

Extent versus Range of Service Digitization: Implications for Firm Performance

Completed Research Paper

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Abstract

Service Digitization is a key means by which organizations derive value from their IT investments. We theorize that Service Digitization consists of two underlying dimensions – Extent of Digitization (EoD) and Range of Digitization (RoD), which present a trade-off scenario for a resource-constrained firm. We examine the firm performance implications of EoD and RoD and identify Human Capital Intensity (HCI) and Marketing Intensity (MI) as two complementary organizational competencies. Our empirical analysis of an archival panel data set, consisting of thirty-five quarters of financial and service digitization data from over 7000 credit unions, demonstrates strong support for our theoretical model. We find a J-shaped relationship between EoD and firm performance, which is positively moderated by HCI; and we find an inverted U-shaped relationship between RoD and firm performance, which is positively moderated by MI. Our results contribute towards the IT business value, IT-enablement of services and IT-enabled organizational agility literatures.

Keywords

Service Digitization, IT-Enabled Services, Business Value of IT, Resource Constraints, Firm Performance.

Introduction

Organizations operating in the knowledge-driven digital economy of the 21st century face several paradoxical demands and challenges. How organizations react in the face of such demands is a key determinant of firm performance and competitive advantage. Information Technology (IT) and IT-enabled organizational agility are two mechanisms by which firms tolerate the stresses arising from strategic tradeoffs (Kathuria and Konsynski 2012). Researchers have identified several such tradeoffs, including internal versus external sourcing of technology (Rothaermel and Alexandre 2009), development of new versus leverage of old competencies (Vera and Crossan 2004), and efficiency versus flexibility of business processes (Konsynski and Tiwana 2004). Such tradeoffs also exist in a firm's management of Information Technology (IT), and in the process of software development (e.g. Im and Rai 2008; Lee et al. 2007). The strategic options available to firms in Service Digitization represent another paradoxical challenge faced by firms in the 21st century.

Service Digitization refers to the IT-enabled provisioning of a service and reflects the scenario wherein a service is offered to consumers through a digitized medium, such as through a website, mobile app, voice activated self-service telephone helpline, etc. Customers are increasingly demanding greater digitization of services as it leads to smoother processes and delivery of services. These demands are accentuated by

the competitive need to imitate, if not lead, the market in service digitization initiatives. For example, several financial institutions, such as banks, have invested heavily in service digitization over the past decade. This has resulted in customers demanding and pressuring other financial institutions to invest in digitization of processes. Increasingly, service digitization has become a competitive necessity in such markets (DeYoung et al. 2007). Service digitization also provides several performance enhancing benefits to adopting firms due to lower costs from process automation and improvement and higher revenues due to better customer experiences. Thus service digitization is a key means by which organizations derive value from their investments in IT.

We posit that Service Digitization consists of two underlying dimensions – Extent of Digitization and Range of Digitization. Extent of Digitization (EoD) is defined as the pervasiveness of IT-enabled service provisioning and reflects the number of unique IT-enabled services offered by a firm. Range of Digitization (RoD) is defined as the options for IT-enabled service provisioning and reflects the number of unique IT-enabled channels through which services are offered by a firm. We assert that strategically, EoD and RoD present a trade-off scenario for a resource-constrained firm. Managers must decide whether to invest in increasing the number of services that are offered through a particular digital channel, or to expand the number of digital channels through which a service is offered. For example, consider a hypothetical situation where a firm has 100 units available to invest in service digitization. In the extreme cases, managers can choose to either invest all 100 units to offer digitized services through a single channel, or invest the 100 units equally across all available digital channels to offer digitized services. In the first scenario, assuming it costs 10 units to IT-enable a service offering, this hypothetical firm would present its customers with 10 different services via a single channel (for example, its website). In the second scenario, the firm would offer a single service through 10 different channels. Which of these two scenarios presents better performance implications for the firm? In this study, we help to resolve part of this conundrum by examining how the performance benefits from range of digitization and extent of digitization differ as firms invest more in these capabilities.

The performance implications of the tradeoff between EoD and RoD represent a critical addition to our understanding of IT business value. While studies that examine the business value of IT are abundant in the Information Systems (IS) literature, several gaps remain in this stream of research. Few studies examine IT business value in the context of service firms; fewer attempt to parse the nuances of applying IT to service provisioning processes. However, our research enquiries go beyond the direct effects of EoD and RoD. While the EoD and RoD dimensions of Service Digitization may offer differing impacts on firm performance, these relationships do not exist in isolation. Research in IT business value has demonstrated that the impacts of a firm's IT initiatives on its performance are complemented by its prior resource endowment and competencies (Bharadwaj et al. 2007). In this study, we identify two such organizational competencies, Marketing Intensity and Human Capital Intensity, and attempt to explicate the role of these competencies in complementing the effects of EoD and RoD. Specifically, we ask the following research questions: *How do Extent of Service Digitization and Range of Service Digitization influence firm performance?* Further, we ask, *what role do the firm competencies of Marketing Intensity and Human Capital Intensity play in augmenting the effects of Extent of Service Digitization and Range of Service Digitization on firm performance?*

To answer these questions, we draw upon the IT business value literature and assert the positive influence of Extent of Digitization and Range of Digitization on firm performance. We argue that EoD has an increasingly positive relationship with firm performance as increasing the extent of digitization would build on existing digitization efforts and the benefits towards firm performance would compound. In contrast, we theorize that RoD has a negative quadratic effect on firm performance. This inverted U-shaped relationship is a result of cross substitution effects. Further, we examine two organizational competencies that we believe to be important in the context of our study (Bharadwaj et al. 2007). First, since EoD involves providing extended services over the existing channels, how much human resources the organization can deploy to facilitate these services is important. Therefore, we consider the role of human capital intensity and we posit that Human Capital Intensity complements the effect of EoD on firm performance. Second, since increasing the RoD pertains to how widely accessible the services are to customers, it is pertinent to examine how the marketing investments of the firms can amplify the effect of RoD on performance. Therefore, we examine the moderating role of marketing intensity and we posit that Marketing Intensity complements the effect of RoD on firm performance. To test our model, we use a unique archival panel data set consisting of thirty-five quarters of financial and service digitization data

from over 7000 credit unions in the United States. Through our empirical analysis, we demonstrate strong support for our theoretical model. We find a J-shaped relationship between EoD and firm performance, which is positively moderated by Human Capital Intensity; and we find an inverted U-shaped relationship between RoD and firm performance, which is positively moderated by Marketing Intensity.

Our results offer several contributions towards our understanding of the business value of IT, IT-enablement of services and IT-enabled organizational agility. First, our findings suggest how the strategic choices of Extent of Service Digitization and Range of Service Digitization represent a tradeoff scenario, which can have severe implications for firm performance. Second, we reconcile findings of prior research that found both positive and negative effects of IT investments in service processes by establishing the simultaneous performance enhancing and performance reducing effects of Range of Service Digitization. Third, we strengthen the organizational complements thesis of IT business value by uncovering two firm competencies that complement IT investments in a service context. Fourth, our results suggest how IT can concurrently increase and decrease organizational agility through the effects of Service Digitization. Finally, we establish Service Digitization as a step on the journey from IT investment to value creation. For managers, our findings suggest a potential solution to the Service Digitization tradeoff, which involves a judicious approach in extending digitized service provisioning over additional channels and investments in complementary firm competencies. Overall, our study enables us to suggest to managers that their Service Digitization efforts would potentially provide greatest value under conditions of high Extent of Digitization, medium Range of Digitization, high Human Capital Intensity and high Marketing Intensity.

Theory & Hypotheses

There are several succinct reviews of the IT business value literature (e.g. Dedrick et al. 2003; Kohli and Devaraj 2003; Wade and Hulland 2004), which examine how IT contributes to firm performance, thereby creating business value. The overwhelming majority of this work provides evidence to demonstrate that the answer to the famous question “Does IT matter?” (Carr 2004) is a resounding yes. Research in this stream has progressed to identifying the various “underlying mechanisms” (Bharadwaj 2000) by which IT improves firm performance. The recent literature on the business value of IT has identified several intermediate mechanisms that mediate the relationship between IT and performance. These include knowledge creation, new product development, competitive network position, capacity utilization, superior customer services, and service development (Andrade Rojas and Kathuria 2014; Banker et al. 2006; Kane and Alavi 2007; Ray et al. 2005; Saldanha and Krishnan 2011). Although some of this work has applied the IT assets paradigm, which measures the effects of IT investments and IT applications (Bharadwaj et al. 1999), several recent studies have considered the IT capabilities paradigm. Based on the resource-based view of the firm, they consider IT capability as a firm’s ability to mobilize and deploy IT resources in combination with other capabilities or resources (Bharadwaj 2000). In this research, we apply this theoretical lens and respond to calls to add to this growing stream of literature by asserting Service Digitization as an intermediate mechanism through which IT influences firm performance.

By nature, the management of digitized services and the mechanisms by which they influence performance is complex (Rai and Sambamurthy 2006). Empirical investigations of the impact of Service Digitization on firm performance are scarce. Research suggests that firms can use IT to identify service gaps and potential solutions (Mithas et al. 2006; Ray et al. 2005), and enhance service process efficiency and effectiveness, thereby generating customer value and sustained firm performance (Sambamurthy and Zmud 2000). IT can improve the quality of services and customer outcomes and augment service-rendering activities contingent on different service contexts (Khuntia et al. 2012; Mithas 2005). However, the results from some studies suggest plausible negative effects of service digitization due to ossification of processes (Kathuria and Konsynski 2012). Thus an examination of the mechanisms that underlie the performance enhancing effects of Service Digitization is required. Furthermore, while IT business value research has identified several organizational characteristics, including business process design and organizational structure that complement the positive effects of IT on firm performance, the organizational competencies that enhance payoffs from IT-enablement of services are yet to be examined (Barua et al. 1995; Bharadwaj et al. 2007; Dedrick et al. 2003; Melville et al. 2004).

We posit that Service Digitization consists of two underlying dimensions – Extent of Digitization and Range of Digitization. We define Extent of Digitization (EoD) as the pervasiveness of IT-enabled service provisioning, and suggest that it reflects the number of unique IT-enabled services offered by a firm. Range of Digitization (RoD) is defined as the options for IT-enabled service provisioning and reflects the number of unique IT-enabled channels through which services are offered by a firm. We assert that strategically, EoD and RoD present a trade-off scenario for a resource-constrained firm. Further, we posit that as EoD and RoD increase, their influence on firm performance differs. Finally, we suggest that two organizational competencies, Marketing Intensity and Human Capital Intensity, enhance the effects of EoD and RoD on firm performance.

Greater Extent of Digitization of services provides organizations the ability to reach a broader market (Chi et al. 2010). As such, EoD enables the firm to capitalize on growth opportunities for revenue. Digitization of more services allows firms to compound the benefits because firms can utilize IT for increasing revenue and performance. Furthermore, while the EoD is likely to benefit firm performance, we propose that EoD may influence performance at an accelerating rate. Thus, we expect that the relationship would be J-shaped because the digitization of more services would build on existing digitization and the benefits would compound due to synergies between various services as well due to increased use by customers because of simplified and consolidated access to services. Hence we hypothesize:

H1: Extent of Digitization has an increasingly positive relationship with firm performance, such that it has (a) a positive linear effect and (b) a positive quadratic effect on firm performance.

Increased Range of Digitization provides customers with more avenues or channels of access to services. This can be a critical component of value creation and performance. Digitized avenues such as website based information, interactive response systems, and kiosks help customers get information anywhere, anytime. As a result, firms can be able to convert potential opportunities to revenue, and also capture a good reputation in the industry for its service orientation. Finally, increased RoD provides firms with more avenues by which to sense and respond to changes in the marketplace, thereby increasing organizational agility. Overall, we posit that RoD enhances the customer access to available services, thereby creating more opportunities for value creation, and hence enhancing the performance of firms. Therefore, we posit that Range of Digitization has a positive linear effect on firm performance.

Although we argue that increased RoD improves performance, we theorize that this effect would be tempered as the range of digitization increases beyond a point. Two key reasons underlie our theory. First, customers often like to get personalized services rather than automated services from the firms. Often IT-based or automated responses to issues and concerns are not appreciated by customers, especially when they expect a personalized service from service-oriented firms. Furthermore, when digital access channels offered to customers are not integrated with back-end IT systems, it may create more issues than solutions. Finally, when digital access channels ossify business processes, this may reduce organizational agility and thereby the organization's ability to react and respond to changing market competition and customer needs. Second, although greater RoD results in more service access opportunities for customers, the underlying services remain the same. Thus eventually, greater RoD would result in customers' substituting one access channel with another, while still using the same services. As the number of IT-enabled channels for access of digitized services increases, customers may lessen their involvement, or completely stop using other IT-enabled channels. Hence beyond a point, the value of potential opportunities converted due to greater RoD would become lesser than the costs incurred to provide services through the channel. In line with these arguments we posit that the Range of Digitization has a negative quadratic effect on firm performance. Formally,

H2: Range of Digitization has an inverted U-shaped relationship with firm performance, such that it has (a) a positive linear effect and (b) a negative quadratic effect on firm performance.

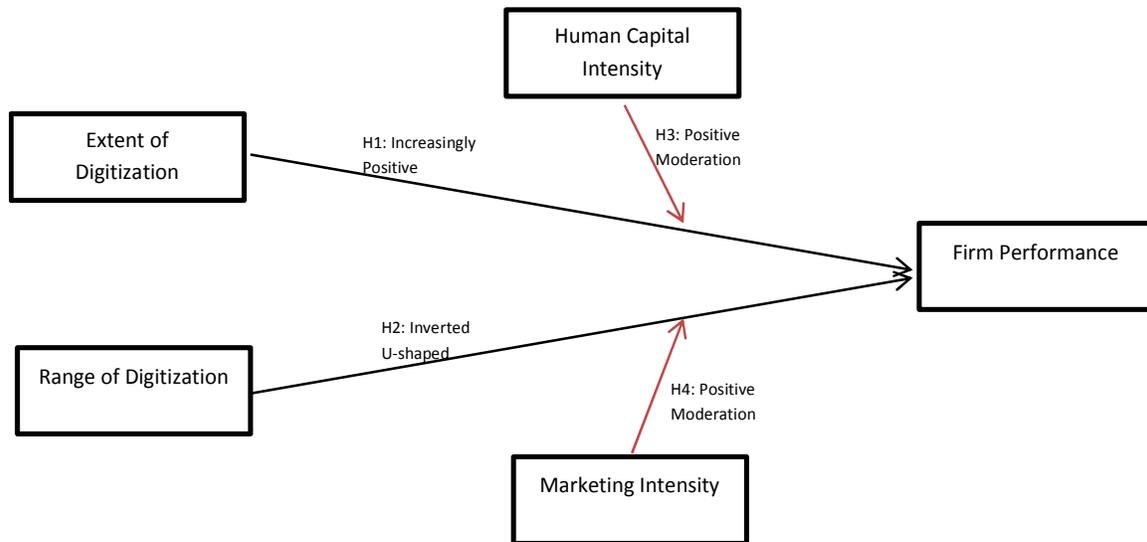


Figure 1. Conceptual Model

The production and delivery of services is dependent upon the intensity of human capital in firm. Consequently, Human Capital Intensity, defined as the skills, talent and knowledge of the firm's employees, reflects a core organizational competency that plays a key role in value creation in service firms (Bouquet et al. 2004). Though arguably Service Digitization reduces the role of human capital in the production, and especially delivery of services, the differential in value creation across firms is still due to this critical competency. The quality and effectiveness of the underlying service is largely dependent upon Human Capital Intensity. Thus while EoD enables the firm to capitalize on growth opportunities for revenue, these opportunities arise due to the strengths of the service. Hence we assert that Human Capital Intensity complements the effect of EoD on firm performance.

H3: Human Capital Intensity strengthens the positive effects of Extent of Digitization on firm performance.

Marketing Intensity, defined as the quality and quantity of the firm's marketing, reflects another core organizational competency that plays a key role in value creation in service firms (Capron and Hulland 1999; Krasnikov and Jayachandran 2008). The commercialization of services is dependent upon the intensity of the marketing efforts of the firm. This competency increases customer awareness of services and service access possibilities, thereby enabling greater customer engagement. Therefore, while RoD enhances the customer access to available services and thus creates more opportunities for value creation, customers become aware of these access modes due to the effectiveness of marketing efforts. Hence we assert that Marketing Intensity complements the effect of RoD on firm performance.

H4: Marketing Intensity strengthens the positive effects of Range of Digitization on firm performance.

Methods

Data & Measures

Variable	Description
Extent of Digitization	Number of unique digitized services offered by a firm, coded as a summative score of questions on twenty-one services.
Range of Digitization	Number of unique channels through which digitized services are offered by a firm, coded as a summative score of questions on five channels.
Loans	Total loans in millions disbursed (log-transformed).
Marketing Intensity	(log) Expenses of the firm on advertising, publicity, and promotions as a ratio of its revenues
Human Capital Intensity	(log) Expenses of the firm on employee compensation and benefits as a ratio of revenues
Assets	Assets per employee, calculated as the ratio of total assets to the number of full time employees.
Interest rate spread	Difference between interest generated per unit of loan and interest paid per unit of deposit.
CreditCard	Unsecured credit card loans per unit of total assets.
Institution Type	1 if the financial institution is a federally chartered and insured, 0 otherwise
Securitization	Securities per unit investment, calculated as (Trading securities + Available for sale securities + held to maturity securities) / Total Investments
Delinquency	Total loan delinquency per unit of total loans.
Branches	Number of physical branches.
Region1-Region5	Geographical region of the financial institution (of five regions in U.S.).
Table 1. Variable Descriptions	

We use a unique archival data set from quarterly financial reports of over 7000 credit unions in the U.S. that have been collected by a supervisory federal agency for regulatory purposes. We matched information on service digitization and performance of these firms, which are an exemplar of a service firm, across thirty-five quarters between 2000 and 2009. The dependent variable for our analysis is firm performance, which is measured as the (log) loans disbursed by the financial institution. This is a widely used metric of performance for financial institutions and is appropriate for our analysis as one of the basic purposes of a non-profit financial institution is to provide loans to its customers. As such, loan provisioning reflects the performance of a financial service firm. The independent variables EoD and RoD are count-based composite measures that are constructed as per prior research (e.g. Banker et al. 2006). EoD includes all digitized services offered by the focal firm. RoD measures the number of channels across which customers can access digitized services. Marketing Intensity is measured as the (log) expenses of the firm on advertising, publicity, and promotions as a ratio of its revenues and hence has a negative mean value. Human Capital Intensity is measured as the (log) expenses of the firm on employee compensation and benefits as a ratio of revenues and hence has a negative mean value.

We include a robust set of control variables that together account for several factors that are indicated by prior research to provide alternative explanations for firm performance. We account for prior endowment and scale effects by controlling for the size of the financial institution in terms of gross assets per employee. We control for type of financial institution (state or federal), interest rate spread, and the nature of the asset and liability portfolio (unsecured credit card loans, level of securitization, and ratio of loan delinquency) (Dandapani et al. 2008). Finally, we include region dummies to control for uneven macroeconomic and market conditions at the regional level that may influence performance. Variable descriptions and descriptive statistics are provided in Table 1 and Table 2 respectively.

	Variable	1	2	3	4	5	6	7	8	9	10	11
1	Loans	1										
2	Range	0.71	1									
3	Extent	0.7	0.9	1								
4	MI	0.35	0.39	0.4	1							
5	HCI	-0.11	0.09	0.08	0.06	1						
6	Assets	0.37	0.18	0.2	-0.04	-0.4	1					
7	Spread	0.03	0.01	0.01	0.02	0.02	0	1				
8	CreditCard	0.39	0.37	0.36	0.2	0.01	-0.01	0.01	1			
9	Securitization	0	0.01	0.01	0.06	0	0.07	0	0	1		
10	Delinquency	-0.37	-0.24	-0.23	-0.07	-0.01	-0.18	-0.01	-0.13	0.01	1	
11	Branches	0.49	0.31	0.32	0.14	-0.06	0.12	0.01	0.17	0.01	-0.08	1
	Mean	1.95	1.71	4.59	-4.62	-1.24	14.77	-0.06	0.02	0.23	0.02	2.39
	S.D.	2.14	1.38	4.01	1.11	0.44	0.53	1.67	0.03	14.36	0.05	4.86
Table 2. Descriptive Statistics												

Estimation Models

To test our hypothesis, we employed a Hausman test (Hausman 1978) for consistency and utilized a fixed effects model to obtain the estimates. To deal with potential heteroskedasticity and clustering issues in the data, we used robust standard errors. Following precedents in prior research, we test the hypothesized non-linear relationships through the following models:

$$(Model\ 1) : FirmPerformance = f(MI, HCI, Controls)$$

$$(Model\ 2) : FirmPerformance = f(MI, HCI, Range, Extent, Extent^2, Range, Range^2, Controls)$$

$$(Model\ 3) : FirmPerformance = f(MI, HCI, Range, Extent, Extent^2, Range, Range^2, Range \times MI, Extent \times HCI, Range^2 \times MI, Extent^2 \times HCI)$$

To mitigate multicollinearity between the square and interaction terms, we mean centered each variable that forms part of an interaction term and created the interaction terms by multiplying the corresponding mean-centered variables (Aiken and West 1991).

Results

VARIABLES	(Model 1)		(Model 2)		(Model 3)	
	coefficient		coefficient		coefficient	
Assets	0.207***	(0.012)	0.193***	(0.011)	0.193***	(0.011)
Spread	0.786***	(0.071)	0.736***	(0.070)	0.748***	(0.068)
Institution Type	0.129	(0.145)	0.098	(0.142)	0.097	(0.138)
CreditCard	0.905***	(0.175)	0.795***	(0.197)	0.799***	(0.196)
Securitization	0	(0.00)	0	(0.00)	0	(0.00)
Delinquency	0.538***	(0.098)	0.515***	(0.095)	0.523***	(0.095)
Branches	0.044***	(0.008)	0.042***	(0.008)	0.041***	(0.008)
REGION1	-0.052***	(0.006)	-0.044***	(0.006)	-0.044***	(0.006)
REGION2	-0.019***	(0.006)	-0.012*	(0.006)	-0.012**	(0.006)
REGION3	-0.023***	(0.005)	-0.014***	(0.005)	-0.014***	(0.005)
REGION4	-0.027***	(0.004)	-0.018***	(0.004)	-0.018***	(0.004)
Marketing Intensity (MI)	0.024***	(0.002)	0.022***	(0.002)	0.021***	(0.003)
Human Capital Intensity (HCI)	-0.171***	(0.011)	-0.191***	(0.011)	-0.208***	(0.013)
Range			0.035***	(0.005)	0.038***	(0.005)
Extent			0.013***	(0.001)	0.013***	(0.001)
Extent ²			0.001***	(0.00)	0.001***	(0.00)
Range ²			-0.001	(0.002)	-0.004**	(0.002)
Range x MI					0.013***	(0.001)
Extent x HCI					0.006**	(0.002)
Range ² x MI					0	(0.001)
Extent ² x HCI					0.001	(0.001)
Constant	-0.555***	(0.180)	-0.467***	(0.171)	-0.495***	(0.169)
Observations	241,425		222,411		222,411	
R-squared	0.479		0.609		0.199	
Robust standard errors in parentheses						
*** p<0.01, ** p<0.05, * p<0.1						
Table 3. Regression Results						

Hypothesis 1 considers the effect of Extent of Digitization on firm performance. As we show on Table 3, Models 2 and 3, both Extent ($b=0.013$, $p<0.01$) and Extent² ($b=0.001$, $p<0.01$) are positive and significant. Therefore, we find support for Hypothesis 1.

As Model 3 shows, Range ($b=0.038$, $p<0.01$) positively relates to firm performance, while Range² ($b=-0.004$, $p<0.05$) negatively affects firm performance. While the quadratic term is not significant in Model 2, it is significant in the fully specified model. Thus, Range of Digitization has an inverted U-shaped relationship with firm performance. This is consistent with Hypothesis 2.

Hypothesis 3 assesses the moderating role of Human Capital Intensity on the effects of Extent of Digitization. As shown on Model 3, the first order interaction between Extent and HCI has a positive effect on firm performance ($b=0.006$, $p<0.05$). However, their second order interaction is non-significant ($b=0.001$, $p>0.1$). Therefore, Hypothesis 3 is partially supported.

In Hypothesis 4, we consider the moderating effects of Marketing Intensity on the positive relationship between Range of Digitization and firm performance. As Model 3 shows, the first order interaction between Market Intensity and Range positively affect firm performance ($b=0.013$, $p<0.01$), which indicates that Market Intensity strengthens the positive effects of range of digitization on firm performance. Therefore, Hypothesis 4 is supported.

Conclusions

In this study, we focused on how two underlying dimensions of Service Digitization - Extent of Digitization (EoD) and Range of Digitization (RoD) - affect firm performance. We examined how organizational competencies, specifically Marketing Intensity and Human Capital Intensity, complement the effects of EoD and RoD on firm performance. We argued that EoD has an increasingly positive relationship with firm performance, while RoD has a negative quadratic effect. We further proposed that Human Capital Intensity complements the role of EoD, whereas Marketing Intensity complements the effect of RoD on firm performance. Our findings provide support for these arguments. First, we find that EoD has a J-shaped relationship with firm performance, which is positively moderated by Human Capital Intensity. Second, we find that RoD has an inverted U-shaped relationship with firm performance, which is positively moderated by Marketing Intensity.

Our results yield novel insights on how IT influences firm performance. This research makes several important contributions to the business value of IT and IT-enablement of services literature. First, we draw attention to how the tradeoff scenario between EoD and RoD affects firm performance. We move the research discourse beyond how IT enables firms to tolerate tradeoff to how IT also results in tradeoffs (Kathuria and Konsynski 2012). Second, our findings about the simultaneous performance enhancing and performance reducing influence of RoD make an important contribution to research on the effects of IT investments in service processes. Prior research in this area has found both positive and negative effects of IT investments (Khuntia et al. 2012; Ray et al. 2005). Third, we complement the research on the business value of IT by proposing and empirically demonstrating that Human Capital Intensity and Marketing Intensity complement Service Digitization by positively moderating the effects of EoD and RoD, respectively. Fourth, we conceptually and empirically untangle two underlying dimensions of Service Digitization and contribute to the literature on service systems and IT-enablement of services. Fifth, our results suggest how IT concurrently enhances and diminishes organizational agility through the effects of RoD and adds to the growing stream of work that suggests agility and rigidity as two sides of the same IT payoff coin (Andrade Rojas and Kathuria 2014; Kathuria and Konsynski 2012). Finally, this study adds to the growing list of 'intermediate' constructs (Bharadwaj 2000; Saldanha and Krishnan 2011) and points to the role of Service Digitization as an important step to create value through IT investments.

Our study has relevant managerial implications. Our findings suggest the necessity to recognize the tradeoff of Service Digitization as a transcendental strategic choice of firms. Thus the results of this study help managers and policymakers to make optimal use of limited resources by identifying appropriate strategic choices of service digitization and complementary organizational competencies to improve firm performance. With the concerns on how to allocate investments in IT, our research suggests that firms can obtain greater performance benefits with a high EoD, a medium RoD, high Human Capital Intensity and high Marketing Intensity.

Our study has limitations that may be overcome by future research. First, despite the use of panel data spread across thirty-five quarters and more than 7000 firms, and conceptually asserting causal relationships, we cannot confirm purely causal effects. Second, our use of data from a single and specific set of firms may limit the generalizability of our results. Third, our examination is limited to only two of the many potential organizational complements of Service Digitization.

Acknowledgements

We thank the mini-track chairs, and the two anonymous reviewers of AMCIS 2014 for their valuable comments and suggestions which helped improve the manuscript.

REFERENCES

- Aiken, L., and West, S. 1991. *Multiple Regression: Testing and Interpreting Interactions*. Thousand Oaks, CA: Sage Publications.
- Andrade Rojas, M.G., and Kathuria, A. 2014. "Competitive Brokerage: External Resource Endowment and Information Technology as Antecedents," *Best Paper Proceedings of the Academy of Management Annual Meeting*, Philadelphia.
- Banker, R., Bardhan, I., Chang, H., and Lin, S. 2006. "Plant Information Systems, Manufacturing Capabilities and Plant Performance," *MIS Quarterly* (30:2), pp. 315-337.
- Barua, A., Kriebel, C., and Mukhopadhyay, T. 1995. "Information Technologies and Business Value: An Analytic and Empirical Investigation," *Information Systems Research* (6:1), pp. 3-23.
- Bharadwaj, A. 2000. "A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation," *MIS Quarterly* (24:1), pp. 169-196.
- Bharadwaj, A.S., Bharadwaj, S.G., and Konsynski, B.R. 1999. "Information Technology Effects on Firm Performance as Measured by Tobin's Q," *Management Science* (45:7), pp. 1008-1024.
- Bharadwaj, S., Bharadwaj, A., and Bendoly, E. 2007. "The Performance Effects of Complementarities between Information Systems, Marketing, Manufacturing, and Supply Chain Processes," *Information Systems Research* (18:4), pp. 437-453.
- Bouquet, C., Hebert, L., and Delios, A. 2004. "Foreign Expansion in Service Industries: Separability and Human Capital Intensity," *Journal of Business Research* (57:1), pp. 35-46.
- Capron, L., and Hulland, J. 1999. "Redeployment of Brands, Sales Forces, and General Marketing Management Expertise Following Horizontal Acquisitions: A Resource-Based View," *Journal of Marketing* (63), pp. 41-54.
- Carr, N.G. 2004. *Does It Matter?: Information Technology and the Corrosion of Competitive Advantage*. Boston, MA: Harvard Business Press.
- Chi, L., Ravichandran, T., and Andrevski, G. 2010. "Information Technology, Network Structure, and Competitive Action," *Information Systems Research* (21:3), pp. 543-570.
- Dandapani, K., Karels, G.V., and Lawrence, E.R. 2008. "Internet Banking Services and Credit Union Performance," *Managerial Finance* (34:6), pp. 437-446.
- Dedrick, J., Gurbaxani, V., and Kraemer, K.L. 2003. "Information Technology and Economic Performance: A Critical Review of the Empirical Evidence," *ACM Computing Surveys (CSUR)* (35:1), pp. 1-28.
- DeYoung, R., Lang, W.W., and Nolle, D.L. 2007. "How the Internet Affects Output and Performance at Community Banks," *Journal of Banking & Finance* (31:4), pp. 1033-1060.
- Hausman, J.A. 1978. "Specification Tests in Econometrics," *Econometrica: Journal of the econometric society*, pp. 1251-1271.
- Im, G., and Rai, A. 2008. "Knowledge Sharing Ambidexterity in Long-Term Interorganizational Relationships," *Management Science* (54:7), pp. 1281-1296.
- Kane, G.C., and Alavi, M. 2007. "Information Technology and Organizational Learning: An Investigation of Exploration and Exploitation Processes," *Organization Science* (18:5), pp. 796-812.
- Kathuria, A., and Konsynski, B. 2012. "Juggling Paradoxical Strategies: The Emergent Role of IT Capabilities," *Proceedings of the Thirty Third International Conference on Information Systems (ICIS)*, Orlando, FL: Association for Information Systems.
- Khuntia, J., Mithas, S., Agarwal, R., and Roy, P.K. 2012. "Service Augmentation and Customer Satisfaction: An Analysis of Cell Phone Services in Base-of-the-Pyramid Markets," in: *Thirty Third International Conference on Information Systems*. Orlando, FL.
- Kohli, R., and Devaraj, S. 2003. "Measuring Information Technology Payoff: A Meta-Analysis of Structural Variables in Firm-Level Empirical Research," *Information Systems Research* (14:2), pp. 127-145.
- Konsynski, B., and Tiwana, A. 2004. "The Improvisation-Efficiency Paradox in Inter-Firm Electronic Networks: Governance and Architecture Considerations," *Journal of Information Technology* (19:4), pp. 234-243.
- Krasnikov, A., and Jayachandran, S. 2008. "The Relative Impact of Marketing, Research-and-Development, and Operations Capabilities on Firm Performance," *Journal of Marketing* (72), pp. 1-11.

- Lee, G., DeLone, W., and Espinosa, J. 2007. "Ambidexterity and Global Is Project Success: A Theoretical Model," *Proceedings of the 40th Annual Hawaii International Conference on System Sciences (HICSS)*, Waikoloa, Hawaii.
- Melville, N., Kraemer, K., and Gurbaxani, V. 2004. "Information Technology and Organizational Performance: An Integrative Model of It Business Value," *MIS Quarterly* (28:2), pp. 283-322.
- Mithas, S. 2005. "Effect of Information Technology Investments on Customer Satisfaction: Theory and Evidence," *Ross School of Business Working Paper Series* (971).
- Mithas, S., Almirall, D., and Krishnan, M. 2006. "Do Crm Systems Cause One-to-One Marketing Effectiveness?," *Statistical Science*, pp. 223-233.
- Rai, A., and Sambamurthy, V. 2006. "Editorial Notes-the Growth of Interest in Services Management: Opportunities for Information Systems Scholars," *Information Systems Research* (17:4), pp. 327-331.
- Ray, G., Muhanna, W.A., and Barney, J.B. 2005. "Information Technology and the Performance of the Customer Service Process: A Resource-Based Analysis," *MIS Quarterly* (29:4), pp. 625-652.
- Rothaermel, F., and Alexandre, M. 2009. "Ambidexterity in Technology Sourcing: The Moderating Role of Absorptive Capacity," *Organization Science* (20:4), pp. 759-780.
- Saldanha, T., and Krishnan, M. 2011. "Bi and Crm for Customer Involvement in Product and Service Development," *Proceedings of the Thirty Second International Conference on Information Systems (ICIS)*, Shanghai, China.
- Sambamurthy, V., and Zmud, R.W. 2000. "Research Commentary: The Organizing Logic for an Enterprise's It Activities in the Digital Era—a Prognosis of Practice and a Call for Research," *Information Systems Research* (11:2), pp. 105-114.
- Vera, D., and Crossan, M. 2004. "Strategic Leadership and Organizational Learning," *Academy of Management Review* (29:2), pp. 222-240.
- Wade, M., and Hulland, J. 2004. "Review: The Resource-Based View and Information Systems Research: Review, Extension, and Suggestions for Future Research," *MIS quarterly* (28), pp. 107-142.