Dynamic Capabilities in Information Systems Research

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Outline of today...

- Introduce NTNU
- Present how the dynamic capabilities view fits into information systems research
- Explain how fsQCA can complement PLS analyses
- Talk about current research on Big Data and Business Value

NTNU

TRONDHEIM

ÅLESUND

GJØVIK

NTNU

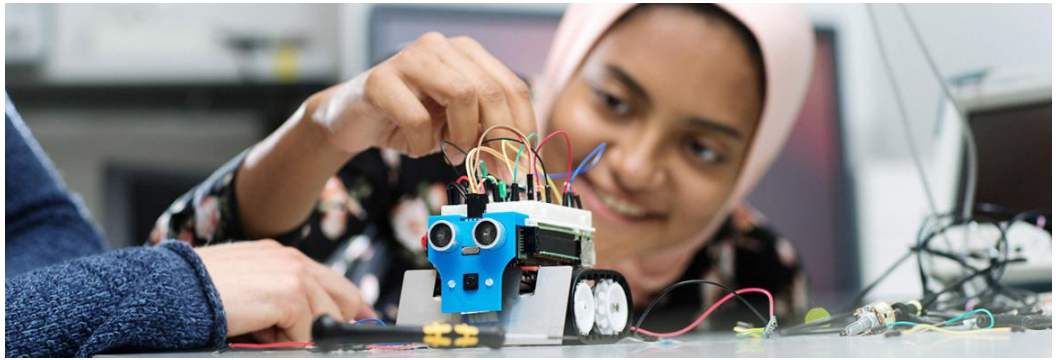
NTNU

- 8 faculties, 55 departments and NTNU University Museum
- 7.134 full-time equivalent staff (2017)
- Over 40.000 students (2017)
- 6.800 completed bachelor’s and master’s degrees (2016)
- 366 doctoral degrees completed in 2016, of which 42% by international PhD candidates
- Participating in 91 Horizon 2020 projects and has 4 ERC grants

Department of Computer Science (IDI)

Research groups

- Information Systems and Software Engineering (ISSE)
- Data and Artificial Intelligence (DART)
- Computing (COMP)



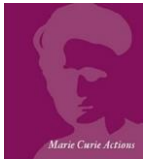
Teaching

- 4 Bachelor Degrees
- 4 Master Degrees
- Over 2500 students
- Center for Excellence in Education

Centre for Excellence in Education

Department of Computer Science (IDI)

- International
  - 10 active H2020
  - 2 active EEA
  - 1 active FP7



- Norwegian Research Council
  - 10 active H2020
  - 2 active EEA
  - 1 active FP7

Department of Computer Science (IDI)

- Industrial Collaboration
  - 6 active projects
  - Close cooperation with many industry partners

Dynamic Capabilities in Information Systems Research

IT-Business Value Research

- The fundamental question in the field of IS Strategy is how firms can achieve and sustain a competitive advantage from their IT investments (Melville et al. 2004)

- IT-business value research has predominantly relied on the Resource Based View (RBV) through the notion of IT Capabilities (Grover et al., 2009)
  - is internally oriented
  - simple view of how resources are connected to strategies that a firm pursues
  - does not explain how IT investments can help firms evolve under changing market conditions

- The complexity, velocity, and uncertainty of contemporary market conditions requires adopting a new theoretical paradigm

Some points from literature

- *“IT is increasingly deeply embedded in processes, so rather than separating out IT, we must understand capabilities (or digital capabilities) first.”*

  “In other words, the question of "what business capability is needed" should come first. Then the resources required in building that capability comes next.” (Kohli & Grover, 2008).

- *“It is clearly time to rethink the role of IT strategy, from that of a functional-level strategy—aligned but essentially always subordinate to business strategy—to a fusion between IT strategy and business strategy into an overarching phenomenon we herein term digital business strategy.” (Bharadwaj et al., 2013)*

Research Question

“How can IT enable a firm to reconfigure its current means of operation and support the dynamic co-evolution with the constantly changing business environment?”

A review of literature

Resources

- “commodity-like assets that are widely available and can purchased from the factor market” (Wang et al., 2012)
- Tangible (financial and physical resources), human (knowledge and skills), or intangible (reputation and culture) (Grant, 1991)

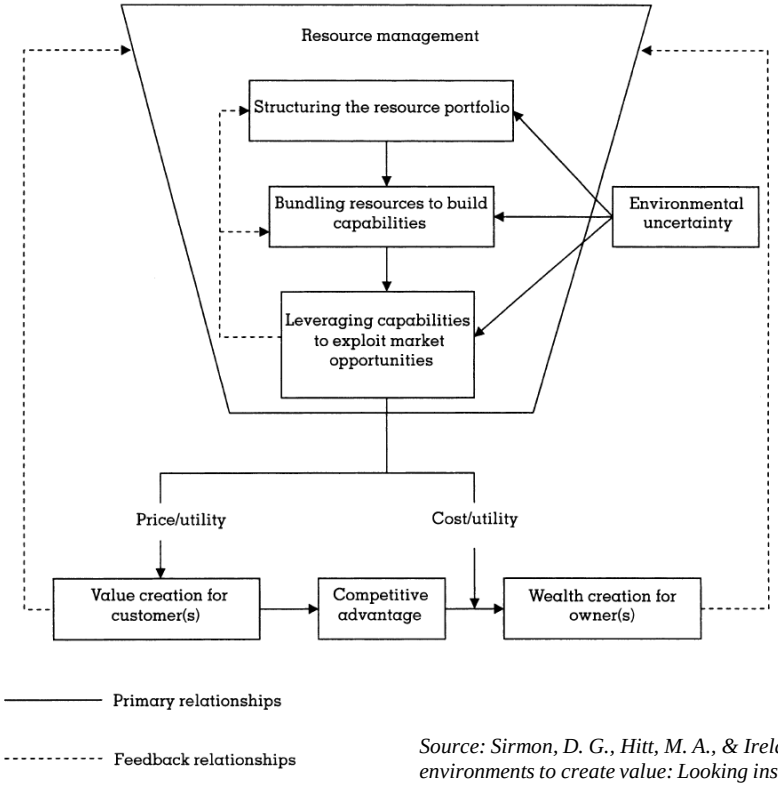
Competencies

- The ability to effectively manage resources (orchestration/structuring)
- “competencies involve the ability to develop, manage and deploy resources in support of a capability” (Cragg et al., 2011)

Capabilities

- represent the potential of a business to attain certain goals through focused deployment of resources and competencies, and constitute the basis on which firms compete (Schreyögg & Kliesch-Eberl, 2007)
- the capacity to perform a particular activity in a reliable and at least minimally satisfactory level (Helfat & Winter, 2011)

Resource Management



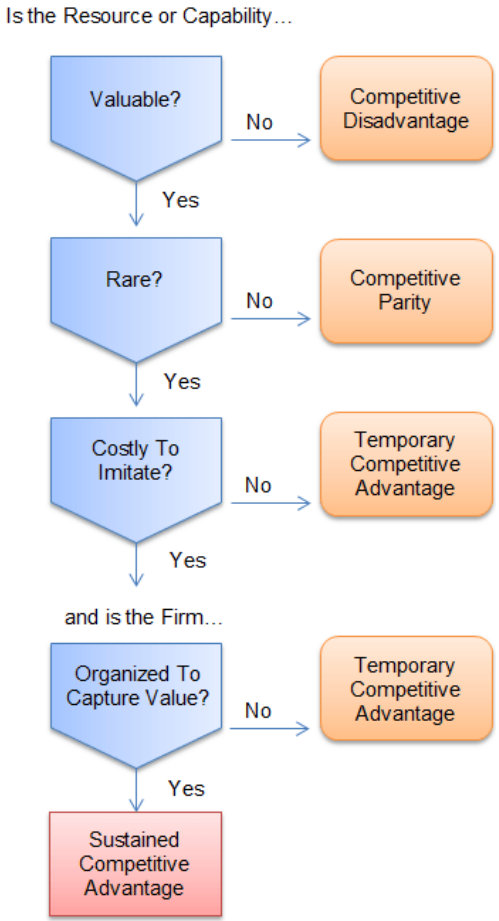
Source: Sirmon, D. G., Hitt, M. A., & Ireland, R. D. (2007). Managing firm resources in dynamic environments to create value: Looking inside the black box. Academy of management review, 32(1), 273-292.

Two critical assumptions

Two assumptions that underlie the RBV and are critical in explaining superior firm performance

Heterogeneity
The first assumption is that skills, capabilities and other resources that organizations possess differ from one company to another.

Immobility
Resources are not mobile and do not move from company to company, at least in short-run



Dynamic Capabilities

- Why are some firms, despite the relatively superior resources they possess, not able to sustain their competitive advantage over time, especially in dynamic markets?

- “The ability of an organization and its management to integrate, build, and reconfigure internal and external competences to address rapidly changing environments” (Teece et al., 1997)

- Firms with dynamic capabilities can adapt their resources and competences and exploit opportunities created by market shocks and discontinuities.

Dynamic and Ordinary Capabilities

	ORDINARY CAPABILITIES	**DYNAMIC** CAPABILITIES
Purpose	• Technical efficiency in basic business functions	• Strategic “fit” over the long run (evolutionary fitness)
Schema	• Operational, administrative, and marketing	• Sensing, integrating, learning, coordinating and reconfiguring
Imitability	• Relatively easy; imitable	• Difficult; inimitable
	Doing *things “right”*	**Doing** *the “right” things*

- Strong ordinary capabilities are necessary but not sufficient for long-run success. They can be acquired (“bought”) from consultants or through investments in training.
- Strong dynamic capabilities and good strategy are necessary for long-run success. They cannot be bought and must be built.

Dynamic Capabilities and IS

Three questions emerge when applying the Dynamic Capabilities View to IT research:

- How should IT-Enabled Dynamic Capabilities be measured?
- Are IT-Enabled Dynamic Capabilities valuable for firms, and if so through what mechanisms and under what conditions?
- What factors enhance the formation of IT-Enabled Dynamic Capabilities?

Measuring IT-enabled Dynamic Capabilities

Defining IT-enabled Dynamic Capabilities

- “IT-enabled dynamic capabilities are defined as a firm’s ability to leverage its IT resources, in combination with other organizational resources, in order to address rapidly changing business environments.”

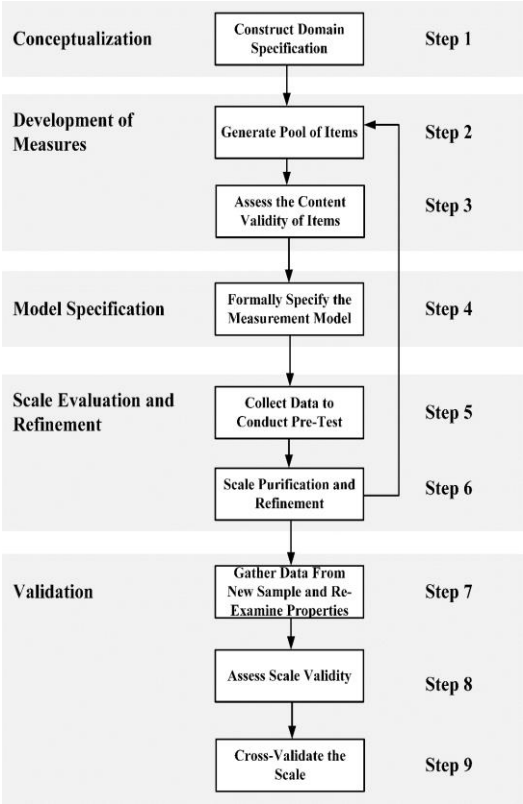
- Dynamic Capabilities are often operationalized as a set of identifiable and specific routines, or else capabilities (Eisenhardt & Martin, 2000).

- To identify the routines that underpin dynamic capabilities past studies have relied on the definitions of Teece et al. (1997), and Teece (2007).
  - Sensing
  - Coordinating
  - Learning
  - Integrating
  - Reconfiguring

Developing a measurement instrument

- According to DeVellis (2012), a measurement instrument is used to “develop scales when we want to measure phenomena that we believe to exist because of our theoretical understanding of the world, but we cannot assess directly”

- The process described by DeVellis (2012), Lewis et al. (2005), and MacKenzie et al. (2011) was followed



Selecting measures and items

- Generated a pool of items
  - Adapted existing measures of empirical studies
    - Strategic Management
    - Information Systems
  - Deduction from conceptual definitions
  - Expert suggestions

- Items were then subjected to empirical assessment of their content validity
  - Q-sort (Hit rate)
  - Content Validity Ratio (CVR)

- An expert group of:
  - 5 Academics
  - 4 Executives

Assessing content validity

- Q-sort

Dimension	Sensing	Coordinating	Learning	Integrating	Reconfiguring	Number of Items	Total	Item Placement Ratio
Sensing	50	0	2	2	0	6	54	92%
Coordinating	1	44	1	2	6	6	54	82%
Learning	1	0	31	1	3	4	36	87%
Integrating	0	4	2	37	2	5	45	82%
Reconfiguring	0	3	1	3	38	5	45	85%

- Content Validity Ratio (CVR)
  - Experts were asked to rate how important they thought each item was on its respective dimension. (1 – Not relevant, 2 – Important, and 3 – Essential)
  - The CVR was calculated through the formula: $\mathrm{CVR} = \frac{\mathrm{Ne} - \frac{N}{2}}{\frac{N}{2}}$
  - For a group of 9 experts the minimum required CVR score is 0.78 (Lawshe, 1975)

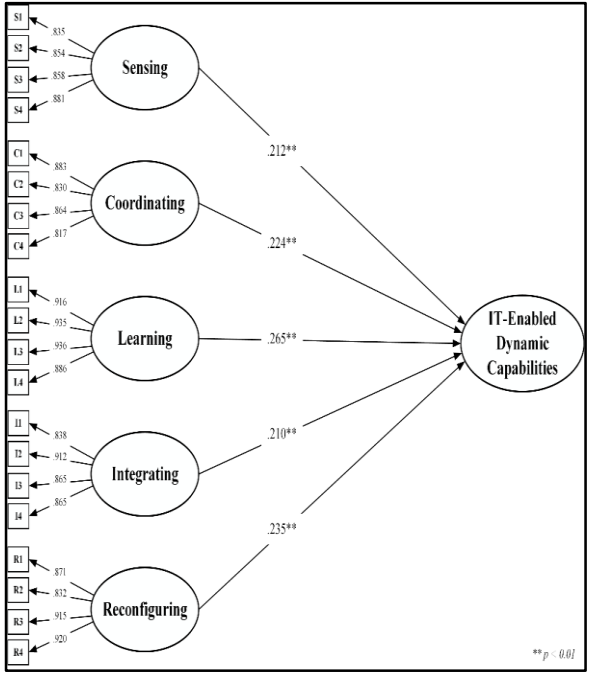
- From each dimension a number of items was dropped
  - Sensing (2 Items)
  - Coordinating (2 Items)
  - Learning (0 Items)
  - Integrating (1 item)
  - Reconfiguring (1 Item)

Model specification, scale evaluation, and validation

- Model Specification
  - Recommendation by Jarvis et al. (2003) and MacKenzie et al. (2005) were followed
  - IT-Enabled Dynamic Capabilities were specified as a Type II second-order construct (first-order reflective, second-order formative)

- Scale Evaluation
  - The statistical properties of IT-Enabled Dynamic Capabilities were pre-tested on a small-cycle study of 17 Greek companies.
  - Convergent and discriminant validity and reliability
  - First-order factors were tested to confirm that they had significant associations with the second-order factor and there are no issues of multicollinearity (VIF)

- Instrument Validation
  - Final validation was performed as part of the main empirical study with 322 international firms

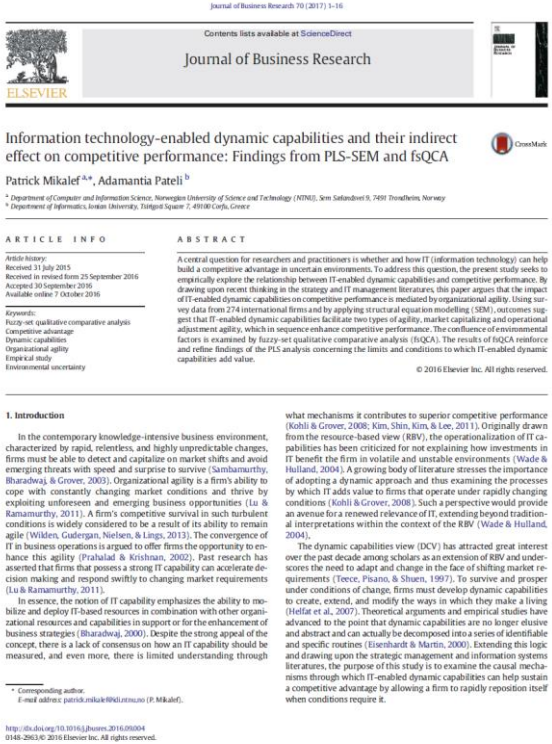


IT-enabled dynamic capabilities and their indirect effect on competitive performance

Findings from PLS-SEM and fsQCA

Do IT-enabled dynamic capabilities impact competitive performance?

- What is the value of IT-enabled dynamic capabilities?
- Through what mechanisms is their effect realized?
- Under what conditions are they of most value?



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Information technology-enabled dynamic capabilities and their indirect effect on competitive performance: Findings from PLS-SEM and fsQCA

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Environmental uncertainty

ABSTRACT

A central question for researchers and practitioners is whether and how IT (information technology) can help build a competitive advantage in uncertain environments. To address this question, the present study seeks to empirically explore the relationship between IT-enabled dynamic capabilities and competitive performance. By drawing upon recent thinking in the strategy and IT management literatures, this paper argues that the impact of IT-enabled dynamic capabilities on competitive performance is mediated by organizational agility. Using survey data from 274 international firms and by applying structural equation modelling (SEM), outcomes suggest that IT-enabled dynamic capabilities facilitate two types of agility, market capitalizing and operational adjustment agility, which in sequence enhance competitive performance. The confluence of environmental factors is examined by fuzzy-set qualitative comparative analysis (fsQCA). The results of fsQCA reinforce and refine findings of the PLS analysis concerning the limits and conditions to which IT-enabled dynamic capabilities add value.

1. Introduction

In the contemporary knowledge-intensive business environment, characterized by rapid, relentless, and highly unpredictable changes, firms must be able to detect and capitalize on market shifts and avoid emerging threats with speed and surprise to survive (Sambamurthy, Bharadwaj, & Grover, 2003). Organizational agility is a firm's ability to cope with constantly changing market conditions and thrive by exploiting unforeseen and emerging business opportunities (Lu & Ramamurthy, 2011). A firm's competitive survival in such turbulent conditions is widely considered to be a result of its ability to remain agile (Wilden, Gudergan, Nielsen, & Lings, 2013). The convergence of IT in business operations is argued to offer firms the opportunity to enhance this agility (Prahalad & Krishnan, 2002). Past research has asserted that firms that possess a strong IT capability can accelerate decision making and respond swiftly to changing market requirements (Lu & Ramamurthy, 2011).

In essence, the notion of IT capability emphasizes the ability to mobilize and deploy IT-based resources in combination with other organizational resources and capabilities in support or for the enhancement of business strategies (Bharadwaj, 2000). Despite the strong appeal of the concept, there is a lack of consensus on how an IT capability should be measured, and even more, there is limited understanding through what mechanisms it contributes to superior competitive performance (Kohli & Grover, 2008; Kim, Shin, Kim, & Lee, 2011). Originally drawn from the resource-based view (RBV), the operationalization of IT capabilities has been criticized for not explaining how investments in IT benefit the firm in volatile and unstable environments (Wade & Hulland, 2004). A growing body of literature stresses the importance of adopting a dynamic approach and thus examining the processes by which IT adds value to firms that operate under rapidly changing conditions (Kohli & Grover, 2008). Such a perspective would provide an avenue for a renewed relevance of IT, extending beyond traditional interpretations within the context of the RBV (Wade & Hulland, 2004).

The dynamic capabilities view (DCV) has attracted great interest over the past decade among scholars as an extension of RBV and underscores the need to adapt and change in the face of shifting market requirements (Teece, Pisano, & Shuen, 1997). To survive and prosper under conditions of change, firms must develop dynamic capabilities to create, extend, and modify the ways in which they make a living (Helfat et al., 2007). Theoretical arguments and empirical studies have advanced to the point that dynamic capabilities are no longer elusive and abstract and can actually be decomposed into a series of identifiable and specific routines (Eisenhardt & Martin, 2000). Extending this logic and drawing upon the strategic management and information systems literatures, the purpose of this study is to examine the causal mechanisms through which IT-enabled dynamic capabilities can help sustain a competitive advantage by allowing a firm to rapidly reposition itself when conditions require it.

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NTNU

Dynamic capabilities and competitive performance

- Why Firm-Level Capabilities?
  - Capabilities cannot be readily assembled through markets
  - Many distinctive elements of internal organization cannot be replicated in the market, or just through formal contracts

- Empirical studies demonstrate a positive overall impact of dynamic capabilities on competitive performance (Schilke, 2014)

- Impact of Dynamic Capabilities on Competitive Performance
  - Direct (Originally)
  - Indirect (Favored in recent work)

- Competitive performance does not stem from dynamic capabilities per se, but rather, on the resource configurations created by dynamic capabilities

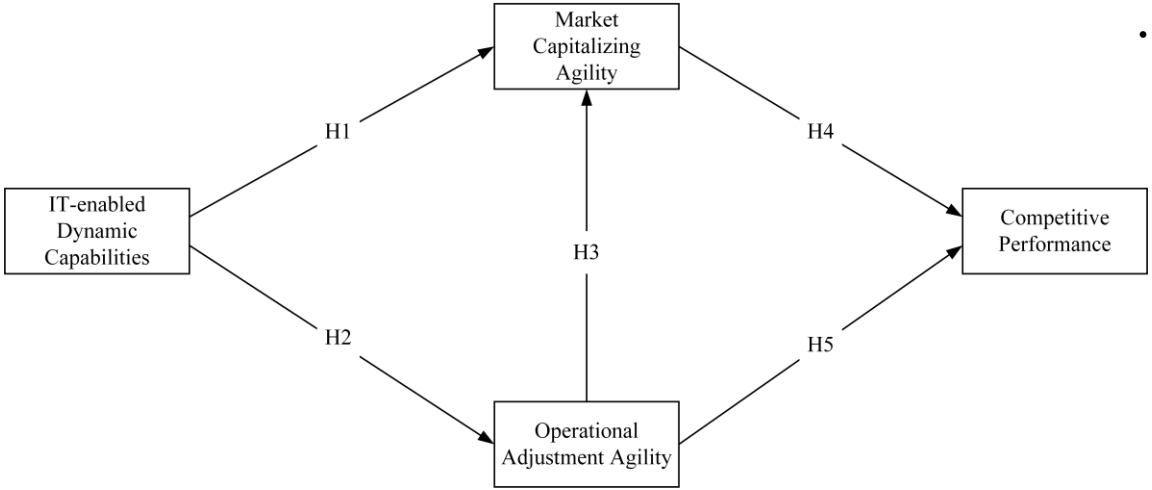
Mechanisms of action

Theoretical suggestions argue that dynamic capabilities exert effect through two primary mechanisms:

- can improve the speed, effectiveness, and efficiency with which a firm operates and responds to changes in its environment

- can positively affect firm performance by allowing the firm to identify and respond to opportunities through developing new processes, products, and services

Research model



- Market capitalizing agility is defined as the ability to rapidly improve product/service offerings in response to shifting customer needs through continuous monitoring and exploitation of changes that occur in the business environment.

- Operational adjustment agility is defined as the ability of a firm to adjust its internal business processes to physically and rapidly cope with market or demand changes.

The impact of environmental uncertainty

- Much empirical work has focused on the value of Dynamic Capabilities in highly uncertain environments (Teece et al., 1997)

- Dynamic Capabilities can be of importance in conditions of moderate or even low environmental uncertainty (Eisenhardt and Martin, 2000; Helfat & Winter, 2011)

- The contingency perspective argues that the value of Dynamic Capabilities is influenced by different environmental conditions (Aragon-Correa & Sharma, 2003; Sirmon et al., 2007)

- Dynamic Capabilities should be examined under diverse environmental conditions (Barreto, 2010)

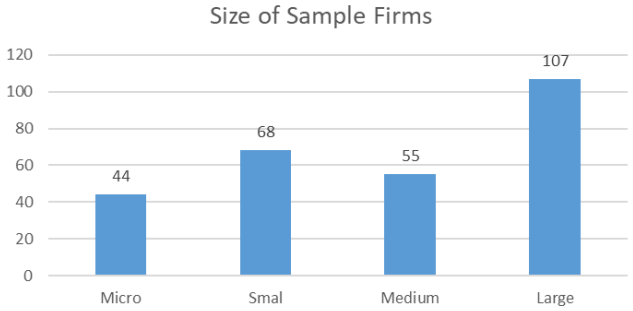
Constructs and definitions

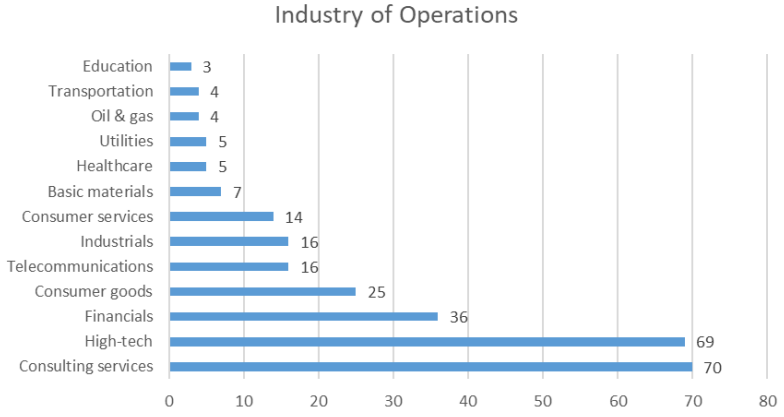
Construct	Dimensions	Items	Definition	Source
IT-Enabled Dynamic Capabilities	Sensing Coordinating Learning Integrating Reconfiguring	20	A firm's ability to leverage its IT resources and IT competencies, in combination with other organizational resources and capabilities, in order to address rapidly changing business environments.	Own defined
Market Capitalizing Agility		3	A firm's ability to quickly respond and capitalize on market changes by improving products and services to address customer needs	Lu & Ramamurthy, 2011
Operational Adjustment Agility		3	A firm's ability to rapidly restructure its internal business processes in response to market or demand changes	Lu & Ramamurthy, 2011
Dynamism		4	The rate and unpredictability of environmental change	Newkirk & Lederer, 2006
Heterogeneity		3	The complexity and diversity of external factors, such as the variety of customer buying habits and the nature of competition	Newkirk & Lederer, 2006
Hostility		5	The availability of key resources and the level of competition in the external environment	Newkirk & Lederer, 2006
Competitive Performance		10	The degree to which a firm performs better than its key competitors	Rai & Tang, 2010

Data collection

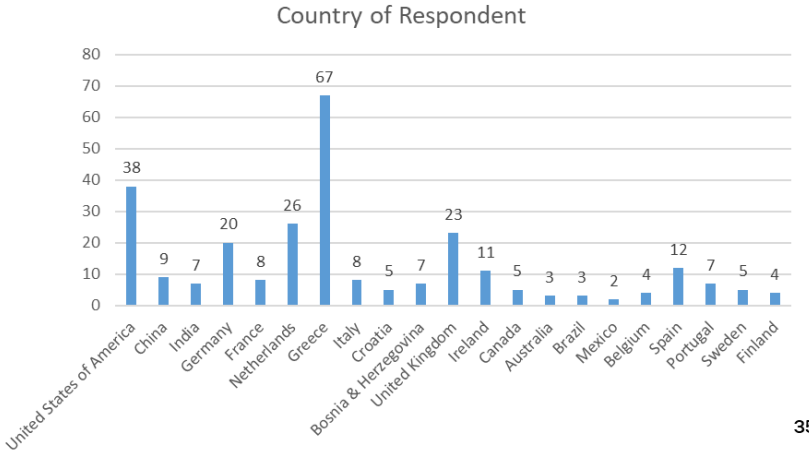
- Survey based study with key informants
  - CIOs, CTOs, Enterprise Architects, CEOs
  - 1300 firms were selected from the ICAP business directory
  - Three email reminders
- Data collection period January 2015 – May 2015 (5 months)
- Incentive to participate a personalized report
- 291 responses / 274 usable questionnaires (21.07% response rate)
- Early (first 3 weeks) and late (last 3 weeks) responses were compared

Sample





Position	No. of Responses
Chief Information Officer (CIO)	68
Chief Technology Officer (CTO)	56
IT Manager	45
Chief Executive Officer (CEO)	32
Enterprise Architect	24
Business Analyst	13
Chief Operations Officer (COO)	9
Director of IT	8
IT Consultant	8
Business Manager	6
Project Leader	5
Total Responses	274

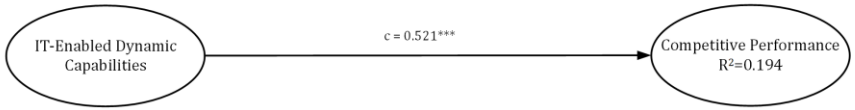


Data analysis methodologies

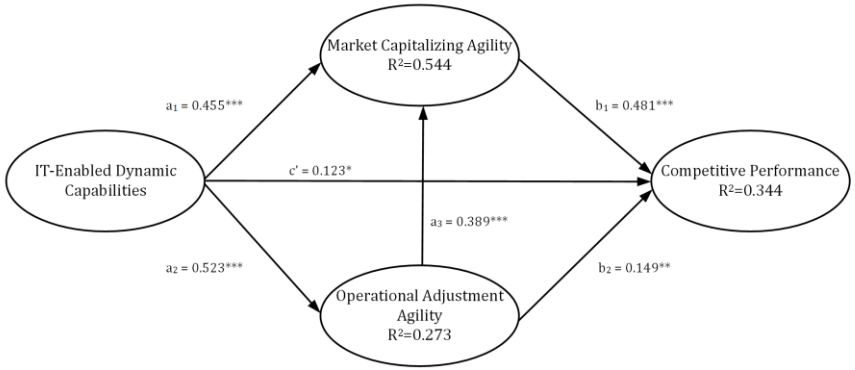
- Partial Least Squares - Structural Equation Modeling (PLS-SEM)
  - The effect of IT-Enabled Dynamic Capabilities on Competitive Performance
- Fuzzy set Qualitative Comparative Analysis (fsQCA)
  - The influence of Environmental Uncertainty on the value of IT-Enabled Dynamic Capabilities

Results

A) Model with total effect



B) Model with multi-step multiple mediation design



*** p < 0.001, ** p < 0.01, * p < 0.05

Model A Total effect (c)			Model B Direct effect (c')			Model B Indirect effects			
Path	Coefficient	t-Value	Path	Coefficient	t-Value	Path	Point estimate	Bias corrected bootstrap 95% confidence interval	
								Lower	Upper
ITDC → CP	0.52***	3.78	ITDC → CP	0.12*	2.11	Total	0.40	0.32	0.49
						a_1b_1 (via MCA)	0.22	0.17	0.26
						a_2b_2 (via OAA)	0.08	0.04	0.11
						$a_2a_3b_1$	0.10	0.09	0.12

ITDC: IT-enabled dynamic capabilities, MCA: market capitalizing agility, OAA: operational adjustment agility, CP: competitive performance. Bootstrapping 15% confidence interval based on 5000 samples.
*** $p < 0.001$.
* $p < 0.05$.

Theories and tools

- **Variance theories** are concerned with predicting levels of outcome from levels of predictor variables

- **Process theories** are concerned with explaining how outcomes develop over time

- **Complexity theories** attempts to reconcile the unpredictability of non-linear dynamic systems with a sense of underlying order and structure

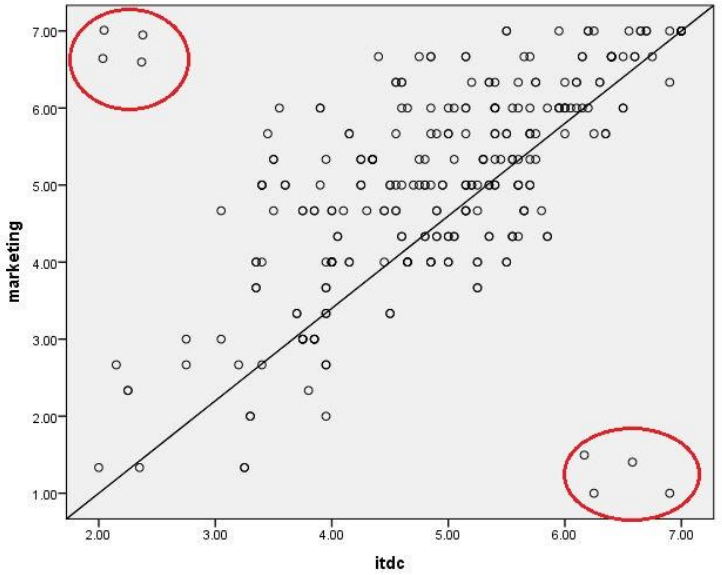
Beyond linear structures in IS theories

"You cannot observe a quark using Newtonian physics" (Niels, Bohr)

"IS strategy research may be missing many crucial phenomena around digital eco-dynamics by using theory structures and methodologies that are more suitable for a neat linear world with separable variables and invariant unifinal relationships" (El Sawy et al., 2010)

Contrarian cases

- Most observable relationships are not 100% linear, thus, correlation coefficients cannot accurately capture them (Woodside, 2013; Skarmeas et al., 2014)
- Asymmetrical conditions should be explored through a contrarian case analysis (Woodside, 2014)
- Explore under what circumstances of environmental uncertainty IT-enabled dynamic capabilities affect outcomes



Contrarian case analysis

Market capitalizing agility

IT-enabled dynamic capabilities	1	2	3	4	5	Total
1	31 (11.3%)	16 (5.8%)	4 (1.5%)	**4 (1.5%)**	**0 (0%)**	55 (20.1%)
2	9 (3.3%)	21 (7.7%)	9 (3.3%)	**8 (2.9%)**	**9 (3.3%)**	56 (20.4%)
3	6 (2.2%)	20 (7.3%)	9 (3.3%)	11 (4.0%)	9 (3.3%)	55 (20.1%)
4	**0 (0%)**	**20 (7.3%)**	8 (2.9%)	16 (5.8%)	9 (3.3%)	53 (19.3%)
5	**2 (0.7%)**	**0 (0%)**	0 (0%)	19 (6.9%)	34 (12.4%)	55 (20.1%)
Total	48 (17.5%)	77 (28.1%)	30 (10.9%)	58 (21.2%)	61 (22.3%)	274 (100%)

Note. The significant main effect relationship indicates a large effect size, $\varphi^2 = 0.588$ ($p < 0.001$). However, contrarian cases still occur (marked in light grey bolded squares).

Operational adjustment agility

IT-enabled dynamic capabilities	1	2	3	4	5	Total
1	18 (6.6%)	27 (9.9%)	3 (1.1%)	**4 (1.5%)**	**3 (1.1%)**	55 (20.1%)
2	17 (6.2%)	16 (5.8%)	7 (2.6%)	**11 (4.0%)**	**5 (1.8%)**	56 (20.4%)
3	5 (1.8%)	22 (8.0%)	6 (2.2%)	10 (3.6%)	12 (4.4%)	55 (20.1%)
4	**4 (1.5%)**	**10 (3.6%)**	6 (2.2%)	19 (6.9%)	14 (5.1%)	53 (19.3%)
5	**3 (1.1%)**	**0 (0%)**	10 (3.6%)	12 (4.4%)	30 (10.9%)	55 (20.1%)
Total	47 (17.2%)	75 (27.4%)	32 (11.7%)	56 (20.4%)	64 (23.4%)	274 (100%)

Note. The significant main effect relationship indicates a medium–to–large effect size, $\varphi^2 = 0.374$ ($p < 0.001$). However, contrarian cases still occur (marked in light grey bolded squares).

fsQCA in management and IS literature

fsQCA identifies patterns of elements, between independent and dependent variables, that lead to an outcome and goes a step further from the analyses of variance, correlations and multiple regression models.

BUILDING BETTER CAUSAL THEORIES: A FUZZY SET APPROACH TO TYPOLOGIES IN ORGANIZATION RESEARCH

PEER C. FISS
University of Southern California

Typologies are an important way of organizing the complex cause-effect relationships that are key building blocks of the strategy and organization literatures. Here, I develop a novel theoretical perspective on causal core and periphery, which is based on how elements of a configuration are connected to outcomes. Using data on high-technology firms, I empirically investigate configurations based on the Miles and Snow typology using fuzzy set qualitative comparative analysis (fsQCA). My findings show how the theoretical perspective developed here allows for a detailed analysis of causal core, periphery, and asymmetry, shifting the focus to midrange theories of causal processes.

Types and typologies are ubiquitous, both in everyday social life and in the language of the social sciences. Everybody uses them, but almost no one pays any attention to the nature of their construction.

-McKinney (1969: 4)

The notion of causality plays a key role in both the strategy and organization literatures. For instance, cause-effect relationships are the central way in which strategic decisions and organizational structures are understood and communicated in organizations (Ford, 1985; Huff, 1990; Huff & Jenkins, 2001). Building on this insight, the cognitive strategy literature has aimed to map and explain the causal reasoning of managers regarding both organizational performance and competitive environments (e.g., Barr, Stimpert, & Huff, 1992; Nadkarni & Narayanan, 2007a, 2007b; Reger & Huff, 1993). Similarly, cause-effect relationships are the main building blocks of the organizational design literature and have recently received increasing attention (e.g., Burton & Obel, 2004; Grandori & Furnari, 2008; Romme, 2003; Van Aken, 2005).

A key way of organizing complex webs of cause-effect relationships into coherent accounts is by means of typologies. As Doty and Glick (1994) argued, typologies are a unique form of theory building in that they are complex theories that describe the causal relationships of contextual, structural, and strategic factors, thus offering configurations that can be used to predict variance in an outcome of interest. As such, typologies have been very popular and form a central pillar of both the strategic management and organizational literatures. For instance, typologies such as those of Blau and Scott (1962), Burns and Stalker (1961), Etzioni (1961), Miles and Snow (1978), Mintzberg (1983), Porter (1980), and others have figured prominently in both fields of research and continue to draw considerable attention (e.g., DeSarbo, Di Benedetto, Song, & Sinha, 2005; Kabanoff & Brown, 2008; Meyer, Tsui, & Hinings, 1993).

Typologies are theoretically attractive for a number of reasons. Because of their multidimensional nature, the configurational arguments embedded in typologies acknowledge the complex and interdependent nature of organizations, in which fit and competitive advantage frequently rest not on a single attribute but instead on the relationships and complementarities between multiple characteristics (e.g., Burton & Obel, 2004; Miller, 1996; Siggelkow, 2002). As such, typologies at their best result in integrative theories that account for multiple causal relationships linking structure, strategy, and environment (Child, 1972; McPhee & Scott

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"Tools impact thinking and theory crafting as well theory testing."
(Woodside, 2013)

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Moving beyond multiple regression analysis to algorithms: Calling for adoption of a paradigm shift from symmetric to asymmetric thinking in data analysis and crafting theory☆

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ABSTRACT

This editorial suggests moving beyond relying on the dominant logic of multiple regression analysis (MRA) toward thinking and using algorithms in advancing and testing theory in accounting, consumer research, finance, management, and marketing. The editorial includes an example of testing an MRA model for fit and predictive validity. The same data used for the MRA is used to conduct a fuzzy-set qualitative comparative analysis (fsQCA). The editorial reviews a number of insights by prominent scholars including Gerd Gigerenzer's treatise that "Scientists' tools are not neutral." Tools impact thinking and theory crafting as well theory testing. The discussion may be helpful for early career scholars unfamiliar with David C. McClelland's brilliance in data analysis and in introducing business research scholars to fsQCA as an alternative tool for theory development and data analysis.

1. Introduction: tools-to-theory perspective

MRA is more than just a statistical tool—the method shapes thinking and theory crafting. "Scientists' tools are not neutral" (Gigerenzer, 1991, p. 19). This editorial is an echo and an application of Gigerenzer's (1991) general thesis that scientific tools (both methods and instruments) suggest new theoretical metaphors and theoretical concepts once they are entrenched in scientific practice; familiarity with the tools within a scientific community also lays the foundation for the general acceptance of the theoretical concepts and metaphors inspired by the tools. This editorial is not to suggest that researchers should always avoid using MRA.

The editorial does suggest that most MRA applications in business research and JBR submissions are done badly and that researchers should think and craft algorithms for building and testing theory much more often than they now do. The recommendations concerning MRA apply to structural equation modeling (SEM) as well.

Additional comments on the severe limitations of MRA and SEM research using fixed-point five- and seven-point self-report scales to learn cognitive processes appear elsewhere (Woodside, 2011). The limitations of using one-shot, one-person-per-firm, or one-person-per-household, self-reports as valid indicators of causal relationships of actual processes are so severe that academics should do more than think twice before using such surveys as the main method for collecting data—if scholars seek to understand and describe actual thinking processes additional methods are necessary for data collection. The relevant literature includes several gems of exceptionally high quality, validity, and usefulness in the study of actual processes; reading these studies is a useful step toward reducing the reliance on one-shot self-report surveys (Woodside, 2011, describes some of these exceptionally high-quality studies).

2. A call to move beyond MRA

Several tenets support this call to move beyond MRA to crafting and testing theory using algorithms. First, researchers using MRA focus on estimating whether or not the influence (i.e., the effect size) of each hypothesized independent variable associates significantly with a dependent variable after separating out the influence of other independent variables in an equation involving two or more independent variables—a "net effects" estimation approach to research. Frequently, such research reports include comparisons of models with specific independent variables having significant versus insignificant net effects depending on the presence or absence of other independent variables in the models.

Given that multi-collinearity (i.e., significant correlations among the independent variables) always occurs with a high number of

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fsQCA

- A logical (deterministic) and not a statistical (probabilistic) technique that uses Boolean algebra to identify patterns of elements that lead to desired outcome

- Builds on Complexity theory and incorporates two core principles:

  – **Equifinality,** based on which the outcome of interest can be explained equally by alternative sets of causal conditions that combine in sufficient configurations for the outcome

  – **Causal asymmetry** means that for an outcome to occur, the presence and absence of a causal condition depend on how this condition combines with one or more others

Data calibration

- Direct method
  - Choose three qualitative thresholds
    - Full-set membership, full-set non-membership, intermediate-set membership

- Here we are based on the survey scale (7-point Likert).
  - Full membership threshold → 6
  - Full non-membership threshold → 3
  - Crossover point → 4.5

Results

Configuration	Solution								
	Market capitalizing agility				Operational adjustment agility				
	1	2	3	4	1	2	3	4	5
Dynamism		●	●	●		●	●	●	⊗
Heterogeneity				●				●	⊗
Hostility	⊗		⊗		⊗		⊗		
IT-enabled dynamic capabilities	●	●	●	●	●	●	●	●	⊗
Firm size	⊗	⊗			⊗	⊗			●
Consistency	0.901	0.917	0.917	0.923	0.766	0.842	0.829	0.888	0.774
Raw coverage	0.439	0.428	0.503	0.500	0.428	0.450	0.521	0.551	0.129
Unique coverage	0.111	0.010	0.050	0.030	0.086	0.007	0.027	0.031	0.054
Overall solution consistency	0.895				0.775				
Overall solution coverage	0.745				0.802				

The black circles (●) denote the presence of a condition, while the crossed-out circles (⊗) indicate the absence of it (Ragin, 2008). Core elements of a configuration are marked with large circles (prime implicants), peripheral elements with small ones, and blank spaces are an indication of a “don’t care” situation, in which the causal condition may be either present or absent.

Theoretical Implications

- Developed and validated the IT-enabled dynamic capabilities construct as a set of specific and identifiable routines
- Explored the mechanisms through which IT-Enabled Dynamic Capabilities impact Competitive Performance
- IT-Enabled Dynamic Capabilities are found to be of value under varying levels and different configurations of environmental uncertainty
- Contributes to the field of Information Systems Strategy by presenting the importance of IT-Enabled Dynamic Capabilities and how they complement past research

Methodological Implications

- Using fsQCA enables a different point-of-view concerning the impact of IT, since it allows for equifinality, meaning that an outcome of interest may be explained by one or more solutions.

- PLS-SEM and fsQCA techniques produce virtuous complementarities:
  - The former provide an indication of general tendencies in complex cause-effect associations
  - The latter allows the examination of specific conditions as well as possible contrarian cases.

- General tendencies are important in deriving implications for theory,

- In practice, however, it is important to examine those cases that run counter to main theorizations, since they may provide rich information on contingency effects.

Work under development

- Examine the structural conditions that facilitate the formation of IT-enabled dynamic capabilities
  - Modular systems theory

- Investigate the impact of IT-enabled dynamic capabilities on firm innovativeness

- Examine competing mechanisms of agility and innovativeness based on context and environmental conditions

Future areas of research

- Investigate how IT-Enabled Dynamic Capabilities are formed in different industries and contexts:
  - High-tech/Low-tech sectors
  - New/Established companies
  - International/Local operations
  - Political and economical stability
- Examine the forms IT-Enabled Dynamic Capabilities may take in different contexts and under varying environmental uncertainty conditions
- Investigate how the value of IT-Enabled Dynamic Capabilities is diffused within the organization and determine what enhances or hinders the impact on competitive performance
- Explore how path-dependency in the IT area influences the formation and potential value of IT-Enabled Dynamic Capabilities
  - Multiple respondents
  - Qualitative methods for identifying micro-foundations
  - Longitudinal study to explore how IT-Enabled Dynamic Capabilities are formed and how they are utilized over time

Big Data and Business Value

CADENT

CADENT (2016 - 2019), “Competitive Advantage for the Data-driven Enterprise”, Horizon 2020 – EC Funded (http://www.cadent2020.eu)

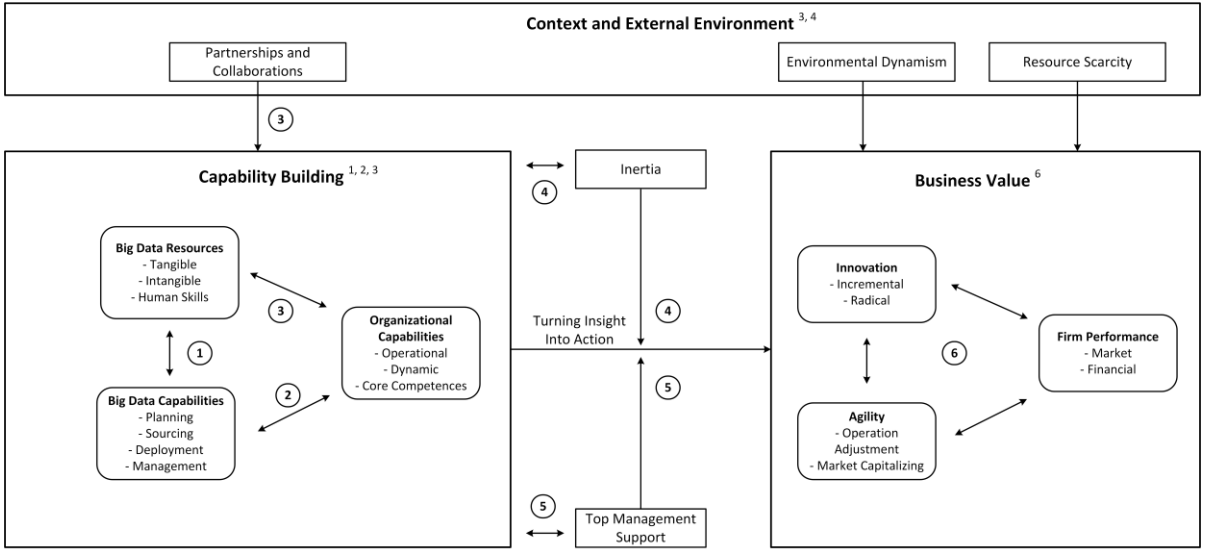
The purpose of the Competitive Advantage for the Data-driven ENTerprise (CADENT) project is to address the issue of how companies should optimally deploy and exploit big data as part of their competitive strategies.

While most efforts have focused on technological aspects of big data, the human, organizational, and strategic shifts that big data entail are largely under-researched.

Research topics

- Big data analytics capability and business value
- The role of information governance
- How does big data insight feed into strategy
- Data reach and bounded rationality

- Multi-level inertia
- Data-oriented strategic alliances and innovation
- Psychological foundations of dynamic capabilities – dual process theory



Empirical research

- Quantitative studies
  - 500 largest Norwegian companies – 202 responses (Completed)
  - Greek companies – 175 responses (Completed)
  - Paired responses (CIO & CEO) (Planned)

- Qualitative studies
  - International CIO's – 28 case studies (Completed)
  - Focus groups (Planned)

Ongoing activities

Develop a monitoring mechanism of big data status in Norway through semi-annual feedback and reporting

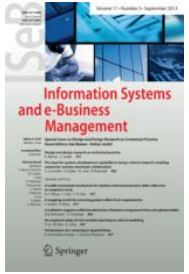
Understand challenged that companies face and develop a forum for discussion

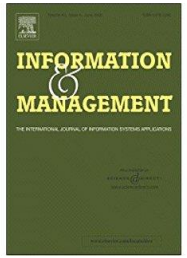
- Technical
- Human skills
- Top management
- Quantifying value of big data

Gain a more in-depth view of trends and emerging directions related to big data and analytics

Identify fore-runners and laggards and compare performance

Academic community





- Special issues
  - Information Systems and e-Business Management (Completed)
  - Information & Management (Ongoing)

- Conference tracks
  - ECIS – 2017, 2018
  - AMCIS – 2017, 2018
  - MCIS – 2016, 2017, 2018

ASSOCIATION FOR INFORMATION SYSTEMS

- Conference organization
  - IFIP 6.11 I3E – Trondheim, 2019

ifip

Thank you for your attention!

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