The Paradox of Routines for Change in a volatile environment:
Source of Inertia or Improvement?

Systematic literature review which sheds lights on the role of routines on organizational change in a volatile environment.

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Abstract

Routines are an important facet of any organization and can influence overall firm performance. These organizational routines seem to have a double role in organizational change. By performing a systematic literature review, we try to analyze this double role in dynamic environments, to come to a deeper understanding of the effects of routines and its micro-foundations. The results give insights in several fields, including a dynamic environment, routine rigidity or stability or change and its underlying factors and the balancing of stability and change in routines.

1. Introduction

Routines are an important facet of any organization and can influence overall firm performance. However, whether their influence is helping or hindering organizational change, remains unclear. A general description of a routine is a recurrent interaction pattern, Dosi, 2000, and this same routine can generate many different patterns (Pentland, Hærem and Hillison, 2010). This means that a routine is a recurring sequence of tasks performed by different organizational members (Argote, 2016). Hence routines play a central role in organizations and are the carriers of operational, tacit knowledge (Dougherty, 2004). Routines, in a certain way, store the information of the organization's past experience and, since they do not have to be adapted every time, are a way to achieve constant performance levels over time (Argote, 2016).

A branch of research sees routines in the form of routine dynamics, based on the idea that routines are practices with internal dynamics that contribute to both stability and change in organizations (Feldman and Pentland, 2003). Adopting this view enables us to link routines to their influence on organizational change, because routine dynamics see routines as patterns of actions, not as things (Feldman, 2016). This description shows us that routines can have a double role in organizational performance.

The first role of routines is that routines have a strong drive towards organizational stability, with forthcoming inertia that is slowing down organizational change (Hannan and Freeman 1984; Tushman and Romanelli, 1985; Leonard-Barton 1992; Amburgey et al. 1993; Tushman and Romanelli, 1985 Larsen and Lomi 2002; Aldrich and Ruef 2006). Sull (1999) refers to this effect of hindering organizational change as *active inertia*, which is the tendency of organizations to follow established patterns of behavior, even when facing dramatic changes. Having these established patterns of behavior as guidelines in a volatile environment will result in a company not taking the appropriate action to solve that particular crisis. In a worst-case scenario, this can result in the bankruptcy of a company (Sull, 1999). The problem of routines here is thus not rooted in not taking action, but in taking inappropriate action. The second role of routines advocates that routines are facilitators of organizational change (Feldman, 2003; Adrot, and Robey 2008; Sangyoon, Thorbjørn, and Becker, 2016;).

The double role of routines on organizational change has a high interest for both scholars as well as practitioners, since organizational change itself is often assumed to ensure an increase

in performance (Zimmermann, 2009). Organizations faced with a fast-changing and volatile environment are often unable to meet the requirements for change (Hannan and Freeman 1977, 1984; Tripsas and Gavetti 2000; Tushman and O'Reilly III 1996; Utterback 1994) and this may lead to organizational failure.

This double role of routines on organizational change can be seen as a paradox. A paradox is defined by Smith and Lewis (2011) as: *"contradictory yet interrelated elements that exist simultaneously and persists over time"*. A paradox is a powerful lens for comprehending and managing organizational tensions. The paradox we present here shares some similarities with the learning paradox of Smith and Lewis (2011). They both can be associated with innovation, renewal and change. We can identify factors present in the learning paradox which are also present in the paradox on the roles of routines. These factors are that organizational routines and capabilities seek stability, clarity, focus, and efficiency while also enabling dynamic flexible, and agile outcomes (e.g., Eisenhardt & Martin 2000; Teece & Pisano, 1994). By categorizing our paradox as a learning paradox, we can understand more of the factors present within our paradox and focus on these to help us solve it and deepen our understanding of organizational routines. In a way, the paradox view gives us an understanding of the tensions present within a dynamic environment in relation to change and routines. With applying a paradoxical lens, we can consider the divergent views on the roles of routines on organizational change. The paradox enables us to look at the effect of routines on organizational change in a rapidly changing, volatile, crisis environment. Through the analysis of the role of routines within a context of organizational crisis, we hope to clarify messages that invoke contradictions and in a way, solve the paradox of the effect of routines.

A concept closely linked to organizational change, volatility and routines is organizational improvisation. Routines can be linked to improvisation, since the performative aspect of a routine can be changed to different contexts (Feldman and Pentland, 2003). Companies might use routines and practices to achieve improvisation and ensure the positive effects of it, that in the future can be collected (Miner et al., 2001). Routines are the practices needed for organizations to achieve improvisation and perform tasks in ways that differ from the original performances (Adrot and Robey, 2008). Improvisation can often be needed in a volatile and uncertain situation and thus routines can play an important role in this.
This sense-making of the role of routines on organizational change in a volatile environment is what led to the central research question of this literature review:

'What is the role of routines in an organizational change in a volatile environment?'

The objective of this literature review is to seek a resolution of the paradox present within the role of routines on change in a volatile, crisis environment. As mentioned by previous studies (Sangyoon et al., 2016; Feldman and Pentland, 2003), the effect of routines on any specific circumstance, thus also volatile, crisis environments, is a topic which still needs exploration.

This paper is organized in the following way (1) define routines and frame it within the concept of routine dynamics and (2) investigate the role that routines play in volatile environments and change, (3) make suggestions for further research. The first need exists because researchers have defined routines in many different ways, thus making it necessary to first explain the concept. Next to that, we will explain routine dynamics, which is necessary to be able to analyze the effect of routines on change and link this to volatile environments. We then address the second need by reviewing the literature on the effect of routines to crisis and change. Lastly, suggestions for further research will be made by finding gaps in empirical research.

2. Theoretical Framework

Routines are assumed to have an effect on organizational change, with that effect either being organizational stability and possible inertia, or facilitation of organizational change, or even both. Routines are present in all facets of the organization and in all situations.

This means that when the company is facing a change in a volatile environment, the strategy of the firm to overcome this crisis is often based on holding on to routines or adapting them. As stated in the research of Feldman and Pentland (2003) the changes in routines are often the result of external pressures, needed to improve the performance of the company. Given that point of view, the performative aspect of a routine can be seen as improvisational, in the sense that it is essential for routines to be adjusted to changing contexts (Feldman and Pentland, 2003). Improvisation is present when the design and execution of novel action converge (Miner et al., 2001). Improvisation can occur on both a tactical- and strategical level (Moorman and Miner, 1998; Eisenhardt and Tabrizi, 1995). Qualitative studies of Quinn, (1980); Pascale, (1984); Mintzberg and McHugh, (1985) concluded that some firms maintain stable patterns of improvisation and use routines that enhance the chances their improvisational activity will produce effective outcomes in the short term.

As stated in the research of Adrot and Robey (2008) many examples of crisis indicate that operational routines are the only means to complete response when planned strategy cannot be followed. Often companies stick to their existing routines in a crisis situation, which might be surprising. This is because all too often we believe that decisions of managers are made very spontaneous with no structure or planning (Weick, 1998). However, the response of a company to a crisis situation should be seen in a more structured way, which indeed includes routines in it. This shows that routines can be seen as a 'reference point' from which adjustments or radical changes can be made (Adrot and Robey 2008).

As many companies hold on to routines to overcome their own difficulties in volatile times, it can be contemplated whether it has a positive effect on organizational change for the company. Therefore, to be able to link routines to organizational change in a volatile environment, first of all, a more explicit and comprising definition of the concept routines should be presented. After that, we will link the concept routines to routine dynamics and define organizational change and volatile environments.

2.1 Organizational Routines

Nature of organizational routines

The concept 'organizational routine' is central to the evolutionary theory of the firm, however it has no single universally accepted definition (Becker, 2005). The definition used in this paper is "*A routine is a recurrent interaction pattern*" (Dosi, 2000). This means that a routine is a recurring sequence of tasks performed by different organizational members (Argote, 2016). This definition gives you the means to assess whether a process is an organizational routine or not. However, it does not determine the effects of routines (Feldman and Pentland, 2003).

Historically, routines have been placed in several metaphors. First of all, they have been compared to individual habits (Nelson and Winter, 1982). Habits are automatic, individual and require no thought. This is not in line with the concept of routines used in this paper, since we see routines as a collective process with interaction among different actors.

Secondly, routines have been compared to programs. Programs may require more processing than habits because they may involve choices, branches or decision points (March and Simon, 1958). The third metaphor links organizational routines to evolutionary theory (Nelson and winter 1982). In this metaphor, routines serve as the genes of the organization, which pass on knowledge through time.

These three metaphors, give a relatively fixed image of routines. This makes it hard to shed light on routines as a more dynamic process which can help flexibility and change, not just serve as inertial forces (Feldman and Pentland, 2003). A more modern branch of research is that of routine dynamics, which sees routines as dynamic processes and not fixed things like the previous metaphors presented. That is why in the next paragraph we will discuss routines in relation to routine dynamics.

Organizational Routines in relation to Routine Dynamics

Routine dynamics is a branch of research based on the idea that routines are practices with internal dynamics that can contribute to both stability and change (Feldman and Pentland, 2003). Routines are thus seen as dynamic processes, not as things. Ethnographic fieldwork has been an important contributor of observations which resulted in the branch of routine dynamics. Routine dynamics have changed the perception of routine from 'work is routine' to 'routine is work' (Feldman, 2016). This new perception wants to highlight that it is effortful to develop and maintain a routine and that routines are not unchangeable and stable, but can certainly change over time. This view is especially needed in fast-changing and volatile environments, in which companies operate nowadays (Feldman, Pentland, Lazaric, and D'adderio, 2012).

Routine dynamics can give us a broader understanding of the concept routines. For example, routines can be prevalent in domains which might not be associated with routines immediately. Think of routines in intensive care, new product development and logistics. These domains seem very spontaneous and certainly not structured and routinized. However, seen in the light of routine dynamics, they do fit our description of routines: "*recognizable, repetitive patterns of interdependent action carried out by multiple actors*" (Feldman, 2016).

If we define routines as things (as standard operating procedures, or machinery, or genes) we cannot define routines as dynamic patterns of interdependent action (Feldman, 2016). The ability to see a routine as a dynamic process and not as a fixed, unchangeable 'thing', allows us to assume that routines may have more effects on change than just stability and inertia. This definition of routines as dynamic thus enables us to see the paradox present within the influence of routines on change in volatile environments. It provides us with the means to consider divergent ideas simultaneously. The dynamics of routines in organizations is thus the requisite assumption to acknowledge that routines can change and influence organizations in multiple ways.

2.2 Volatile environment

Organizations and volatile environments

The world is developing faster than ever and organizations need to deal with this. The organization's operating sphere can be fast-changing and risky (known unknowns) and organizations have to endure a great portion of uncertainty (unknown unknowns). To deal with this volatility, organizations seek a balance, between stability, flexibility and change, since this will help them to achieve greater efficiency, excellence, resilience, sustainability and relevancy (Carayannic et al., 2017). Organizational routines can improve or hinder this quest for a balance.

This means that when the company is facing a change in a volatile environment, the strategy of the firm to overcome this crisis is often based on holding on to routines or adapting them. As stated in the research of Feldman and Pentland (2003) the changes in routines are often the result of external pressures, needed to improve the performance of the company. The ability of organizations to change by performing routines thus increasing in times of crises and ambiguity. Many examples of crisis thus also indicate that routines are the only means to complete response when an originally proposed strategy has been disregarded (Adrot and Robey, 2008).

Another concept which is closely linked to volatility and crisis are the improvisational capabilities of a firm. Improvisation is defined as the convergence of designing and executing of novel activities (Baker, Miner and Eesley, 2003). Improvisation is an important aspect of a crisis response. This is because every crisis is unique and 'planning' for a crisis only will help to a limited extent (Mendonça, 2007). There is no fixed formula for responding to a crisis or volatile situation, hence often plans need reconsideration or restructuring. However, improvisation is closely linked to routines and routines can be seen as a reference point in times of crisis, from which adjustments or radical changes can be made (Adrot and Robey 2008). Routines are used to enhance chances of success of an organization its improvisational activities performed. (Quinn, 1980; Pascale, 1984; Mintzberg and McHugh, 1985). The presented definition of improvisation shows us that there is a structured part in improvisation, as well as a novel, creative part.

Volatile environments, routines and organizational change

Organizational change is considered to increase the performance of a firm (Zimmermann, 2009). It is thus in the firm its best interest to be aware of factors influencing organizational change. Routines seem to have an impact on organizational change, as well as on organizational structure, technology, innovation and decision-making (Feldman, 2000).

In a fast-changing and volatile environment it might be difficult for organizations to meet the requirements for change, Hannan and Freeman (1977),; Tripsas and Gavetti (2000); Tushman and O'Reilly III (1996); Utterback (1994) and this may lead to organizational failure. How organizations react to volatility and threats in their environment can differ. Routines play a role in the reaction of the company to threats, but whether this is a positive role or not remains ambiguous (Zimmerman, 2009). Some studies indicate that the ability of an organizational routine to generate change can be heightened in times of uncertainty and volatility (Feldman and Pentland, 2003).

A crisis can be seen as a specific volatile situation, which can be very impactful for an organization. The concept routines, improvisation and volatile are closely linked to it and thus a more precise definition and some examples of crises will be presented as well.

Crisis situation

An organizational crisis is a low-probability, high-impact event that threatens the viability of the organization and is characterized by ambiguity of cause, effect, and means of resolution, as well as by a belief that decisions must be made swiftly (Pearson and Clair, 1998). Although we can specify in many types of crises, all crises share a number of common elements: (1); High ambiguity when causes and effects are unknown (Dutton, 1986); (Quarantelli, 1988) (2); Low probability of occurring and very hazardous for survival of an organisation and its stakeholders. (Jackson and Dutton, 1987; Shrivastava et al., 1988) (Shrivastava, 1987) (3); Offer little time to respond (Quarantelli, 1988) (4); Can be surprising for organizational members (Hermann, 1963) (5); Present a dilemma in need of decision or judgment that will result in change for better or worse (Aguilera, 1990; Slaeikeu, 1990). In the table below, some of the specific types of crises are displayed, which seek to show the breadth of organizational vulnerabilities.

Table 1: An Array of Organizational Crises

● Extortion	● Bribery
● Hostile takeover	● Information sabotage
● Product tampering	● Workplace bombing
● Vehicular fatality	● Terrorist attack
● Copyright infringement	● Plant explosion
● Environmental spill	● Sexual harassment
● Computer tampering	● Escape of hazardous materials
● Security breach	● Personnel assault
● Executive kidnaping	● Assault of customers
● Product/service boycott	● Product recall
● Work-related homicide	● Counterfeiting
● Malicious rumour	● Natural disaster that destroys corporate headquarters
● Natural disaster that disrupts a major product or service	● Natural disaster that eliminates key stakeholders
● Natural disaster that destroys organizational information base	

(Pearson and Clair, 1988)

3. Methodology

For selecting the articles used in this paper, the principles for systematic literature review originally proposed by Tranfield, Denyer and Smart (2003) are used. The basic principles as stated in the research of Thorpe, Holt, Macpherson and Pittaway (2005) are transparency, clarity, focus, equality, accessibility, broad coverage and unification of research and practitioner communities (Pittway et al., 2004; Tranfield et al., 2003).
In similarity to the approach of Cardinal, Kreutzer and Miller (2017), we focus in the study on areas, specifically the areas of management and innovation. This enables us to identify a great body of research which is diverse and still consistent. Moreover, the influence of the research will reach future research in the management and innovation area.

A systematic literature review is an efficient and high-quality approach for identifying and evaluating literature (Mulrow, 1994). It adopts a replicable, scientific and transparent process and thus reduces bias through extensive literature research and by indicating all the reviewer's decisions, procedures and conclusions, making it different from traditional narrative reviews (Tranfield, 2003). This way, systematic literature reviews can also provide a basis on which decisions can be made by policymakers (Tranfield et al., 2003).

The review process generally consists of three parts: data collection, data analysis and synthesis (Crossan and Apaydin, 2010). The next part will discuss how the systematic review methodology was operationalized in this study.

Systematic Review Strategy

An initial list of keywords has been established to form the search string. The outline of these search terms can be found in table 1. The study itself was limited to peer-reviewed journal articles published up to 2017 (inclusive). The systematic research of the electronic databases Scopus and ABI/INFORM was conducted on the 7th of December 2017 and was conducted in four steps. First, the studies were filtered by exclusion criteria. Secondly, the studies were filtered by title analysis. Lastly, quality and relevance analysis of abstracts categorized the remaining articles into three lists (relevant, partially relevant, less relevant). Besides that, we have also scanned through the reference list of all eligible articles to identify any additional studies.

Table 2: Outline of search terms used for systematic research regarding routines, volatile environment and the effect on change.

Concept	Search terms
Routines	("Routine" OR "Routines")
Volatile-environment	("Volatil*"OR"Uncertain*"OR"Cris*"OR"Emergen*"OR"Distast*"OR"distress"OR"Unstable"OR"Unstabil*"OR"Unstead*"OR"Turbulent"OR"Turbulenc*"OR"threat*")
Change	("Adopt*"OR"Adjust*"OR"modif*"OR"change*"OR"Var*"OR"Transform*"OR"Evolultion*"OR"Evolv*"OR"Reorganiz*"OR"Reshape"OR"Innovat*")
Effect negative	("Inertia"OR"Inactiv*"OR"Passiv*"OR"Stagnat*"OR"Inflexible"OR"Inflexibilit*"OR"negativ*"OR"Resistanc*"OR"Restrict*"OR"Competency trap")
Effect positive	("Stability*"OR"Stabiliz*"OR"Focus"OR"effic*"OR"flexible"OR"Flexib*"OR"Agile"OR"positiv*")
Organization	("Organization"OR"Organization*")

Inclusion/exclusion criteria

Eligibility of the studies was assessed using the following inclusion criteria 1) the review was limited to peer-reviewed journal articles published up to 2017 (inclusive). This disregards working papers, editorials, research notes and commentaries, interviews, dissertation abstracts, books, book chapters and conference papers (Keupp et al., 2012). 2) We have chosen the databases which covered the greatest full article access and provided most functionality. Since influential journals are most likely to shape a representative picture of relevant scholarly research (Furrer et al. 2008).

Studies were excluded from the research if 1) not published in the English language; 2) routines, change and volatility were not the main topics; 3) not reporting primary data; 4) the articles were not having a business/management background.

Study quality

The study quality was assessed using Thompson's Web of Science. To assess the quality of the journal articles, we identified management journals in Thompson's Web of Science and only included journal articles published in a journal with an impact factor higher than three for five years. Following this approach, we have included the following journals in the study: *Organization Science, Academy of Management Journal, Long Range Planning, Information and Organization, Strategic Management Journal, Journal of Management Studies, Organization Studies, Accounting, Auditing & Accountability Journal.*

4. Results

A total of 675 publications were initially identified: 469 documents in Scopus and 206 in ABI Inform. Table 3 provides an overview of the results gathered from the systematic literature review. After a thorough selection process twelve studies were included for analysis. Table 4 provides a summary of these twelve studies that met the inclusion criteria.

The studies were conducted in various parts of the world: United States, Japan, Russia, Switzerland, Norway and the Netherlands. However, some studies (since these were intensive case studies) did not reveal the name nor location of where the case study was conducted. This often was due to privacy reasons of the participating company(s). Eight of the studies included in this literature review were case studies, two studies use empirical/field data and another study uses this to develop an interpretative model. Then at last, we have one study conducting a natural experiment. We have identified studies with various key results, namely studies explaining various effects of a dynamic, changing environment on routines and studies examining the underlying factors causing routines to enact in inertial ways or create stability and change.

Table 3: Overview of the Systematic Literature Review Results. (Current Search Query used)

Databases searched	2
Keywords used in search query	45
Documents retrieved	Scopus: 100.539 ABI/Inform: 1437
Studies after being filtered by exclusion criteria (Stage one)	Scopus: 469 ABI/Inform: 206
Studies after being filtered by title analysis (Stage two)	Scopus: 68 ABI/Inform: 30
Studies after being filtered by quality and relevance analysis of abstracts	Scopus: 28 ABI/Inform: 6

Table 4: Summary studies analyzing the effect of routines on change in a volatile environment

Studies	Key findings	Method & Scope	Journal	Country
Ringov, D. (2017) 'Dynamic capabilities and firm performance'	The research provides evidence that the value of codified dynamic capabilities declines as environmental dynamism and the performance of firms is significantly influenced by any form of dynamism exposure and asset base complexity.	Empirical study using mutual funds: the main source of data is the Survivor-Bias-Free U.S. Mutual Fund Database maintained by the Center for Research in Security Prices (CRSP)	Long Range Planning	US (Booth Graduate School of Business of the University of Chicago)
Gilbert, G. C. (2005) 'Unbundling the Structure of Inertia: Resource versus Routine Rigidity'	In the research an interpretative model is developed that explores mechanisms to overcome amplification of routine rigidity and resource rigidity simultaneously, when facing a threat	Developing an interpretive model by using field data of eight newspaper organizations	The Academy of Management Journal	Unknown
Dönmez, D., Grote, G., Brusoni, S. (2016) 'Routine interdependencies as a source of stability and flexibility. A study of agile software development teams'	In the research they explain how controlling the interplay of routines via choices regarding the protection given to routines enables teams to balance stability and flexibility	Qualitative study of eight agile software development teams, using a multiple-case study design based on field observations and	Information and Organization	Switzerland

		semi-structured, open-ended interviews		
Dixon, S., Meyer, K., Day, M. (2014) 'Building Dynamic Capabilities of Adaptation and Innovation: A Study of Micro-Foundations in a Transition Economy'	In the research an empirically-grounded synthesis of the micro-foundations of dynamic capabilities involved in organizational change is proposed. The research also distinguishes between two types of dynamic capabilities: adaptation (routine-based) and innovation and show us that highly politicized context can be influential on dynamic capabilities	A longitudinal case study of the four largest Russian Oil Companies: Yukos, TNK-BP, Lukoil and Surgutneftegaz. Yukos was selected for deeper analysis	Long Range Planning	Russia
Brauer, M., Laamanen, T. (2014) 'Workforce downsizing and firm performance: an organizational routine perspective'	The research shows the relationship of routines and disrupted/disbanded key individuals involved in them. It shows that organizational routines and small-scale downsizing lead to efficiency improvements without disrupting existing routines and that large-scale downsizing might work better than small-scale downsizing.	Empirical Analysis of a sample including all firms listed on the STOXX Europe 50 or the Dow Jones Eurostoxx 50 on any of the years from 1996 to 2006. In total 73 firms were selected.	Journal of Management Studies	Unknown
Pentland, T. B., Hærem, T., Hillison, D. (2017) 'The (N)Ever-Changing World: Stability and Change in Organizational Routines'	The study has made three contributions to research on routines, namely (1); empirical support for the ongoing endogenous change in routines (2); evidence of interaction of human and non-human actors in a socio-material ensemble (3); solving the paradoxical tension between stability and change in routines with their observable aspects and as generative systems	This study uses data on invoice processing in four organizations (labor union, public statistical research institute, construction company and a meat-packing plant)	Organization Science	Norway
Collinson, S., Wilson, C. D. (2006) 'Inertia in Japanese Organizations: Knowledge Management Routines and Failure to Innovate'	The study shows that the Traditional Japanese Human Resource Management systems, life-time employment and their customer obligations and networks lead to constraints in terms of transferability of knowledge related routines and constraints on the ability to restructure them in times of change.	Two in-depth case studies of Japanese Organizations: Sumitomo Chemical and Nippon Steel	Organization Studies	Japan

Knott, A. M. (2003) 'Organizational routines factor market paradox'	This study shows that routines are a valuable resource for a company and that the need for isolating mechanisms for these routines can be relaxed. They also found that tacitness is not necessary for routines to hold value and that risks increase the need to adopt new practices, however this can also lead to the adoption of 'non-fitting routines'.	A natural experiment that tests hypotheses with franchisees as a treatment group (with franchisor organizational routines), and independents as a control group (without franchisor routines).	Strategic Management Journal	Unknown
Van der Steen, M. (2009) 'Inertia and Management accounting change: contradiction between formal rules and routines'	The research identifies ways in which inertia manifests itself in management accounting rules. It also shows how ambiguity and contradictions can play an important role in the presence of inertia.	A longitudinal case study was conducted at one of the largest banks in The Netherlands.	Accounting, Auditing & Accountability Journal	The Netherlands
Feldman, S. M., Pentland, T. B. (2003) 'A performative perspective on stability and change in organizational routines'	The case study provides an explanation of why routines can remain stable/unchanged based on mindfulness rather than mindlessness	Case study of a housing division in a large state university (12 residence halls and 10.000 single students)	Industrial Corporate Change	Name/Place of Housing Division remains anonymous
Adler, P., Goldoftas, B., Levine, I. D. (1999). 'Flexibility Versus Efficiency? A Case Study of Model Changeovers in the Toyota Production System'	The case study found 4 underlying mechanisms supporting flexibility and efficiency in combination, namely: 1) Meta-routines; 2) workers and suppliers contributing to non-routine tasks whilst working in routine production; 3) routine and non-routine tasks were separated temporally; 4) novel forms of organizational partitioning enabled work on non-routine tasks.	Case Study of NUMMI: a Toyota subsidiary located in Fremont California	Organization Science	US; Fremont California
Dittrich, K. Guérard, S., Seidl, D. 'Talking about Routines: The role of reflective talk in routine change'	The study shows that reflective talk about can help routines change by enabling participants to collectively reflect on routines; their ostensive and performative aspects and think about new ways to perform routines and look at this from multiple perspectives. The findings thus relate to three important aspects: routine	A year-long ethnographic case study of CellCo (a start-up company in the pharmaceutical industry)	Organization Science	Unknown

	change, variation and selective retention in routine change and balancing competing pressures for consistency and change			

4.1 Effect of a dynamic environment on routines

Ringov (2017) has analyzed the effect of environmental dynamism on codified analytic routines. Their empirical research has proven that the performance of codified, analytic routines decreases as environmental dynamism increases. This also has to do with the firms' dynamism exposure and their asset-based complexity. The research proposes that the lower the dynamism exposure is, the lower the effects of inertia and loss of flexibility will be in a highly dynamic environment. Next to that the research proposes that the higher the complexity of the organization its resource/asset base and reconfiguration or integration activities, the higher the value of codified analytic routines in a dynamic environment. This complex asset base helps companies see through the fog of causal ambiguity and help to see their cause-effect relationships of their performances more clearly. The codified knowledge will also make up space for managers to explore non-routine tasks and create new situation-specific knowledge, since less time is needed for trial and error. In times of high volatility, this can be very useful for a firm since managerial attention is a constraint resource.

Dixon, Meyer and Day (2014) explore what underpinning routines contribute to competitive advantages in dynamic environments. In their case study of the oil company Yukos they found out that the organization had some enabling routines to increase their performance. For example, the organization gathers knowledge from outside the organization and then internalized and disseminates it in different ways. These ways of internalizing and disseminating can be seen as enabling routines. These enabling routines could even lead to reconfiguration and turn away from their business model to develop something completely new. They also engaged in various exploration routines, namely search routines for new ideas, experimentation and calculated risk-taking, which are all enabling change. These previously mentioned factors are all micro-foundations for adaptation and innovation. The research namely distinguishes between two larger constructs for adaptation and innovation to explain the micro-foundations for success in performance in a dynamic environment. The table shows how they have ordered these constructs and micro-foundations.

Taxonomy of Microfoundations, Second-order Capability Constructs and Dynamic Capabilities

Microfoundations	Second-order capability constructs	Dynamic capabilities
Knowledge acquisition (Huber, 1991)	Exploitation (March,1991)	Adaptation
Knowledge internalisation (Huber, 1991)		
Knowledge dissemination (Huber, 1991)		
Resource reconfiguration (Teece et al., 1997)	Deployment (Helfat et al., 2007)	
Resource divestment (Teece et al., 1997)		
Resource integration (Teece et al., 1997)		
⇩ Operational capabilities (Winter, 2003) (Catch-up and survival)		
Search (March, 1991)	Exploration (March, 1991)	Innovation
Experimentation (March, 1991)		
Risk-taking (March, 1991)		
Project selection (Own data)	Path creation (Garud & Karnoe, 2001)	
Project funding (Own data)		
Project implementation (Own data)		
⇩ Unique capabilities (Prahalad & Hamel, 1990) Potential competitive advantage (Barney, 1991)		

Brauer and Laamanen (2014) analyze a specific form of dynamism, namely that of a situation in which a number of key individuals are removed from the routine due to workforce downsizing. They concluded that in small-size downsizing, actors would stick to existing routines whilst being more efficient than before. Medium-downsizing is less beneficial than large-scale downsizing, since with medium downsizing employees try to restore old routines even when these are not appropriate anymore. The large-scale downsizing will make employees more innovative and make them change practices completely. They also concluded that when there is no time pressure, in all the downsizing conditions this will lead to a more careful and well thought-out approach for routine disruptions.

4.2 Effect of routine rigidity and its underlying factors

Collinson and Wilson (2006) look into inertia in Japanese organizations. Japanese organizations used to be admired for their capabilities to innovate, change and be flexible. However, as the studies highlights, these capabilities are barriers for change in a turbulent environment. This inertia which is explained by them is rooted in routines and in the research they showed exactly what specific routines in the studied Japanese organizations led to this inertia. The routines causing inertia were all needed for the acquiring, developing,

disseminating, integrating and leveraging knowledge. The company had clanged on to their routines involving too little specialist knowledge, hardly any internal or external networks and knowledge integrations mechanisms. This was also amplified by their control routines, stimulating this way of organizing the company and the line of thinking. The research argues that this is because of the different ratios of active to latent routines, which can result in different degrees of adaptability when facing a change. The latent routines are described as routines which can be drawn upon when a change should be activated in the strategic direction of the company. The Japanese companies, which are prone to inertia, might have fewer resources at their disposal than a more adaptable type, which might have a lot of latent resources (agency, routines, capabilities and knowledge).

Gilbert (2005) tries to look more into the structure of inertia. He splits the effect of inertia in two different forms: resource inertia and routine inertia. His research shows that a strong threat perception can help eliminating resource rigidity, but that at the same time it amplifies routine rigidity. The amplification of this routine rigidity is caused by a threat-based response resulting in three intermediate behaviors: contraction of authority, reduced experimentation and focus on existing resources. This routine rigidity is based on the inability to react appropriately to change, caused by a threat and the underlying structure of a routine. This differs from routine rigidity, which is more linked to the unwillingness to invest in something or the concept of motivation, which should be separated from the routine rigidity. A given example that shows this clear distinction is that managers can invest as much as they want to get something to change, but the underlying factors of routines could still be blocking the change, resulting in the change not happening.

Van der Steen (2009) shows that ambiguity and contradictions play an important role in inertia. Ambiguity was mainly an issue in tacit scripts and contradictions in a conscious script. These tacitly invoked scripts consist of patterns of interaction that are invoked on a subconscious level. This makes them unable to be addressed consciously. Ambiguity in tacit scripts can be manifested in two ways: new rules are interpreted with existing knowledge, which might be inappropriate for the situation at hand, which can cause inertia. The other factor is that conflicting rules and structures, which makes organizational members stick to their existing knowledge and routines. Consciously invoked scripts involve conscious actions with a predefined goal. These consciously invoked scripts can cause inertia, since

organizational members might consciously refuse the adaptation of new practices. This can be rooted in self-interest and are thus a contradiction between own interests and the new rules.

Knott (2003) concludes that routines are a valuable resource and that explicit (conscious) practices can offer sustained performance advantages. They state that tacitness of routines is not needed to create this advantage. They also agree on van der Steen's (2009) point of the self-interest which must be in line with the routine, in order for it to be successful and changing. They also include two more variables effecting inertia, namely greater equipment tends to reduce the adoption to new routines, since these great investments which are made will make the company less likely to invest in replacement technology. Also age plays a role. The older the organization, the more likely they are to adapt to new practices. Risk in itself also increases the likelihood of new practice adoption.

4.3 Effect of routines on stability and change and its underlying factors

Feldman and Pentland (2003) they explain some underlying factors supporting organizational stability or change in routines, based on fieldwork which they performed at a housing division of a large state university. They argue that stability in routines is often based on mindfulness of its actors rather than mindlessness (proposed in traditional theories). They illustrate that if a proposed change in an organizational routine is inconsistent with the actors' perception of an organization in a broader understanding, and if that change is not aligned with the company its core values, the change will not come about. The core values, broader understandings of the organization and its operations have to be in line with the proposed change in a routine, otherwise actors will not be willing to change that routine due to misalignment of internal factors. Feldman and Pentland (2003) suggest that this inability to bring around intended changes might be the explanation to why organizations are seen as inertial and resistant to change. It also suggests that stability and change stem from the same dynamics, but that the role of agency of the organizational actors might be larger than we think. As stated in their research, the following quote I found worth mentioning: *"The performances create and recreate the understandings, while the understandings constrain and enable the performances."* (Feldman, Pentland 2003; P729).

Joining the findings of Feldman and Pentland, the research of Pentland, Hærem and Hillison (2011) also finds supporting data for continuous endogenous change in organizational

routines. They have observed a lot of changes in routines during a five-month period in four different organizations. The routines which they had analyzed were based in invoice-processing, which is seen as a very stable and strong context, applying always the same technologies. However, they still managed to observe many changes, which shows that routines might be more changing in nature. The data of their research shows that if invoices were handled by more experienced people, change was less likely to occur. Bringing in new people in the organization to help with certain tasks, would lead to more variation and change. Automation of routines by for example machines did only have a small negative effect on the likeliness of change and only on high automated routines. Next to that, they also point out that to solve the paradox of change or stability in organizational routines, routines should be seen in layers. Their conclusion of this is that a routine might perfectly have a stable outcome, but there could still be variety in the process which resulted in that stable outcome. However, if this variety would lead to change is still unaddressed in this research, since this also has to do with the structure and rigidity of rules within the organization which can be of influence. For example, a less rigid structure may enable this variation in initiating changes at a higher level. Their last conclusion is on if the paradox of routines could ever be analyzed and understand completely with empirical research. An ending quote which they used to describe this is:

"Whether a river is ever-changing or not, as long as it is flowing, it is still a river." Pentland, Hærem and Hillison (2011, P:1381).

4.4 *The balancing of stability and change in routines*

Dönmez, Grote and Brusoni (2016) look into the balancing of stability and flexibility in organizational agile software development teams. They concluded that the level of stability or flexibility of an organizational routine depends on the level of protection this routine is granted. Less protection will result in more flexibility, whereas more protection will result in higher levels of stability. In their research they also investigate routine-interdependency. They found that several routines of the teams were performed simultaneously, to create both stability and flexibility. These performances of routines have mutual influences and teams rely on and choose these routines among several interlinked routines to respond to environmental changes. Routines in that way can be seen as options for actions. The activation of this interlinked routines can lead to stability or flexibility, depending on the needs of the team, the environment and the routines which are activated. As Dönmez, Grote and Brusoni (2016) state, the act of planning is better than being in possession of a plan, since

that specific plan will be subjected to change anyway in a dynamic environment. The fact that these routines can create this flexibility or stability is because they are not always bound to a fixed schedule, but can be responding to specific circumstances or sometimes by pre-specified schedules. Task size and allocation might change at any point of carrying out the routine. The teams have a set of strictly prescribed actions (the ostensive aspects), but allow the performative aspects of routine to vary. However, even these ostensive aspects of routines are re-visited in pre-scheduled meetings to see if deviations are needed to increase their teams' performance. The following model gives a good description of the way routines are interlinked and creating stability or flexibility.
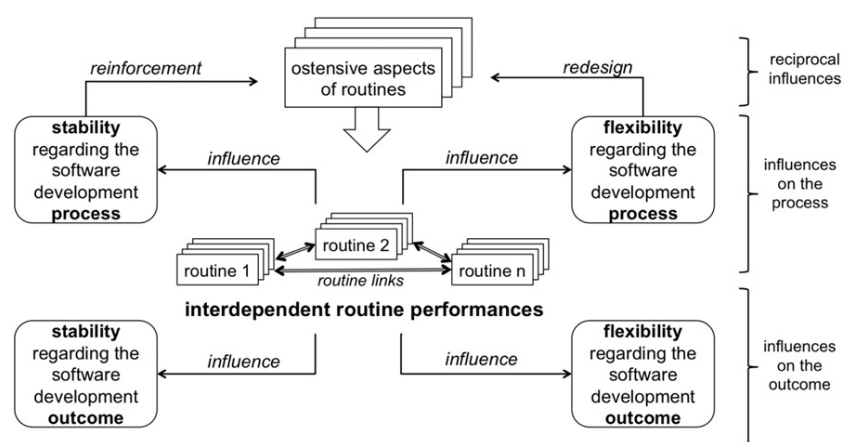
(Dönmez, Grote and Brusoni, 2016)

Adler, Goldoftas and Levine (1999) have identified four underlying mechanisms enabling the company NUMMI to achieve both excellence in flexibility and efficiency. Meta-routines of standardized problem-solving, process procedures and a reflection process allowed NUMMI to routinize non-routine tasks. This enabled both flexibility and efficiency. They also trained employees to stay alert for opportunities, switched them between routine production roles and non-routine production roles and used partitioning effectively. Leadership, trust and training are some necessary pre-conditions for applying these mechanisms successfully.

Dittrich, Guérard and Seidl (2016) studied the effect of talk on organizational change and reflection. They concluded that three aspects of talk supported collective reflection (1) the identification and situating of problems or opportunities with regard to the performative and ostensive aspects of a routine (2) envisioning and exploring alternative ways of performing the routing and (3) evaluating these different ways of performing and questioning them from

different angles. For changing the performative aspect of a routine, mostly envisioning and exploring alternative ways is needed against the background of an established routine pattern. If you would want to change the ostensive part (the pattern) of a routine, the former part is needed but you would also need to reflect on changing the routine by comparing it against concrete envisioned performances. Change can be made from this reflective talk in two ways, namely the reflective talk presents opportunities to address topics of questioning or make new connections among the routines. Next to that, shifting between the two forms of reflective talk enables a routine pattern to change.

5. Discussion

In this systematic literature review the main objective was to find out more about the effect of routines on change in a dynamic environment. The results cover the following subjects: *effect of a dynamic environment on routines, effect of routine rigidity and its underlying factors, effect of routines on stability and change and its underlying factors and the balancing of stability and change in routines.* The literature has been put under the previously mentioned subtitles, since our paradox is very broad and can be viewed from different perspectives. In the papers we have reviewed we could distinguish different focuses whilst addressing the paradox and thus found it appropriate to sub-categorize these papers. It also gives us a clear overview of the different aspects included in our paradox. Categorizing results has also been done by other scholars addressing routines (Becker, 2004), since this might clarify the different aspects included in the matter. This immediately points out the greatest implication of this literature review: the diversity of the concept routines. As stated by other researchers, it might be difficult to empirically give meaning to the effect of routines, since it might not be a concept which can be explored in that way (Pentland, Hærem and Hillison , 2011).

5.1 Interpretation Results

3 of the 12 studies dealt specifically with the effect of a dynamic environment. Ringov (2017) states that the lower the dynamism exposure, the lower the effects of inertia and inflexibility. A high asset-based complexity is also beneficial in volatile times. Dixon, Meyer and Day (2014) show us that 'enabling routines' can increase the firms' performance in volatile times. These enabling routines can be seen as the micro-foundations for adaptation and innovation. Brauer and Laamanen (2014) found out that small and large-size downsizing can be beneficial, leading to efficiency or radical change. However, medium-size downsizing will

lead to inappropriately sticking to old routines, whilst these might be insufficient. This shows us that the scale of 'dynamism' will also affect the likeliness for change.

4 out of 12 studies dealt with the underlying factors of inertia and routine rigidity. Collinson and Wilson (2006) show that routine rigidity is related to the ratio of active to latent routines, resulting in different degrees of adaptability when facing a change. Less latent resources lead to more inertia. Gilbert (2005) says that routine rigidity is based on the inability to react properly to change, caused by a threat and the underlying structure of a routine. Van der Steen (2009) shows that ambiguity and contradictions (of self-interest) play an important role in inertia. Knott (2003) also agrees with van der Steen (2009) that self-interest in routines plays an important role in the success of a routine. They also show that greater equipment tends to reduce the adoption of new routines and age and risk positively influence the adoption of new routines.

2 out of 12 studies discussed the effect of routines on stability and change. Feldman and Pentland (2003) argue that stability in routines is often based on mindfulness of its actors rather than mindlessness. They show that the core values of the organization, as well as its broader understandings must be in line with the proposed change in a routine for that change to happen. Pentland, Hærem and Hillison (2011) conclude that a routine might have a stable outcome, but there could still be variety in the process which resulted in that stable outcome. They show that routines are more varying in nature than previously assumed.

3 out of 12 studies discussed the balancing of stability and change in routines. Dönmez, Grote and Brusoni (2016) show that the level of stability or flexibility of an organizational routine depends on the level of protection this routine is granted. Less protection will result in more flexibility, whereas more protection will result in higher levels of stability. Adler, Goldoftas and Levine (1999) show that excellence in both flexibility and stability can be achieved with help of meta-routines of standardized problem-solving, process procedures and a reflection process. This allows a company to routinize non-routine tasks. Dittrich, Guérard and Seidl (2016) show that reflective talk can be helpful to create change. Change can be made from this reflective talk in two ways, namely the reflective talk presents opportunities to address topics of questioning or make new connections among the routines. Next to that, shifting between the two forms of reflective talk enables a routine pattern to change.

5.2 Implications of findings

The aim of this research was to resolve the paradox present within the effect of routines on change in a dynamic environment. We have analyzed twelve studies that address one or multiple aspects of the paradox or the paradox in general. However, due to the large diversity in the findings and other aspects possible affecting the results (type of routines, company, country, other influential settings) this led to few overarching conclusions (Elam, 1993). This large variation can be caused by the fact that routines are not fixed, which makes them hard to compare to a fixed description (Douglas, Coleman and Oddy, 2003).

5.3 Future Research

Only twelve studies were included after the thorough selection process in the research. This shows that more research might be needed on the effect of routines on dynamic environments (Sangyoon et al., 2016; Feldman and Pentland, 2003). As previously mentioned, we have found a large variety of case studies: different routines, companies, sectors, countries. This gives us many different insights. Perhaps in the future more attention can be given to a very precise setting for a specific business sector, so that the insights of various papers are useful for companies to scan through and directly applicable for their type of business.

5.4 Strengths and limitations

A strength of this review is that it is conducted in a systematic way, identifying articles from multiple databases and having a thorough selection process: data collection, data analysis and synthesis. However, due to the fact that the concept 'routines' is very broad, some articles regarding routines might have been overlooked. The routines studied in this review have all been in different work-fields, countries or other applicable circumstances. This makes it difficult to draw uniform conclusions to the main question.

6. Conclusion

This research examines the role of routines in a dynamic environment. The recent literature is reviewed in an attempt to provide a better understanding of enabling and impeding routines (and their micro-foundations) for change in a dynamic environment. With the results we hope to provide a deeper understanding of the concept routines and its effects on dynamic environments. To do this we have presented several cases showing the effect of routines on stability, change, inertia and a dynamic environment. These insights will provide an awareness of the complexity and diversity that can be present within routines and will provide a piece of the puzzle to solve the paradox of routines and its effects.

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