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Abstract By conducting moderation mediation analyses, we investigate how IT human capability (ITHC) and IT flexibility—independently and jointly—influence the formation of IT-enabled dynamic capabilities (ITDC). In this paper, we also analyze the influence of different environmental conditions on the relationship between ITHC and ITDC. We do so by empirically testing the constructed model on a dataset of 97 international firms, using the PROCESS technique. We draw upon the dynamic capabilities view and modular system theory, which emphasize the need for a firm to develop ITDC to respond to changes. Currently, there is a gap in the literature concerning the role of ITHC on the formation of ITDC. Our results show that there is a positive effect of ITHC and IT flexibility on the formation of ITDC. Hence, organizations should invest in their ITHC and IT flexibility to address the rapidly changing business environment.

Keywords: • Dynamic capability view (DCV) • Modular systems theory (MST) • IT-enabled dynamic capabilities (ITDC) • IT human capability (ITHC) • IT flexibility • IT governance • Environmental dimensions •

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1 Introduction

In recent years, business environments have become more complex and turbulent, due to disruptive digital technologies such as big data, cloud computing, AI, and IoT. Hence, academics and practitioners need to recognize which IT-related capabilities are critical to an organization's survival and growth. The information systems (IS) literature broadly discusses the IT capabilities, the firm's ability to acquire, deploy, combine, and reconfigure IT resources to support business strategies and processes, in which organizations strategically must excel to add business value (Bhatt & Grover, 2005; Sambamurthy, Bharadwaj, & Grover, 2003). However, organizational capabilities, that enable organizations to coordinate and utilize their resources are also seen as critical success factors for success (Chen et al., 2014). Yet, the findings on whether the focus should be on the IT capabilities of the company to positively influence IT resources and IT competencies, or it is more strategic to focus on the organizational skills that IT initiatives should pursue, are not unambiguous (Kim, Shin, Kim, & Lee, 2011; Pavlou & El Sawy, 2011). Moreover, according to the dynamic capability view (DCV), the firm's capabilities should be dynamic to enable them to cope with a constantly changing competitive environment (Applegate, 2009; Eisenhardt & Martin, 2000; Sambamurthy & Zmud, 1999; Teece, 2007). In addition to dynamic capabilities, system modularity is another means proposed in the literature to manage turbulent environments (Langlois, 2002; Schilling, 2000).

Mikalef, Pateli, and Van de Wetering (2016) based their research upon the DCV and modular system theory. Their study emphasizes the need for *"strategically leveraging IT in core areas"* to gain business value. The IT-enabled dynamic capabilities (ITDC) of a firm refer to its capacity to deploy IT resources and IT competencies. The results demonstrate that IT architecture flexibility, positively influenced by IT governance decentralization, can contribute to the formation of ITDC. Although IS researchers acknowledge that ITDC has strategic value, they emphasize the role of IT human capabilities (ITHC) in this process (Fink, 2011; Kim et al., 2011; Sambamurthy et al., 2003). However, there is a literature gap concerning the role of ITHC in the formation of ITDC. Furthermore, several IS researchers have emphasized the role of environmental dimensions as an essential variable in developing dynamic capabilities, IT capability, and strategy-making behavior (Davis, Eisenhardt, & Bingham, 2009; Wilden & Gudergan,

2015; Zhou & Li, 2010). Given the considerable influence of the business environment, it is intriguing to analyze the role of ITHC and IT Flexibility in enhancing ITDC across different environmental conditions and states. Accordingly, our current research aims to address the gap above in the literature further. Concretely, the research questions in this paper are:

1. *How do ITHC and IT flexibility—independently and jointly—influence the formation of ITDC?*
2. *Does IT governance decentralization strengthen these influences?*
3. *What is the influence of different environmental conditions on the relationship between ITHC and ITDC?*

This paper comprises four sections. The first builds the theoretical foundation for the study. The second section describes the hypotheses formed. The third part describes the survey research (cross-sectional) and statistical analyses; the research methodology for data collection and analysis is also explained in detail. The final section presents the research conclusions, limitations of the study, as well as suggestions for future research.

2 Theoretical Background

2.1 The IT-enabled dynamic capability view

Strong IT capabilities enable organizations to leverage and utilize their existing IT assets, resources, and know-how effectively (Mikalef et al., 2016). Firm-specific IT resources are classified as IT infrastructure, human IT resources, and IT-enabled intangibles (Bharadwaj, 2000; Kim et al., 2011). To achieve a deeper understanding of the mechanisms through which flexible IT architecture adds value, and the key areas in which IT investments must be leveraged, Mikalef et al. (2016) developed a conceptual model on the formation of ITDC. They argue that it is more relevant to identify the organizational and dynamic capabilities that should be targeted by IT, rather than the aggregation of IT capabilities (IT resources and IT competencies). The focus in the DCV (Teece, 2007) is on the company's specific characteristics instead of the industry specifications as in traditional strategic management literature. Within the DCV the dynamic capabilities have been operationalized along the dimensions: sensing, seizing and reconfiguring, since an organization's capacity to sense and shape opportunities

and threats, re-integrate, build, and reorganize external and internal competencies is foundational to dynamic capabilities. The dimensions that Mikalef et al. (2016) used to constitute ITDC are adapted measures of (1) sensing, (2) coordinating, (3) learning, (4) integrating, and (5) reconfiguring routines. These dimensions are used in other studies as well. Research results underline that the use of IT to support or enable various capabilities is very useful, particularly when it comes to coordinating and learning activities (Chen et al., 2014; Wilden & Gudergan, 2015).

2.2 Modular systems theory

The design structure of the modular system theory by Schilling (2000), decomposing systems, permits addition, modification, and removal of any software, hardware, or data components of the infrastructure with ease and with no major overall impact (Byrd & Turner, 2001; Langlois, 2002). The advantage of decomposition systems is that the formatted modules can be managed independently and efficiently, which improves system flexibility and responsiveness. It offers companies the opportunity to redesign existing processes rapidly, allowing them to respond quickly to market dynamics and customer demands (Chen et al., 2014). IS studies have measured IT infrastructure as technical modularity (Byrd & Turner, 2001; Mikalef et al., 2016; Tafti, Mithas, & Krishnan, 2013). Cloud computing, for example, makes it possible to scale application components independently. However, it is not only the flexibility of the IT architecture which is a factor in the ability of a firm to reshape business processes. Modularity can also be, besides a technical, an organizational characteristic. Already, since the 1980s and 1990s executives have been experimenting with solutions to decentralize decision making among departments/business units, so that decisions could be made faster through local control and ownership of resources (Applegate, 2009; Langlois, 2002; Schilling, 2000). A modular organization structure is one in which decision making is intentionally decentralized among departments, which, in IT context, is represented by IT governance decentralization (Mikalef et al., 2016; Tiwana & Konsynski, 2010).

3 Research Model

ITHC refer to skills required to manage resources related to IT. For instance, professional and relational skills and knowledge of technologies, technology management, and business functions are necessary for IT staff to undertake assigned tasks effectively (Denis, Trauth, & Farwell, 1995). Past studies identify ITHC through the presence of technical, behavioral, and business capabilities. IS studies reveal that organizations with competent IT staff are better at integrating IT and business planning, making investment decisions based on anticipated business needs, engaging in effective communication with business units, and executing systemic controls to achieve determined goals. In particular, the strategic sense-making ability of senior managers can help organizations deploy modular technology resources in ways that lead to new dynamic capabilities and advantages. Moreover, ITHC is of significant strategic value since they are not susceptible to rapid imitation (Fink, 2011; Kim et al., 2011; Sambamurthy & Zmud, 1999). Hence, the expectation is that ITHC has a positive impact on the enablement of ITDC (H1).

H1: *ITHC has a positive impact on ITDC*

Several studies emphasize the importance of a modular, flexible IT architecture to address rapidly changing business environments (Sambamurthy et al., 2003; van de Wetering, Versendaal, & Walraven, 2018; Zhu, Kraemer, Gurbaxani, & Xu, 2006). Mikalef et al. (2016) stated that the processes underlying ITDC are built on digital infrastructures. The ability to change these infrastructures fast, easy and relatively inexpensive helps an organization to develop ITDC. A valid, reliable instrument for measuring IT flexibility is through the four dimensions of loose coupling, standardization, transparency, and scalability (Byrd & Turner, 2001; Mikalef et al., 2016; Tafti et al., 2013; Tiwana & Konsynski, 2010; van de Wetering, Mikalef, & Pateli, 2018). The expectation is that IT flexibility has a positive influence on ITDC and moderates the effect of ITHC on ITDC. First, because with a loosely coupled IT architecture business processes can be reconfigured independently, which makes it easier to adjust. Loose coupling enables firms to decompose the IT architecture into units of functionality, referred to as software components, modules, objects, or services, which can be recombined easily with other modules in order to quickly construct a new process (Mikalef et al., 2016; Tafti et al., 2013). Next, standardization refers to the degree

to which a firm establishes policies on how applications connect and interoperate (Mikalef et al., 2016; Zhu et al., 2006). Standardization increases modularity; by using open standards and off-the-shelf open source software (OSS), an organization can quickly adopt new technologies, with low cost and risks (Tiwana & Konsynski, 2010). Furthermore, transparency is associated with a greater likelihood of collaborative alliance formation, since the use of open standards for exchanging information, such as web services, increases transparency and visibility of capabilities across an organization. Transparency magnifies the possibility of merging or combining capabilities with other companies (Mikalef et al., 2016; Tafti et al., 2013). Ultimately, scalable IT architecture increases the agility of an organization. Based on continuously changing business needs, increased workload, transaction volume, or changed scope, a service or configuration can easily be increased or reduced (Byrd & Turner, 2001; Fink, 2011; Mikalef et al., 2016). In combination, these four dimensions allow an organization to change and innovate faster and enable ITDC (Mikalef et al., 2016). Based on the foregoing theoretical findings, and the previous hypothesis (H1), the following three hypotheses (H2, H3, and H4) are raised:

H2: *ITHC has a positive influence on IT Flexibility*
H3: *IT flexibility has a positive influence on ITDC*
H4: *IT flexibility positively mediates the effect of ITHC on ITDC*

In a modular organization structure, decision making is consciously decentralized among departments, which in the IT context is represented by IT governance decentralization. In past studies, IT specification (decisions about what business processes in the line functions IT must support) and IT implementation (decisions about the methods, programming languages, platforms, definition of IT standards and policies, and IT sourcing) have been defined as formative dimensions of IT governance decentralization (Mikalef et al., 2016; Tiwana & Konsynski, 2010). Mikalef et al. (2016) argue that even though IT governance decentralization is seen as a more efficient and effective response to emerging opportunities, the absence of a flexible IT infrastructure may weaken response. They claim that IT governance decentralization strengthens the effect of IT flexibility on the formation of ITDC. In light of the above discussion, it seems sensible to investigate if the effect of ITHC on the formation of ITDC, through IT flexibility, is strengthened by IT-governance decentralization. Therefore, we formulate the following moderation hypothesis (H5):

H5: *IT governance decentralization positively moderates the mediating effect of IT flexibility on the relationship between ITHC and ITDC*

Most IS researchers claim that dynamic capacities are needed to deal with rapidly changing environments. However, Eisenhardt and Martin (2000) suggested that in a moderately changing environment capabilities are detailed, analytical, stable processes with predictable results. Whereas in high-speed environments capabilities are simple, highly experiential, and fragile processes with unpredictable results. Three characteristics of a firm's external environment are discussed in the literature, namely: dynamism, hostility, and heterogeneity. Environmental dynamism is seen as an enabler unpredictable changes, which increases organizational uncertainty. Heterogeneity concerns the differences in competitive tactics, product lines, distribution channels, etc., across the firms' respective markets. Hostility is triggered by various economic, societal, and political factors, such as globalization and rapidly emerging new digital technologies, and can hinder firms in their effort to achieve process agility (Chen et al., 2014; Dale Stoel & Muhanna, 2009; Miller & Friesen, 1983; Newkirk & Lederer, 2006). Especially during periods of environmental change (threatening), the need for a developed ITDC, such as sensing and responding to shifts to remain competitive, is keenly felt (Mikalef et al., 2016). Following Teece (2007), environmental dynamism is an important driver of dynamic capabilities. Chen et al.'s (2014) research showed that environmental dynamism and environmental heterogeneity (complexity) positively moderate the relationship between IT capability and process agility. Based on the preceding discussion, it is clear that environmental factors affect organizations. It is, therefore, worthwhile examining the influence of different environments on the impact of ITHC on the formation of ITDC (H6).

H6: *Different environmental conditions (hostility, dynamism, and heterogeneity) influence the impact of ITHC on the formation of ITDC (through IT flexibility)*

4 Methodology

4.1 Data collection

To empirically test our research model and hypotheses, we developed a survey instrument and distributed it to key informants within international firms. A quantitative research approach was adopted to collect and analyze the data (Saunders, Lewis, & Thornhill, 2012), similar like Mikalef et al. (2016), Fink (2011), and Chen et al. (2014).

The data gathering process took only 1.5 months (October 2017 – November 2017). The key informants included Enterprise Architects (EAs), Chief Information Officers (CIOs), IT managers, Chief Technology Officers (CTOs), and Chief Executive Officers (CEOs). The study had a total dataset of 97 firms. The response rate grouped by firm size-class was 65% large (250+ employees), 16% medium (50-249 employees), 9% small (10-49 employees), and 9% micro (1-9 employees). The industries in which these firms operate are presented in the table 1.

Table 1. Characteristics of the sample

Industry	**N**
Basic Materials (Chemicals, paper, industrial metals & mining)	5
Industrials (Construction & industrial goods)	5
Consumer Goods	12
Health Care	13
Financials	15
Technology	11
Utilities	6
Consulting Services	10
Government	7
Other (Consumer Services, Telecommunications, Education, Oil & Gas)	13
Total	**97**

Furthermore, actions were taken to make sure that non-response bias would not become an issue. The respondents were aware that the survey would be strictly anonymous, and that the results of the study would only be reported at an abstract level. They were informed that the information would be coded and remain confidential. As a token of appreciation for their contribution, they could

seek to receive a copy of this research. A maximum of two personal reminders were sent to non-responders.

4.2 Construct and items

The dimensions used to measure the constructs are based on earlier empirical and validated work from the areas of information systems, strategic management, and organizational science. ITHC was measured by adapting scales on the dimensions of *technical capability, behavioral capability,* and *business capability*, each dimension containing five indicators per construct on a 7-point Likert scale (Fink, 2011). We included the following dimensions for IT flexibility: (1) loose coupling, (2) standardization, (3) transparency, and (4) scalability, compromised of four constructs on a 7-point Likert scale (Byrd & Turner, 2001; Mikalef et al., 2016; Tafti et al., 2013; Tiwana & Konsynski, 2010; van de Wetering, Mikalef, et al., 2018). ITDC was measured through the five dimensions of *sensing, coordinating, learning, integrating,* and *reconfiguring*, with four indicators per construct, measured on a 7-point Likert scale (Mikalef et al., 2016; Teece, 2007). The continuum of centralization–decentralization IT governance was measured on a 5-point Likert scale (Chen et al., 2014; Mikalef et al., 2016). The environmental dimensions: *dynamism, heterogeneity*, and *hostility*, varied from three to five items on a 7-point Likert scale (Mikalef et al., 2016).

4.3 Data analysis

The quantitative gathered data was analyzed with IBM SPSS Statistics version 22. We conducted a moderated mediation analysis using a macro for SPSS called PROCESS to mathematically infer the existence and relationship of the latent variable. This technique relies on the inter-correlation between variables. A few standard statistical tests were carried out using SPSS, before running the PROCESS macro (Hayes, 2013). The dataset was screened for missing data, accuracy, and outliers. Based on the Cook's cutoff score, respondents marked as outliers were excluded so that the linearity assumption was satisfied and the heteroscedasticity assumption also was satisfied to run the fully specified predictive model.

A validity test was performed using principal component factor analysis to make sure that each item was measuring what it purported to measure (Pedhazur & Schmelkin, 1991). The Bartlett's test of sphericity value for all the scales is .000, meaning it is significant, and the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) values for all the scales are above .6. Construct reliability (for quantitative analysis) was established by examining that all Cronbach's Alpha (CA) values were above the threshold of >0.70 (Saunders et al., 2012).

When analyzing the reliability of the 16 sub-scales, the CA of all the sub-scales was above 0.70, except the sub-scale dynamism (.446), which therefore was excluded from further research. If hostility item 1 is dropped, then the CA of the hostility variable becomes .717. The remaining 15 sub-scale item variables were merged to an average score per construct as mentioned in section 4.2. The relationship between the scale item variables was tested using the Pearson correlation. The matrix (table 2) shows that there is no significant correlation between the moderated variable IT-governance decentralization and the other variables.

Furthermore, there is practically no visible relationship between the variables ITHC and ITFL. The variance inflation variance (VIF) value from the predictors (i.e., independent variables) in the model variables is below 3, which is lower than the recommended maximum VIF value, meaning no multicollinearity is present. Table 2 also presents the mean, standard deviations, correlations, VIF, and the reliability coefficients (Cronbach's Alpha) of all the variables without the outliers as discussed above (N = 97).

Table 2: Assessment of the validity of the construct (sub-scales) variables

Constructs and sub-scales*	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.
1. Dynamism																
2. Heterogeneity	.15															
3. Hostility	.36**	**.47***														
4. Sensing	.46**	.24*	.13													
5. Integrating	.29**	.21*	.21*	**.58***												
6. Coordinating	.38**	.41*	.41*	.62*	**.74***											
7. Reconfiguring	.26*	.27*	.28*	.62*	.69*	**.72***										
8. Learning	.39**	.26*	.22*	.63*	.57*	.62*	**.53***									
9. Loose Couplin	.26*	.20*	.18	.64*	.63*	.68*	.71*	**.72***								
10. Transparency	.22*	.13	.16	.46*	.49*	.51*	.59*	.49*	**.64***							
11. Scalability	.12	.08	-.03	.45*	.45*	.46*	.46*	.47*	.61*	**.62***						
12. Standardizatic	.17	-.02	.05	.48*	.52*	.50*	.48*	.52*	.55*	.56*	**.63***					
13. IT Governanc	.08	.00	.11	.01	-0.7	.07	.11	-.03	.05	.02	.03	**.11**				
14. Technical capability	.23*	.03	.30*	.12	.14	.31*	.15	.17	.11	.25*	.10	.13	.18			
15. Behavioral capability	27**	13	.28*	.31*	.24*	.26*	.25*	.19	.13	.19	.01	.10	-0.9	**54***		
16. Business capability	.22*	.14	.20*	.27*	.19	.20	.18	.17	.14	.15	.05	.07	.00	.55*	**.77***	
Mean	4.08	3.95	3.85	3.95	3.76	3.88	3.64	4.08	3.82	4.19	4.65	4.57	3.73	3.93	4.01	4.06
Standard Deviatio	90	1.38	.96	1.30	1.25	1.31	1.27	1.35	1.38	1.41	1.39	1.18	0.97	1.37	1.43	1.38
VIF	-	-	-	-	-	-	-	-	2.15	2.18	2.35	1.95	-	1.80	2.91	2.75
Cronbach's Alph	.45	.79	.73	.87	.87	.90	.90	.89	.92	.88	.92	.85	.85	.83	.94	.92

*. Correlation is significant at the 0.05 level (2-tailed), **. Correlation is significant at the 0.01 level (2-tailed).

* Environmental dimensions 1-3, IT-enabled dynamic capabilities 4-8, IT flexibility 9-12, IT Governance decentralization 13, IT human capability 14-16

Based on theoretical findings (Hayes, 2013; Mikalef et al., 2016; Wang & Ahmed, 2007; Zhou & Li, 2010), we conducted a conditional process analysis. In this analysis, ITHC acted as a predictor (X), ITDC as a dependent variable (Y), IT flexibility (ITFL) as a mediator (M), and IT governance decentralization (GOV) as a moderator (V). The conditional indirect effect quantifies how differences in ITHC map onto differences in ITDC indirectly through ITFL, depending on the

value of GOV. This is a conditional process analysis model containing a mediation process $(X \rightarrow M \rightarrow Y)$ combined with the moderation of the $M -> Y$ effect by V. The two equations representing this model, are: $M = i_1 + aX + e_M$ and $Y = i_2 + c'X + b_1M + b_2V + b_3MV + e_Y$. The direct effect of X on Y = c'. The conditional indirect effect is: $a\theta_{M\rightarrow Y} = a(b_1 + b_2V)$ (figure 1 and table 3).

A conceptual model (figure 1) was developed, based on the theoretical framework, reflecting the six hypotheses proposed in this research. A 95% confidence interval (CI) was calculated based on 5000 bootstrap samples for computing indirect effects at various values of the moderator (Hayes, 2013).

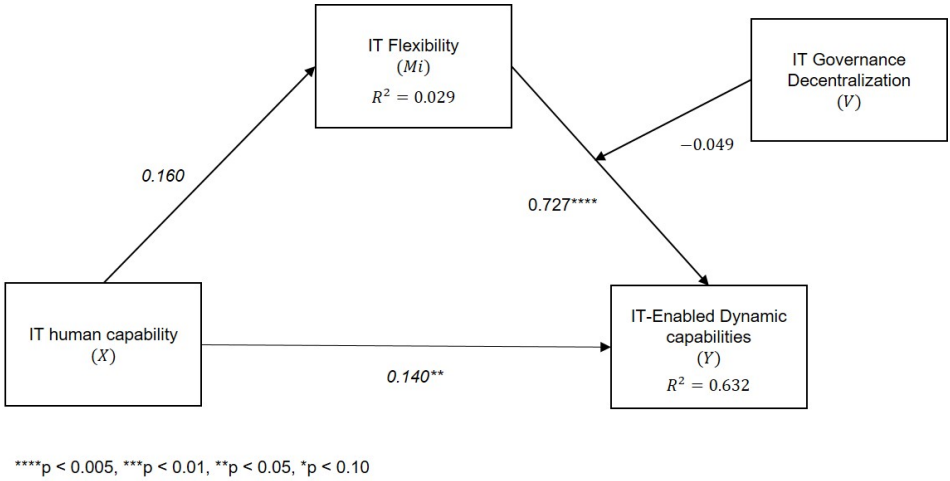

Figure 1: Moderated mediation model

Table 3: Coefficients for the moderated mediation model

		Consequent						
		M (ITFL)				*Y* (ITDC)		
Antecedent		Coeff.	*SE*	*p*		Coeff.	*SE*	*p*
X (ITHC)	a	0.160	0.128	0.216	c'	0.140	0.061	0.024
M (ITFL)		_	_	_	b_1	0.727	0.060	0.000
V (GOV)		_	_	_	b_2	-0.016	0.074	0.824
M x *X*		_	_	_	b_3	-0.049	0.063	0.440
Constant	i_1	-0.638	0.501	0.206	i_2	3.304	0.268	0.000
		$R^2 = 0.029$				$R^2 = 0.632$		
		$F(1.95) = 1.554), p > 0.1$				$F(4.92) = 47.099), p < 0.005$		

4.4 Results

Table 3 shows the resulting coefficients and model information summary. The model is significant $(F = (4.92) = 47.099, < 0.005)$, with a model prediction of 63.2% $(R^2 = 0.632)$ which indicates a strong positive relationship (Saunders et al., 2012). Looking at path c' in the model, ITHC has a direct, statistically significant positive effect on the formation of ITDC $(\beta\ 0.140\ t(92) = 2.295\ p < 0.05)$. The positive impact of ITHC on ITDC is hereby confirmed, and thus H1 is accepted. Furthermore, it appears that when ITHC is enhanced the IT flexibility increases, path $a = 0.160$; however, this relationship is not statistically significant $(\beta\ 0.160\ t(95) = 0.128, p = 0.216)$. Therefore, H2 is rejected. Also, the percentage of the explained variance is low, at 2.9% $(R^2 = 0.029)$, which means there is practically no correlation between the two variables. However, the relationship between IT flexibility and ITDC, path $b1$, is positive and significant $(\beta\ 0.727\ t(92) = 12.164, p = < 0.005)$, thus confirming H3. Since there is no significant relationship between ITHC and ITFL, there is no mediatory effect of $X \rightarrow M \rightarrow Y$. Given this result, there is no mediatory effect of ITFL between ITHC and ITDC, and thus H4 is rejected. Remarkably, the effect of IT flexibility on ITDC turns out to be not contingent on IT governance decentralization, path $b3\ (MiV)$, as evidenced by the statistically non-significant interaction between M and V in the model of

$Y\ (\beta = 0.049, p = 0.440)$. Following this result, H5 is rejected. This is in contrast to the earlier described theoretical findings, that future research should address.

This research also investigated the moderated influence of environmental factors on the enablement of ITDC, i.e., H6. The two constructs hostility and heterogeneity were measured on a 7-point Likert scale, which then, through dummy coding was divided into two different levels of groups: low <3.5 and high >3.5. Based on the findings (table 6), it is clear that environmental hostility, as well as environmental heterogeneity, do not influence the relation between ITHC and ITDC. Furthermore, the data shows that the effect of IT flexibility on ITDC is statistically significant $(p = 0.034, p = 0.000)$ for all the tested dimensions of environmental variables. Still, there is a slight change visible in the coefficients from the total effect β .727 $(\beta = .649, \beta = .691, \beta = .589\ and\ \beta = .753)$. This indicates that environ-mental factors influence the intensity of the effect of IT flexibility on ITDC. Therefore, hypothesis 6 is partly rejected.

Table 6: Environmental factors

Environmental factors	*No. of companies*	*Direct effect X on Y*	*Effect M on Y*	*Model Summary*
Low environmental hostility	28	$\beta = .205$, $p = 0.176$	$\beta = .649$, $p = 0.034$	$(F = (4,23) = 19.065, < 0.005)$, $R^2 = 0.787 = 78{,}7\%$
High environmental hostility	69	β = .088, p = 0.170	β = .691, p = 0.000	$(F = (1,67) = 0.844, < 0.005)$ $R^2 = 0.625 = 65{,}6\%$
Low environmental heterogeneity	37	β = .139 p = 0.196	β = .589, p = 0.000	F=(4,32) = 13.632, < 0.005), R^2 = $0.605 = 60{,}6\%$
High environmental heterogeneity	60	β = .109, p = 0.121	β = .753, p = 0.000	F=(4,55) = 30.381, < 0.005), R^2 = $0.656 = 65{,}6\%$
Total model	97	β = .140, p= 0.024	β = .727, p = 0.000	(F=(4,92) = 47.099, < 0.005), R^2 = $0.632 = 63{,}2\%$

5 Conclusion and future work

Our research contributes to the IS literature through four important findings. First, the moderation mediation analysis shows a positive effect of ITHC and IT flexibility on the formation of ITDC. Based on these results, we claim that organizations that want to respond to rapid change should not only develop a higher degree of IT flexibility but also invest resources in the development of ITHC. ITHC is highly required to remain competitive, especially during periods of environmental change (threatening) (Miller & Friesen, 1983). Moreover, according to past IS research, ITHC is a resource-based competitive advantage which is hard for competitors to imitate in a short period (Eisenhardt & Martin, 2000; Fink, 2011; Sambamurthy et al., 2003; Teece, 2007). Hence, it is crucial for firms to invest in their ITHC to compete, survive and grow. Second, in a surprising outcome, the effect of IT flexibility on ITDC turns out to be not contingent on IT governance decentralization. This particular outcome contrasts the analyses in an earlier study conducted by Mikalef et al. (2016) and calls for further research. Third, since the results show that firms benefit from an IT flexible architecture in their response to technological changes, we assume that ITDC is a requirement, regardless of environmental factors. It should be mentioned, howerver, that firms which operate in a highly complex environment would benefit the most. Fourth, this paper supports the findings of earlier research, that IT flexibility is a strong enabler of ITDC. These results indicate that flexible IT architecture enables organizations to address the rapidly changing business environment.

Despite its contributions to the literature, this study contains several limitations, that future research should seek to address. First, a more extensive dataset can contribute to the generalizability of our findings. Second, although there is no significant indication of moderation, it is interesting to get a better understanding of the interaction between IT flexibility and IT governance decentralization. Additionally, researchers have also called for considering the *industry* as an essential contextual variable for environmental conditions (Dale Stoel & Muhanna, 2009). Hence, comparing results across industries and distinct groups can contribute to the generalizability of our current findings. Future research can, then, also identify various configurational and contingency patterns and antecedents of ITDCs and how they collectively contribute to organizations'

competitive and innovative performance (Fiss, 2007; Mikalef, Pateli, Batenburg, & Wetering, 2015; van de Wetering, Mikalef, & Helms, 2017).

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