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The Role of IT and Organizational Capabilities on Digital Business Value

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Abstract

The opportunities and threats that digital technologies like SMACIT (Social, Mobile, Analytics, Cloud and Internet of Things) bring to organizations are increasingly being explored by the academia and industry. Organizations face the challenge not only to use new technologies but to gain competitive advantage from such embracement in order to stay relevant in the market. This study aims to provide practical insights on how Small and Medium Enterprises (SMEs) can prepare to embrace Digital Technologies. For this, it proposes that a combination of both IT and Organizational capabilities can be the foundation for achieving Business Value with Digital Technologies or "Digital Business Value". IT capabilities are evaluated by the IT capability maturity framework (IT-CMF) and Organizational Intelligence Quotient (Mendelson and Pillai, 1999) is used to evaluate organizational capabilities. Digital Business Value is defined as the achievement of business objectives using Digital Technologies (Riera & Iijima, 2017). The target population was one hundred Japanese SMEs which were awarded by The Ministry of Economy, Trade and Industry due to their effective utilization of IT supporting business performance in the list of "Competitive IT Strategy SME Selection 100" over the years 2015, 2016 and 2017. Data collection was done with questionnaires sent to all the awarded organizations and collected 34 responses. A quantitative approach was used and the data analysis was done with correlation and regression analysis. Empirical evidence demonstrated that IT and Organizational capabilities are linked to Digital Business Value. A subset of IT capabilities like Risk Management, Business Planning among others was indeed related to Digital Business Value. In addition, Internal Knowledge Dissemination and Continuous Innovation dimensions from Organizational IQ showed relationship with Digital Business Value. This study unveiled that the combination of IT and Organizational capabilities leverage the value from Digital technologies. The outcomes from this study may be of reference to SMEs that look to embrace Digital Technologies as it shows which particular capabilities may be of interest for developing. This study extends the Digital Transformation literature in particular how dynamic capabilities work together in order to enable Digital Business Value.

Keywords: Digital Business Value, IT Capabilities, SME IT-CMF, Organization IQ, Dynamic Capabilities

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Introduction

Together with the availability of Digital Technologies like SMACIT (Sebastian et al., 2017) organizations have opportunities to reinvent the way they engage with customers and suppliers, create and deliver new services and products to stay competitive. A study produced by Microsoft in partnership with IDC Asia/Pacific (Microsoft Asia News Center, 2018) based on 1,560 respondents from 15 Asia Pacific markets reported the actual potential of Digital transformation. For example manufacturing industry in the region could add an extra US$387 billion to Asia/Pacific's GDP by 2021 and grow by extra 1.0% annually. A similar scenario was identified for the Financial sector (FSI) where an extra US$292 billion could be added if all FSI organizations in the region embrace digital transformation, representing an annual growth of 1.5%. This new force demands that organizations redesign themselves in order to take advantage of digital technologies (Ross et al., 2016a; Ross et al., 2016b). Research suggests that the keys for defining and implementing digital strategies are: an effective digital strategy between customer engagement and digitized solutions, an operational backbone enabling operational excellence, a digital services backbone supporting rapid innovation and responsiveness to new market opportunities and a continuous organizational redesign (Ross et al., 2016b). Digital Technologies are not anymore a luxury option that only large corporations afford but nowadays are available for any size of organizations. Although Small and Medium Enterprises (SME) have limited resources and limited specialization skills compared with larger organizations, SMEs have some advantages. For example, their simpler level of hierarchy allows them for greater agility and quicker decision making (Carcary et al., 2014).

Such specific characteristics of SME combined with their economic relevance for the market made Japanese SMEs become the focus of this study. In Japan it is reported by the Ministry of Economy, Trade and Industry that SMEs account for 99.7% of all enterprises in the Japanese economy (SME Agency, 2016).

This study aims to gain a deeper understanding on how such organizations can effectively use digital technologies and it is aligned with the research agenda on Information Systems (IS) in general but most importantly with the development in the Asia Pacific region. It can be observed on the IS articles published on the PAJAIS community and PACIS conferences. In case of PAJAIS, the attention is evident starting with special issues dedicated to Digital Society and E-Technologies (Issa et al., 2013), Social Media and Social Commerce (Ye et al., 2016) which focused on the adoption or use case of specific technologies first. With a recent focus at the characteristics needed in the organizations in order to support Digital Transformation such as Digital leadership (Tanniru et al., 2018). Similar attention is also observed in the papers presented at PACIS conferences over the recent years. With studies focusing on describing the journey to digitalization that brick and mortal organizations or traditional industries are following (Tim et al., 2018; Törmer, 2018), as well as specific studies on the challenges for adoption of a particular technology like cloud or mobile (Budiono et al., 2018; Rana et al., 2018). Studies have also targeted how IT capabilities such as IT infrastructure, IT managerial skills and IT technical skills can support the delivery of new technologies (Zhu et al., 2018) as well as how IT exploration and exploitation (named IT Ambidexterity) have an impact on the digital innovation capability of the organizations (Tai et al., 2017).

This study leverages the experiences from the existing literature that found organizational capabilities as the enablers or moderators of the benefits that organizations achieve from technology or IT investments (Weill & Aral, 2007). It considers that the organizations' capabilities -such as Organizational Intelligence Quotient (OIQ) and the IT Maturity (IT-CMF)- can become the foundation for achieving value from Digital

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Technologies. The complementarity between the capabilities is emphasized in order to acknowledge that IT capabilities used for the design and delivery of Digital solutions are actually embedded into an organization and its context.

Organizational Intelligence Quotient (OIQ) was selected to provide this context as it is a measure of how organizations assimilate, manage and use information in order to make effective decisions (Mendelson, 2000). OIQ has been tested and associated positively with organizations' financial and market performance (Mendelson & Pillai, 1999; Mendelson, 2000), positively associated together with IT investment to Labour Productivity (Riera & Iijima, 2007); and recently also used in an effort to understand its relationship with IT investment with the purpose of getting insights of organizational design in a digitized world (Hirano & Goodman, 2016).

IT capabilities in the IT Capability Maturity Framework "IT-CMF" (Curley et al., 2016) were selected as IT-CMF presents a meta-model for managing IT in organizations and its development followed Design Science Research principles (Donnellan & Helfert, 2010; Carcary, 2011). From the 36 IT capabilities that the full IT-CMF describes, this study uses the 10 IT capabilities relevant for SME described on the SME IT Capability Maturity Framework "SME IT-CMF" (Doherty et al., 2015). There is also a current attempt linking the original IT-CMF with some of the keys for defining and implementing digital strategies. Such is part of the Innovation Value Institute (IVI)'s Digital Readiness Assessment (IVI, 2018). The 10 SME IT capabilities were also included in the plan-make-sell-operate framework of IVI.

Digital Business Value was defined as the level of achievement of business objectives using Digital Technologies (Riera & Iijima, 2017). This study explored the relationship that Organizational capabilities (OIQ) and IT Capability Maturity (SME IT-CMF) have with Digital Business Value. The model was tested on Japanese SMEs with the below findings.

- SMEs with Medium or Higher organizational capabilities (OIQ) obtained higher levels of Business Value than SMEs with lower organizational capabilities (OIQ).
- As the level of IT capabilities (SME IT-CMF) increased, SMEs were able to achieve higher levels of Business Value.
- The combined effect of both Organizational (OIQ) and IT capabilities (SME IT-CMF) yielded higher levels of Business Value.

The relationships were further tested at a detail level aiming to identify which components contributed more to the generation of Business Value using Digital Technologies (i.e. OIQ's 5 dimensions and SME IT-CMF's 10 capabilities).

The findings verified how IT capabilities together with Organizational capabilities can enable digital business value.

Literature Review and Hypothesis Development

Considering that Digital Technologies are an application of technology, this section describes first how research on the contribution of technology (IT) to organizations evolved. Then the key concepts used by the present study: Digital Business Value, IT Capability (IT-SME CMF) and Organizational IQ are elaborated together with the associated hypothesis.

From IT Productivity Paradox to Digital Investment Paradox

The term "Productivity Paradox" emerged in the late 1980s as large investments in information technology apparently failed to produce significant increases in productivity (Brynjolfsson & Hitt, 1998). In the 1990s studies brought inconclusive results. While some researchers identified a positive effect of IT on firm performance (Hitt & Brynjolfsson, 1996), others found a negative effect of IT spending on the cost

effectiveness of the organizations (Mitra & Chaya, 1996).

The research evolved from the view that considered IT spending as an independent asset towards the view in which the combination of IT with organizational capabilities moderated the results that organizations obtained from IT. For example specific organization characteristics such as market position, rigidities in cost structures, brand recognition, the vision and leadership abilities of key executives, specific features of organizational structure, strategy, and organizational and management practices (Bresnahan et al., 2002; Motohashi, 2006; Riera, 2007).

Such research helped to understand why returns from IT were not similar to all organizations. The academia was able to address the questions on how IT investment might combine with the business processes being touched by IT (Sandulli et al., 2007) as well as organizational factors or capabilities affecting the organization performance (Bresnahan et al., 2002; Riera & Iijima, 2007; Weill & Aral, 2007; Riera & Iijima, 2017; Riera & Iijima, 2019).

Over the last decade with the increasing availability of Digital Technologies, the research agenda has looked onto the new challenges and opportunities that Digital Technologies offer, how to create competitive advantage from digital technologies and which capabilities are needed to reinvent the organizations to navigate the digital threat and opportunity (Weill & Woerner, 2018).

As the businesses are becoming digital, with increasing interconnections among products, processes and services; digital technologies can fundamentally transform business strategies, business processes, products and services, and the relationships in partners. This has opened new business opportunities that challenge existing organizations (Bharadwaj et al., 2013, Ross et al., 2016a; Ross et al., 2016b; Stockhinger & Teubner, 2018). Within this context, there has been a shift on the role of IT not to only be aligned with the business strategy but instead to be a fusion between business strategy and IT strategy as referred as “Digital Business Strategy” (Bharadwaj et al., 2013). The relevance of digital technologies to the organizations can be observed on the different notions or concepts in which the digital strategy is being explored on the IS literature: “Digital business strategy” addressing the concern of “How can digital technologies leverage differential value and build competitive advantage?”, “Digital IT/IS strategy” focusing on the concern of “What is the potential of digital technologies? Which capabilities are required to exploit their potential? How can these technologies be implemented in competitive IS?” and “Digital transformation strategy” concerning on “How to plan, govern, and implement digital transformation?”(Stockhinger & Teubner, 2018).

Such shift from IT to a Digital portfolio taken by the academia can be observed for example on how the IT investment definition used by the Center for Information Systems Research at MIT (MIT Sloan CISR) changed on 2015. CISR has been executing surveys on IT investment data from 1993, until 2015 the IT investment was conceptualized as “Total IT spending in the enterprise -operating expenses plus capital depreciation- including all IT, technology, services, data, outsourcing, and people dedicated to IT”. On 2015 the definition expanded to digital investment as “all digital spending in the enterprise -operating expenses plus capital depreciation- including all IT, technology, services, digitized information, outsourcing, and people dedicated to IT” (Weill & Woerner, 2016).

With all the attention and effort that is being directed to digital initiatives, it is reasonable to think that sooner rather than later the actual effect on organizational performance may be of similar scrutiny as the investment in IT was put under the IT Productivity paradox, raising to what has been termed as “Digital Investment Paradox” (Riera & Iijima, 2018). Such scrutiny is recently being tested for

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example linking the organization's Digital orientation positively with firm performance indicators such as profitability and market value (Beutel, 2018). Other studies have focused on unveiling the link of organizational capabilities -such as knowledge creation- with organizational performance -measured as the level of business objective achievement named Digital Business Value- (Riera & Iijima, 2017).

Table 1 lists recent studies related to Digital technologies, organizational capabilities and firm performance.

Table 1 - Recent studies exploring Digital Technologies

Studies	Focus and *Findings*
Digital Technologies (e.g. adoption)	
Budiono et al. (2018)	Cloud computing adoption *Contributing factors affecting cloud computing adoption*
Rana et al., (2018)	Adoption of Digital Financial Services *Identify challenges for Digital financial services adoption and establish relationships.*
Tim et al. (2018)	Journey to digitalization (traditional industry) *<Research-in-progress>*
Törmer (2018)	Journey to digitalization (brick-and-mortal company) *<Research-in-progress>*
Zhu et al. (2018)	IT capabilities supporting delivery of big data services
Digital Technologies & Organization Capabilities	
Bharadwaj et al. (2013)	Digital Business Strategy conceptualization *(Model proposition)*
Ross et al. (2015)	Business Strategy / Organizational Design for Digital Innovation *Digital strategy: decision between customer engagement and digitized solutions*
Ross et al. (2016a, 2016b)	Business Strategy / Organizational Design for Digital Innovation *Three elements for successfully leverage opportunities from digital technologies*
Rossmann (2018).	Digital Maturity and capabilities *(Model proposition)*
Stockhinger & Teubner (2018)	Digital Strategy conceptualization *(Content / IS literature analysis)*
Tai et al. (2017)	Digital Innovation capabilities *IT exploration and exploitation impact on the innovation capability* *Research-in-progress*
Tanniru et al. (2018)	Digital leadership *Three leadership styles and four foundational platforms to support business transformations*
Digital Technologies, Organizational Capabilities & firm performance	
Beutel (2018)	Digital strategy (digital orientation) and firm performance. *Positive relationship.*
Riera & Iijima (2017)	Organizational capabilities and firm performance. *Positive relationship (specific organizational objectives).*
Riera & Iijima (2018)	Organizational capabilities and firm performance. *Positive relationship (specific organizational objectives).*
Weill & Woerner, (2013)	Digital business models: capabilities linked to firm performance. *Positive relationship.*
Weill & Woerner, (2016)	Infrastructure capabilities and their management. *Positive relationship.*

Digital Business Value

Digital Business Value refers to the level of achievement of business objectives using digital technologies (Riera & Iijima, 2017). The concept uses the categorization given by the Balanced Scorecard (Kaplan & Norton, 1996) in order to generalize the business objectives. Four categories of business objectives are used: Financial objectives (expanding revenue, improving productivity, improving the financial structure, etc.), Customer-related objectives (improving customer satisfaction, improving customer loyalty, increasing sales to new customers, etc.), Business Process objectives (quality improvement, productivity improvement, etc.) and Learning and growth objectives (securing human resources, human resources education, creativity, development capability, etc.).

This definition of Digital Business Value was designed to address a pitfall revealed by the IT Productivity Paradox. In the past decades, studies have referred to a particular set of organization performance indicators (usually financial) and did not acknowledge the individuality of the organizations when selecting the objectives they pursue with IT or digital initiatives (Riera & Iijima, 2017). The definition of Digital Business Value provided a business-oriented perspective while proposing a concrete way to measure the contribution of digital technologies to towards organizational goals.

IT Capability Maturity (IT-CMF) and Organizational Intelligence Quotient (OIQ) as Organizational Capabilities

Starting with the resource-based view and later on with dynamic capabilities, a fair amount of research has been done aiming to explain how organizations develop and maintain competitive advantage.

The resource-based view sees organizations as a collection of physical, human and organizational resources and considers that when resources possess certain characteristics -valuable, rare, imperfectly imitable and imperfectly substitutable-, those could become the source of sustainable competitive advantage (Barney, 1991). It differentiates between resources and organizational capabilities. Resources are converted into products or services, while capabilities are the organizations' capacity to deploy resources to achieve a desired end (Amit & Schoemaker, 1993). An organization capability refers to an organization's ability to "perform a set of coordinated tasks, utilizing organizational resources, for the purposes of achieving a particular end result" (Helfat & Peteraf, 2003).

Dynamic Capabilities emerged to acknowledge that due to the dynamic nature of the market, organizations' resources needed to change over a period of time to make them relevant (Teece et al., 1997). Dynamic capabilities become the foundation on which managers decide how to develop, acquire and combine such resources in order to generate value-creating strategies (Grant, 1996). Dynamic capabilities can be considered as the "organizational and strategic routines by which firms achieve new resource configurations as markets emerge, collide, split, evolve, and die" (Eisenhardt & Martin, 2000).

Strategic decision making for example is a dynamic capability in which managers pool their various business, functional, and personal expertise to make the choices that shape the major strategic moves for their organizations (Eisenhardt & Martin, 2000).

In alignment with this, two organizational capabilities were tested in this study. The first organizational capability relates to the maturity of the IT capability in the organizations; as measured by the IT Capability Maturity Framework "IT-CMF" from the Innovation Value Institute (Curley et al., 2016). IT capability is defined as the "organization's ability to mobilize and deploy IT-based resources to effect a desired end, often in combination with other resources and capabilities" (Curley et al., 2016). The second organizational capability focuses on the ability to assimilate, manage and use information in order to make effective decisions; as

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measured by the Organizational Intelligence Quotient (OIQ) (Mendelson, 2000).

IT Capability Maturity Framework (IT-CMF)

IT capability maturity is measured by the IT Capability Maturity Framework (IT-CMF). It allows organizations to identify and develop the IT capabilities in the organization to deliver agility, innovation and value for the organization (Curley et al., 2016).

The IT-CMF leverages the concept of dynamic capabilities providing a mechanism for not only developing capability but enabling reconfiguration to dynamically adapt to changing circumstances and strategy (Curley, 2008). It is considered a meta-model and acts as the unifying or umbrella framework that complements domain-specific frameworks such as ITIL, PMP, COBIT, etc.

The IT-CMF has its origins in 2000 when Intel Corporation started an initiative to transform its IT function and realized that there was no comprehensive, integrated, CIO-level framework available. Intel approached it by developing a maturity framework approach. Such approach was further developed with additional research and feedback from users from several industries in order to make the framework applicable across industries (Curley et al., 2016).

The architecture of the framework covers on a higher layer four strategic areas (called macro-capabilities): managing IT like a business, managing the IT budget, managing the IT capability, and managing IT for business value. Each the four macro-capabilities embraces a number of critical processes (called critical capabilities) central to the IT organization. Such capabilities are said that can contribute to agility, innovation and value (Donnellan & Helfert, 2010; Curley et al., 2016).

The Innovation Value Institute acknowledged that SMEs are different to large organizations and may not be examined under the same lens and developed the SME IT-Capability Maturity Framework "SME IT-CMF" (Doherty et al., 2013; Carcary & McLaughlin, 2014). The SME IT-CMF focuses on 10 IT critical capabilities which were identified applying a mixed-methods approach through direct engagement with SME organizations. Such 10 critical capabilities reflect the top IT-related challenges/priorities faced by SMEs (Doherty et al., 2013; Carcary & McLaughlin, 2014; Doherty et al., 2015).

The IT capabilities included in the SME IT-CMF are listed in Table 2.

Table 2 - IT critical capabilities part of SME IT Capability Maturity

Risk Management (RM)	The ability to assess, prioritize, handle, and monitor the exposure to and the potential impact of IT-related risks that can directly impact the business in a financial or reputational manner.
Business Planning (BP)	The ability to produce an approved document that provides implementable detail for the IT strategy, setting out the IT function's tactical objectives, the operational services to be provided, and the financial and other resources and constraints that apply in the coming planning period.
Solutions Delivery (SD)	The ability to design, develop, validate, and deploy IT solutions that effectively address the organization's business requirements and opportunities.
Strategic Planning (SP)	The ability to formulate a long-term vision and translate it into an actionable strategic plan for the IT function.
Relationship Asset Mgmt (RAM).	The ability to analyse, plan, maintain, and enhance relationships between the IT function and the rest of the business. Currently named Relationship Management "REM" in the second edition of IT-CMF Body of knowledge.
Business Process Mgmt. (BPM)	The ability to identify, design, document, monitor, optimize, and assist in the execution of both existing and new organizational processes.

Funding and Financial (FF)	The ability to determine the funding level required for IT and to allocate it appropriately.
Sourcing (SRC)	The ability to evaluate, select, and integrate IT service providers according to a defined strategy and sourcing model, which could include service providers both inside and outside the organization.
Service Provisioning (SRP)	The ability to manage the life cycle of IT services to satisfy business requirements. This includes ongoing activities relating to operation, maintenance, and continual service improvement, and also transitional activities relating to the design and introduction of services, their deployment, and their eventual decommissioning.
User Experience Design (UED)	The ability to proactively consider the needs of users at all stages in the life cycle of IT services and solutions.
Source: Curley, M., Kenneally, J., & Carcary. M. (2016). IT Capability Maturity Framework (IT-CMF) - The Body of Knowledge Guide - Second Edition. Van Haren Publishing: Zaltbommel/Netherlands.	

Although the IT-CMF at its core acknowledges that IT capability is the organization's ability to mobilize and deploy IT-based resources to effect a desired end (Curley et al., 2016), there is no measurement proposed that links the IT capability maturity (IT-CMF) with the achievement of organizations' objectives. This study investigates if such linkage exists specifically with the value that Digital Technologies can contribute to organizations. Hypothesis 1 is proposed as follows.

- H1: IT Capability (SME IT-CMF) is positively related with the achievement of Digital Business Value.

H1 addresses the lack of measurements of the impact of IT Capability Maturity (SME IT-CMF) on the achievement of business objectives.

Organizational IQ (OIQ)

Organizational IQ (OIQ) has its root in the mid 1990s and was proposed by Stanford Business School professor Haim Mendelson and consultant Johannes Ziegler (Mendelson & Ziegler 1999). The empirical data that they collected showed that companies with higher Organizational IQ showed higher growth, performance and productivity than their peers with lower Organizational IQ (Mendelson & Pillai, 1999). OIQ is a quantitative measure of an organization's effectiveness in information distribution, decision making, and execution (Synesis 2001). OIQ can be considered closely associated with human IQ but viewing the organization as an organism that grows and adapts to environment changes (Mendelson & Pillai, 1999). However, a key difference is that an organization's intelligence (OIQ) can be improved with focused effort (Hansen, 2003).

The core OIQ principles (called dimensions) are included in Table 3.

Table 3 – Organizational IQ Dimensions	
External Information Awareness (EIA)	Degree to which a company or business unit has developed a deep and consistent understanding of its environment; including information about customers, suppliers, technology and competitors.
Internal Knowledge Dissemination (IKD)	Ensures that each part of the organization knows what it needs to know when it needs to know. It includes metrics across 3 axes: horizontal (cross-functional), vertical (hierarchy) and time (internal feedback, reviews and external benchmarking of key processes).
Effective Decision Architecture (EDA)	Ensures that decisions are made at the right level, by people with the best knowledge. EDA frees key-decision makers from the burden of tactical decisions and makes them available to take critical and strategic decisions.

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Organizational Focus (OF)	Refers to the need to work against information overload and organization complexity, as well as aligning organizations along their strategy. It includes development of a focused strategy, its communication, and the alignment of incentives with strategic goals.
Continuous Innovation (CI)	Refers to the need of reinventing products and services, as well as processes (i.e., entrepreneurial environment and promoting creativity).
Source: Synesis (2001).	

Although it has been a while since OIQ was first introduced and linked with specific financial performance measures (profitability and growth); a key characteristic of OIQ has kept the concept relevant in the academia over the years: the more dynamic the business environment of a company, the greater the importance of a high OIQ is for organizations (Mendelson & Pillai, 1999; Hansen, 2003).

The verification of the impact of OIQ on firm performance has continued over the years (Suzuki & Mori, 2005; Riera & Iijima, 2007). In addition, OIQ has been used as a framework to conceptualize and prioritize management measures to improve an organization's knowledge and information processing and, to gain insights on the differences of the managerial practices between Japan and US organizations (Hirano et al., 2006). The most recent study on OIQ was published in 2016 and investigated the relationship of IT investment/spending and OIQ in order to "understand and envision the future of organizational design in a digitized world" (Hirano & Goodman, 2016).

The existing literature positions OIQ first as an organizational capability which is directly associated with organizational performance (based on particular financial measures) and second, an organizational capability influences how the organization utilizes its resources (e.g. IT spending/investment).

This study expands the literature and tests OIQ impact on the organization performance not only against a specific financial performance measure but includes together with financial objectives, the other 3 categories of business objectives (customer-related, business process improvement and learning & growth objectives). Hypothesis 2 is defined as follows.

- H2: Organizational Capabilities (OIQ) are positively related with the achievement of Digital Business Value.

H2 suggests that the more dynamic the business environment is, the greater the importance of a high Organizational IQ. H2 tests the impact of Organizational IQ on the achievement of business objectives with digital technologies.

Hypothesis 3 evaluates the effect of OIQ on the relationship between IT capability Maturity and Digital Business Value as follows.

- H3: Organizational Capabilities (OIQ) leverage the effect of IT Capabilities (SME IT-CMF) on the achievement of Digital Business Value.

H3 proposes to take a look at the combined effect of both organizational and IT capabilities (Organizational IQ and IT Capability Maturity) when considering the opportunities new technologies offer. This exploration is needed due to the boundaries of the IT Capability Maturity Framework. IT-CMF can ensure that the IT function or IT objectives are in close alignment with the overall organizational objectives (business objectives), however it may not be able to influence the strategic business decisions themselves. Organizational IQ instead, as it is a metric of how organizations assimilate and manage information and use it to make effective decisions; can actually shape such business decisions which become fundamental when considering how to transform the organization and make the best use of the new digital technologies.

The research framework is presented in Figure 1 and explores whether IT capabilities (SME IT-CMF) and Organizational capabilities (OIQ) are enablers for Digital Business Value.

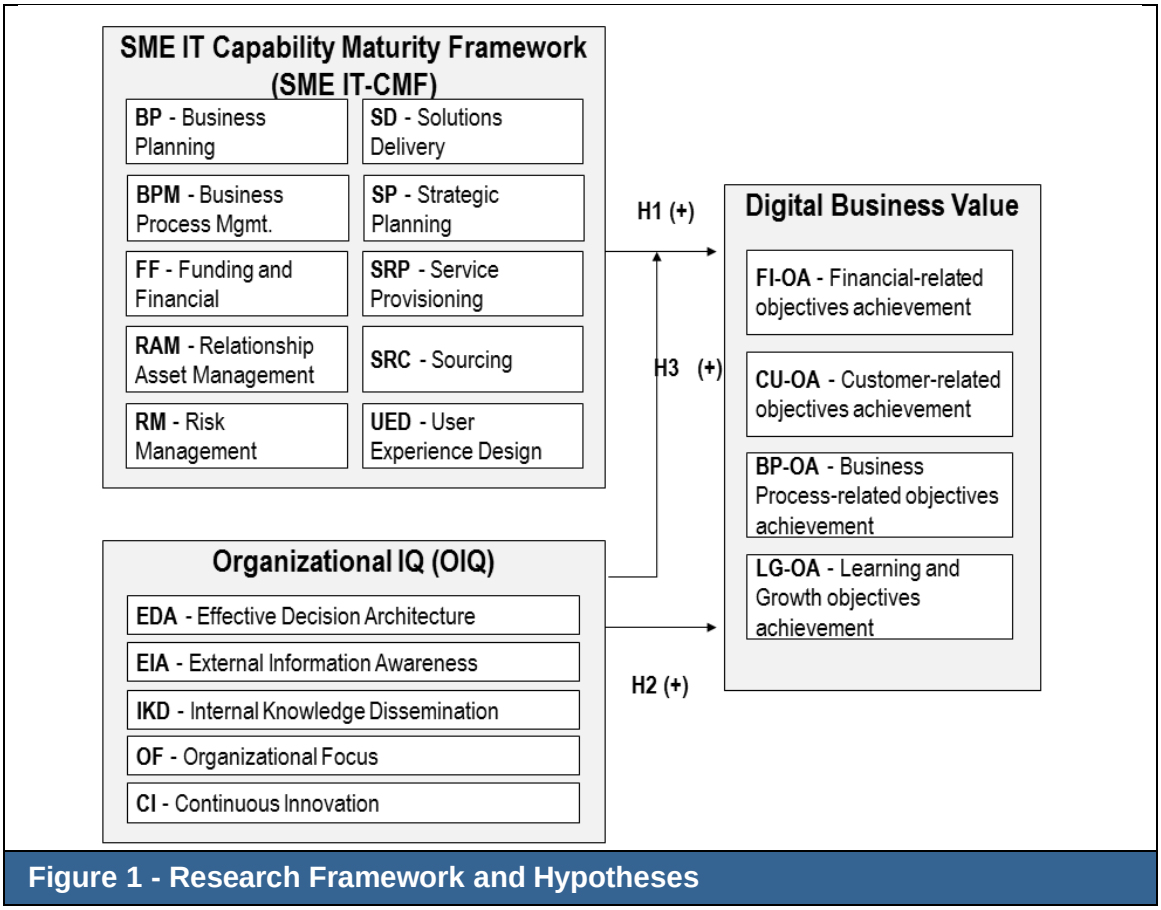

Figure 1 - Research Framework and Hypotheses

The framework is built on dynamic capabilities and recognizes that the effect of Digital technologies can be impacted or leveraged by the organizational capabilities surrounding them. It also aims to identify which IT capabilities organizations should be more aware to be successful in the Digital Age. IT maturity level measured by IT-CMF can be the operational backbone that enables operational excellence. On the other hand, Organizational IQ can be the base for organizations to define which digital strategies to pursue as it is a measure of an organization's effectiveness in information distribution, decision making, and execution.

Measurements and Methodology

An empirical approach was used to evaluate the research model in alignment with previous studies that explored the relationship between IT and organizations performance (Weill & Aral, 2007; Riera & Iijima, 2007). In order to collect the empirical data, a questionnaire to evaluate SME IT-CMF capabilities, Organizational IQ, and Digital Business Value per organization was used.

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Measuring SME IT-CMF

The assessment of the maturity of IT capabilities was done with the SME IT-CMF framework.

The framework itself offers two types of capability assessments: 1) an "Executive" Assessment which is at a higher level or the organizations and provides the current IT maturity across all ten capabilities; and 2) "Critical Capability Deep Dive" Assessments. The deep dive assessments provide a detailed status of a particular IT capability (Carcary & McLaughlin, 2014). The standard methodology proposed by the Innovation Value Institute when executing an Executive Assessment of the IT-CMF capabilities in an organization was applied. This is done with a questionnaire inquiring the current maturity level of IT capabilities. While the whole IT-CMF consists of 36 IT Capabilities; 10 IT Capabilities relevant for SME organizations were selected as part of the SME IT-CMF provided by IVI (Doherty et al., 2015). The questionnaire of IT-CMF for the 36 IT capabilities was developed by the Innovation Value Institute (https://ivi.ie/it-effectiveness/) as part of their standard offering. The questions selected for this study are the ones relevant to the 10 IT capabilities included on the SME IT-CMF. The maturity of the 10 IT capabilities was measured in total with 20 statements which described a desired maturity. Organizations answered based on a Likert-scale: Disagree, Partially Agree, Strongly Agree, and Fully Agree. The score for a particular IT critical capability was the average of the score from the questions associated with it. The total maturity was calculated as the average of the 10 capabilities for each organization.

Sample maturity statements are included in Table 4.

Measuring Organizational IQ

The questionnaire included 78 items covering the five dimensions of Organizational IQ: Effective Decision Architecture (EDA), External Information Awareness (EIA), Internal Knowledge Dissemination (IKD), Organizational Focus (OF) and Continuous Innovation (CI). Approximately half of the questions used a "yes / no / don't know" style; the majority of the other half were multiple-selection type questions. The questions relevant to OIQ from the survey were developed and validated by previous studies (Riera & Iijima, 2007; Riera 2007). These studies built on the available OIQ literature such as the 22 variables proposed by the mentors of OIQ (Mendelson & Pillai, 1999); 26 variables measured by Japanese researchers (Suzuki & Mori, 2005) and additional studies done in Japan (Hirano, 2005; Hirano et al., 2006; Stoffels et al., 2006). Below are the verifications that were reported for the survey used in the present study (Riera, 2007):

- Content validity was done based on a wide literature review and discussions with academic advisors and researchers.
- Construct validity was tested using confirmatory factor analysis.
- All the items of the questionnaire could be grouped under a certain topic within each OIQ dimension, for example:
  - EDA: Agile decision making, Decentralization Authority
  - EIA: Client awareness, Competitor and Industry awareness, Environment Awareness, Market and Technology awareness
  - IKD: Knowledge Integration, Cross-functional teams, Knowledge Reutilization, Knowledge Transparency
  - OF: Strategy Focus
  - CI: Entrepreneurial Spirit, Knowledge Creation, Learning from Clients, Learning from Industries.

Sample questions are included in Table 4.

Each of the five OIQ dimensions is measured on an ordinal scale of a 5-point scale and is calculated based on the

average score of its factors. The aggregated score of the 5 dimensions becomes the total OIQ score of each organization.

Table 4 - Questionnaire sample items

SME IT-CMF sample items	
- Processes that are used to run the organization are managed using common standards, methods, governance models and technologies.	
- IT funding levels and sources of funding are flexible, aligned with IT and business strategies.	
- IT solutions are specified, designed, and implemented in a consistent manner.	
- Business and IT alignment is validated, ensuring that IT strategy is aligned with business priorities.	
Organizational IQ (OIQ) sample questions	
EDA	Period and decision maker until a new price is determined when necessary after the main raw-material cost changes or the competitors' price changes. - Period: <1week, 1 week-1 month, 1-3 months, 3-6 months, >6months - Decision maker: a. President, b. Director / Executive / Department Head / Factory Manager, c. Division or Line Head, d. Section or Subsection Head, e. Regular Employee
EIA	Call center or client service divisions are used not only for customer service but also to obtain information about customer needs (yes, no, don't know).
IKD	The corporate culture encourages the creation of new ideas and theories (yes, no, don't know).
OF	Please order the following strategies by importance for your company a. Narrowing the business and product and service, b. Differentiation of product and service, c. Cost Reduction, d. All have the same importance
CI	The corporate culture encourages taking risks and challenges.
EDA = Effective Decision Architecture; EIA = External Information Awareness; IKD = Internal Knowledge Dissemination; OF = Organizational Focus; CI = Continuous Innovation	

Measuring Digital Business Value

Digital Business Value was measured by the level of achievement that the organization had using Digital Technologies over the past three years on four types of business objectives. The four types of business objectives referred to the Balanced Scorecard (Kaplan & Norton, 1996): Financial (expanding revenue, improving productivity, improving the financial structure, etc.), Customer-related (improving customer satisfaction, improving customer loyalty, increasing sales to new customers, etc.), Business Process (quality improvement, productivity improvement, etc.) and Learning and growth (securing human resources, human resources education, creativity, development capability, etc.). The achievement scale used was: "Not Achieved", "Partially Achieved", "Highly Achieved" and "Fully Achieved". In order to align the responses from the organizations, the survey asked first to identify the percentage of investment in digital technologies (Social, Mobile, Analytics and Big Data, Cloud, IoT, AI, 3D printing and others) for each of the four types of business objectives: financial, customer-related, business process and learning & growth and then assess what was their achievement level. The questionnaire on Digital Business Value is included in Table 5.

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Table 5 - Questionnaire to capture Digital Business Value

Business Objective	Sample	Percentage of IT Investment per business objective from the past 3 years	From that investment, in a scale of 0-10 how much was used on Digital Tech.	Objective Achievement from the IT Investment	Objective Achievement from Digital Technologies	Digital Technologies
Financial	expanding revenue, improving productivity, improving the financial structure, etc.	%		[ ] Not Achieved [ ] Partially Achieved [ ] Highly Achieved [ ] Fully Achieved	[ ] Not Achieved [ ] Partially Achieved [ ] Highly Achieved [ ] Fully Achieved	[ ] Social [ ] Mobile [ ] Analytics & Big Data [ ] Cloud [ ] IoT [ ] AI [ ] 3D printing [ ] others
Customer	improving customer satisfaction, improving customer loyalty, increasing sales to new customers, etc.	%		[ ] Not Achieved [ ] Partially Achieved [ ] Highly Achieved [ ] Fully Achieved	[ ] Not Achieved [ ] Partially Achieved [ ] Highly Achieved [ ] Fully Achieved	[ ] Social [ ] Mobile [ ] Analytics & Big Data [ ] Cloud [ ] IoT [ ] AI [ ] 3D printing [ ] others
Business Process	quality improvement, productivity improvement, etc.	%		[ ] Not Achieved [ ] Partially Achieved [ ] Highly Achieved [ ] Fully Achieved	[ ] Not Achieved [ ] Partially Achieved [ ] Highly Achieved [ ] Fully Achieved	[ ] Social [ ] Mobile [ ] Analytics & Big Data [ ] Cloud [ ] IoT [ ] AI [ ] 3D printing [ ] others
Learning &Growth	securing human resources, human resources education, creativity, development capability, etc.	%		[ ] Not Achieved [ ] Partially Achieved [ ] Highly Achieved [ ] Fully Achieved	[ ] Not Achieved [ ] Partially Achieved [ ] Highly Achieved [ ] Fully Achieved	[ ] Social [ ] Mobile [ ] Analytics & Big Data [ ] Cloud [ ] IoT [ ] AI [ ] 3D printing [ ] others

Dataset and Data Collection

100 Japanese SMEs awarded by the Japanese Ministry of Economy, Trade and Industry on the list of "Competitive IT Strategy SME Selection 100" from 2015, 2016 and 2017 (METI, 2017) were selected for the research due to their characteristic of pro ven effective utilization of IT to support business performance. A similar data set was previously used in other studies (Hirano, 2005; Riera & Iijima, 2007; Riera & Iijima, 2017).

A total of 34 organizations answered the survey (response ratio: 34%) and their industry composition is as follows: 32% Manufacturing, 18% Service, 12% Printing, 12% Wholesale, 9% Construction, and 3% for: Information and Communication, Transportation, Gravel sampling, Food & Beverage, Dental technology and other industries. Non-Response bias was tested with Kruskal-Wallis Test and no differences were found between the organizations that answered the survey versus the organizations that did not answer. The non-parametric tests were done for organization's capital, size (number of employees) and years of operations.

Analysis and Findings

This study uses statistical analysis in order to verify the relationships proposed by the research framework. The key variables in the data set were verified as normal thus parametric tests are executed. The analysis starts with Pearson correlations to identify relationships. The organizations were classified into groups based on their level of IT capability maturity (low, medium and high). Analysis of Variance (ANOVA) and Post Tukey HSD tests were done in order to identify if the difference of the means between the groups was also statistically significant. Linear Regression analysis was done to identify the IT Capabilities and OIQ dimensions that could explain the level of achievement of Digital Business Value. Finally, General Linear Model was used to explore the effect of both IT and Organizational capabilities on Digital Business Value.

Hypothesis 1: IT Capability (SME IT-CMF) is positively related with Digital Business Value

The tests for Hypothesis 1 identified a moderate ($r = 0.569$, $n = 28$, $p = 0.002$) relationship between the level of IT Capability Maturity on the organizations and the level of achieved Digital Business Value. The differences according to IT Capability Maturity are presented below followed by analysis at each of the 10 IT Capabilities.

Differences in Digital Business Value according to the level of IT Capability Maturity

The overall result was also verified by ANOVA and Post Tukey HSD tests where SMEs with High IT Maturity demonstrated higher Digital Business Value achievement (achievement of business objectives by the use of Digital Technologies) than their peers with low IT Maturity scores [$F(2,24) = 6.01$, $p = 0.008$]. The difference between the groups is presented in Figure 2.

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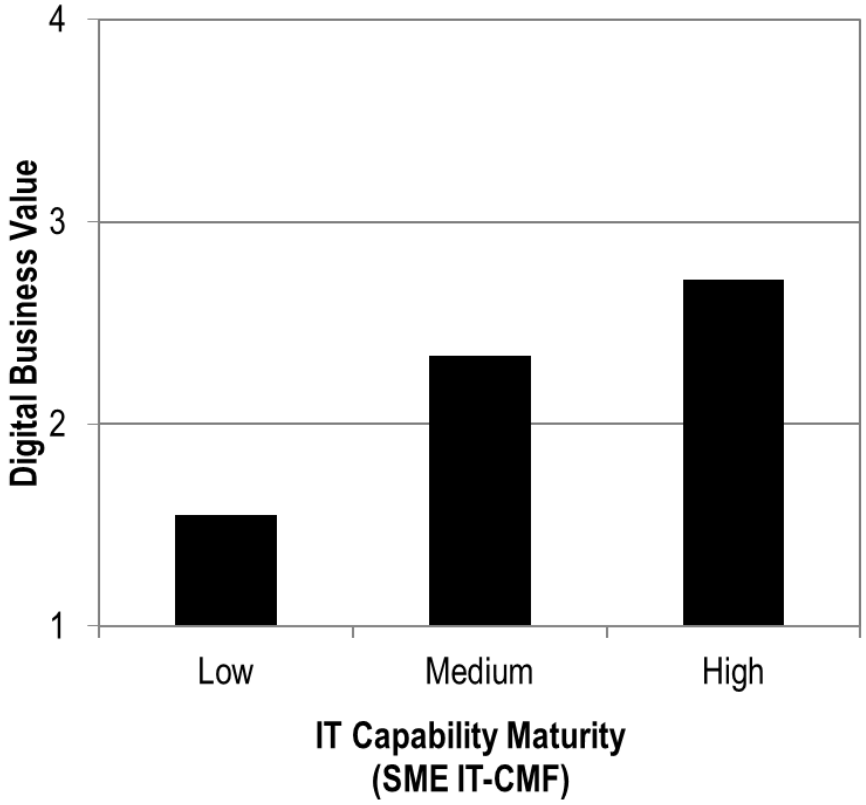


Note: Y-Axis represents the level of achievement of business objectives by Digital Technologies with scale: Not Achieved (1), Partially Achieved (2), Highly Achieved (3) and Fully Achieved (4).

Figure 2 - IT Capability and Digital Business Value Achievement

Figure 2 shows that SMEs with Low IT Maturity were between the "Not Achieved (1)" and "Partially Achieved (2)" range while the organizations with High IT Maturity were between the "Partially Achieved (2)" and "Highly Achieved (3)" range.

An exploration per each SME IT-CMF Critical Capability (10 IT critical capabilities) found that Digital Business Value had below relationships with IT critical capabilities:

- A strong relationship with Risk Management (RM) critical capability [0.723, n = 27, p < 0.001].
- A moderate relationship with Business Planning (BP), Strategic Planning (SP), Solutions Delivery (SD) critical capabilities [BP: r = 0.583, n = 28, p = 0.001; SP: r = 0.537, n = 27, p = 0.004; SD: r = 0.540, n = 26, p = 0.004];
- A weak relationship with Business Process Management (BPM), Financial and Funding (FF), Relationship Asset Management (RAM) critical capabilities [BPM: r = 0.491, n = 26, p = 0.011; FF: r = 0.419, n = 27, p = 0.030; RAM: r = 0.439, n = 27, p = 0.022];
- No statistically-significant relationship found with Sourcing (SRC), Service Provisioning (SRP) and User Experience Design (UED) IT critical capabilities.

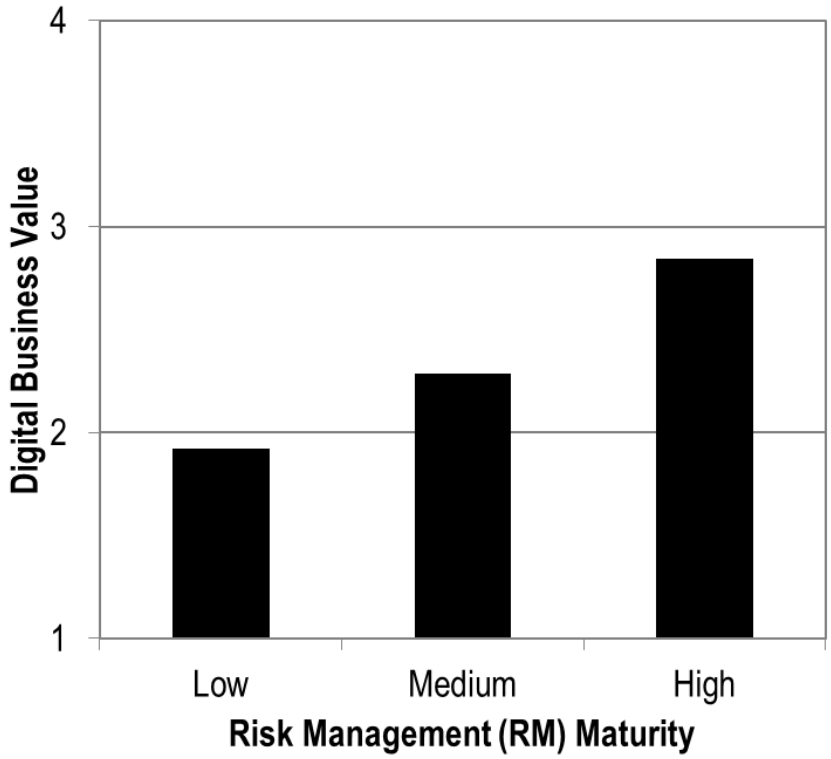
The comparison using analysis of variance and Post Tukey HSD tests over the individual capabilities also validated the majority of the relationships identified previously by correlation analysis as described below. For this analysis the organizations were classified onto Low, Medium and High "Digital Achievers" groups using their achievement score and analysis of variance was done.

Between the Low and High "Digital Achievers" for Risk Management (RM) [F(2,24) = 6.083, p =.007], Business Planning (BP) [F(2,25) = 5.123, p = 0.014], Relationship Asset Management (RAM) [F(2,24) = 5.318, p = 0.012], Solutions Delivery (SD) [F(2,24) = 4.536, p = 0.021], Strategic Planning (SP) [F(2,24) = 5.857, p = 0.008] critical capabilities.

Analysis of variance did not find a difference in the means of the groups for below IT critical capabilities.

- Financial and Funding (FF) and Business Process Management (BPM) critical capabilities, in contrary to the weak relationship that the correlation analysis identified.
- Service Provisioning (SRP), Sourcing (SRC) and User Experience Design (UED) critical capabilities, no difference found aligned with the results from the correlation analysis.

Figure 3 shows the variance difference between the groups for the findings supported by both correlation analysis and analysis of variance at a capability level for Risk Management capability. Similar figures were observed for BP, SD, SP, RAM capabilities.



Note: Y-Axis represents the level of achievement of business objectives by Digital Technologies with scale: Not Achieved (1), Partially Achieved (2), Highly Achieved (3) and Fully Achieved (4).

Figure 3 - Risk Management capability maturity and Digital BV Achievement

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A summary of the results is included in Table 6.

Table 6 - Summary of H1 Results: Digital Business Value by IT Capability Maturity

Relationship between Digital Business Value and IT Cap.	Correlation Analysis	Analysis of Variance. Groups: L/M/H IT Capability Mat
IT Capability Maturity (10 CC)	Moderate	"Low" and "High" IT capability maturity groups show different Digital BV Achievement level. Higher IT maturity show high achievement of Digital Business Value.
RM - Risk Management	Strong	
BP - Business Planning	Moderate	
SD - Solutions Delivery	Moderate	
SP - Strategic Planning	Moderate	
RAM - Relationship Asset Mgmt.	Weak	
BPM - Business Process Mgmt.	Weak	
FF - Funding and Financial	Weak	
SRC - Sourcing		
SRP - Service Provisioning		
UED - User Experience Design		

The results for H1 indicate that the level of IT Capability Maturity (measured by SME IT-CMF) is related to the level of achievement of business objectives using Digital technologies (Digital Business Value). These initial findings are not unexpected considering that existing study noted that organizations that manage their IT capabilities better have better performance (Mithas et al., 2011) and also considering how the Innovation Value Institute defines IT-CMF: enabler for organizations to identify and develop the IT capabilities needed to deliver agility, innovation and value for the organization (Curley et al., 2016).

The results at IT capability level provide further insights. The results suggest that only a set of particular IT capabilities such as Risk Management (RM), Business Planning (BP), Solutions Delivery (SD), Strategic Planning (SP) and Relationship Asset Management (RAM) are indeed directly related with the achievement of Business Value using Digital technologies.

The association of these particular IT capabilities with Business Value from Digital technologies could emphasize the importance for SMEs to develop the ability to translate their vision into actionable strategic plan for IT (SP, BP), to design and deliver solutions (SD) while being able to handle risks of IT or Digital technologies (RM). All of this supported by a structured approach to maintain and leverage the Business and IT relationship (RAM).

Other IT capabilities like Service Provisioning (SRP), Sourcing (SRC) and User Experience Design (UED) were not found directly related to Business Value with Digital technologies. Finally, mixed results were identified for Business Process Management (BPM) and Financial and Funding (FF) capabilities. This may indicate that although these capabilities could be important for traditional IT, they may not be significant influencers in the Digital Age.

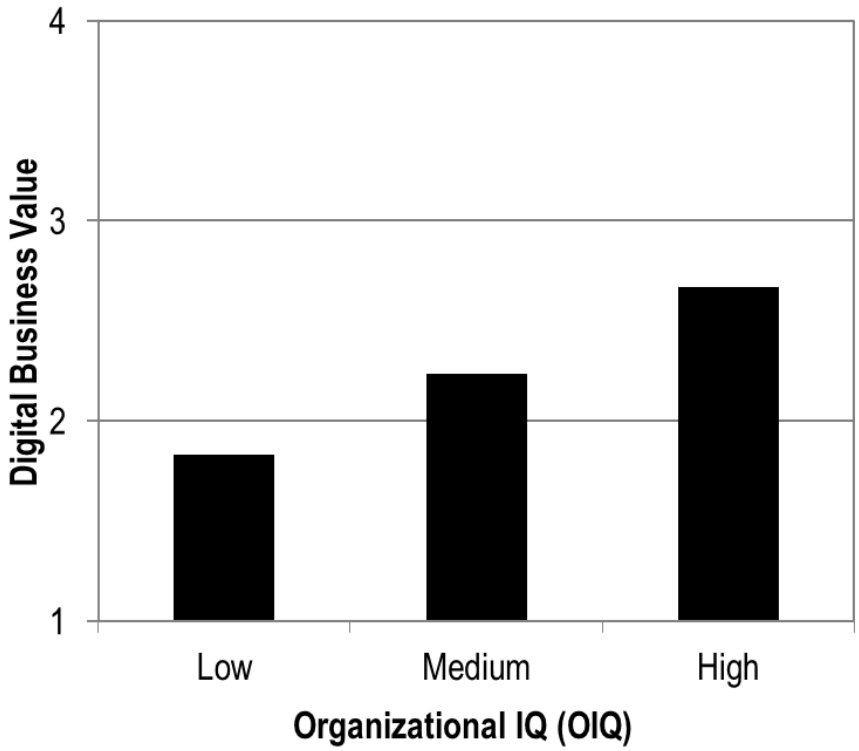
Hypothesis 2: Organizational Capabilities (OIQ) are positively related with Digital Business Value

Similarly to Hypothesis 1, for Hypothesis 2 first the relationship was tested on an overall level, this identified a "weak to moderate" relationship [r = 0.480, n = 28, p = 0.010] between the score of Organizational Intelligence Quotient (OIQ)

and Digital Business Value (achievement of business objectives using Digital Technologies). The differences according to OIQ level are presented below followed by analysis at each of the five dimensions of OIQ.

Differences in Digital Business Value according to the level of Organizational IQ

It was verified by ANOVA [F(2,25) = 3.366, p = 0.0507] and Post Tukey HSD tests that SMEs with high OIQ score demonstrated higher Digital Business Value achievement than their peers with low OIQ score. The difference between the groups is presented in Figure 4.



Note: Y-Axis represents the level of achievement of business objectives by Digital Technologies with scale: Not Achieved (1), Partially Achieved (2), Highly Achieved (3) and Fully Achieved (4).

Figure 4 - Organizational IQ and Digital Business Value Achievement

Figure 4 shows that SMEs with Low OIQ scores were between the "Not Achieved (1)" and "Partially Achieved (2)" range while SMEs with High IT Maturity were between the "Partially Achieved (2)" and "Highly Achieved (3)" range.

The exploration per each OIQ dimension found that Digital Business Value had below relationships with OIQ dimensions:

- A weak relationship with Internal Knowledge Dissemination (IKD) and Continuous Innovation (CI) [IKD: r = 0.400, n = 28, p = 0.035; CI: r = 0.430, n = 27, p = 0.025].
- No statistically significant relationship found with External Information Awareness (EIA) and Effective Decision Architecture (EDA) dimensions of OIQ.
- There was no difference in score for Organizational Focus (OF) for the organizations thus it was excluded from the analysis.

A summary of these results is included in Table 7.

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Table 7 - Summary of H2 Results: Digital Business Value by OIQ and OIQ dimensions		
Relationship between Digital Business Value and OIQ.	**Correlation Analysis**	**Analysis of Variance.** Groups: L/M/H OIQ
OIQ (avg. of 4 dimensions)	Weak	"Low" and "High" OIQ groups show different Digital BV Achievement level. Higher OIQ show high achievement of Digital Business Value. However, "Low" and "High" Digital Business Value not found significant difference
EDA - Effective Decision Architecture		
EIA - External Inf. Awareness		
IKD - Internal Knowledge Dissemination	Weak	
CI - Continuous Innovation	Weak	

The results indicate that SMEs experiencing benefits from Digital technologies are SMEs with higher levels of OIQ. Such SMEs are able to combine information and knowledge available outside their organizations (from customer, competitors, suppliers) with internal information and knowledge in order to make effective decisions regarding their products and services that allow them to remain competitive in the market.

The analysis at OIQ dimensions unveiled the link between OIQ's Internal Knowledge Dissemination (IKD) and Continuous Innovation (CI) dimensions with Digital Business Value. This may be evidence that although it may be important that SMEs are aware of their environment (EIA) and have practices or processes that enable them to take the right decisions at the right organizational level (EDA); what really pays off is how the SMEs are able to use knowledge and information from outside together or combined with the internal knowledge and information (IKD) in order to reinvent their products and services, supported by a company culture fostering innovation at all levels in the organization (CI).

Hypothesis 3: Organizational Capabilities (OIQ) leverage the effect of IT Capabilities (SME IT-CMF) on the achievement of Digital Business Value

Linear Regression was done to validate the isolated effects on Digital Business Value first by IT Capability Maturity (SME IT-CMF), later on to explore the isolated effects of Organizational IQ. Finally, the combination of both using General Linear Model analysis was done. The results indicated a positive relationship in each of the cases but with greater impact when both IT Maturity and OIQ were part of the model as described in Table 8.

Table 8 - Regression and GLM Results for Digital Business Value			
odel	A	B	C
Constant	0.797* (.436)	2.289*** (.114)	1.045* (.531)
IT Capability (SME IT-CMF)	**0.616*** **(.175)**		**0.503**** **(.209)**
Organizational Capability (OIQ)		**0.117**** **(.043)**	0.203 (.162)
IT Capability (SME IT-CMF) X Organizational Capability (OIQ)			-0.054 (.066)
R^2	.324	.220	.407
Adj. R^2	.298	.190	.333
No. observations	28	.220	.407
SME IT-CMF = Small Medium Enterprise IT-Capability Maturity Framework; OIQ = Organizational Intelligence Quotient			

Notes: Standard errors are reported in parenthesis. *, **, *** indicates significance at the 90%, 95%, and 99% level, respectively.

Models A and B in Table 8 present the isolated effect of SME IT-CMF and OIQ on Digital Business Value. Model C shows the combination effect and it can be observed that Adjusted R^2 increased. This confirms the combined effects of both Organizational and IT capabilities for the achievement of Digital Business Value. Multicollinearity tests indicated there was no collinearity (VIF=1.121) between the dependent variables: IT Capability (SME IT-CMF) and Organizational Capability (OIQ). The minimal but negative coefficient for the combined effects in Model C suggested a small impact on the Digital Business Value. This motivated to further explore the effect of IT Maturity and OIQ on Digital Business Value. A positive trend from the relationship of IT Maturity and OIQ as can be observed in Figure 5.

It can be observed in Figure 5 that SMEs with low Organizational Capabilities (low OIQ) had lower achievement levels of Digital Business Value than their peers with medium and High Organizational Capabilities (medium or high OIQ). The effect of higher IT Capabilities (higher IT maturity as of SME IT-CMF) can be also seen as an enabler of Digital Business Value. As the level of IT capability increased, the level of achievement of Digital Business Value also increased. This was observed in particular for SMEs with medium OIQ; where the actual achievement was between partially and highly achieved levels (scale 2 and 3 from Figure 5). The group of SMEs with high Organizational Capabilities (high OIQ) showed a small decrease between medium and high IT Maturity but still kept a similar achievement level between partially and highly achieved.

Statistically significant differences were found in the group of medium OIQ between SMEs with low and high IT Capabilities.

These results indicate that organizational capabilities (OIQ) leverage the effect that higher IT capability maturity (SME IT-CMF) has on the achievement of Digital Business Value. This could be evidence that while IT capabilities can ensure that the business objectives/strategic vision are translated and incorporated on IT and that the actual delivery of IT services or products supports that vision; IT capabilities by themselves cannot ensure the right business strategy or objectives are defined. Instead,

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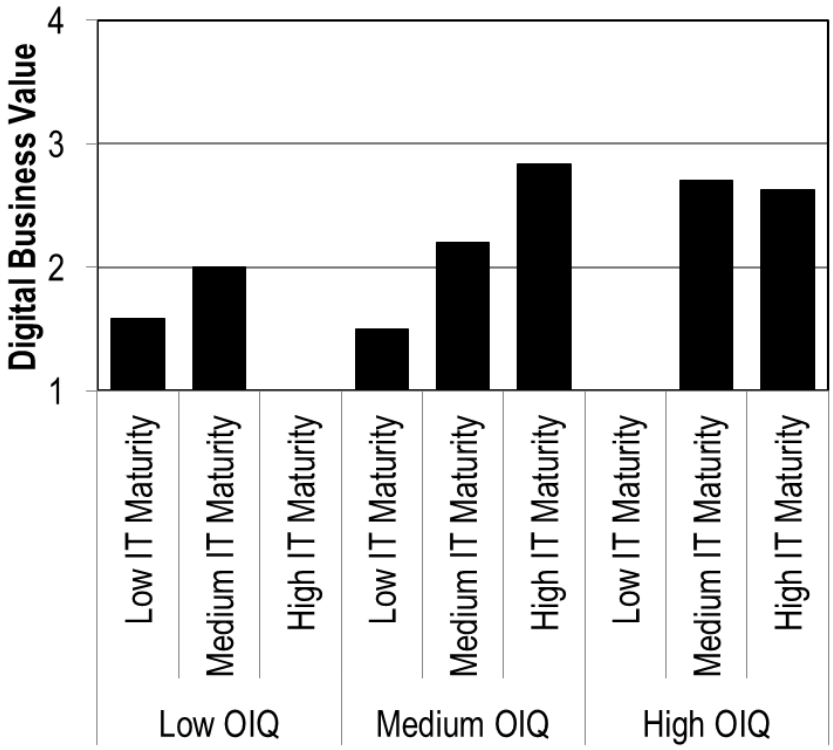
organizational capabilities (OIQ) can ensure business strategy is defined by leveraging both external and information and knowledge in a way that its products and services remain competitive by continuous innovation.



Note: Y-Axis represents the level of achievement of business objectives by Digital Technologies with scale: Not Achieved (1), Partially Achieved (2), Highly Achieved (3) and Fully Achieved (4).

Figure 5 - Combined effects of Organizational and IT Capabilities on Digital Business Value

Updated Framework

The updated framework is described in Figures 6 and 7.

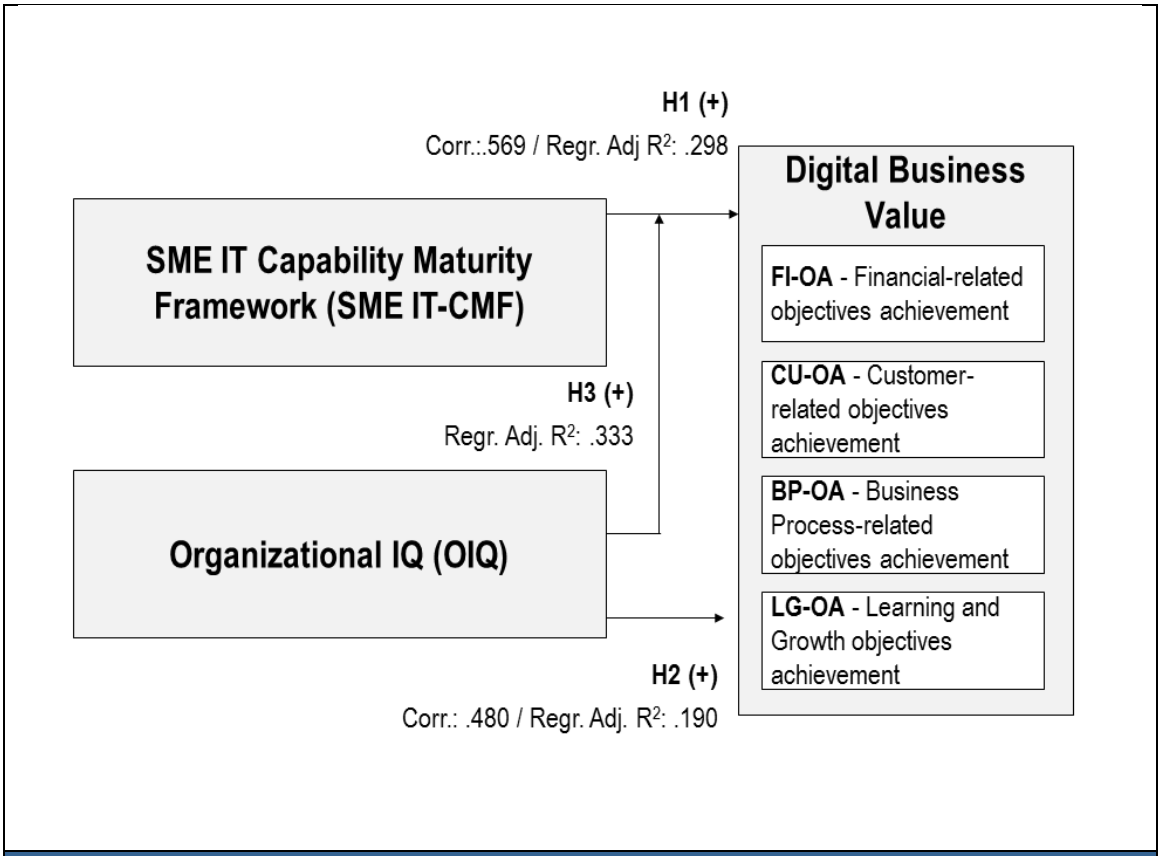


Figure 6 - Updated Framework (high level)

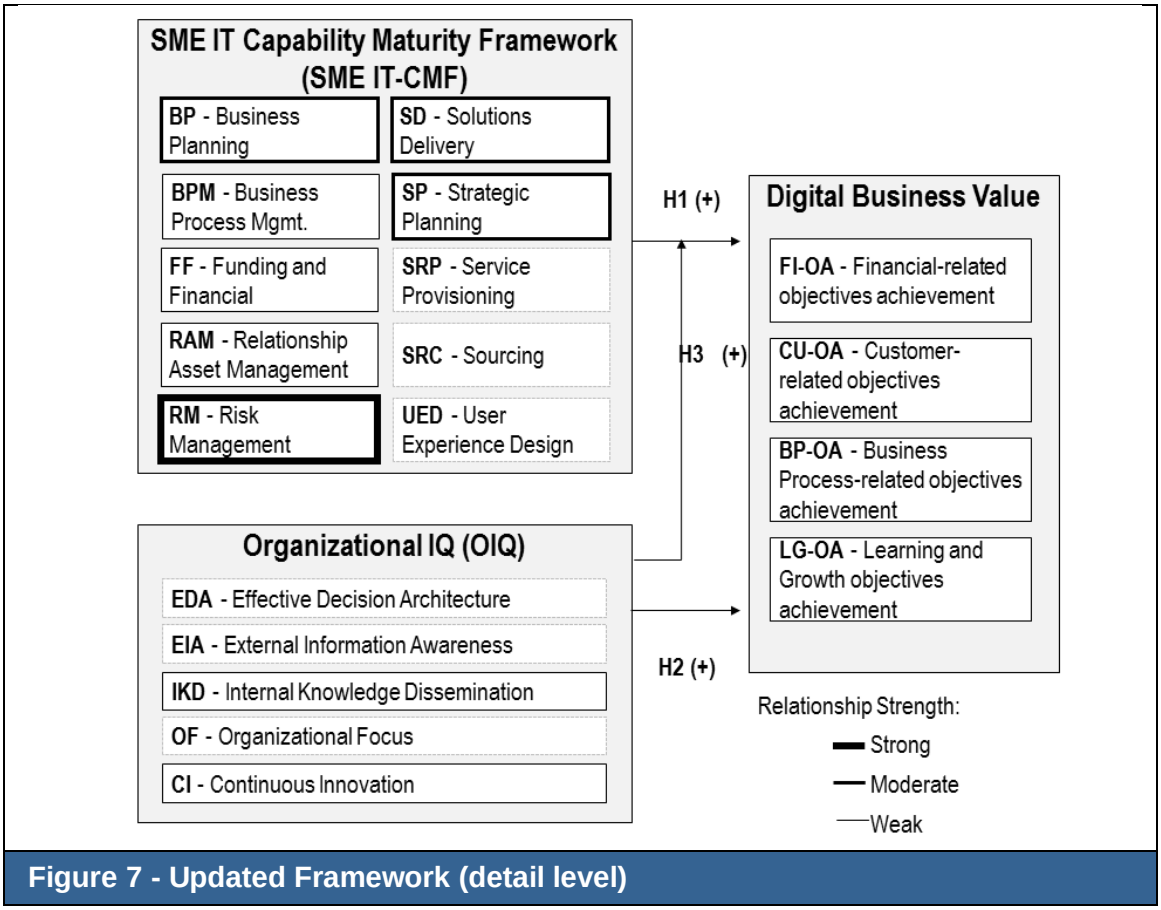


Figure 7 - Updated Framework (detail level)

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Discussion

Position of the article

This study is based on the Dynamic Capabilities theory. It emphasizes the role of the combined effect of IT and Organizational Capabilities towards the achievement of business objectives by the application of Digital Technologies. The study is aligned with the current research focusing on how to enable organizations to face the challenges, opportunities and risks that Digital Technologies offer (Ross, Sebastian & Fonstad, 2015; Ross et al., 2016a; Ross et al., 2016).

This combination acknowledges the organizational context where IT capabilities develop and where they translate onto execution and implementation. This study suggests that in order to achieve Digital Business Value it is not only required to have an appropriate maturity of IT capabilities but also other organizational capabilities where these IT capabilities coexist.

The decisions made prior to any Digital initiative start by defining a digital strategy or focus for the digital endeavour at the organizational level. These are equally important as the digital initiative implementation itself.

Organizational IQ is used since it measures whether an organization effectively gathers and uses external and internal information in order to make decisions, execute them while constantly reinventing their products and services to stay relevant in the market. The SME IT-CMF framework is used since it provides an overall framework for Managing IT in order to create Business Value (IT function transitioning from Cost Centre to Value Centre; changing from Technology Supplier to Strategic Business Partner and finally Corporate Core Competence).

Interpretation of the Results

This research aimed to identify in particular the OIQ dimensions and IT capabilities that are related to the generation of Business Value with Digital Technologies. The empirical evidence supports this association and better results were achieved by organizations where these capabilities were present.

The empirical analysis indicated that from the four OIQ dimensions considered in the analysis only Internal Knowledge Dissemination (IKD) and Continuous Innovation (CI) were relevant for the achievement of business objectives with Digital Technologies. This suggests that SMEs that achieve Business Value in the Digital Age have also two additional characteristics: the right knowledge is available for each part of the organization at the required time and; promote creativity and innovation across all functions, hierarchies and boundaries.

Other OIQ dimensions like External Information Awareness (EIA) and Effective Decision Architecture (EDA) did not appear in the results from the tests; this should be interpreted as that the levels of these two dimensions were present on both organizations that were able to achieve Digital Business Value but also in the ones that were not as successful.

The analysis for the ten IT capabilities from SME IT-CMF confirmed that only seven IT capabilities were actually directly linked with Digital Business Value. A strong relevance of Risk Management (RM), moderate relevance of Solutions Delivery (SD), Business Planning (BP), Strategic Planning (SP) and with lower but still relevant contribution of the capabilities of Relationship Asset Management (RAM), Business Process Management (BPM) and Funding & Financial (FF) for the achievement of Digital Business Value.

The strong relation observed on Risk Management (RM) emphasizes the importance of the ability to assess, prioritize, handle and monitor the exposure and potential impact of IT (or Digital) related risks as a key factor for achieving value from Digital Technologies.

The moderate relation observed for Strategic Planning (SP), Business

Planning (BP) and Solutions Delivery (SD), indicates that SMEs that obtain better Digital Business Value performance have the following characteristics: the ability to formulate a long-term vision and translate it into actionable strategic plan for the IT function, the ability to link the defined IT strategy with the operational delivery, ensuring that necessary financial and other resources are allocated and, the capability to design and deploy solutions that fulfils business requirements and opportunities.

The weak relation identified with Relationship Asset Management (RAM), Business Process Management (BPM) and Funding & Financial (FF) capabilities suggest that SMEs achieving Digital Business Value are also supported -at least in a minimal way- by: the ability to analyse, plan and enhance relationship between IT function and the rest of the business; the capability to design, monitor and optimize the execution of both existing and new organizational processes and; the ability to determine and allocate the funding level for the IT function.

For the remaining three IT capabilities: Sourcing (SRC), Service Provisioning (SRP) and User Experience Design (UED); there was no empirical evidence supporting their direct relation with the achievement of Digital Business Value. This suggests that the ability to evaluate and manage IT suppliers, the ability to manage the life cycle of IT services; or the ability to consider the needs of users at all stages in the life cycle of IT solutions had a minor relevance at the time of achieving business objectives by Digital Technologies.

It is worth to mention that the ideal state for the maturity of IT capabilities is not to achieve full maturity for all the 10 IT capabilities. Each organization usually should identify the target state based on the importance and maturity gap between AS-IS maturity and TO-BE maturity in order to prioritize any improvement initiative.

Further work and Limitations

Although the sample used for the empirical evaluation has some specific characteristics (such as the focus on Japanese small and medium enterprises from a specific population), it served as a case study how the capabilities (OIQ, SME IT-CMF and the combination of both) were positively related with Digital Business Value and offered practical implications to the industry.

A key consideration is that the SMEs in the target population are Japanese organizations; thus cultural behaviour could have some implications on their responses. For example the focus on Risk Management capability or the reported achieved level. This can be overcome in the future by expanding the organizations in scope in order to include non-Japanese SMEs as well. There are also other opportunities to enhance this research in the future. For example, one way to provide further aid to the SMEs to improve their capabilities could be the execution of deep-dive analysis for the key IT capabilities identified by the updated framework. This would help to understand on a detailed level how to develop such capabilities. Another further work would be a deeper integration with the four keys for digital strategy definition and implementation (digital strategy, operational backbone, digital services backbone and continuous organizational redesign). In addition, a deeper analysis regarding the findings on Internal Knowledge Dissemination (IKD) and Continuous Innovation (CI) could provide insights on how knowledge is shared and combined with the knowledge existing already inside the organization (e.g. knowledge creation or management) in order to make the right decisions for selection and implementation of digital initiatives.

Finally, an important limitation of this study relates to the accuracy of the answers collected by the questionnaire as it was a self-reported survey. This study tried to minimize the risk by addressing the survey to the company registered representative and included a cover letter explaining the

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motivation and objective of the study. The actual responders were IT representative in some cases and business representative in others, which is appropriate and minimizes possible bias since the survey intended to measure digital technologies contribution to achieve business objectives.

Conclusions

This research provides practical insights that SMEs can refer in order to prepare themselves to overcome the challenges and seize the opportunities ahead of the adoption of Digital Technologies. The results provided empirical evidence that not only IT capabilities but the combination with other Organizational capabilities enable the business value achieved using Digital Technologies.

The selection of Organizational IQ and IT Maturity as the two combined organizational capabilities provided a better result in terms of achievement of Digital Business Value. SMEs with higher Organizational IQ were more successful in achieving their objectives using Digital technologies than their peers with lower Organizational IQ. At the same time, SMEs with a higher level of IT maturity had better performance than their peers with lower IT maturity. The regression and General Linear Model results showed that the combination of both Organizational IQ and IT Capability Maturity explained better the achievement of business objectives using Digital Technologies. The answer to the question proposed by this research is affirmative: IT and Organizational capabilities enable Digital Business Value, and; Organizational capabilities have a leveraging role on the IT capabilities for the achievement of Business Value from Digital technologies.

This study identified two dimensions from Organizational IQ relevant to Digital Business Value achievement: Internal Knowledge Dissemination (IKD) and Continuous Innovation (CI). It also identified the IT Capabilities related to Digital Business Value. SMEs with higher maturity levels of Risk Management (RM), Strategic Planning (SP), Business Planning (BP), Solutions Delivery (SD), Relationship Asset Management (RAM), Business Process Management (BPM) and Funding & Financial (FF) IT capabilities showed higher achievement of Digital Business Value than the organizations with lower IT maturity levels.

The results contribute with valuable insights on how SME can prepare in order to achieve the opportunities that Digital Technologies like SMACIT offer. They also extend the Digital Transformation literature in particular how dynamic capabilities can work together in order to enable Digital Business Value.

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