [47], [56], [66], [69],[71]
	Relationship Management	[55], [52], [75], [77], [26], [49], [58]
	Marketing Capability	[9], [56]
	Dynamic Capabilities	[79]
	Market Sensing & Brand Management	[66], [70]

3. Organization core competencies

The variables that are mostly used by researchers to represent organization core competencies are related to the product (unique, inimitable, new product development) and none product (IT competence, IT support competence, process oriented dynamic capability, and market competence).

TABLE III. GROUPING OF ORGANIZATION CORE COMPETENCIES DIMENSION

Dimensions	Indicators	References
<i>Core Competence</i>		
Product	Unique & Inimitable New Product Development	[28], [29], [58] [79], [29]
	Non Product	[27], [59], [26], [63]
Exploratory innovative competence	IT Competence	[39]
	IT Support	[61]
	Exploitative & Process Oriented	[53], [54]
	Dynamic Capabilities	[59], [63]
Market & Integrative Competence		

4. IT resources

There are two variables in the grouping of IT resources dimension, i.e., technology resources and organization

resources. Table IV shows matrix results of clustering technology resources that include IT investment, IT infrastructure and IT assets, and organization resources that include the knowledge and human resource.

TABLE IV. GROUPING OF IT RESOURCES DIMENSION

Dimensions	Indicators	References
<i>Technology Resource</i>		
IT Investment	IT Investment	[32], [34], [9], [44], [30],[31], [53]
	IT Budget	[30], [6], [37], [50],[70]
	IT Spending	[72]
IT Infrastructure	IT Infrastructure	[39], [40],[51], [67], [73], [7]
	IT Vendor Support	[35], [46], [67]
IT Assets	IT/Relationship Assets	[78], [7],[45], [77], [35],[51], [73]
	IT Use	[43], [65], [46], [79]
	IT Strategic Alignment / Relatedness	[32], [67], [7]
	IT Readiness / Commitment	[48], [67], [74]
	IT Planning and Management	[35],[51]
	Software, System Application	[40], [53], [44], [39], [48]
		[27], [40], [50], [53]
<i>Organization Resource</i>		
Knowledge Resource	IT training and support	[40]
	Knowledge Resource	[53], [73], [77], [4], [7]
Human Resource	Human Resource Skill	[40], [35],[45], [67], [77], [46]
	Technical IT & Relational IT Skill	[39], [50], [9],[51]
	IT Personel Skill	[55], [66]
	IT Steering Committee	[76]

B. Model IT value

1. Direct effect model

The meta-analysis result of the direct effect model is shown in Table V. It can be seen that the combined Z Scores of all the hypothesis testing are significant. Nfs of the hypothesis passes their tolerance level of Nfs. It means that IT resources have the positive effect on the organization performances. Their effect size (*r*) is < 0.3. So, the direct effects between IT resources and organization performances are in low effect. Therefore, direct effect model of IT value is not suggested.

TABLE V. CORRELATIONS BETWEEN IT RESOURCES AND ORGANIZATION PERFORMANCES

Hypothesis Test (H1)	TR-FP	TR-EP	TR-OP	OR-FP	OR-EP	OR-OP
Number of Studies	14	7	11	7	6	8
Total Samples Size	4955	1604	2678	1490	704	1864
Effect size (<i>r</i>)	0,11	0,11	0,17	0,22	0,27	0,18
Combined Z Scores*	9,01	6,09	9,38	8,62	6,75	8,02
Tolerance Level of Nfs	80	45	65	45	40	50
Nfs (<i>p</i> =0.05)	283,00	61,00	242,00	129,00	66,00	127,00
	Support Effect	Support Effect	Support Effect	Support Effect	Support Effect	Support Effect

Note: * (*p*<0.001)

2. Indirect effect model

a. IT resources and organization performances, organization capabilities as mediator

Table VI shows statistic results between IT resources and organization capabilities. It can be seen that the combined Z Scores of all the hypothesis testing are significant. Nfs of the hypothesis passes their tolerance level of Nfs. It means that IT resources have the positive effect on the organization capabilities. Their effect sizes (*r*) are > 0.3 and < 0.5. It means that the effects between IT resources and organization capabilities are in medium effect.

TABLE VI. CORRELATIONS BETWEEN IT RESOURCES AND ORGANIZATION CAPABILITIES

Hypothesis Test (H1)	TR-IC	TR-EC	OR-IC	OR-EC
Number of Studies	12	6	9	5
Total Samples Size	2541	1100	1454	809
Effect size (<i>r</i>)	0,44	0,33	0,47	0,44
Combined Z Scores*	20,88	10,92	18,78	12,49
Tolerance Level of Nfs	70	40	55	35
Nfs (<i>p</i> =0.05)	1352,00	181,00	819,00	199,00
Hypothesis Supported	Support	Support	Support	Support
	Medium Effect	Medium Effect	Medium Effect	Medium Effect

Note: * (*p*<0.001)

Table VII shows that all the hypothesis are significantly supported. The internal capability has the medium effect on other performances (e.g. innovation, satisfaction) but it has low effect on financial performance. However, the internal capability has no effect on efficiency performance. On the other hand, the external capability has the medium effect on organization financial, efficiency, other performances.

TABLE VII. CORRELATIONS BETWEEN ORGANIZATION CAPABILITIES AND PERFORMANCES

Hypothesis Test (H1)	IC-FP	IC-EP	IC-OP	EC-FP	EC-EP	EC-OP
Number of Studies	9	7	11	8	8	8
Total Samples Size	2351	1554	2354	1485	2176	1612
Effect size (<i>r</i>)	0,27	0,09	0,36	0,40	0,36	0,42
Combined Z Scores*	14,67	7,45	18,92	16,54	18,84	18,66
Tolerance Level of Nfs	55	45	65	50	50	50
Nfs (<i>p</i> =0.05)	496,00	95,00	1015,00	562,00	732,00	718,00
Hypothesis Supported	Support	Support	Support	Support	Support	Support
	Low Effect	None	Medium Effect	Medium Effect	Medium Effect	Medium Effect

Note: * (*p*<0.001)

b. IT resources and organization performances, organization core competencies as mediator

IT resources have the medium effect on organization core competencies as shown in Table VIII. The effect sizes of these variables are 0.39 and 0.33. In addition, the relationship between organization capabilities and core competencies is not significantly supported by both organization capabilities, but only on internal capability. Nfs of external capability does not pass tolerance level of Nfs. Furthermore, core competencies and organization performances have the medium effect. The

biggest effect of core competencies is in other performances then is followed by financial and efficiency performance. This result can be seen respectively in Table VIII and Table IX.

TABLE VIII. CORRELATIONS BETWEEN IT RESOURCE AND ORGANIZATION, CORE COMPETENCIES, AND CAPABILITIES

Hypothesis Test (H1)	TR-CC	OR-CC	IC-CC	EC-CC
Number of Studies	6	3	3	3
Total Samples Size	1613	539	651	509
Effect size (<i>r</i>)	0,39	0,33	0,40	0,19
Combined Z Scores*	15,29	10,00	10,66	5,09
Tolerance Level of Nfs	40	25	25	25
Nfs (<i>p</i> =0.05)	360,00	76,00	86,00	18,00
Hypothesis Supported	Support	Support	Support	Not Support
	Medium Effect	Medium Effect	Medium Effect	

Note: * (*p*<0.001)

TABLE IX. CORRELATIONS BETWEEN ORGANIZATION CORE COMPETENCIES AND PERFORMANCES

Hypothesis Test (H1)	CC-FP	CC-EP	CC-OP
Number of Studies	6	3	6
Total Samples Size	1267	576	1044
Effect size (<i>r</i>)	0.35	0.32	0.36
Combined Z Scores*	12.05	7.70	12.32
Tolerance Level of Nfs	40	25	40
Nfs (<i>p</i> =0.05)	221.00	44.00	232.00
Hypothesis Supported	Support	Support	Support
	Medium Effect	Medium Effect	Medium Effect

Note: * (*p*<0.001)

Based on the results of meta-analysis study above, the model of IT value is proposed. The proposed model shows the relationship and the effect of all the variables to organization performances. Fig. 2 shows the direct effect and indirect effect of IT value model. The direct model has the low effect and indirect model has the medium effect. It means IT resource has the best effect on organization performance through organization capabilities and organization core competencies.

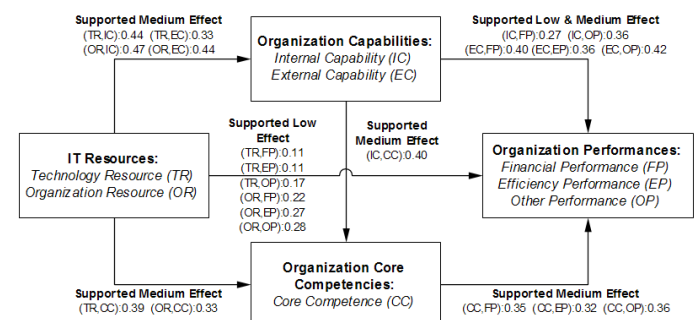


Fig 2. The Result of IT Value Model

V. CONCLUSION

The result of IT value model shows that technology resources and organization resources enhance internal and external capabilities and core competencies toward the organization performances. Through external capability and

core competence, the organization can maximize the IT resources and perform the best performance (financial, efficiency, and others). While the external capability has the possible effect on all type of performances, internal capability only covers on the financial and other performance. Furthermore, internal capability and organization core competence have positive relationships and medium effect on each other. It means that enhancing capability will enhance the core competence values, and the core competence will enhance the value of capability and then will enhance organization performance. So, the indirect effect model is better than the direct effect model in describing the effect of IT value on organization performances.

VI. LIMITATION AND FURTHER RESEARCH

The meta-analysis study in this research has some limitations. First, the number of publications that uses the core competence as the component of IT value model is limited. Further research needs to enhance the component of organization core competencies, particularly on the dimension and indicators of core competencies. Second, the proposed of IT value model need to be verified and implemented in the IT-intensive organizations. Future research will cover this limitation by verifying and implementing the proposed model in the private industrial organization, such as banking sector and telecommunication organization, and also IT-intensive public sectors.

REFERENCES

- [1] T. Jacks et al., "A framework for the impact of IT on organization value," *Business Process Management Journal*, 17(5), 846–870, 2011
- [2] P. B. Seddon, "Implications for strategic IS research of the resource-based theory of the firm: A reflection," *Journal of Strategic Information Systems*, 23(4), 257–269, 2014.
- [3] N. Wang et al., "Resource Structuring or Capability Building? An Empirical Study of the Business Value of Information Technology," *Journal of Management Information Systems*, 29(2), 325–367, 2012
- [4] P. Setia et al. "Leveraging Digital Technologies: How Information Quality Leads To Localized Capabilities And Customer Service Value," *MIS Quarterly*, 37(2), 565–590, 2013.
- [5] C. W. Y. Wong et al., "The value of Information Integration to Supply Chain Management: Roles of Internal and External Contingencies," *Journal of Management Information Systems*, 28(3), 161–200, 2012.
- [6] M. S. Pang et al., "In public sector organizations: A public value management perspective," *Journal of Information Technology*, 29(3), 187–205, 2014.
- [7] S. Aral and P. Weill, "IT Assets, Organization Capabilities, and Firm Value: How Resource Allocations and Organization Differences Explain Value Variation," *Organization Science*, 18(5), 763–780, 2007.
- [8] T. P. Liang et al., "A Resource-Based Perspective on Information Technology and Firm Value: A Meta-Analysis," *Industrial Management & Data Systems*, 110(8), 1138–1158, 2010.
- [9] J. L. Chen, "The synergistic effects of IT-enabled resources on organization capabilities and firm value," *Information and Management*, 49(3–4), 142–150, 2012.
- [10] V. Grover and R. Kohli, "Cocreating It Value: New Capabilities And Metrics For Multifirm Environments," pp. 225–232, Januari, 2011.
- [11] G. Piccoli and B. Ives, B. "Review: IT Dependent Strategic Initiatives And Sustained Competitive Advantage: A Review And Synthesis Of The Literature," *MIS Quarterly*, 29(4), 747–776, 2005.
- [12] M. Wade and J. Hulland, "Review: The Resource Based View and Information Systems Research: Review, Extension, and Suggestions for Future Research," *MIS Quarterly*, 28(1), 107–142, 2004.
- [13] S. Kim and J. Lee, "E-Participation, Transparency, and Trust in Local Government," xx, 2012.
- [14] E. T. K. Lim et al., "Relationships in Electronic Government: The Singapore E-Filing Journey," (West 2004), 1–21, 2012.
- [15] W. T. Wang et al., "The stickiness intention of group-buying websites: The integration of the commitment-trust theory and e-commerce success model," *Information and Management*, 53(5), 625–642, 2016.
- [16] W. Tsai et al., "The Impact of IT Management Process of COBIT 5 on Internal Control," *Information Quality, and Business Value*, 631–634, 2015.
- [17] J. Park et al., "Exploring the impact of communication effectiveness on service quality, trust and relationship commitment in IT services," *International Journal of Information Management*, 32(5), 459–468, 2012.
- [18] S. E. Fawcett et al., "Information technology as an enabler of Supply Chain Collaboration: A dynamic-capabilities perspectives," *Journal of Supply Chain Management*, 47(1), 22, 2011.
- [19] G. Hamel, and C.K. Prahalad, "The core competence of the corporation", *Harvard Business Review*, May-June, pp. 79-91, 1990.
- [20] D. Helleloid and B. Simonin, "Organization learning and a firm core competence", in Hamel, G. and Heene, A. (Eds), *Competence-Based Competition*, John Wiley and Sons, New York, NY, 1994.
- [21] G. Dosi and D. Teece, "Organization competence and the boundary of the firm", in Arena, R. and Longhi, C. (Eds), *Markets and Organizations*, Springer-Verlag, New York, NY, 1998.
- [22] G. Hamel and A. Heene, "Competence-Based Competition," John Wiley Sons, 1994.
- [23] J.E. Hunter and F.L. Schmidt, "Method of Meta-analysis: Correcting Error and Bias in Research Finding," Sage, Newbury Park, CA, 1990.
- [24] L.V. Hedges and L. Olkin, "Statistical Methods for Meta-analysis," Academic Press, Orlando, FL, 1985.
- [25] R. Rosenthal, "Meta-analytic Procedures for Social Research," Rev. ed., Sage, Beverly Hills, CA, 1991.
- [26] M. J. Tippins and R. Sohi., "It Competency And Firm Performance: Is Organization Learning A Missing Link?," *Strategic Management Journal*, 24: 745–761, 2003.
- [27] J. Kim et al., "Technological diversification, core technology competence, and firm growth," *Research Policy* 45 (2016) 113–124, 2016.
- [28] E. Bacha, "The impact of information systems on the performance of the core competence and supporting activities of a firm," *Journal of Management Development Vol. 31 No. 8*, 2012.
- [29] O Gokkaya and G. K. Ozbag, "Linking Core Competence, Innovation, and Firm Performance," *Journal of Business Research*, 2015.
- [30] M. Thoun et al., "The Effect of Information Technology (IT) Investments on Firm-Level Performance in the Healthcare Industry," *Health Care Manag. Review.* 33(1), pp. 60-69, 2008.
- [31] B. W. Lin, "Information technology capability and value creation: Evidence from the US banking industry," *Technology in Society* 29 (2007) 93–106, 2007.
- [32] S. Mithas and R. T. Rust, "How Information Technology Strategy And Investments Influence Firm Performance: Conjecture And Empirical Evidence," *MIS Quarterly Vol. 40 No. 1*, pp. 223-245, 2016.
- [33] Z. Meng and S. Y. T. Lee, "The value of IT to firms in a developing country in the catch-up process: An empirical comparison of China and the United States," *Decision Support Systems* 43, pp. 737–745, 2007.
- [34] S. Mithas et al., "Information Technology And Firm Profitability: Mechanisms And Empirical Evidence," *MIS Quarterly Vol. 36 No. 1* pp. 205-224, 2012.
- [35] A. Ordanini and G. Rubera, "How does the application of an IT service innovation affect firm performance? A theoretical framework and empirical analysis on e-commerce," *Information & Management*, 47(1), 60–67, 2010.

- [36] M. S. Pang et al., "Information Technology And Administrative Efficiency In U.S. State Governments: A Stochastic Frontier Approach," *MIS Quarterly* Vol. 38 No. 4, pp. 1079-1101, 2014.
- [37] M. Pang et al., "Do CIO IT Budgets Explain Bigger or Smaller Governments? Theory and Evidence from U.S. State Governments," *Management Science*, (April 2016), 2015.
- [38] P. Setia et al., "Leveraging Digital Technologies: How Information Quality Leads To Localized Capabilities And Customer Service Value," *MIS Quarterly*, 37(2), 565-590, 2013.
- [39] N. Wang et al., "Resource Structuring or Capability Building? An Empirical Study of the Business Value of Information Technology," *Journal of Management Information Systems*, 29(2), 325-367, 2014.
- [40] J. B. Gidumal and M. S. Gonzalez, "Maximizing the positive influence of IT for improving organization performance," *Journal of Strategic Information Systems*, 20(4), 461-478, 2011.
- [41] M. Stael et al., "IT capabilities and firm performance: A contingency analysis of the role of industry and IT capability type," *Information and Management*, 46(3), 181-189, 2009.
- [42] A. Tafti et al., "The Effect of Information Technology-Enabled Flexibility on Formation and Market Value of Alliances," *Management Science*, 59(1), 207-225, 2013.
- [43] K. Iyengar et al., "Information Technology Use As A Learning Mechanism: The Impact Of It Use On Knowledge Transfer Effectiveness, Absorptive Capacity, And Franchisee Performance," *MIS Quarterly*, 39(3), 615-641, 2015.
- [44] J. B. Amado et al., "Information technology-enabled intrapreneurship culture and firm performance," *Industrial Manag. & Data Systems*, 110(4), 550-566, 2010.
- [45] Y. Jiang and Zhao J., "Co-creating business value of information technology," *Industrial Management & Data Systems* Vol. 114 No.1, 2014.
- [46] L. L. Palacios et al., "Complementary IT resources for enabling technological opportunism," *Information and Management*, 2016.
- [47] H. Wu et al., "Dynamic capabilities as a mediator linking international diversification and innovation performance of firms in an emerging economy," *Journal of Business Research*, 2015.
- [48] F. Wu et al., "The impact of information technology on supply chain capabilities and firm performance: A resource-based view," *Industrial Marketing Management* 35, pp. 493 - 504, 2006.
- [49] K. U. Rehman and Z. Saeed, "The impact of Dynamic Capabilities on Firm Performance: Moderating Role of Organizational Competencies," 2015.
- [50] Ray et al., "Information Technology And The Performance Of The Customer Service Process: A Resource-based Analysis," *MIS Quarterly* Vol. 29 No. 4, pp. 625-652, 2005.
- [51] H. Mao et al., "Information technology resource, knowledge management capability, and competitive advantage: The moderating role of resource commitment," *International Journal of Information Management*, 36(6), 1062-1074, 2016.
- [52] S. Mithas et al., "How Information Management Capability Influences Firm Values," *MIS Quarterly*, 35(1), 237-256, 2011.
- [53] G. Kim et al., "IT Capabilities, Process-Oriented Dynamic Capabilities, and Firm Financial Performance," Vol. 12, Issue 7, pp. 487-517, 2011.
- [54] S. F. Wamba et al., "Big data analytics and firm performance: Effects of dynamic capabilities," *Journal of Business Research*, 2016.
- [55] G. Garrisona et al., "The effects of IT capabilities and delivery model on cloud computing success and firm performance for cloud supported processes and operations," *International Journal of Information Management* 35, 2015.
- [56] S. C. Ros and T. F. G. Cruz, "Service firm capabilities and performance: Contingent analysis of customer contact," *Journal of Business Research*, 2015.
- [57] A. Saunders and E. Brynjolfsson, "Valuing Information Technology Related Intangible Assets," *MIS Quarterly*, 40(1), 83-110, 2016.
- [58] Y. F. Chen and T. C. Wu, "An empirical analysis of core competence for high-tech firms and traditional manufacturers," *Journal of Management Development* Vol. 26 No. 2, pp. 159-168, 2007.
- [59] K. F. Wu, "An Empirical Study of Small- and Medium-Sized Firms in Taiwan: Entrepreneurship, Core Competency, and Market Performance," *Journal of Management Review*, 2015.
- [60] J. Kim et al., "Technological diversification, core technology competence, and firm growth," *Research Policy* 45 (2016) 113-124, 2016.
- [61] H.T Tsou et al., "Market and technology orientations for service delivery innovation: the link of innovative competence," *Journal of Business & Industrial Marketing*, pp. 499-513, 2014.
- [62] N. Wang et al., "Resource Structuring or Capability Building? An Empirical Study of the Business Value of Information Technology," *Journal of Management Information Systems*, 29(2), 325-367, 2012.
- [63] Y. Wang et al., "The constituents of core competencies and firm performance: evidence from high-technology firms in china," *J. Eng. Technol. Manage.* 21, pp. 249-280, 2004.
- [64] C. C. Yang, "The integrated model of core competence and core capability," *Total Quality Management & Business Excellence*, 2013.
- [65] M. Subramani, "How Do Suppliers Benefit From Information Technology Use In Supply Chain Relationships?," *MIS Quarterly* Vol. 28 No. 1, pp. 45-73, 2004.
- [66] J. Hulland et al., "The Impact of Capabilities and Prior Investments on Online Channel Commitment and Performance," *Journal of Management Information Systems*, 2007.
- [67] H. Tanriverdi, "Performance Effects Of Information Technology Synergies In Multibusiness Firms," *MIS Quarterly* Vol. 30 No. 1, pp. 57-77, 2006.
- [68] K. H. Lai et al., "A coordination-theoretic investigation of the impact of electronic integration on logistics performance," *Information & Management* 45, pp. 10-20, 2007.
- [69] R. Klein and A. Rai, "Interfirm Strategic Information Flows In Logistics Supply Chain Relationships," *MIS Quarterly* Vol. 33 No. 4, pp. 735-762, 2009.
- [70] G. Ray et al., "Competitive Environment and the Relationship Between IT and Vertical Integration," *Information Systems Research* 20(4):585-603, 2009.
- [71] K. N. S. Iyer et al., "B2B e-commerce supply chain integration and performance: A contingency fit perspective on the role of environment," *Information & Management* 46 313-322, 2009.
- [72] I. Bardhan et al., "Information Technology, Production Process Outsourcing, and Manufacturing Plant Performance," *Journal of Management Information Systems* Vol. 23, No. 2, pp. 13-40, 2006.
- [73] J. Karimi et al., "The Role of Information Systems Resources in ERP Capability Building and Business Process Outcomes," *Journal of Management Information Systems* Vol. 24, No. 2, pp. 221-260, 2007.
- [74] H. Tanriverdi, "Information Technology Relatedness, Knowledge Management Capability, And Performance Of Multibusiness Firms," *Quarterly* Vol. 29 No. 2, pp. 311-334, 2005.
- [75] A.M.G. Padilla and T. F. E. Rodriguez, "Strategic value and resources and capabilities of the information systems area and their impact on organizational performance in the hotel sector," Vol. 63 No. 3, pp. 21-47, 2008.
- [76] A. Prasad et al., "A capabilities-based approach to obtaining a deeper understanding of information technology governance effectiveness: Evidence from IT steering committees," *International Journal of Accounting Information Systems* 11, pp. 214-232, 2010.
- [77] A. Rapp et al., "Performance implications of customer-linking capabilities: Examining the complementary role of customer orientation and CRM technology," *Journal of Business Research* 63, 2010.
- [78] L. Xue et al., "Efficiency Or Innovation: How Do Industry Environments Moderate The Effects Of Firms' It Asset Portfolios?," *MIS Quarterly* Vol. 36 No. 2 pp. 509-528, 2012.
- [79] P. A. Pavlou and O. A. E. Sawy., "From IT Leveraging Competence to Competitive Advantage in Turbulent Environments: The Case of New Product Development," *Information Systems Research*, Vol. 17, No. 3, pp. 198-227, 2006.j