



Dynamic Capabilities within the Project Management Environment

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Summary

Dynamic Capabilities is a contemporary popular notion, incorporating the ability to adjust a company's resources adequately to exploit opportunities, prevent threats and consequently retain competitive advantage. Teece et al. (1997) coined Dynamic Capabilities and triggered a wave of research on the topic. However the notion is still in its infancy through academic disputes, different viewpoints and multiple definitions. Consequently tool, measure and procedures of Dynamic Capabilities are absent. Likewise the research on a project management level is scanty and just recently caught attention amongst scholars. To further tap into this research area, this study aims to analyse how project managers in Bayer AG can, and do, reinforce Dynamic Capabilities within their strategic projects. Nevertheless this is a difficult undertaking and other theories linked to the idea of Dynamic Capabilities were utilized to substitute and support this study.

The research is based on the definition of Zollo and Winter (2002) who divides Dynamic Capabilities into three main levels. *Learning* (level 2) is at the core of the notion and comprises of Knowledge Management activities. *Dynamic Capability* (level 1) denotes the possibility and flexibility to translate knowledge into practice through the adjustment and re-location of available resources. The final outcome is the adjustment of the *operations* (level 0) and the modification of on-going processes. However numerous scholars, including this study, exclude level 0 as Dynamic Capabilities and merely see it as the final outcome. To substitute the gaps in theory, support available concepts and extend the view on the levels, other theories such as Knowledge Management and Risk Management are enclosed.

Analysis of theory as well as the practical investigation of project managers from Bayer AG, revealed that knowledge exchange is the predominant driver of Dynamic Capabilities. While theory stipulates that IT software should be adequate enough to provide fast and easy access to information, project managers highlight that their main focus is on a culture encouraging personal, honest and open communication. Contradicting the idea of Dynamic Capabilities, a majority of project managers highlight that projects are locked after planning, neglecting change during execution. However, budgets are spaciouly calculated providing flexibility to attain further resources when required. Additionally, Bayer provides a large pool of available resources, a culture encouraging communication and freedom of choice to their project managers. Merely detailed feasibility studies, monitoring processes and control mechanism are enforced to ensure successful project completion. The ultimate source of project success is implied to be practical experience. The theory of Dynamic Capabilities has aroused curiosity encouraging for further, deeper research on the topic.

Key words:

Dynamic Capabilities, Projects, Project Management, Knowledge Management, Strategic Flexibility, Project Flexibility, Dynamic Markets, Strategy, Competitive Advantage

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1. Introduction

“He who rejects change is the architect of decay. The only human institution which rejects progress is the cemetery” - Harold Wilson, 1967

Since the beginning of the 21st century, the pace within various markets has accelerated. Open markets, globalisation and technological advancements have altered the ways in which customers consume, firms produce, and rivals compete. It is widely acknowledged that sustaining and formulating a long-term strategy has become an increasingly difficult endeavour (Tidd & Bessant, 2011, p.112; D’Aveni et al., 2010, p.1372). Organizations face these challenges to keep up with changing demands in markets, the increased pace of competitive innovations as well as the ease and speed by which competitors can replicate innovative ideas. Hence, organizations are forced to continuously develop and improve their products and operations to maintain a competitive advantage. Most markets are therefore affected by a reinforcing dynamism, which rejects traditional methods and well-established school of thoughts (Eisenhardt & Martin, 2000, p.1106; Priem & Butler, 2001, p.23; Wang & Ahmed, 2007, p.32).

Considering these new challenges in the market, new ideas and theories of strategy have emerged. A contemporary, promising idea in strategic literature is: Dynamic Capabilities. Coined by Teece, Pisano & Shuen in 1997 they extended the strategic prevailing ideology of ‘Resource Based View’ (RBV) incorporating the context of a dynamic environment. The notion includes that corporations should embrace the transformations in the market, continuously adapt, reconfigure and renew their resources and capabilities (Hällgren & Jacobsson, 2012, p.698; Li & Liu, 2014, p.2796). Over the past decade, the idea has been further researched and adapted, however no consensus on the definition of Dynamic Capabilities has been reached. Therefore, many scholars highlight that the concept of Dynamic Capabilities is still in its infancy and ought to be further explored (Zollo & Winter, 2002, p.340; Zahra et al., 2006, p.919; Helfat et al., 2007, p.21; Teece, 2007, p.1319; Ambrosini et al., 2009, p.10).

The key concept of Dynamic Capabilities, as described by Teece et al. (1997, p.516) is “the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments”. This includes the ability of managers to continuously adapt and re-allocate the organization’s resources, through the continuous acquisition and exploitation of new knowledge, to achieve organizational effectiveness (Eisenhardt & Martin, 2000, p.1110; Zollo & Winter, 2002, p. 345; Lampel & Shamsie, 2003, p.849). The initial concept and corresponding literatures of Dynamic Capabilities is related to organizational strategy and the preservation of the company’s competitive advantage (Teece et al., 1997, p.510). However, an increasing number of scholars publish articles, which relate Dynamic Capabilities to projects as well as ‘Project-, Programme- and Portfolio Management’ (PPPM). This drift is not surprising, since projects are perceived as temporary organizations to undertake unique endeavours and contributing to the organizational strategy (Turner & Müller, 2003, p.1; PMI, 2004, p.5; Artto et al., 2004, p.596). Henceforth, projects have become of increased importance in contemporary, competitive and deregulated markets, which are characterised by reduced product life cycle and dynamic markets (Lawson & Samson, 2001, p.377; Menor et al., 2002, p.135; Galende, 2006, p.301; Phaal et al., 2006, p.337; Kahn, 2007, p.199).

A few authors, such as Easterby-Smith and Prieto (2008), Eltigani et al. (2011) and Gardiner (2014), have recently explored the combination of Dynamic Capabilities within a 'Project Portfolio Management' environment. Their results indicate that learning, respectively Knowledge Management is at its core and influences subsequent action – hence, leading to flexibility within projects. While theoretical concepts and abstractions are developed and investigated, practical exploration has been mainly neglected. This is in line with the current state of Dynamic Capabilities, where available research predominantly focuses on theoretical and rarely on practical issues (Helfat & Peteraf, 2009, p.99). Likewise, there is a deficiency in project management tools, processes and actions, which contributes to establish and support flexibility and dynamism in projects. Due to the absence of a consolidated theoretical foundation of Dynamic Capabilities on a project level, new approaches must be found and developed. Particularly in relation to Knowledge Management and Resource (re-)allocation that are at the core of related theories. A connection to projects and project management must be established in order to trigger more practically applicable discussions among scholars and base future research on the contemporary state of knowledge. Singh and Oberoi (2013, p.1443) suggest that the idea of Strategic Flexibility might be a valuable reference to associate the notion of Dynamic Capabilities to projects and towards a collection of processes, tools and practices, as this theory holds a more developed context.

This new insight of practical applications, tools and process of Dynamic Capabilities within Projects would enhance the flexibility of projects and augment a corporation's competitive advantage. It is therefore not surprising that an increasing amount of companies attempt to explore such superior managerial procedures, practices and tools to counteract the newly imposed threats by the rapid market (Singh & Oberoi, 2013, p.1443). Especially firms within 'hypercompetitive' markets could positively reinforce their strategies through more flexibility and enhanced Dynamic Capabilities within projects. Hypercompetitive depicts that firms, such as the pharmaceutical giant Bayer AG, are struggling at multiple fronts to ensure successful development of new drug formulas, authority approval of new discoveries, counteract imitating products, market penetration, brand development and continuous growth (D'Aveni, 2002, p.39; Wang, 1997). These companies know that continuous adaption and flexibility is of essence and that a potential consequence could be, as Harold Wilson (1967) pointed out, to end up on the graveyard. Hence, one response to such pressures is the application of an effective project system (Daniel et al., 2014, p.99). Likewise, Dynamic Capabilities are required for superior execution of projects, through the incorporation of, and adjustment to, the environment. In that respect, responsible project managers are challenged to identify means by which they can enable and enhance Dynamic Capabilities to help their project to perform better, become more flexible and make the company more competitive.

1.1 Research Question

To contribute to the discussions on Dynamic Capabilities and Project Management, this research aims to investigate the previously highlighted theoretical absence of Dynamic Capabilities within projects, respectively the processes, practices, tools and activities project managers can use to enhance their (strategic) projects. The authors of this

research believe that for successful project execution a certain degree of project flexibility is required to adjust to environmental changes, and that this flexibility is in direct relation to the discussion and the notion of Dynamic Capabilities. In order to explore this gap, theoretical parallels and similarities between the notion of project management and Dynamic Capabilities are investigated. To deepen the reliability, the established theory on Project Flexibility is being investigated and eventually utilized to build a connection between the concepts and to provide a point of reference. The theory and validity of the link of Project Flexibility to Dynamic Capabilities will be further explored in the literature review. In order to provide a frame for this research, the investigation will have a strong focus on available literature as well as previous studies and subsequent collate this knowledge with the practical applications of project managers, employed by the international pharmaceutical corporation Bayer AG. Bayer appears as an interesting point of (practical) reference since they are within a 'hypercompetitive' market environment and have often multiple international projects running in parallel (Biedenbach & Söderholm, 2008; Biedenbach & Müller, 2012). Hence, this research adds to the knowledge within the fields of Project Management and Dynamic Capabilities through the investigation of available theories and the collection of practical usable processes, tools, practices and activities enhancing a project's Dynamic Capabilities. The thesis aims to answer the following research-question:

How do project managers positively reinforce Dynamic Capabilities within strategic projects, by the pharmaceutical company Bayer AG, through means of Knowledge Management and Resource Management?

1.2 Objective of the Study

The research output is expected to shed light into the vaguely investigated area of Dynamic Capabilities in connection with projects. The aim is to examine explicit corporate procedures (e.g. official organizational project guidelines) for strategic projects and link these to the established notion of Dynamic Capabilities within Projects. Additionally, the project manager's non-specified processes, to address environmental changes, are being researched to provide this investigation with a more holistic view. Therefore this study considered strategic projects, ranging from HR- and IT- restructuring projects, process- development and optimisation, to world-wide licensing and brand development projects. An important key point is, that the projects being investigated are expected to have effects on the whole Bayer Company. The study will draw on established ideas of Dynamic Capabilities theories and develop them further with project management literature. In order to bridge the gaps between the two theories, ideas of the topic on Strategic Flexibility on an organizational level and Project Flexibility on a project level, are utilized. The authors aim on presenting findings, which will provide an enhanced perspective on the topic of Dynamic Capabilities.

To explore the discoveries in a practical environment, the collection of tools, processes, practices and actions enhancing Dynamic Capabilities within projects are cross-referenced with performing project managers. In a first step, available project guidelines from Bayer AG will be acquired and analysed in order to establish an initial idea on

how projects must be set up and navigated on a fundamental, but corporate-wide level. Not only will this highlight the degree of specified and/or mandatory project activities, but also provide a ground for supplementary investigations. In a second step, the actions of various project managers from different departments are investigated and related to Bayer AG's project guidelines, the findings from the literature review and beyond. This will complete the thesis providing a theoretical and a practical view on the topic and the identification of processes and tools that strategic project managers *could* use, *must* use and practically *do* use. In other words, linking project management and Dynamic Capabilities in this respect could aid managers on how to set up their projects to maintaining a certain degree of flexibility in order to become agile to environmental dynamism.

Additionally, it is expected that the findings of this research will encourage and stimulate other scholars, interested in the topics of project management, corporate strategy, Dynamic Capabilities, and Strategic Flexibility to further investigate in this field and contribute to the maturity of the idea. Linking project management and Dynamic Capabilities could aid managers as a guideline on how to set up their projects to maintain a certain degree of flexibility in order to become agile to the environmental dynamism. This need is confirmed by Petit (2011, p.75) "the concept of dynamic capabilities has been prevalent in the strategic management literature for at least ten years, only a few of such capabilities have been investigated empirically, and, unfortunately, there are very few descriptions of how firms can implement and maintain dynamic capabilities in practice".

1.3 Delimitations

Since this thesis is undertaken within an immature area of research and comprises two differently developed theories, the successful correlation and overall success of this research can neither be derived nor estimated. The concept of Dynamic Capabilities has been linked to organizational strategy and PPPM management; however, the direct link to strategic projects and project management has not been specifically addressed by applicable literature. The theory of Dynamic Capabilities is still in its infancy and scholars argue on its definition, application, applicability, transferability and even its existence. Hence, this study will choose and limit itself to one of the many plausible definitions, which is by Zollo and Winter (2002), who perceives Dynamic Capabilities as the capability to adjust its resources (1st level) as well as the overall, organization-wide concepts to adjust to the dynamic environment. This will be further discussed as part of chapter 3.1. Through application of the previously named definition this study will bridge arising gaps with rational concepts linked to strategy, flexibility and project management practices.

This thesis, due to the lack of previous research, is in itself affected by Dynamic Capabilities and needs to maintain flexible throughout the investigation and documentation. This will be evident in the literature review, where concepts and ideas on Dynamic Capabilities within projects are investigated and conceptualised in order to use them in subsequent stages of the research. At this point the authors of this thesis are largely unaware of the depth of the topic. Henceforth, the investigation is not concerned with an in-depth analysis of Dynamic Capabilities within projects but rather with

identifying project management activities, processes, tools and practices linked to the notion and supported by literature, document, practice, application and rationality.

This study will further relate to the notion of Risk Management in connection to mitigation actions and project preparation. Risk Management is a fundamental part of most projects, especially within a dynamic, uncertain environment. Risk Management denotes to plan for the future risk within the early stages of the Project Life Cycle, reserve contingency resources to counteract potential threats and continuously track changes in the market during project execution. Hence this theory will be a fundamental part within the resource aspect of Dynamic Capabilities. However it is not the entire picture of Dynamic Capabilities nor does it cover the whole Project Life Cycle. Therefore this idea of Risk Management plays an important, but merely contributing part supporting one aspect of Dynamic Capabilities within this research.

Finally, this research is conducted within the frame of the German pharmaceutical company Bayer AG with the aim to investigate strategic projects. R&D projects are especially exclude as they would make up a large part of the on-going projects, are usually long-term (>5years), uncertain in their success, and not particularly motivated by common project management practices. Furthermore, the output of this research's applicability and transferability across companies and industries is questioned. Especially since projects are defined as 'unique endeavours' and Dynamic Capabilities are occasionally believed to be unique to each (project-) organization.

1.4 Disposition

In order to answer the research question and provide a clear and coherent investigation process, the following structure will be followed, which outlines the main content of each upcoming chapter. The process is strongly linked to the thesis guideline provided by Umea School of Business and Economics in order to correspond closely with their expectations.

Methodology

The purpose of this chapter is to outline and examine the thesis' theoretical methodology and underlying motivations leading to the decisions made. First, it will be looked at the research design and its several discussions of ontological and epistemological stances are presented. Second, the researcher's background is presented to provide an understanding of motivations and bias. Third, the choice of theories of theories and secondary data is considered, before, fifth, it deals with source criticism, sampling, interview design and analysis. Finally, ethical issues are illustrated.

Literature Review

The literature review chapter aims to summarize the various theories, definitions, perceptions and discussions from documents created around the topic of Dynamic Capabilities in Strategic Project Management. The ultimate purpose of the literature review is to provide a solid fundament of theoretical knowledge, bridging the gap between Dynamic Capabilities and project management, in order to build up a scientifically appropriate research. This chapter includes, in a first part, the theoretical, critical review of the topic at hand to guide the reader to the core of the theme. In a

subsequent section a link from Dynamic Capabilities to project flexibility and project Knowledge Management will be presented. Finally, a connection to applied project management procedures in relation to Dynamic Capabilities is made.

Empirical Findings

The purpose of this chapter is to enhance the current status on Dynamic Capabilities within Projects, collected in the literature review, and further develop the ideas with practical investigation. This data collection will comprise of two distinctive parts. The first is concerned with the results of a secondary data collection and analysis of organizational project manuals. This step should provide a further level of foundation to build up towards the qualitative research as well as provide first applicable evidence of Dynamic Capabilities within Bayer's projects. Based on the findings, the second step will be supported. In this second step qualitative Interviews with experienced project managers aims to provide further, deeper insight into the undertakings towards project flexibility and enhancement of Dynamic Capabilities within projects.

Research Analysis

This chapter critically analyses the findings of the empirical study with the concepts, theories and ideas of available literature. It aims to identify to what extent the theoretical inclinations corresponds to the practise of project managers within various divisions and departments in Bayer AG. It further analyses to what extent the concept of Dynamic Capabilities, as an organizational concept, can be transferred on a (strategic) project level. For this the two pillars of Dynamic Capabilities receive particular attention to comprehend which concepts are more utilized, stronger emphasized and more relevant to project managers as well as a summary of which tools, processes and procedures are employed.

Concluding Remarks

This chapter will wrap up the investigation on Dynamic Capabilities within projects. This includes a look at theoretical as well as practical findings, implications and considerations in connection to the research question. Special attention will be on the related topics of Knowledge Management and Risk Management, as they are strongly related to this thesis and form the foundation of this investigation. Additionally the findings are evaluated according to their significance and contribution to the theory. In a final sub-chapter, further areas of research are listed to offer alternative and potential fields that need investigation, and in turn which might support this study. This includes a similar an investigation on more structured projects, such as research and development (R&D), which have been neglected in this thesis.

Truth Criteria

This chapter is concerned with the presentation of truth criteria of this study's scientific methodology. "Scientific methodology needs to be seen for what it truly is, a way of preventing me for deceiving myself in regard to my creatively formed subjective hunches which have developed out of the relationship between me and my material" (Raimond, 1993, p.55) This issue is also referred to as reliability. Truth criteria usually contain two main concepts: Trustworthiness and authenticity. The two concepts were introduced to assess qualitative research in the 1980's (Lincoln & Guba, 1986) and will be discussed in the following.

2. Methodology

The purpose of this chapter is to outline and examine the thesis' theoretical methodology and underlying motivations leading to the decisions made. First, it will be looked at the research design and its several discussions of ontological and epistemological stances are presented. Second, the researcher's background is presented to provide an understanding of motivations and bias. Third, the choice of theories of theories and secondary data is considered, before, fifth, it deals with source criticism, sampling, interview design and analysis. Finally, ethical issues are illustrated.

2.1 Research Design

To deepen the understanding of the research at hand, this chapter elaborates on the scientific circumstances and their meaning. The objective of this section is to discuss the choice of methods and their suitability in line with epistemology and ontology. Hence, in the following a critical evaluation is provided which is concerned with the literature review, practical investigation and data gathering, and data analysis.

Field research is primarily done to create knowledge. In this respect an understanding of the development and nature of knowledge is crucial (Saunders et al., 2006). When conducting research on behaviours of project managers in order to enhance Dynamic Capabilities certain assumptions about worldviews are made. This assists in choosing an appropriate study approach and corresponding research methods.

Epistemology deals with what is considered as acceptable knowledge in a field (Bryman & Bell, 2003, p.569). This consideration contains two contrary positions: positivism and phenomenology. Positivists take the stance of an on facts focusing natural scientist. Hence, usually the conducted research follows the testing of previously determined hypotheses. These follow mostly simplifications of the reality. In contrast, Interpretivism, which is associated with phenomenology, is providing rich insights into the complex world (Saunders, 2006, p.106). Interpretivists see knowledge as a result of interpretation and acknowledge that it has to be seen in its specific context. Interpretivists believe that in their core people and institutions are principally diverse compared to those of natural science (Bryman & Bell, 2003, p.571). Hence, in contrast to a purely positivistic framework, an interpretivist takes a rather subjective view of the world and by emphasising the interpretation of meanings used by the actors, he follows a rather socially oriented account of life.

To understand the world and social environment from the research target's point of view is a critical challenge for an interpretivist (Saunders et al., 2006, pp.106-107). Often the interpretivistic approach is understood as rather inductive, while positivistic research is mostly related to deductive research. Research that follows inductive reasoning, by nature, is more open and exploratory, while deductive research is considered as narrower by dealing with hypotheses testing and validation (Trochim & Donnelley, 2006). Both approaches may also be differentiated by their nature of knowledge: inductive research focuses more on the interpretation of meanings; in contrast, deduction rather follows scientific principles.

In between the previously mentioned contrasting notions is realism, which adopts a similar scientific approach as positivism (Saunders et al., 2006, pp. 104-105). There are different types of realism: direct realism and critical realism. While the former believes that what you sense is reality; the latter argues that first experiences may be deceptive; hence, first impressions need to be mentally processed to identify reality (Saunders et al., 2006, p. 103).

Saunders et al. (2000, p.70) refer to the research's strategy as a general plan of how to answer the research question. These authors state, that this strategy should follow the research question as a clear objective, indicate sources of data collection, and constraints the researchers will face. Also Remenyi et al. (1998, p.43) stress the importance of a clear research question as it facilitates accessibility among researchers and is the basis and conceptual framework for logical structuring.

There are two major approaches of research strategies: quantitative and qualitative research (Bryman & Bell, 2003, p.480). The former is based on deductive theory testing. The applied practices are often compared to those of a natural scientific model, in particular positivism. The view on reality is from an external objective reality point of view. The latter approach, qualitative research, is concerned with word and analysis in collection and analysis of data. Its focus is on the creation of theories, by drawing from an inductive approach. In this notion, other foci are the recognition in the study of how individuals interpret their social environment and that this social reality is a continuously changing emergent construct of the individual's perception.

The gained understanding of the different methodologies helped the authors to make a decision on which methodology would be the most suitable for the investigation and research question on hand. For this investigation the researchers take a stance, which is in line with interpretivism (Saunders et al., 2009, p.119) by undertaking an in-depth investigation through small-sample qualitative interviews. As previously indicated Trochim (2006, p.1) refers to two approaches of reasoning: induction, which begins with the specific and moves to the general, and deduction, which is directed the other way around. These are often linked to quantitative (deductive approach) and qualitative (inductive approach) research (Soiferman, 2010, p. 3). However, both are not considered as opposites, but rather as differences on a continuum (Creswell & Plano Clark, 2007). Their main difference lies in their perception of reality. While quantitative researchers refer to "a single reality that can be measured reliably and validity using scientific principles", qualitative researchers "believe in multiple constructed realities that generate different meanings for different individuals, and whose interpretations depend on the researcher's lens" (Onwuegbuzie & Leech, 2005, p.270). In that respect, even though mostly associated with quantitative study approaches, the researchers in their first part of the study decided on adopting a deductive-reasoning approach in order to deduct scientific knowledge about Dynamic Capabilities in projects; in contrast the second part of the study will follow an inductive- and qualitative research approach, as they will contrast empirics with existing theory. At this point a reconsideration of the purpose of the research and the research question is essential. As this investigation aims on providing an understanding of how project managers enhance Dynamic Capabilities within their projects, a mixture of interpretivistic and critical realism, hence following an inductive approach in the second part of the investigation. This is perfectly suitable for studies conducted in the field of management (Saunders, 2006, pp. 106-107).

Due to the nature of this study the qualitative approach was chosen. During the literature review it was recognised that even though there were theories and models on Dynamic Capabilities, not much research has been done on understanding how these are encouraged practically within projects. As such this investigation is relying on interpretation of the individual within its environment; hence, it is reflective – which strengthens the application of a qualitative approach. This investigation aims to understanding the respondents and individual perceptions on how to handle and deal with the supporting tools and procedures that encourage Dynamic Capabilities in projects. Therefore, this research investigates complex issues such as perceptions, feelings, and thought processes. The chosen qualitative research approach is perfectly fitted for this research; due to the difficulty of gaining an understanding from such complex details which are hard to access through conventional methods.

Another important issue to be discussed is concerned with the time horizon of the investigation, whether the research rather represents a “snapshot” taken at a particular time or is rather a “diary” representing a given period of time (Saunders et al., 2006, p.148). The former perspective is called cross-sectional, while the latter is referred to as longitudinal study. Cross-sectional studies focus on a specific phenomenon at a particular point in time. Cross-sectional studies often attempt to investigate by qualitative means in the form of “interview conduction over a short period of time” – which may also be due to time constraints (Saunders et al., 2006, p.148). In contrast, longitudinal studies focus on events occurring over a period of time. The biggest strength of longitudinal studies “is the capacity that it has to study change and development” (Saunders et al., 2006, p.148). Longitudinal studies do also provide the researcher with the possibility to apply a measure of control over the variables being studied (Adams & Schvaneveldt, 1991) following the question “has there been any change over a period of time?” (Bouma & Atkinson, 1995, p.114). For the investigation on hand rather a snapshot reflection of the studied phenomenon is useful, as such issue is not much investigated yet, and therefore it is first important to identify relationships in the moment instead of over a period of time. Additionally, as strategic projects, which are long-term, are analysed with a rather short-term study time-frame / constraint, a focus on a particular point of time seems more appropriate. Hence, a cross-sectional study design was chosen.

Due to the research methods nature, during the research process the researchers will inevitably be in touch with multiple subjective perspectives of reality, which need to be critically interpreted. Through the conduction of interviews the researchers become part of the research context, this interaction leads to subjectivity in opinion – also during the interpretation of the gained results. Therefore, on the one hand, the researchers, by making a qualitative research attempt, need to be aware of the importance of the relationship between researchers and participants for a holistic understanding of the observed (Soiferman, 2010, p.4). On the other hand, a priority here is the focus on details of the situation (Creswell, 2005, p.39). As the results, such research approach is based on interpretations, a critical reflection of the researcher’s values and preconceptions is inevitable to gain an understanding of the value of the conduct research – this will be done in the subsequent section (Onwuegbuzie & Leech, 2005, p.260).

2.2 Researcher's Background

This subchapter aims on supporting the reader in critically reflecting on the contribution of this thesis. Possible preconceptions might lead to subjectivity of the research (Lindfors, 1993, p.125). For this reason an exploration of the researcher's background and experiences that might affect the research undertaken as well as the following results will help the reader to gain a better understanding of the decisions made during the process. Simultaneously, this illustrates the awareness of the researchers towards such effects on the research executed.

The researchers' backgrounds are alike due to the career choices made early on. Both have gained a Bachelor degree (undergraduate) in the cross-national economics' field, one in International Management, and the other in International Business. This has provided both with a good understanding of business studies, and also lead to the development of profound interest in strategy, strategic planning and organizational processes which is also reflected in a Bachelor's Thesis about strategic reactions to changes in the external environment. Both have also gained valuable insides into the international perspective of their field of study during semesters spent at host universities abroad. Their Master's degree study in Strategic Project Management European has fostered their mutual interest in strategy and projects over the time spent on the programme. First, a course by Amos Haniff has outlined the wide influence projects may have in a strategic perspective. This has been further developed during a course in strategic change by Robert Graham, before Paul Gardiner outlined the concept of Dynamic Capabilities to the researchers, which fascinated both. Additionally to academic background knowledge, both researchers have also gained first practical experiences in the field of project management, whereby one even gained insights into the pharmaceutical industry. An initial investigation in the field has made the authors aware of the complexity of Dynamic Capabilities and its reach into different departments of an organisation and its environment. Therefore, the authors believe that their background knowledge is a solid base for approaching this research.

2.3 Choice of Theories and secondary data

This section aims on providing an understanding about choices of theories and secondary data for the purpose of this investigation. The theoretical framework for this investigation will follow a literature review which aims to clarify and deepen the understanding of topics relevant to the research question. This includes a clear outline on the concept of Dynamic Capabilities and a link to projects as well as project management to build a solid theoretical base for the following investigation. In order to explore how Dynamic Capabilities function within projects the research aims to investigate the parallels between the theories on Dynamic Capabilities as well as on projects, respectively project management. Therefore, a solid understanding of the theoretical construct and their connection is required in order to form an appropriate framework to ensure an effective investigation. The concept of Dynamic Capabilities as well as the strategic dimensions of projects will be explored in detail, compared, and merged. This also accounts for the related fields of Knowledge Management and project flexibility, which will be explored in connection to project management practice. The

resulting combination of knowledge will provide a solid foundation for the empirical investigation. It is crucial to note, that the purpose is not the development of a new theory, but rather a reflection on discussions in the related fields of science, which are in line with previous research contributions. This will be obtained through a critical analysis of relevant secondary sources.

The main knowledge input will derive from secondary data, which may be found in literature resources such as scientific articles and books, which will be primarily accessed through the libraries of Umeå University and Heriot-Watt University as well as partnering libraries such as the British Library in the UK's national repository library. In order to contribute to the knowledge development it is crucial to identify literature that is relevant to the fields addressed in the thesis' context. To prevent misunderstanding and superficial judgement of an article, it is important to execute an entire and deep analysis of its content, context, background, as well as underlying motivations of its author; in order to identify the value of the contribution. In this thesis secondary data is only considered relevant, if the analysis has led to the conclusion, that the source on hand operates at the core of the issue, dynamic capabilities and strategic projects or necessary related fields. Although this research's practical assessment is conducted in the pharmaceutical industry, the literature review is not bound to this industry. A limitation to conduct a literature studies primarily within this industry's context is not considered as beneficial for two reasons: First, from a macro point of view, a project's structure or configuration is not dependent on the industry in which it is initiated. Secondly, a practical reason is the lack of research conducted in the field – meaning that there are limited studies available that were conducted dealing with Dynamic Capabilities in a project environment within the pharmaceutical sector. As a consequence the authors decided on accessing data for the literature review through diverse channels and different renowned research databases such as Business Source Premier, Academic Search Elite, or Wiley Online. These multiple sources have been chosen, because their focus areas lie within different fields and enable the researchers to gain a holistic view on Dynamic Capabilities in the project environment:-

2.4 Source Criticism

In order to conduct a reliable and valid study it is crucial to evaluate and weight the information critically according to their date of publication and credibility. Steward and Kamins (1993, p.17) identified a process consisting of six steps and according questions to evaluate a research and their source critically. This process will be applied on the resources used for this investigation. The reflecting questions are: “(1) What was the purpose of the study? (2) Who collected the information? (3) What information was collected? (5) How was the information obtained? (6) How consistent is the information with other sources?” (Steward & Kamins, 1993, p.17)

Within this investigation the focus of the literature obtained will be on recently published scientific articles from academic journals of the field. This is due to the recent emergence of project management and dynamic capabilities as research area. Hence, relevant data for these relatively new fields of research is rather to be found in scientific articles than in books, due to the different lengths of publishing cycles. In order to still work with relevant contributions to the theory, a focus will be set on literature that is

peer-reviewed and accept largely in the field of study. This will lead to an increased credibility and larger academic significance of the theoretical framework developed.

2.5 Sampling

Industry choice

The pharmaceutical industry was chosen due to two main aspects: First, the authors early on were interested in the industry and its processes in general due to their major economic and social influences on the societies in their hometowns Basel (CH) and Cologne (GER). While Basel is an international hub of chemical and pharmaceutical headquarters, hosting about 50 headquarters of international pharmaceutical companies; close to Cologne there is the headquarter of Bayer, but also Lanxess as well as further smaller pharmaceutical companies are situated there. As these companies have an impact on the authors' cities, there is also concern and interest in exploring and getting to know these in detail. The second aspect is, that the pharmaceutical industry is often characterised as hypercompetitive and dynamic (D'Aveni, 1994, Biedenbach, 2011a;b), mostly focusing on R&D processes, however the authors of this investigation believe that competition in this industry should not be reduced to R&D purely, but that there are multiple facets of competition that need to be considered. The authors believe that within the pharmaceutical industry decisions are likely to be more strategic due to two causes: First, the industry is considered as a defensive industry (Marcial, 2008, p.1), which means, that the market changes slower compared to other markets. This in return, means that strategic decisions rather have a longer impact on the company and market than in other markets. Second, even though, not considered in this study, the drug development cycle is much larger than product development cycles in other industries. As these developments are relatively fixed due to their time-dimension, companies are challenged to compete on other facets of competition to boost performance. The authors believe that these facets will be exploited through specific strategic projects in which the use of Dynamic Capabilities is essential for achieving competitive advantage. Hence, the industry delivers very interesting circumstances for an investigation on exploration of Dynamic Capabilities in projects.

Area of Bayer's project environment

Bayer AG has been chosen due to its size and international presence, and consequently the larger size and impact of their projects. The Bayer Corporation operates worldwide and created a profit of €2.446 (Bayer, 2012) in 2012. Also, Bayer executes diverse strategic projects within their subsidiaries, among those: Bayer MaterialScience, Bayer USA, Bayer Schering Pharma, Bayer HealthCare Pharmaceuticals, Bayer Business Services, Bayer Technology Services, Currenta, and Bayer CropScience. In the researchers' perception Bayer appears as an interesting point of (practical) reference since they operate within the previously examined 'hypercompetitive' industry environment and execute multiple international projects simultaneously (Biedenbach & Söderholm, 2008; Biedenbach & Müller, 2012) – this in return increases the probability of identification of a suitable project. However, the choice of Bayer AG is also a practical one as Bayer operates large parts of their management in the German headquarter in Leverkusen near Cologne and Swiss operations in Basel, there is an easy access to a lot of staff through the societies in both cities. Due to the time-frame allocated for this study, the researchers needed to find fast access to project managers

working with the investigated projects. Hence, the researchers focused on gaining access through personal contacts, which currently worked with such projects.

Strategic projects’ choice

Sampling of the projects has been done by means of purposive sampling, which Saunders et al (2009, p.598) describe as “Non-probability sampling procedure in which the judgement of the researcher is used to select the cases that make up the sample”. Following this approach, the strategic projects were chosen by pre-established criteria: a) availability of the project manager and availability for investigation, b) time horizon of the project, c) financial costs, d) expected range of impact / beneficiary, e) which are the expected benefits, f) as how strategic does the project manager consider the project, g) is it a non-routine project? The criteria are also listed in the subsequent table. Among these dimensions the projects for this investigation have been characterised as strategic and hence as relevant for the study on hand. Additionally, when considering the topic of the project a focus was made on projects that are non-routine projects in order to ensure, that projects are identified that which are reliable on the identification of Dynamic Capabilities. Also, R&D projects are especially exclude as they would make up a large part of the on-going projects, are usually uncertain in their success, and not particularly motivated by common project management practices.

	Criteria	
a)	Availability?	Of the PM and the project
b)	Time horizon of project?	6 months +
c)	Financial costs?	Medium < (perception of PM) €5.000.000 <
d)	Range of impact? Beneficiaries?	Major organisational impact
e)	Expected Benefits?	Cost-, time-, control-, legal-, process-, efficiency related
f)	PM’s perception if project is of strategic nature	
g)	Is it a non-routine project?	Scope of the project

Table 1: Steps for project evaluation as ‘strategic’

Source: Authors

2.6 Interview Design and Data Collection

The practical investigation is divided into two parts. First, attainable project management guidelines will be analysed to understand Bayer’s way of thinking and internal communication flows encouraging Dynamic Capabilities in a project context. Second, semi-structured interviews with relevant practitioners will be conducted to gain qualitative insights into the undertaking of project managers in order to handle Dynamic Capabilities within the flux of projects. This, on the one hand, relates practice and theory, and on the other hand, considers the two diverse origins of capabilities discussed in the Dynamic Capabilities literature: internally through learning processes (Zahra, Sapienza and Davidsson, 2006), or externally through imitation and replication

(Eisenhardt and Martin, 2000; Lampel and Shamsie, 2003; Zahra, Sapienza and Davidsson, 2006).

The first part of the practical research is concerned with a comparison of the findings of the literature review and of project management guidelines or manuals. In order to receive these, the researchers will get in contact with Bayer through available contact persons. The obtained project management guidelines will be analysed in order to gain an understanding of the organisation's knowledge and communication flows within the project context. Hence, the researchers will attempt to get as many documents that are in relation with project management, Knowledge Management, IT, and resource flexibility as possible. As this will be done already at the beginning of the investigation, the aim is to develop an understanding of procedures of how e.g. knowledge in projects is managed and whether there are guidelines on keeping a project flexible. In order to gain preliminary knowledge which in the following will be further deepened during the subsequent interviews. It will be focused on indicators for Dynamic Capabilities and their development to draw conclusions on the project manager's way of communicating and interacting within the project environment. The results of the interpretation of the obtained documents will be used to construct and adjust the interview guides to maximise the attainable information on Dynamic Capabilities within projects to be obtained from the following semi-structured interviews. An example for the application might be a deeper focus on project Knowledge Management or project flexibility procedures and tools, which are only possible if previously a more superficial level as a basis has been obtained. Also, it might be possible that the obtained guidelines provide knowledge into related areas, which might widen the scope of the researchers to other significant or minor issues in support of the investigation.

The second part of the practical research is concerned with obtaining primary data through the conduction of semi-structured interviews in order to gaining qualitative insights (Jones, 1985; Rosetto, 2014) of what project managers do to handle Dynamic Capabilities within the flux of projects. In doing so, this study will represent the individual perception of practitioners on procedures and knowledge and information flows. Even though each project is, due to its uniqueness, handled in a diverse way, there will be similar behavioural structures. However, these will only be identified by dealing with individual opinions and their interpretation, analysis, and comparison. The purpose here is not the collection of opinions in itself, but rather the focus on the overall presentation of underlying meaning. In order to ensure the identification of patterns of handling projects, the choice of a qualitative research approach in studying individuals is inevitable as it "attempts to make sense of, or interpret, phenomena in terms of the meanings people bring to them" (Denzin & Lincoln, 2005, p.3). In similar cases it is suggested to conduct a case study analysis, which is done through the conduction of in-depth interviews (Lewis, 2003, p.52).

The interview guidelines were developed ensuring key-characteristics of semi-structured interviews: flexibility to a certain degree. Saunders et al. (2009, p.601) describe semi-structured interviews as a "category of interview in which the interviewer commences with a set of interview themes but is prepared to vary the order in which questions are asked and to ask new questions in the context of the research situation". The interview guide was developed by selecting main themes of the interview deriving from the literature review and the also following the analysis of the project management guidelines. These included e.g. Dynamic Capabilities, Knowledge Management, and

Resource Flexibility. Furthermore, opening questions regarding basic information about the project were chosen as a warm up to guarantee that the project was within our sample and to establish trust by the interviewee. Additionally, a focus was on formulating questions as simple, understandable, and bias free as possible. Finally, the interviewers prioritised the questions and allocated time as a guideline to each question according to the chosen priority; this also included that in case of running out of time, some questions were moved to the end of the interview.

Semi-structured interviews have been chosen as data collection technique due to the depth of data needed in this research and because the context may be a critical issue when examining episodes of organizational change, which is implied in the focus on strategic projects (Pettigrew, Woodman & Cameron, 2001). Semi-structured interviews have the advantage that they offer both: a certain degree of guidance along ideas and key topics as well as the flexibility to dig further into details at the discovery of interesting points instead of staying at a superficial level (Jones, 1985). Furthermore, semi-structured interviews are interactive which on the one hand allows researchers to clarify their questions and what they search for. On the other hand, the interpretations are bound to the specific context in which the research aims to gain detailed insights and understanding (Gillham, 2000; Ritchie & Lewis, 2003). A disadvantage of the conduction of interviews is the so called 'interviewer effect', referring to the fact that people respond differently depending on their perception of the interviewer considering values, norms, age, and ethical origin (Denscombe, 2007). However, the researchers see this rather as an opportunity to build a fruitful relationship with the interviewee by creating an open, friendly and value free atmosphere. This is supported by Gomm (2004), who sees a good relationship as the only option to make respondents feel able to disclose the truth. This includes offering the interviewees' absolute anonymity, individual choice of depth of information provided as well as the choice to decline participation at any point.

Even though semi-structured interviews were chosen, the researchers have carefully considered alternative methods such as unstructured interviews, which might have led to richer data while bearing the risk of drifting away from track and thereby from the objective. In contrast, a fully structured interview or questionnaire might have made the data collection easier; however, it might lead to misinterpretations and lead to rather superficial results.

The semi-structured interviews will be done with relevant representatives such as project managers or members of a project management office at Bayer, which will be summarised in an anonymous way in the following table. The research has been limited to Bayer beforehand in order to ensure as much homogeneity in the influence the company has on the projects – if different project owners (=companies) would have been chosen this would have led to a more diverse set of circumstances influencing the projects differently. Project managers and members of the management office were chosen as representatives if a) their project can be classified as a strategic project among our previously examined criteria (compare with the previous table 1), b) they were available for interviews within our timeframe, and c) if these hold major parts of responsibility in managing the projects. The representatives have been accessed through different contacts within the company. The interviews conducted differed in duration depending on the availability of the interviewee, ranging from 25 minutes (shortest interview) to about 100 minutes (longest interview).

Interv.	Position	Department	Bayer work experience	Project experience	Project short description
1	Senior PM	O&I	9 years	16 years	Product Lifecycle Management
2	Team Leader Special Projects	R&D ^{Special}	6 years	6 years	Licensing globally (3 other projects in parallel)
3	Junior PM	Business Services – Inhouse Consulting – R&D	5 years	2 years	Restructuring processes, policies, IT and operation models
4	PM	Supply Chain Operations	5 years	5 years	Decreasing fixed capital and increasing flexibility
5	PM	IT Integration projects	8 years	4 years	Implementation for an web application firewall
6	PM	O&I	4 years	2 years	Product process and operation improvement
7	PM Special Projects	R&D ^{Special}	5 years	3 years	Global Licensing
8	Senior PM	Inhouse Consulting	7 years	7 years	Process and policy improvement

Table 2: Interviewee Overview

Source: Authors, based on Interviews

The interviews were conducted at the location preferred by the interviewees to make them feel comfortable. However, the researchers aim to conducting the interviews at a place, which is as neutral as possible, to overcome the risk that the interviewee may not feel free to speak openly. The interviews are guided along previously elaborated key points and topics. With permission by the candidates the interviews are recorded and later transcribed. Additionally, the interviewers will take notes focusing on perceptions and interpretations of the situation. After an analysis of the interviews content, these findings will be compared and discussed in relation to previous findings in order to gain a profound understanding of the procedures undertaken by project managers to enhance Dynamic Capabilities in projects.

2.7 Data Analysis

The analysis part of the thesis aims on translating the previously gathered data into findings. The focus will be on the identification of procedures that project managers execute in order to encourage Dynamic Capabilities within their projects.

“Qualitative data is gathered through methods of observation, interviewing, and document analysis” (Soiferman, 2010, p.10). Such data is interpreted subjectively, organised and allocated to categories and searched for patterns. Creswell (2005) describes six steps, including key characteristics, to analysing qualitative data: First, the detailed data is used to generate a broad picture. Second, the data is analysed already during its collection. Third, there is a constant recursive movement backwards and forwards from data collection to analysis, and vice versa. Fourth, several reviews and analyses of the data allow the researcher to identify more and more details, connections, and patterns related to each category. Fifth, qualitative analysis is an eclectic process, depending on the data on hand. Sixth, such analysis is interpretive, thus, the selected patterns and themes are developed from individual perceptions of the data and its linkages. The researchers will attempt to implement the steps suggested by Creswell (2005) in the practical analysis. This includes that after the interviews, respectively at the start of the analysis, the authors create a document discussing their individual perceptions in order to gain a big picture of the analysis. These preliminary results are then also used during the detailed analysis, according to Creswell’s third and fourth step. Additionally, during the fourth step, the researchers will create handwritten notes after each review in order to deepen the analysis, and especially realising patterns and similarities – also within the perception of the authors. The several versions of notes throughout the different analysis will also enable the researchers to always review the development of their perceptions. Hence, it is possible to move forward and backward throughout the different analyses and interpretations. Even though the nature of the results will tend to be subjective, the researchers will attempt to create a setting that is as neutral as possible in order to increase the result’s probability of transferability. However the main objective for the analysis remains the delivery of highly accurate findings, which provides a holistic picture of the matter on hand by reflecting on the different facets of the research object.

2.8 Ethical Considerations

As semi-structured interviews allow individuals to disclose thoughts and feeling with a private origin, it is fundamental to protect the interviewees’ privacy. Interviewees’ will be ensured all rights, anonymity and the possibility to reject the participation at any point in time. This also accounts for the recordings of the interviews, which are exclusively handled by the researchers after the interviewees’ permission. Hereby, the authors follow the UN Declaration of Human Rights, especially Articles 3 and 12 (UN General Assembly, 1948). Furthermore, the researchers follow the ICC/ESOMAR International Code on Market and Social Research (ESOMAR, n.d., p.1). This Code consists among eight core principles as well as several interpretations to specific subjects of social research. Among others it is considered that: First, the research is conform to international and national laws. Second, all rights of respondents are

respected, and that their participation is completely voluntary, and that these may reject participation at any point in time. Third, personal data collected is never used by the researchers in any other connection than the investigation itself. This includes that “respondents shall be informed before observation techniques or recording equipment are used for research purposes, except where these are openly used in a public place and no personal data are collected. If respondents so wish, the record or relevant section of it shall be destroyed or delete. In the absence of explicit consent the respondents’ personal identity shall be protected” (ESOMAR, n.d., p.6). Fourth, the research will be carried out under the principles of professional responsibility and fair competition as accepted by the business.

The chosen method relies on the inter-personal skills of the interviewer to build relationship and rapport. These qualities touch borders, which are valuable and ethical sensitive. Hence, it is crucial to show sensitivity when formulating questions in terms of confidentiality. The creation of trust is crucial and requires professionalism. This implies respect for the person and it’s opinions and perspectives (ESOMAR, n.d., p.6). These are unique, valuable and essential for the assessment and discussion.

The interviews will be conducted at the location preferred by the interviewees. However, the researchers aim on conducting the interviews at a place, which is as neutral as possible to overcome the risk that the interviewee may not feel free to speak openly.

3. Literature Review

The literature review chapter aims to summarize the various theories, definitions, perceptions and discussions around the topic of Dynamic Capabilities in general and in connection to strategic project management. The ultimate purpose of the literature review is to provide a solid foundation of theoretical knowledge, bridging the gap between Dynamic Capabilities and project management, in order to build up a scientifically appropriate research. This chapter includes, in a first part, the theoretical, critical review of the topic at hand to guide the reader to the core of the theme. In a subsequent section a link from Dynamic Capabilities to Project Flexibility and project Knowledge Management is presented. Finally, a connection to applied project management procedures in relation to Dynamic Capabilities is being established.

3.1 The concept of Dynamic Capabilities

The concept of Dynamic Capabilities, as described by Teece et al. (1997, p.516); is “the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments”. This includes the ability of managers to continuously adapt and re-allocate the organization’s resources to achieve organizational effectiveness (Eisenhardt & Martin, 2000, p.1106; Zollo & Winter, 2002, p.339; Lampel & Shamsie, 2003, 2192). Resources are the specific tangible (equipment, building, materials), human (skills, knowledge) and organisational (processes, sales force, marketing) assets that can be employed, deployed and exploit. Barney (1991 p.101) adds that an organization’s resources are “all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm that enable the firm to conceive of and implement strategies that improve its efficiency and effectiveness”.

Based on Wang and Ahmed (2004) Dynamic Capabilities consist of three components, namely: adaptive-, absorptive- and innovative capabilities, which form the theoretical pillars.

‘Adaptive capability’ is described as the organization’s ability to identify and capitalise on evolving market opportunities (Miles & Snow, 1978, p.128; Chakravarthy, 1982, p.35; Hooley et al., 1992, p.76; Zollo & Winter, 2002, p.340). This capability is depicted by the company’s ability to adjust to the environment by relocating internal resources, as well as its strategy (Rindova & Kotha 2001, p.1264), to match external demand (Forrant & Flynn 1999, p.168; Alvarez & Merino, 2003, p.1438). Staber & Sydow (2002, p.409) summarise adaptive capability as the focus on effective search and balancing exploration and exploitation strategies.

‘Absorptive capability’ is “the ability of a firm to recognize the value of new, external information, assimilate it, and apply it to commercial ends” (Cohen & Levinthal, 1990, p.128). Hence, the greater the rate of collecting, filtering and implementing external acquired knowledge, the greater a firm’s knowledge base and potential for competitive advantage is (Lane et al., 2001, p.1141; 2006, p.836).

‘Innovative capability’ describes the organization’s capability to refine/replace existing products and processes as well as the penetration of new markets (Wang & Ahmed 2004, p.303; Subramaniam & Youndt, 2005, p.450; Sher & Yang, 2005, p.33). This capability includes multiple dimensions and hence scholars emphasize differently. For

example; Schumpeter (1934) suggests multiple innovative alternatives through new development and adjustments of a firm's products, processes, markets, suppliers and organizational forms. Alternatively, Miller and Friesen (1983, p.222) distinguish 'Innovative capability' between product innovation, production processes, risk averseness of executives and novel solutions.

The three elements (adaptive-, absorptive- and innovative capability) form the core concept of Dynamic Capabilities. Wang and Ahmed (2007, p.18) summarise these distinct capabilities as the organization's "ability to integrate, reconfigure, renew and recreate its resource and capabilities in line with external changes". The elements are interrelated, conjunct and dependent, but conceptually different.

Scholars agree that Dynamic Capabilities are characterised as intangible, whereas outcomes may be visible in adjustment in operations, respectively Operational Capabilities (Collis, 1994, p.145). Dougherty et al. (2004, p.3) specify that a 'capability' is the potential to do something through the change of resources, processes, routines and competences, and not the actual activities that are done. Hence, Operational Capability is often argued as outcome but not part of the theory on Dynamic Capabilities. Contrarily the process of learning – knowledge acquisition, filtering, maintaining, distribution and exploitation - is central to the ideology of Dynamic Capabilities (Mahoney, 1995, p.92; Zollo & Winter, 2002, p.340; Winter, 2003, p.991; Easterby-Smith & Prieto, 2008, p.235). Scholars agree on a superficial level that the topic on Dynamic Capabilities is coupled to knowledge- and resource management and that adjustment of these affect a firm's operations. Concluding, most scholars acknowledge the importance of an organization's Dynamic Capabilities towards addressing the increased velocity in the market, however the *how* is widely debated and argued.

Since the concept of Dynamic Capabilities is still in its infancy, there are more debates, contradictions and critics on the topic than consensus. One main problem is the absence of a generally accepted definition, which would resolve the confusion about the mixed use and interpretation of the terminologies within and around Dynamic Capabilities (Wang & Ahmed, 2007, p.31). Contemporary studies fail to define mechanisms that explain the way corporate resources can be transformed to generate competitive advantage (Williamson, 1999, p.1091; Priem & Butler, 2001, p.33). Hence, it is not surprising that Zollo and Winter (2002, p.340) see Dynamic Capabilities as structured and persistent, while Rindova and Kotha (2001, p.1274) perceive them as emergent and evolving. The notion of learning is central to Dynamic Capabilities; however some authors view learning as a specific process, based on identifying new opportunities (Teece et al., 1997, p.520; Bowman & Ambrosini, 2003, p.294). Other scholars (Zott, 2003, p.108) see learning as a performance-relevant attribute, while Winter (2003, p.994) argues that learning guides the core of Dynamic Capabilities. Additionally, the relationship between resource, routines and capabilities is debated and whether the focus should be the adaption of resources themselves (Helfrat & Peteraf, 2003, p.997), the procedures that make available resources operational, or upon the practices, which enable resource to be reconfigured (Zollo & Winter, 2002, p.340; Easterby-Smith & Prieto, 2008, p.236).

To address the various critics and debates on Dynamic Capabilities, Zollo and Winter (2002, p.340) attempted to update current theory and created a more simplistic concept by establishing a hierarchy between the elements of Dynamic Capabilities, which works funnel-like towards a tangible output: Operational Capabilities. The highest-level

(=second-level) capability is: *learning*, which links directly to the discussed element of ‘Absorptive capability’. On this level, the information and knowledge from the internal and external environment is being processed. The more sophisticated the system in place, the better the identification, acquiring, filtering, distribution, storage and retrieval of information. The *dynamic*-level (=first-level) capability is the ease and speed to reconfigure and acquire resources needed to update current operations and processes to exploit on emerging possibilities in the market. This level relies on the knowledge gained through the second-level and internal flexibility to accommodate. It can be connected to the traditional conception of the ‘Adaptive capability’-element. The *operational*-level (=zero-level) capability is the lowest level and refers to the outcome, respectively the adjustment of the operational processes of the organization. As depicted, Operational Capabilities are seen separate from the Dynamic Capabilities, as they are the visual outcomes from the latter and concerned with the implementation of the operational adjustments and actual enhancement of the firm (Collis, 1994, p.145). Therefore Operational-level Capabilities will not be further investigated in this research. The zero-level capability is closely linked to the ‘Innovative capability’ element, as it comprises of the adjustment of products and services towards the identified market opportunities as well as modifications in the way organizations operate. The concept of Zollo and Winter (2002, p.420) has found some acceptance among scholars, since it provides a rational, broad concept in the mist of Dynamic Capabilities (Easterby-Smith & Prieto, 2008, p.237; Gardiner, 2014, p.87). For the subsequent research, the paper will follow this framework by Zollo and Winter (2002, p.420), which is the most known, utilized and simplistic definition to work with.

To further elaborate, respectively elude against the confusion and clarify the muddle, on the definitions on Dynamic Capabilities, Table 3 provides an overview on the various definitions over the past decade. The Table holds major definitions, including their sub-categorization¹. It is evident that although the terminology has changed, the meaning has generally sustained. Especially Zollo and Winter’s (2002) definition creates misperception, since he utilizes the term Dynamic Capabilities for both: the overall concept as well as the 1st level within the concept. While authors such as Easterby-Smith & Prieto (2008, p.237;) refer to the overarching model, including zero-, first- and second-level, as ‘Organizational Capability’, Zahra et al. (2006, p.921) see Dynamic Capabilities as the overall process to adjust in a dynamic environment. Similarly Helfat and Winter (2011, p.1243) portray Dynamic Capabilities as organization-wide phenomenon, while current articles break down the notion onto a departmental, portfolio or project level (Gardiner, 2014). This confusion is not surprising, since the infant theory of Dynamic Capabilities bears contradicting views from various sources (Ambrosini, Bowman, & Collier, 2009, p.10; Di Stefano, Peteraf, & Verona, 2010, p. 1189; Loasby, 2010, p.2794). Cepeda and Vera (2007, p.426) highlight that “the largest source of confusion is the lack of agreement about a definition of dynamic capabilities and the interplay between dynamic and operational capabilities”. In order to ensure consistency, this thesis follows the definition by Zollo and Winter (2002), who perceives Dynamic Capabilities as the capability to adjust its resources (1st level) as well as the overall, organization-wide concepts to adjust to the dynamic market environment.

¹ The levels within the table only refer to Winter (2003), and are not applicable to all concepts.

Development of the Dynamic Capabilities definition over the past decade						
Teece et al., 1997	Zollo & Winter, 2002 (Levels)	Zollo & Winter, 2002	Easterby-Smith & Prieto (2008)	Wang & Ahmed, 2007	Teece, 2007	Gardiner, 2014
Integrate	2 ^d level	Learning	Learning	Absorptive	Sensing	Knowledge
Build	1 st level	Dynamic	Dynamic	Adaptive	Seizing	Resource
Reconfigure	0 level	Operational	Operational	Innovative	Transforming	Operational

Table 3: Overview of Dynamic Capabilities Definition

Source: Authors

3.1.1. The Linkage: Dynamic Capabilities - Projects

The concept and corresponding literatures of Dynamic Capabilities is primarily related to organizational strategy and the continuous perpetuation of competitive advantage (Teece et al., 1997, p.510). Although the idea has generated great interest across disciplines and provoked many discussions among scholars, the relation to practice and practical application of the concept is largely missing (Eisenhardt & Martin, 2000, p.1114; Barney, 2001; Zollo and Winter, 2002, p.100; Peteraf and Barney, 2003, p.309; Helfat, 2007, p.41). Despite the lack of theoretical knowledge that could support organizations, firms have developed and adjusted themselves in other ways to sustain the dynamic market and maintain flexibility in support of their competitive advantage. One of the major contemporary ideologies is the strategic benefit of projects. Projects are perceived as valuable tools to implement novel ideas into the organization and at the same time isolate them from the main corporate activities (Gutiérrez, 2014, p.31). Additionally projects are believed to enhance a firm’s flexibility towards the dynamic market (Teller & Kock, 2013, p.817). To clarify; PMI (2014, p.3) defines a project as “a temporary group activity designed to produce a unique product, service or result. A project is temporary in that it has a defined beginning and end in time, and therefore defined scope and resources. And a project is unique in that it is not a routine operation, but a specific set of operations designed to accomplish a singular goal”. Artto (2013, p.596) adds to the definition that projects can be viewed as temporary organizations, facing similar challenges than organizations on a different scale. Hence project can come in various sizes and levels of significance. The use of the terminology and the practical application of projects are miscellaneous, however the contribution of a project-outcome is always, to a certain extent, linked to the strategy of an organization (Twigten, 2014).

Companies increasingly rely on projects as a mean to translate strategy into practice. Projects have gained importance in contemporary competitive and deregulated markets, which are characterised by reduced Product Life Cycle and accelerated market conditions (Lawson & Samson, 2001, p.378; Menor et al., 2002, p.136; Galende, 2006, p.301; Phaal et al., 2006, p.337; Kahn, 2007, p.11). This new trend towards the

'management by projects' or 'projectisation' of companies, are subject to various external and internal pressures. Most common are enhanced market velocity, technological advancements, increased complexity in corporate activities, competitiveness as well as the success-rate of project management tools (Webb, 1994; Cleland, 1999). It is therefore not surprising that an increasing amount of contemporary research aims to improve corporation's competitive advantage through a better understanding of the multi-dimensional challenges of projects (Brown & Eisenhardt, 1995, p.345; Ernst, 2002, p.3).

Projects and Dynamic Capabilities have a strong link and several parallels in their concepts. Both theories focus on organizations within competitive and rapidly changing markets and aim to provide components to enhance competitive advantage in correspondence to continuously upgrading organisational strategy. In both notions the key idea is based on resource allocation and re-allocation to maintain flexibility and to implement novel ideas without interfering with regular operations. Yet the theories distinguish themselves in their application. Dynamic Capabilities is an overarching, theoretical concept applicable in various hierarchical levels, while projects are a mean of organizational task execution (Dougherty et al., 2004, p.1; Killen, 2012, p.336). Projects can be seen as a part of Dynamic Capabilities on an organizational level, as they are a collection of modular tasks contributing to a portfolio, respectively programme of similar projects, all targeted to realize the organizational strategy (Meskendahl, 2010, p.808). At the same time, a project is managed and influenced by internal and external transformations. New information will trigger new decisions, which include resource (re-)allocation and task adjustments, to revise the project targets towards enhanced outcome and better organizational strategic alignment (Srivannaboon, 2009, p.2).

It is surprising that the two theories are vaguely investigated in conjunction and lack empirical evidence of their synergy. Killen, Hunt and Kleinschidt (2008, p.335) were one of the first linking Dynamic Capabilities to project management. The authors agree that projects have a connection to Dynamic Capabilities and yield higher competitive advantage when utilized efficiently. Their study found, that Knowledge Management is one of the most important aspects of Dynamic Capabilities within projects. Although their research provides rich theoretical insights into the topic, it lacks practical applicability. Petit (2012) investigates deeper into the topic by analysing organizational risk- and uncertainty management and the effects on projects, with focus on resource administration. While the study provides an overview of broad mechanisms in place, practical methods for project managers are absent. Other authors, such as Biedenbach (2011a, 2011b) and Biedenbach & Müller (2012) are narrower in their investigation by exploring how absorptive-, innovative- and adaptive capabilities within early phases of pharmaceutical R&D-projects affect project-outcomes. Once again, the studies are more on a superficial level, not considering what projects managers can do and are doing to remain flexible. Additionally, they focus on long-term R&D projects, which may be considered as strategic project, however these are excluded from this investigation as these only represent a part of all strategic projects and are different in nature compared to the general idea of strategic projects. Henceforth, to provide a solid theoretical fundament and further support this investigation on processes that project managers can undertake to encourage Dynamic Capabilities in their strategic projects, an additional dimension is needed. Strategic Flexibility holds a promising link to Dynamic Capabilities and has a connection to Project Flexibility, which is a sub-category of the

notion and a depiction of Dynamic Capabilities within projects. Alike Dynamic Capabilities, Strategic Flexibility focus on the corporate-, respectively strategic- level. While Dynamic Capabilities is a theory in its infancy with a rare link to project management, Strategic Flexibility provides an existing connection to projects through the inferior topic of Project Flexibility. The following figure visualises the association, connection and lucidity between Dynamic Capabilities, Strategic Flexibility, Project Flexibility and Dynamic Capabilities in projects. While there is hardly theory available associating the topic of Dynamic Capabilities in Organisations to Dynamic Capabilities in projects, the alternative route through the better investigated notion of Strategic Flexibility and Project Flexibility seems legitimate. This bypass will shed light into the degree at which the topics are related and provide a backbone for this research on processes employed to maintain and facilitate Dynamic Capabilities in projects.

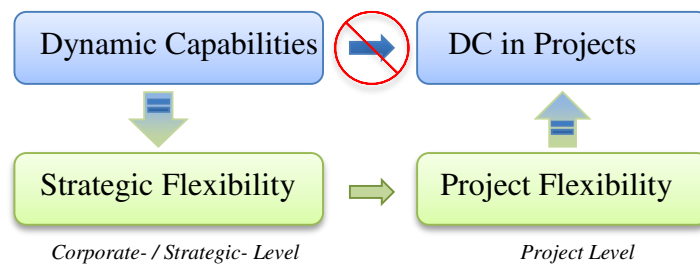


Figure 1: Link: Dynamic Capabilities → Strategic Flexibility → Project Flexibility → Dynamic Capabilities in Projects
 Source: Author

3.1.2. Dynamic Capabilities and Strategic Flexibility

In contrast to projects, the concept of Dynamic Capabilities, although increasingly explored within the past decade, is still in its infancy. Among scholars there is no common agreement on its definition, the areas of study as well as the breadth, depth and boundaries of its application. Dynamic Capabilities are widely perceived as directly linked to organizational- and strategic routines by which managers adjust the firm's resources through acquiring, integrating, (re-)allocating and combining them in order to generate new strategies and enhanced processes (Pisano, 1994, p.86; Grant, 1996, p.396; Salunke et al. 2011, p.1252). Arsha & Zahra (2009, p.32) and Najmaei & Sadeghinejad (2009, p.300) highlight that contemporary, competitive advantage is achieved through knowledge and that managing knowledge efficiently and effectively is the core to success. However, knowledge is only as good as its application and knowledge without the ability to use it is vain (Zack, 2002, p.125). Therefore, the resources and their degree of flexibility are needed to procure new and modify existing resources swiftly to apply learned into concepts or prototypes and subsequently into practice. The final assimilation into the organization is reflected by the operations pillar. It denotes the ability and flexibility to incorporate novelties into the daily routines in a cost-, time- and effortless way (Williams, et al. 2013, p.10).

Strategic Flexibility is a notion that has gained in importance due to recent market acceleration and increased competition (Wiggins & Ruefli, 2005, p.907; Li et al., 2011,

p.256). There is no consensus on its definition, however it can be broadly defined as a firm's capability to identify changes in the environment, to quickly commit resources to a new course of action in response to change (Johnson et al., 2003, p.77; Shimizu & Hitt, 2004, p.44). Singh and Oberoi (2013, p.1444) add that it's a company's ability to "proact, react, reposition quickly or to adapt to highly volatile market environmental conditions, with the help of its resources and capabilities, so as to maintain its competitive advantage". Furthermore, Strategic Flexibility is built upon the idea of managing knowledge, reallocating resources and updating processes to accommodate changes in the market environment and exploit business opportunities by remaining flexible (Sanchez, 1995, p.136). Lau (1996, p.11) affirms that flexibility is attained through the focus on developing skills such as knowledge, capabilities, and a flexible organizational structure, rather than particular techniques or programs.

The concept of Strategic Flexibility is attributed to the combination of mainly two building blocks, which accommodate the process of change: Knowledge Management and Resource Flexibility. Hitt et al. (1998, p.23) state, that Strategic Flexibility and capabilities are achieved through the collaboration and utilization of equal resource in a systematic way, which are based on knowledge resources. "Today's enterprises reside in knowledge economy" (Arash & Zahra, 2009, p.32) and managing existing knowledge as well as absorbing new knowledge is essential for effective decision making and subsequent the adjustment of processes. Any business decision is based on knowledge and knowledge is a constant ubiquitous phenomenon. Managing this occurrence effectively within an organization includes: obtaining internal and external knowledge, process this information, distribute, retain and retrieve it (Zack, 2002, p. 125). Only then enduring strategic decision can be made. De Jarnett (1996, p.3) describe Knowledge Management as the creation of knowledge through acquiring, interpreting, use, retention and refinement of information. Many articles of Dynamic Capabilities and Strategic Flexibility highlight the importance of Knowledge Management as the ultimate key to competitive advantage (Grant, 1996, p.375). These processes, which gain the "organisational knowledge assets represent the pillars of organisational operational and dynamic capabilities. They act both as resources to be transformed to create value both by affecting and responding to the market evolution paths" (Schiuma, 2010, p.41). However, knowledge is only as good as its application and knowledge without the ability to use it is vain (Brock & Yaniv, 2007, p.1). In contemporary organizations, most knowledge is processed through IT systems, which analyse and forward data to corresponding managers to adapt their operations. Operations can only be modified if there are resources available, which allow the amendment. Therefore, 'Resource Flexibility' is the second building block supporting Strategic Flexibility (Combe et al., 2012, p.1323). "Because Strategic Flexibility emphasizes the flexible use of resources and reconfiguration of processes, it reflects one type of Dynamic Capabilities" (Li et al., 2011, p. 258). Resource Flexibility comprises of the effective and efficient integration and deployment of internal and external resources through analysing the variety of alternatives as well as the cost, time and difficulty associated (Sanchez, 1995, p.135; 1997, p.939; Li et al., 2011, p.258). The refined ability to manage resources in an efficient and effective way, positively contributes to Flexibility in execution and operations (Toni & Tonchia, 2005, p.526). Operational Flexibility is the ability to change and react with little penalty in time, cost and effort in current organizational operations (Upton, 1994, p.74). Considering both building blocks: Resource flexibility combined with the facilitation or enablement of knowledge, through Knowledge Management, leads to Strategic Flexibility. These building blocks may also be

connected to the levels of Dynamic Capabilities, as they also rest on knowledge acquisition, resource (re-)allocation and operational changes. Hence both notions are similar from a conceptual point of view, making their utilization as a bridge and backbone in this research genuine.

It is evident that strong commonalities between the concepts of Strategic Flexibility and Dynamic Capabilities exist. Both notions have no clear theoretical definition and process. Additionally, they emerged out of volatile market conditions and increased competition. The core idea lies in the continuous reconfiguration of organizational processes through knowledge and resource adjustments. The idea behind Dynamic Capabilities and its pillars are found within a variety of other organizational disciplines. Scholars indicate a strong commonality between the theories of Dynamic Capabilities and Strategic Flexibility, which are both based on the swift adjustment of operations towards sustaining a competitive advantage, respectively enhanced strategic position. However the boundaries between the two are not clearly cut: While Salunke et al. (2011, p.1255) postulate Strategic Flexibility as the supporting-tool of Dynamic Capabilities; Singh and Oberoi (2013, p.1448) perceive Dynamic Capabilities as “foundations which support different pillars of Strategic Flexibility dimensions” (p.1448) or indicate that Strategic Flexibility is equivalent to Dynamic Capabilities. Singh and Oberoi (2013, p. 1448) state: “The capabilities for Strategic Flexibility can be thought of as dynamic capabilities (Eisenhardt & Martin, 2000, p.1106; Teece et al., 1997, p.525), because they are associated with new resource configurations required to lead or deal with change”. This statement, although not recurring in the same lucidity in other scholarly articles, has a strong position. A variety of scholars perceive the link between the two theories less extensive and merely stipulate that higher order Dynamic Capabilities (level 1 and 2) are required to achieve Strategic Flexibility (Volberda, 1996, p.363; Johnson et al., 2003, p.74; Toni & Tonchia, 2005, p.525; Helfat et al., 2007, p.22). Corresponding to the emergent theory of Dynamic Capabilities - the exact position of Dynamic Capabilities to Strategic Flexibility and vice versa is inconsistent. However, multiple scholars agree that Strategic Flexibility can be applied at various organizational levels (Upton, 1994, p.78; Toni & Tonchia, 2005, p.529). This scalability is in line with the perception that Dynamic Capabilities can be applied at a project level and hence presents a favourable nexus association for this investigation in leading to Dynamic Capabilities in projects via considering first Project Flexibility.

3.1.3. Project Flexibility

De Toni and Tonchia (2005, p.525) point out that Strategic Flexibility as well as Dynamic Capabilities can both be transferred on a project level. “Project managers are challenged to keep their projects focused and at the same time support their organisation’s need to adapt to changes and uncertainty in the business environment” (Olson, 2006, p.66). Not only the external changes in the marketplace, but also the change of project owners and users in their demands towards outcome and deliverables, indicate the need for project flexibility (Midler, 1995, p.366). However, scholars within project management, featured by empirical studies, note that a clear project definition is the main success factor of any project (Morris, 1991, p.307; Miller & Lessard, 2000, p.15). The researchers further highlight, that projects can only be efficient if project managers have a clear target towards the project scope, time, cost and quality. Hence, a

project manager cannot 'do things right' (=efficient) if constant project alterations affect the execution process (Kreiner, 1995, p.366). Consequently, Project Flexibility is controverting to project efficiency (Olson, 2004, p.68). On the opposite, project effectiveness is connected to the contribution, for example the return on investment (ROI), of the project outcome to their owner and user. Project Flexibility directly influences the project effectiveness as it allows a certain degree of adjustment during the project execution in response to changing demands. Therefore, Kreiner (1995, p.337) as well as Brennan and Trigeorgis (2000, p.14) conclude that projects with sufficient flexibility factored at planning stage, can exploit the opportunity to change and at the same time remain within their 'time, cost, quality'-parameters.

Flexibility management in projects is not a novel concept. Tatikonda and Rosenthal (1999, p.401) researched and collected a variety of examples to incorporate flexibility against uncertainty into project planning. On the most fundamental level having an option – the right but not the obligation to take actions in the future - for an alternative course of action is perceived as flexibility (Amram & Kulatulaka, 1999, p.5). Brennan and Trigeorgis (2000, p.13) add that flexibility can to be quantified in financial terms. On the one hand, because a flexible financial budget allows project managers to acquire needed resources to accommodate to the anticipated changes, and on the other hand are imposed changes expected to have an increased positive 'return on investment' (ROI). Other academics are not bound to the idea that an inflated budget does represent flexibility, but postulate that resources, which are not irreversibly committed, are perceived as a signal of flexibility. This goes hand in hand with the notion that the variety of remaining alternatives, after a decision has been made, is seen as the measure of flexibility (Mandelbaum & Buzacott, 1990, p.19; Olsson, 2006, p.67).

In support, Miller and Lessard (2000, p.17) indicate that flexibility within project management is also often associated with project decision processes that may be maintained through the 'late locking' of decisions regarding concepts, specifications, resource commitment, etc. "An improved version of the golden rule, ..., is that it is still better to stay flexible and uncommitted until as late as possible" (Olleros 1991, in Miller et al., 2001, p.203). "When the future cannot be influenced, whatever the causes of uncertainty, the rule of thumb is usually to diversify, stay flexible, and minimize the level of irreversible commitments" (Miller & Lessard, 2000, p.203). Henceforth, final decisions should be made as late as possible to avoid a static, irremediable project. Proposed concepts are continuous step-by-step locking of projects, incremental decision-making (Genus, 1997, p.169) as well as the decision gate model (Eskerod & Östergren, 2000, p.37). However, these concepts for decision deferral are theoretical, context specific, information driven and often not easily implemented into imposed projects. Additionally, Chapman and Ward (2004, viii) highlight that besides late decision making, a contingency plan is of high value. Especially since they are developed in the pre-execution stages of the project and therefore subject to low-cost change, stakeholders integration and commitment (PMI, 2004, p.20).

Various scholars indicate different methods to tackle uncertainty. They all agree that uncertainty is "the gap between the amount of information needed to perform a task and the amount of information already possessed by the organisation" (Galbraith, 1973, p.5). Flexibility is a multidimensional construct, which aims to help project managers during the project execution phase to adjust their 'doings' as new information comes along. Alike the theory of Dynamic Capabilities and Strategic Flexibility, Project

Flexibility is also build upon the idea that knowledge and information is at the centre. Through new, or updated, information more accurate decisions can be made. Therefore fixed decisions should be delayed and resources kept flexible to deploy them accurately.

3.1.4. Evaluating the Bypass of Dynamic Capabilities in Projects

The concept of Project Flexibility seems to be in line with the theory of Dynamic Capabilities on a project level. Since the direct link between Dynamic Capabilities in project cannot be established due to missing empirical evidence, the utilization of Strategic Flexibility as a bypass seems legitimate. Resource Based View is perceived as the fundament of contemporary theory in the field of strategy. It is often used to breakdown the notion of Dynamic Capabilities to the project level because its idea is at the core of the theories of Dynamic Capabilities, as well as at those of Strategic- and Project Flexibility (Ludwig & Pemberton, 2011, p.215).

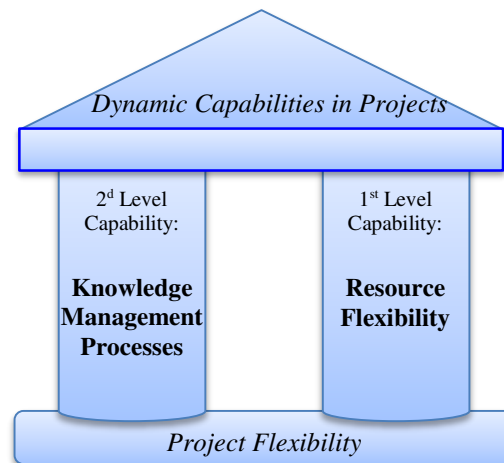


Figure 2: Research Pillars Source: Authors

Since the connection between Dynamic Capabilities and projects has been established in this first part, the subsequent literature review focuses on the collection of project management processes to enhance Dynamic Capabilities within projects. As indicated in Figure 2 “Research Pillars”, the subsequent research incorporates also project management activities, tools and procedures, which are linked to processes and keep projects dynamic. It will draw upon the concepts of Project Flexibility and the first- and second pillars of Dynamic Capabilities in relation to projects and project management. Since Project Flexibility is the foundation of this research and the theory of Dynamic Capabilities the supporting pillars, the process collection will continue as indicated. While the theory on Dynamic Capabilities contain three pillars of capabilities, the zero-level capability, respectively Operational Capability, is not included in this investigation as numerous authors highlight that it is merely the operational outcome of Dynamic Capabilities activities and is therefore not considered part of it (Collis, 1994, p.145).

3.2 Knowledge Management in Projects

Many scholars, experts and practitioners, from various disciplines believe that knowledge is the foundation for success. Unfortunately, we live in a world of imperfect information, where many decisions and ideas are based on incomplete, false or misinterpreted information. Therefore, accumulating adequate information to make reliable decisions in a timely manner is anticipated. Knowledge is the outcome of filtering available data and information that holds meaning and interpretation to someone (Pretorius & Steyn, 2005, p.41). The transformation from information to knowledge is a process that can only be done by people through investigative undertaking (Whysall, 2003, p.10). Although, Information Technology (IT) systems aid to select and process large amount of available information, the data-output needs to be understood by individuals in order to become knowledge. Knowledge can be divided into two main categories: explicit and tacit knowledge. Pretorius and Steyn (2005, p.41) note that “explicit knowledge can be documented and consists of formal models, rules, and procedures, while tacit knowledge consists of implicit, mental models and experiences of individuals”. Explicit knowledge is therefore articulated, codified and stored in some form of media and easily transmittable to a large audience. Known examples are books, articles, manuals, videos, encyclopaedias or audio-files. On contrary tacit knowledge cannot be transmitted easily and often occurs through observations, practice, experience as well as learning-by-doing and culminates in a sort of feeling or sensing (Collins, 2001, p.82). A common example is learning a language or understanding another culture, customer behaviour, market trends etc. (Persaye & Chignell, 1988, p.365). These two forms of knowledge are ubiquitous and influence individuals’ decisions and behaviours on a daily basis. It stipulates that knowledge happens not only through available information, but also experience. Hence, organizations, which provide their staff the right tools and procedures to acquire, expand, share and diversify their knowledge, have a potential for competitive advantage (Mundra et al., 2011, p.8; Mciver et al., 2013, p.597).

Knowledge management may be defined as “a systematic approach to managing and leveraging an organisation’s knowledge assets, which may include knowledge of organisation’s customers, products, market, processes, finances, and personal services” (Cope et al. 2006, p.41). Especially in recent years, practitioners and scholars have recognised the value of knowledge and its well-executed management as being central for company success (Grant, 1996, p.111). Krzakiewicz (2013, p.7) augments that “knowledge is perceived as the firm’s most important strategic resource and arguments are put forward that differences in knowledge resources [...] are the major factor of the firm’s competitive advantages and outstanding results of its activities”. Krzakiewicz (2013, p.13) further stipulates that, while competitors can easily replicate products and services, knowledge and know-how is a process that has come over years of experiences. These experiences must be captured and stored, so that other members of an organization can profit anytime and anywhere from past learning. Alike the two forms of knowledge, such experiences can only be codified to a certain extend. For this codification and retrieval of learning a company requires tangible assets such as IT systems. Within the past decade there has been a significant enhancement of the utilization of Information Technology (IT) systems and Knowledge Management software and processes. The new need for faster information delivery and data process have forced many organizations to upgrade their IT assets, which beneficially reinforce more accurate and complete decision making (Friedman, 2007, p.93; Teece, 2011,

p.31). This computerized aid for transferring knowledge over distance and time is also known as Knowledge Management. Knowledge Management deals with the management and exploitation of organisational knowledge assets. This knowledge may derive from an organisation's customers, products, market, processes, finances, and personal services" (Cope et al. 2006, p.41). Hence, it may include all aspects from the organizations, from client feedback, sales figures, market forecast, profit margin to many more statistics, which visualize activities in a systematic, compacted and easy to understand manner. Nowadays Knowledge Management systems, which are part of the IT within a company, can be relatively easily extended and adjusted according to needs of the organization, the departments, individuals or projects.

Knowledge and Knowledge Management is an ever-present and multifaceted occurrence that is found at each level within an organization, departments and projects. The management of knowledge in a project is described as "processes that aim to generate, utilise, and distribute micro-knowledge necessary for project execution and processes that are performed on the macro-knowledge of people at all organisational levels and the aim to increase the capabilities of direct or indirect participation of people in effective project execution or to increase their possibilities for influencing project execution" (Gasik, 2011, p.40). Thus, it is dealt with the creation, administration, dissemination, and utilisation of knowledge. This knowledge from the project environment may be within or outside the project (Bresnen et al., 2003, p.158). These various sources of information is one of the biggest challenges to the notion, as they have to be discovered, analysed and seized quickly before the dynamism of the market amend their validity.

Villar et al. (2014, p.41) identify an interrelation of Knowledge Management processes and Dynamic Capabilities: While Knowledge Management processes drive the development, evolution, and use of Dynamic Capabilities (Eisenhardt & Martin, 2000, p.1106), the existence of Dynamic Capabilities in return reinforces or leads to adequate changes of Knowledge Management processes (Eisenhardt & Martin, 2000, p.1106; Easterby-Smith & Prieto, 2008, p.241). Hence, Knowledge Management is at the core of Teece et al. (1997) concept of Dynamic Capabilities. The theory denotes that moving faster than your competition is the key to sustainable competitive advantage in highly competitive and dynamic markets (Daniel et al., 2014, p.96). However, the movement is only as good as the information and knowledge on which it is based on. Additionally, an organization is put together out of various departments, tasks and projects, which in conjunction and combination yield the organizational-wide success (Teece, 2008, p.1508). Not only is knowledge and Knowledge Management important on the organizational level, as Dynamic Capabilities' theory stipulates, but also within the various departments, the on-going projects and the individual tasks (Grewal & Slotegraaf, 2007, p.476). Since Dynamic Capabilities is a notion in its infancy, a rare collection of research is available. Therefore subsequent chapters will draw upon the notion of Project Flexibility and other Knowledge Management literature, which indicate processes tool and activities that can be utilized in projects and are enhancing the swift and enhanced decision making process of project managers.

3.2.1. Knowledge Management Life Cycle

Gottschalk (2007, p.154) and various other scholars indicate that contemporary society resides in knowledge economy, where the efficient creation and application of knowledge leads to success². At its core, knowledge comes in several forms, stages, circumstances and purposes, ranging from knowledge acquisition to its capitalization. A majority of academics agree that Knowledge Management can be enclosed under six distinctive processes: knowledge creation, knowledge storage, knowledge finding, knowledge acquisition, its use and learning. These six processes are also the main steps within the Knowledge Management Life Cycle, as indicated in the following Figure 3 (Pandey, 2014, p.156). These steps are a continuous cycle of constantly updating information and learning, applicable at all levels from individual up to organizational.

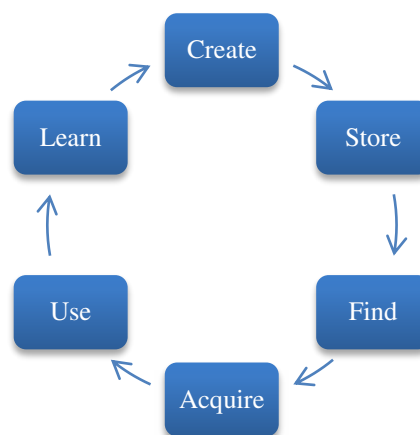


Figure 3: Knowledge Management Life Cycle

Source: Authors, based on Pandey, 2014

Corporate activities usually generate a vast amount of data through their various practices inside and outside their business activities. To maintain their competitive advantage, these data-flows need to be analysed and processed in order to create meaning to them, respectively become valuable knowledge. As Ceptureanu and Ceptureanu (2010, p.150) write: “Creating knowledge requires the existence of a person or group of people who come up with new ideas, new concepts, innovative product or process etc.” Therefore, the creation of knowledge involves both dimensions: people and technology, as well as the process to tie them together (Wickramasinghe, 2006, p.326). The people-dimension has gained greater attention and appreciation, since company-knowledge is generated and put into practice through the actions of individuals, while at the same time mostly fails due to human engagement (Foss & Mahnke, 2003, p.3). Literature on the people-dimension relates to the tacit form of knowledge, where knowledge exists in various forms (encoded, embedded, embodied, encultured, embrained) within the previously mentioned media (Newell et al., 2002, p.8). On contrary to the people-dimension, scientists highlight that also the technology-dimension can be utilized in mechanistic methods, “which enables knowledge discovery in databases through data mining tools” (Pandey, 2014, p.153). Contemporary

² Appendix 1 provides a summary of various studies indicating the positive correlation of learning and knowledge (management) to enhanced project performance.

investigations within the area of knowledge creation state that, “The creation of knowledge occurs in many dynamic forms. Most often, it is through humanistic means, such as formal training, living through new experiences, or talking with people who share similar interest. Technical mechanisms also assist in the knowledge creation process, such as Knowledge Management systems, data warehousing and data mining activities. Therefore, the significance of the employee and supporting Knowledge Management technologies has grown substantially over recent decades. Organizations now live (or die) by their ability to create knowledge, innovate and generate value with new knowledge” (Desouza & Paquette, 2011, p.99).

When knowledge has been obtained, gathered and formed it should be recorded or collected to provide others with the possibility to effectively use it. Gottschalk (2007, p.23) highlight, that companies continuously do not only gather new knowledge, but also keep forgetting. Hence, record knowledge, store, manage and recover the needed information determine an effective and efficient corporate Knowledge Management system. The target of Knowledge Management systems is to store and reproduce available knowledge in a simple and timely manner so that undesirable experiences can be avoided in order to save cost and time (Pandey, 2014, p.156). Information and knowledge can be encapsulated “in various component forms that may include written documentation, structured information stored in electronic databases, codified human knowledge stored in expert systems, documented organization procedures and processes and tacit knowledge acquired by individuals and network of individuals (Benbya et. al., 2004, p.212). To be more precise: hard copy format include: reports, presentations, articles, books, and other forms of written material, while electronic (soft) copy format includes: (word, pdf, etc.) documents, e-mails, e-books, video, audio, etc. (Davenport & Prusak, 2013, p.22). Contemporary organizations predominantly rely on electronic form of repositories, as they provide an easy, cheap, fast and effective way to manage knowledge. For that “an infrastructure capable of supporting the creation and maintenance (.....) and an environment that enables the cultivation and facilitation of knowledge sharing and organizational learning” (Al-Hawamadeh, 2005, p.22). Common computer based storing and retrieval software are search engine, learning reviews knowledge-portal, knowledge cafes, after action reviews, (document) libraries, expert locator, knowledge bases (Wikis) (Pandey, 2014, p.154). Although there is a broad range of Knowledge Management tools available for firms, the ultimate question is if employees use them and how effective they are. Therefore, any organization has to ensure that their culture fosters knowledge sharing and that the tools in place are effective and efficient enough for users in their specific environment and individual tasks (Bukowitz & Williams, 1999, p.1; O’Dell, 2004, p.3).

Martinez–Cavas et al. (2012, p.64) annotate that “the resource-based view of the firm points that intangible resources that are valuable, rare, imperfectly imitable and not substitutable in the long-term provide a competitive advantage for organizations”. In contrast, in the knowledge-based view suggests that a company should be analysed based on its knowledge resources (Grant, 1996), in this context knowledge is referred to as information, know-how, and an organisation’s “ability to create and transfer this knowledge (...) to yield competitive advantage” (Blome et al., 2014, p.309). This notion considers that knowledge can be built up and developed. Hence, companies must utilize their skills and abilities through continuous interactions to identify and appraise (relevant) internal and external knowledge. Hence, the knowledge-based view, is a core principle of Project Flexibility as well as Dynamic Capabilities. Probst et al., (2002, p.3)

indicate that today, many organizations have recognized the value of knowledge acquisitions; the external obtainment of knowledge through experts, the relationship with customers, suppliers, competitors and partners. Mathews (2000, p.78) emphasizes the significance of an external view, which might bring new ideas, innovative solutions and novel knowledge into a company. This is applicable in the enhanced interest in inter-firm relations and cross-organizational collaborations. Additionally, the employment of contractors and consultants is increasingly favoured by many international companies, especially within the Pharmaceutical industry (Stöcklin, 2013). For this, the appropriate company structure as well as Knowledge Management tools must be in place to allow the acquisition of knowledge directly from other companies as well as external hires supporting the organization operations and projects.

3.2.2. Knowledge Management Processes & Practices

In contemporary, dynamic market environment, where knowledge is the epitome of success and speed the driving force, companies increasingly leverage the acquisition of knowledge to contest the new environmental conditions. In the environment of project and business management practice, Knowledge Management aims on giving practitioners, access to relevant information to support their decision making (Gasik, 2011, p.24). For this Young (2010, p.3) created a list of most commonly used Knowledge Management tools & practices, which is available in Appendix 2. For the creation, the author followed closely the steps of the Knowledge Management Life Cycle, that is illustrated in the previously in Figure 3, by dividing the tools and practices into similar categories. The collection “represents those methods and tools implemented by the most successful organizations around the world, within their KM implementation initiatives” (Young, 2010, p.9). The collection provides trainers, facilitators, and managers with practical, in-depth understanding of the core tools and techniques widely used in undertaking KM in an organization” (Young, 2010, p.xi). Also, it contributes to Knowledge Management, more precise and faster decision-making, in contemporary turbulent and dynamic environment. The mentioned tools are often used on an organizational level, but also within departments and projects.

Knowledge Management is a much wider and more complex field of study, which is only partly covered by the provided collection of tools and process. Hence, many more methods and practices will be used by different companies, within different circumstances and corresponding to the respective projects. There are various other factors influencing and contributing to Knowledge Management, Project Flexibility and ultimately Dynamic Capabilities in projects; however, the proper use of knowledge is at its core and seem among the most important influences. The ease within which knowledge and information can be obtained leads to more accurate and faster decisions, hence, contributing to the overall flexibility of the project and the concept of Dynamic Capabilities within projects. Therefore, project managers need to be able to utilise the richness of knowledge, by encouraging the company’s workforces to share learning, manage organisational experiencing, and ultimately ensure accessibility, usability and comprehensibility for employees throughout and beyond the (project-)organisation (Pandey, 2014, p.154).

3.3 Theories on how to keep Project Resources flexible

While Knowledge Management is an integral pillar of Dynamic Capabilities in projects (compare previous Figure 2), it is merely a tool to accommodate the project to change. Accordingly Knowledge Management is second level, filtering project relevant information before attempting to modify the project in the next lower level. Thus, a project should be initiated and built adaptable enough so that change can be implemented effortlessly. In this context, the variables that need to be kept adaptable are mostly the project's resources. Hence, the degree of adaption is termed 'resource flexibility' in Dynamic Capabilities theory. However, since the idea on Dynamic Capabilities is not well established within the project environment context, other theories and terminologies have coined the same phenomenon of flexibility within the project resource. Resource flexibility encompasses the idea that a project is flexible to adapt, inducing rearranging available resources, adjusting processes and changing project execution procedures. For simplicity, the term 'Project Resource Flexibility' is used in subsequent chapters. Likewise the many terms available, multiple theories are available to accommodate Project Resource Flexibility. The three most common are investigated and cover most of the project life cycle. These are Project Risk Management, accommodating the planning phase, Anticipation Capability to support the project in the early phases and Reactive Capability for later phases of the project. It is inevitable to take these dimensions into consideration to gain a complete understanding of Dynamic Capabilities in projects as form a part of the understanding between the theoretical concept of Dynamic Capabilities and practical implications.

3.3.1. Project Resource Flexibility and Project Change

"Resource flexibility enables a firm to adjust its supply to a given demand", hence by "relying on one or few flexible resources", organisations may be able to "significantly reduce the uncertainty they face" (Chod & Rudi, 2005, p.533). Flexibility refers to the notion, that a resource may be "leveraged in new geographic and product markets" (Combs et al., 2011, p.1100). Resource Flexibility is an important component of Strategic Flexibility (Sanchez, 1995), as "the diversity and frequency of shifts in patterns of resource deployment are critical to Strategic Flexibility. Indeed, flexibility in exploiting and controlling resources may explain why some organisations move more quickly into new niches" (Nadkarni & Narayanan, 2007, p. 245). Combs et al. (2011, p.1099) also identified three categories of action to manage Resource Flexibility: procedures related to "(1) *structuring* the resource portfolio; (2) *bundling* resources and capabilities; and (3) *leveraging* resources and capabilities to create customer value" (Combs et al., 2011, p.1099).

Classical project management literature insinuates that Resource Flexibility in project is the result of careful planning. Söderholm (2008, p.80) denotes that this is a binary event, since on the one hand projects managers plan and control possible external impacts throughout the various stages of the project. On the other hand, most organizations have procedures in place to react upon changes. As an example serve environmental issues which are mitigated predominantly through planned events of risk assessment and counter-action procedures. However projects, due to their unique

configuration, are even more subject to uncertainty and evolving markets, which cannot be fully predicted and prepared for (Engwall, 2003, p.790). Project management literature sees such unpredictable changes as prevalent threats to any project and therefore suggest to 'lock' all specifications to avoid alterations during the execution phase (PMI, 2014).

Blocking a project against change is illusive as by definition a project is a unique endeavour and therefore subject to uncertainty and risks. Uncertainty may derive from "customers' needs evolving over time, consequently they require process flexibility to postpone design decisions and request late changes" (Gil & Tether, 2011, p.415). Additionally, as projects are temporary endeavours, they are even more challenged through an increased number of external changes. Sources, which trigger change, are affecting the project among various dimensions. One dimension of project change is 'fine-tuning', which also happens in 'locked' or isolated projects. Fine-tuning is the daily adjustment of tasks, priority setting, incorporation of new ideas, resource sharing, delays etc. from a constant flow of information, expertise and people inside and outside the project. Hence, there is a persistent, continuous fine-tuning of project tasks. It is a result of the ubiquitous presence of "channels for exchange of experiences and knowledge not only within a project but also among projects or from project to the surrounding organization" (Söderholm, 2008, p.84). A second dimension of project change is 'revision'. Revision is linked to the alterations of the project's targets: scope, time, cost or quality and commonly referred to when dealing with change. Revision is mostly inevitable since project plans are made during the initial phase of a project and updated information and new resources generally alter the project targets significantly at a later execution stage. Project with a long time-duration, dependencies to other projects or firms, and innovative and creative tasks are more likely to be subject to revision. The unpredictability of the future requests project managers keep close control of changes, take immediate action when necessary and possess a pinch of creativity. It is common that project managers "are empowered to make decisions necessary to keep the project on track, even though this decision may require complete re-shuffling of resources within the project. (...) Project managers hold the responsibility to attend to the changes as they become inevitable and to foresee potential threats that may develop into change requirements." (Söderholm, 2008, p.83). The third dimension of project change is 're-opening' and refers to major changes caused by stakeholders. Often stakeholders' do not know precisely their needs from the project and henceforth define abstract and contradictory targets at project initiation. Not surprising these interests, preferences and needs change over time, which might lead to a complete turnaround of the project. In this case projects are re-opened for new target-definition and adjustments in budget, schedule and tasks. Re-opening, although a major interruption, it has the advantage that stakeholders will be involved in the modification and committed to the newly defined project (Söderholm, 2008).

Project performance is linked to the different dimensions of change, which include the completion of the project within time, cost, quality and scope according to customer's requirements. It is accustomed that project managers plan ahead to mitigate these risks by organising their resources for immediate availability. However, not all events can be prepared for and need certain project management abilities to adjust timely when circumstances arise. Over the past years, one distinct frame in managing project resources has prevailed: Risk Management. Verganti (1997, p.377) postulated that besides Risk Management, which is strongly correlated to a project planning phase,

there are further capabilities needed throughout the project phases in order to successfully handle uncertainty – one is through Dynamic Capabilities. Many of the phases are not clearly cut and overlap with one another. Therefore, Anticipative Capabilities overlap with Project Risk Management in certain aspects. Furthermore, the development and exploitation of Dynamic Capabilities can help the firm shape a more attractive risk profile – especially in respect to organisation-specific risks which are hard to measure and foresee by standardised management and risk –transfer techniques (Andersen, 2009). Here, Project Dynamic Capabilities do not only support Risk Management, but also reduce risks themselves. Figure 4 visualizes the project stages and three capabilities, which are utilized to maintain project flexibility to adjust to dynamic market environments. In the following subchapters, they will be further investigated.

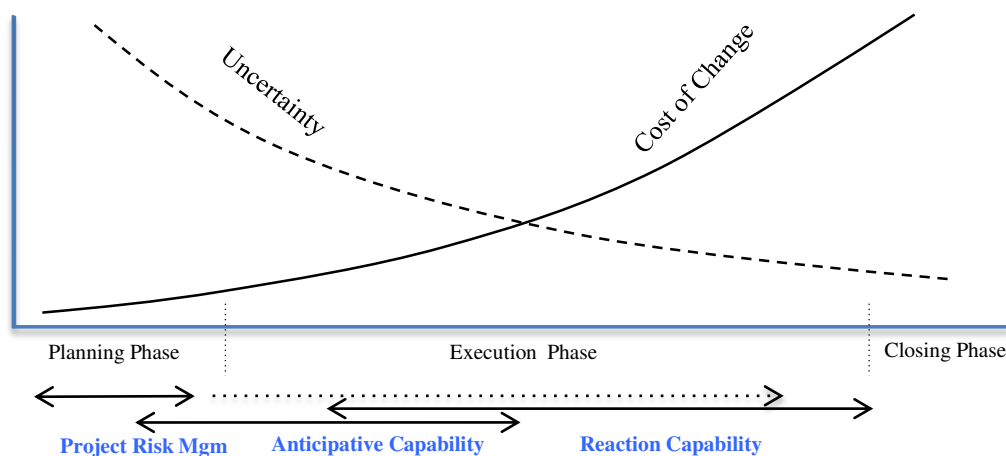


Figure 4: Project Uncertainty VS Cost of Change

Source: Authors, based on Verganti, 1997

3.3.2. Flexibility facilitation in the Planning Phase through Project Risk Management

The correlation between project success/failure and Risk Management has been investigated extensively in the past decade by various scholars such as Ropponen & Lyytinen, 2000; Yetton et al., 2000; Kwak & Stoddard, 2004; Na et al., 2004; Zwikael & Globerson, 2006; Han et al., 2007; Jiang et al., 2009; Bakker et al., 2010; 2012. Risk Management is the continuous control of the project process and performance in retrospective and prospective, to assess potential risks and prepare for them (Cleland & King, 1983, p.191; Cooper & Chapman, 1987, p.145; Morris & Hough, 1987, p.2). “Risk is an uncertain event or condition that, if it occurs, has a positive or negative effect on at least one of the project goals, such as time, cost, scope or quality” (Carvalho & Rabechini Jr., 2015, p.152). Although risk is often associated with a negative impact, multiple authors highlight that risk can also be a positive influence - an opportunity (Hillson 2002, p.235; 2004, p.11; Ward & Chapman 2003, p.98; Perminova, et al. 2008, p.75). Negative risks are only negative as long as the status quo remains and hence the response action taken reveals whether negative risks could be avoided and positive risks

fully exploited. Zwikael and Ahn (2011, p.25) discovered that even modest level of Risk Management Planning have extensive positive effects upon project success. Most literature emphasized the 'hard side' - the Risk Management processes, tools and technique, neglecting any soft skills needed by project managers to succeed. Carvalho and Rabechini Jr. (2015, p.321) studied this relationship and found that the 'soft side' has a substantial impact on the 'hard side' of Risk Management as well as on further aspects correlating positively to project success. Soft skills comprise of, but do not limit to, communication to analyse project performance from various view-points, emotional intelligence, leadership and motivation (Chen et al., 2009, p.650; Jiang et al., 2009, p.801; Morris & Pinto, 2010, p.62). Appendix 2 provides an overview of the two dimensions of hard- and soft approach in Risk Management including relevant sources to the processes. This paper will not further investigate the notion of soft approach as it is outside of the scope of this paper. Nevertheless the authors want to stress the importance of soft skills of project managers in Risk Management and the positive correlation to project success.

Risk Management processes, tools and techniques aim to prepare for deviations from the project plan by making the resources ready for adjustments. Although they are generic tools, processes and techniques, they cannot encompass the whole spectrum of possible impacts by changes. Project Risk Management literature analyse such change, by dividing the sources of change and its mitigation actions into three main categories. The first category is 'front-end strategizing', where various project scenarios are conceptualized, analysed and mitigation actions are constructed. "Seminal studies on managing risk stress the importance of prescriptive activities including defining the project scope and tasks; identifying risks, their likelihood and potential impacts; and planning contingent actions and budgets to counter impacts (Cleland and King, 1983; Cooper and Chapman, 1987)" (Gil & Tether, 2011, p.416). Various scholars include into 'front-end strategizing' activities such as scenario analysis, alternative evaluations, stakeholder investigation and PESTEL factors (Morris & Hough, 1988, p.145; Morris, 1994, p.85; Miller & Lessard, 2000, p.112). The aim is to prepare for uncertainty and adjust the project resources accordingly to minimize any undetected surprises and goal changes (Florice & Miller, 2001, p.445; Dvir & Lechler, 2004, p.1). Although the 'front-end strategizing' is a powerful tool supporting a project's Dynamic Capabilities, it deals with a phenomenon that is uncontrollable and cannot be fully planned for. Hence, for the second category, Sommer & Loch (2004, p.1334) postulate that projects need to build capacities to be able to re-plan quickly. Although this is project dependent, such processes might be the possibility to rapidly prototype and test alternative solutions or maintaining a close, cooperative relationship with suppliers that transform into commitment, common objectives and the flexibility to deal with late project modifications (Clegg et al., 2002, p.317; De Meyer et al., 2002, p.91; Gil, 2009, p.114). The third category is the control of the project owner, the customer and the end user. As stated, it is often the case that stakeholders change the project objectives in late stages of the project execution, which usually lead to a massive increase in costs, extension of the time-schedule and further complications. Hence, project managers are tempted to ignore project amendment to avoid turbulences in their projects in order to achieve the given objectives. This would result in the timely completion of the project and success in its management, but fail to provide the expected benefit to the project initiator. As a countermeasure Hobday (2000, p.873) proposes that end-users and project-owners should dominate the influence of project-, portfolio- and functional managers to emphasize on the usability of the final outcome instead of the budget- and

schedule targets. While Miller and Lessard (2007, p.18) propose to set up governance structure that analyse and outline all effects on the changes, Clegg et al. (2002, p.319) value the cooperation between all relevant parties through regular meetings and collective future planning. Here the notion of soft approach is predominantly emphasized as the best tool to connect to the various stakeholders and ensure prevalent support from them.

Raz and Michael (2001, p.11) compiled a list of processes, which aid project managers to assess and mitigate risks effectively. The investigation initially comprised of a collected more than 100 tools drawn from scholarly articles. However the list has been shortened to the amount of 38, after a group of experts have reviewed the list by eliminating duplications, merging similar tools and excluding idle and outdated processes. The adjusted list is represented in Appendix 3. These procedures can be applied to various categories of risk source within projects, such as ‘front-end strategizing’ as well as capacity building for quick maneuver. “It is interesting to note that certain tools that are normally associated with Risk Management, such as decision trees, fault tree analysis and influence diagrams, were reported to be seldom or not used at all, and consequently are not included in the final list” (Raz and Michael, 2001, p.10). Additionally, the procedures are grouped according to the stages of Risk Management to simplify the relation and enhance intelligibility. The investigation of Raz and Michael (2001, p.11) further analyzed the usage frequency of these procedures and ranked them accordingly. In general, all processes support Dynamic Capabilities in a project through the envisionment of the future and the accordingly preparation of its resources.

Although numerous studies have been conducted over the past decade to understand the notion of Risk Management, including the various ways to soften the disruption during project execution, some authors claim that the current level of knowledge on the topic is still weak. The processes, tools and techniques available have proven to be of value for projects in general, but most are unique and face incommensurable challenges. The project context is of importance and should incorporate the consideration of the industry, the country and many more factors inside and outside the project environment (Bakker et al., 2012, p.445). The hard side of Risk Management helps project managers to prepare for anticipatable uncertainties (Meyer et al., 2002, p.91). However, unanticipated events need other types of managerial skills, found in the more recently developed soft side of Risk Management. Given that a majority of projects are subject to both un- and anticipated change, the investigated tools, techniques and processes are part of a larger picture of Risk Management contributing to the ideas of maintaining projects flexible and enhance Dynamic Capabilities to remain competitive.

3.3.3. Anticipation Capabilities in Project Planning and Execution

Verganti (1997, p.380) found that projects need to be anticipative and reactive to maintain their project flexibility. Anticipative Capabilities, as he describes, have strong parallels to project Risk Management. Managers and scholars advocating Anticipation Capabilities believe that the early phases of a project, such as planning and early execution phase, are most crucial to implement changes. This ground on the opinion that cost and time of corrective actions is lowest at the beginning of a project and increase through time (refer to Figure 4). Hence, decisions made at the beginning of a

project are believed to be more likely to be executed as late changes endanger the project management goals. Therefore, the emphasis is on mitigation and planning to anticipate changes within the project. The forward planning presumes that decisions on project requirements, feasibility, manufacturability, usability, reliability, maintainability, changeability etc. should be made in the early project phases. “Great efforts and managerial focus should be devoted to anticipating formation from downstream phases, so that early solutions already account for future constraints and opportunities” (Verganti 1997, p.364). To fully utilize the Anticipation Capabilities manufacturers, suppliers, regulators, legislators and other stakeholders should be involved in the early phases of the project, in order to incorporate their support in the project. Furthermore, Hughes and Gaffin (1996, p.94) highlights, that tools like ‘Quality Function Deployment’ are useful tools to support Anticipation Capabilities by transforming user demands into parameters, subsystems and components parts to specify project elements early on. Also the Life Cycle Costing by Blanchard (1979, p.213) is a regular utilized tool that supports anticipation and the analysis of downstream information.

The study by Verganti (1997) reveals that companies emphasize two main approaches towards project anticipation. The first was a detailed approach, where a stage-gate structure was used to continuously control events and approve for continuation. In these stage-gate structured projects, only necessary, non-movable decisions are made at each gate, which are based on the most current information available. The second approach, companies regularly used in their projects, was a selective approach where only minimum levels of decisions are made in the early stage. Decisions, which are not urgent, were merely characterized at the beginning and delayed in fixed decisions as long as possible to acquire most accurate information. The main focus of project managers was on critical areas where uncertainty and costs were highly dependent on the decisions. These two decisions are not mutually exclusive and hence used in the observed projects in various combinations and intensities. Verganti (1997, p.384) points out that there was no best way on how to use detailed- and selective approach, but found that the top performers utilized a combination of both approaches in their projects.

As highlighted, Anticipative Capabilities are closely linked to Project Risk Management and therefore most scholars utilize the tools listed in Appendix 3 as project mitigation actions. Zwikael and Ahn (2011, p.28) highlight that preventive planning depends on project circumstances, company or project manager inclinations and that tools used in one theoretical area, such as Risk Management, can also be transferred to other theoretical principles. This is in line with available literature, which provides limited knowledge on top of the topic of Risk Management, which might be utilized at the early stages of a project. Also the Project Management Institute (PMI, 2013, p.112) merely emphasizes that the planning stage is most crucial, and should gain a great deal of attention by the project team to prevent severe deviations from the project plan in the execution stage, but fails to provide knowledge outside of Risk Management on how to achieve this efficiently.

3.3.4. Reactive Capability in Execution and Implementation Phase

Early project mitigation actions, such as Project Risk Management and the development of Anticipation Capabilities, are designed to prepare project managers to accommodate change. Although mitigation is the area, which is most investigated by scholars, it is not the full picture of Project Flexibility and does not lead to the full range of possibility to embrace dynamism, respectively Dynamic Capabilities, in projects. Projects should be capable to react to environmental changes during their executions and rapidly introduce changes in late stages of the process. Clark and Fujimoto (1991) as well as the studies of Iansiti (1993), McKormack (1998) and Iansiti and McKormack (1996) have investigated various kinds of projects and found five major classes, which contribute to the maintenance of Project Flexibility during the execution phase. The five classes are summarized in Appendix 4 and are applicable to a broad range of projects. Further Reaction Capabilities of other authors have been added to complement the list in order to provide a more holistic view on current tools available supporting the projects Reactive Capabilities.

A variety of tools are available to support Resource Flexibility. While late changes mostly result in an increase in costs and time, the updated outcome should be worth the delay. Shenhar (2001, p.395) as well as Floricel and Miller (2001, p.448) support this idea that “changes are typically accepted when their prospective benefits to future operations are thought to outweigh the adaptation costs and risk of delays, which can both be significant, especially in projects with integral design architectures” (Gil & Tether, 2011, p.415). While in practice project managers utilize tools such as various forms of communication, time- and budgeted reserves as well as consultants, scholars advocate modularity in the project and product to enhance Project Flexibility to tackle uncertainty. “Product modularity addresses this challenge as it also increases the flexibility of firms (Sanchez, 1995; Sanchez & Mahoney, 1996), specifically the development resource flexibility (Sanchez, 1995)” (Pasche & Persson, 2012, p.5). While various experts prefer different tools, the utilizations are largely dependent on the project circumstances. Experienced project managers will have the capability to know what is best for their specific project, with its unique tasks, targets and credentials in its matchless environmental setting. “A capability does not represent a single resource in the concert of other resources such as financial assets, technology, or manpower, but rather a distinctive and superior way of allocating resources“ (Schreyögg & Kliesch, 2007, p.914).

4. Empirical Findings

The purpose of this chapter is to enhance the current status on Dynamic Capabilities within projects, collected in the literature review, and further develop the ideas with practical investigation. This data collection will comprise of two distinctive parts. The first is concerned with the results of a secondary data collection and analysis of organizational project manuals and guidelines. This step should provide a further level of foundation to build up towards the qualitative research as well as provide first applicable evidence of Dynamic Capabilities within Bayer's projects. Based on the findings, the second step will be supported. In this second step qualitative Interviews with experienced project managers aims to provide further, deeper insight into the undertakings towards project flexibility and enhancement of Dynamic Capabilities within Projects.

4.1 Introduction to Bayer

Bayer AG is a German chemical and pharmaceutical company. It was founded in 1863 in Barmen (Bayer, 2014), which is close to its current headquarters in Leverkusen in Germany. Bayer's 110,500 employees operate worldwide in different subsidiaries such as Bayer MaterialScience, Bayer USA, Bayer Schering Pharma, Bayer HealthCare Pharmaceuticals, Bayer Business Services, Bayer Technology Services, Currenta, and Bayer CropScience. In 2012 Bayer has earned revenues of €39.76 billion, contributing to a profit of €2.446 billion (Bayer, 2012). Bayer's mission is "Science for a Better Life", which exemplifies the companies values which consider among others sustainability, integrity with people and the environment, flexibility in terms of driving change adequately, and efficiency (Bayer, 2014a). In the researchers' perception Bayer appears as an interesting point of (practical) reference since they operate within a 'hypercompetitive' market environment and often have multiple international projects running in parallel (Biedenbach & Söderholm, 2008; Biedenbach & Müller, 2012).

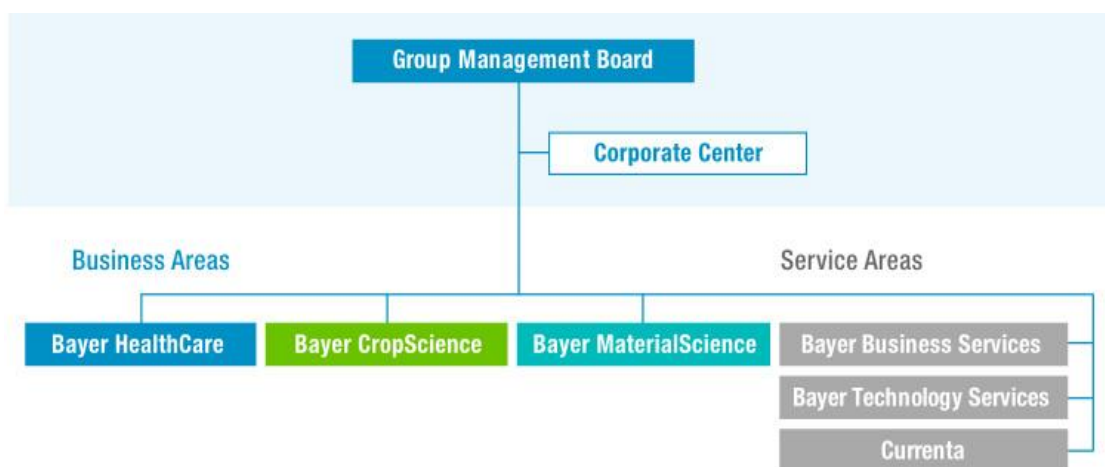


Figure 5: Organisational Structure Bayer AG

Source: Bayer, 2014b

The strategic projects were chosen by pre-established criteria, which were examined in the methodology chapter. Among these dimensions the projects for this investigation have been characterised as strategic and hence as relevant for the study on hand. Additionally, when considering the topic of the project a focus was made on projects that are non-routine projects in order to ensure, that projects are identified that which are reliable on the identification of Dynamic Capabilities. Also, R&D projects are especially exclude as they would make up a large part of the on-going projects, are usually uncertain in their success, and not particularly motivated by common project management practices. A list of the projects chosen may be found subsequently.

Project	Project short description	Expected Value	Financial value	Time frame	People involved
1	Product Lifecycle Management	Efficiency, bigger transparency, innovation	€40million	2 years	20
2	(4 projects) Licensing globally	Company reputation, €4billionn	€4million	3 years	30
3	Restructuring processes, policies, IT and operation models	Cost savings, increasing time efficiency	€120million	4 years	65
4	Decreasing fixed capital and increasing flexibility	Increasing flexibility	€25million	1 year	15
5	Implementation for an web application firewall	Corporate-wide IT protection	€2million	8 years	10
6	Product process and operation improvement	Market development	€80million	2 years	45
7	Licensing Europe (among others)	Sustaining competitive position	€25million	2 years	35
8	Process and policy improvement	Flexibility	€5million	1 years	20

Table 4: Project Descriptions

Source: Authors, based on interviews

4.2 Project Guidelines

This section presents the results of the analysis of the project management guidelines by Bayer. It is important to understand the value of the knowledge gained in this step of the overall analysis as the guidelines might form a frame of what is later analysed in-depth in the interviews. However, these are rather referred to as a superficial knowledge platform which is not specific to a unique project.

As a first result of an analysis, is the notion, that there are project management guidelines at Bayer. These supporting documents are available in different forms as is indicated in the subsequent table. These include content wise instructions on how to handle different undertakings occurring over the project-lifecycle. Following Macher and Mowery (2009, p.45) this leads to better project performance.

	Document	Content
1	ProPedia E-Training	<ul style="list-style-type: none"> • Introduction on ProPedia and its basic functions
2	Working on OPS – first steps in a new project	<ul style="list-style-type: none"> • Introduction to the project management system • Introduction to tools (of the programme) and how to use them
3	Guidelines for PMS (Working on ops II)	<ul style="list-style-type: none"> • Focusing on the logical structure for project approval, who to contact in case of needed help

Table 5: Project Management Guidelines

Source. Authors, based on Interviews

Structure wise, Bayer’s project environment is split into three main elements: Project Support Office (PSO), ProPedia and OPS (IT), and the resource side including human resources and access to the company’s assets. Projects at Bayer are organised centrally from their Project Support Office, who have the responsibility of creation and approval of projects. Once a project has been created, a project manager is assigned by the PSO. The assigned project manager now has to shape or tailor his project, which means that depending on the type and / or size of a specific project, different project classes may be chosen. Also he is now in charge to assign the project team, functions, as well as resources to the several phases and activities within the project.

Projects at Bayer are run using the procedure model “ProPedia” which also includes “OPS”, an integrated work environment. In lack of a project management toolkit, Bayer introduced ProPedia in 2005 and further developed its initial version until 2007. Since then it has been used successfully in over 50 major projects. ProPedia is based on several models and toolkits and combines among others V model XT, iteration based project management methods, Prince2, and Hermes. Hence, ProPedia provides best practices and standards for planning and delivering projects. These are available in the form of templates as well as in detailed work-step descriptions for planning and control, organisational change management, supply and contracting, business requirements engineering, system realization and testing, compliance and validation of Bayer’s

projects. ProPedia is organised as a matrix structure. On the x-axis the time perspective of the project is used. It is equivalent to the different stages of the project lifecycle: P0 – Opportunity Planning, P1 – Initiation, P2 – Planning, P3 – Design, P4 – Development, P5 – Testing, P6 – Migration and Cut-Over, P7 Hypercare and Hand-Over, P8 – Close-out. On the y-axis several functional departments or knowledge areas are used. Crossing both structures, activities can be assigned to the responsible person / department at a specific time. This on the one hand helps project managers to navigate, coordinate, and manage their project, and on the other hand shows them where to access knowledge in specific areas. Depending on how the project manager tailors his project in the ProPedia system using preselection criteria, he receives in return a different set of tools to do his/her project by the system.

OPS is an integrated work environment, which is integrated into the ProPedia system. OPS stands for O&I Project System. It supports planning, monitoring, documentation, and collaboration of projects. It provides ready to use functionality and process flows for the planning and execution of several activities within the project context. OPS also enables managers to keep an overview of their project by offering current performance feedback in the form of status reports, time recording and tracking. Also OPS offers access to information in two ways: Knowledge can be accessed through the OPS knowledge data base (oKB), as well as project knowledge can be shared within a folder structure.

The analysis of Bayer's project management guidelines indicate the structural hierarchy of the project management environment as well as on how relevant project knowledge might partly be obtained. However, the focus of the guidelines as well as of the OPS Knowledge Base is largely on tacit knowledge. Hence, knowledge on procedures that lead to the development of Dynamic Capabilities is indicated.

4.3 Interviews findings

In the following section the results of the interviews will be presented. This analysis will follow a similar structure as the one used in the interviews: Thus, first general observations about the interviews and the interview situation will be presented. Second, projects will be presented broadly. Unfortunately, a detailed description will not be possible due to confidentiality and anonymity restrictions. Third, A focus will be set on Dynamic Capabilities in general, and fourth, in detail summarising the findings that are in the Dynamic Capabilities context related to Project Flexibility, Knowledge Management, Resource Flexibility, and according behaviour by project managers.

The Bayer Corporation has become one of the leading global players in various fields. Although they are mostly known for their drug: Aspirin, they have grown in other segments, such as packaging materials and crop protection. Today, the Bayer Corporation is a well-known multi-national, multi-billion, multi-industry company, with an annual turnover of almost €40 billion (Bayer, 2012). A large amount is being re-invested in projects, either for research of new products, enhancing current products, enhancing internal processes or strategic purposes such as market positioning and penetration. To cope with the 'hypercompetitive' market of Bayer, the company has developed its own set of unique skills for competitive advantage. Bayer (2014)

postulate, that they “provide competitive advantage through improved brand and market insights based on the synthesis of secondary data, analytics, competitive intelligence, marketing science and primary research”. Additionally, they keep “sustainable competitive advantage through leading technologies and solutions” (Bayertechnology, 2013, p.2). Hence, it is evident that Bayer encourages a proactive, leading position in the market, with the support of market insights and other intelligence tools. In order to explore how Bayer, as a top player and innovative company, cope with the dynamic market and strong competition, this study includes interviews with several project managers from various departments. A sample size of eight interviewees has been thoroughly investigated to identify how project managers (PM) utilize, support, enhance and contribute to Dynamic Capabilities in their project.

4.3.1. Interviewee Overview

The interviewees are from five different, strategically important, departments within the Bayer Corporation. These departments are allocated within the following 4 divisions as following:

- Bayer Consumer Care
 - Organisation and Information (O&I)
 - IT Integrations (ITi)
- Bayer Health Care
 - Special Projects R&D (R&D^{special})
- Bayer Business Services
 - Inhouse Consulting – R&D
- Bayer Corporate Centre
 - Corporate Records Management (CRM)

The Bayer interviewees held positions from Junior Project Manager up to Team Leader of Strategic Projects, with occupation of their current position from two up to nine years. The project managers had PM experiences from two up to sixteen years, while the Junior PMs had already worked for Bayer in another position for 3 years prior becoming a Junior PM. From the sample, only five interviewees possessed a recognized Project Management certificate, such as the Prince2 certificate (2) as well as the PMI (Project Management Institute) certificate (1), the IPMA (International Project Management Association) Level C (1), HERMES Swiss Project Team Professional (1) and CSM (Certified Scrum Master) (1) for IT related projects. However, all interviewees did participate in Bayer-internal training and courses.

4.3.2. Departments Overview

Organisation and Information (O&I) Department

The Organisation and Information (O&I) department is located in Basel, Switzerland, in the European headquarter of the Bayer subsidiary: Bayer Consumer Care AG (BCC). It comprises of 8 full-time, permanent employees working in the office in Basel, with affiliates in Germany and North America. The O&I department ensures enhanced and updated information-flow for various departments within the Consumer Care subsidiary. Henceforth, the company is in strong connections with the IT department, which is responsible for the technological aspect, while the O&I department plans, manages, controls and validates the projects. One major project, the department is working on, is in relation to Product Lifecycle Management, R&D and Marketing. It ensures the incorporation of the recently acquired company: Merck Consumer Care into the Bayer Consumer Care organization with the combination, integration and replacement of current Merck IT systems to ensure a smooth information-transfer between both organizations and the merge of different processes into a common one. A further prospective benefit of the project is the increased transparency of R&D project expenditures, with the information harmonisation between both companies. Although the budget for this project is medium sized (no figures provided), the integration project is expected to be complete by the end of Q2 2015. Multiple departments are benefiting from this information-management project, including the Product Supply-, R&D- and Marketing-department through the regulated data synchronization. Consequently the project is, strategic, through the integration of the new acquired company into the Bayer Corporation.

IT – Integrations (ITi)

The IT – Integrations is a small department comprising of a total of 10 full-time, permanent people developing and implementing IT software. More precise the department focuses on the provision of new tools, its integration into other systems in the Bayer Corporation as well as the enhancement of existing web-applications for the Bayer Consumer Care division. A current, high importance project is the enhancement of their Firewall, as currently an increased amount of hacker attacks happened on the Bayer Product database. To protect high sensitive data of BCC, such as drug formulas, internal- and external test results, observed side-effects of products, etc. a new, stronger firewall is planned to be implemented, which in turn leads to complications with the integrations and functionality of existing applications. The project team works together with various departments, including O&I, to ensure a proper integration of all tools and smooth system transformation. Having worked for this project for more than 7 years, the department has been lifted in their priority with a new deadline to finish by the end of 2015. Their current budget amounts to €200'000 to complete the project by next year and contribute to secure high sensitive data of Bayer.

Special Projects R&D Department

Special Projects R&D (R&D^{special}) is a small department within the R&D section, which comprises of 6 people in the BCC headquarter in Basel, Switzerland and 10 employees worldwide. The main duty of this department is to ensure that important international R&D projects are executed rapidly. Although integrated into the R&D section, the Special Projects R&D department is not involved in traditional R&D tasks, such as the

development and refinement of new drugs. They are located as an administrative body in the R&D hierarchy ensuring world-wide compliance with (FDA) standards and internal regulations. The team-leader of the department explained, that there are “4 current projects, but the main one at present is a regulatory compliance project where we are checking that all 4500 licenses globally correctly represent the products we are supplying to the marketplace, and that all products are correctly registered according to the local legal requirements”. For this project, the R&D^{special} department has hired additional 20 contractors to support them in their tight scheduled project. Besides there are many more affiliates and manufacturing site personnel involved on a part-time basis to support the project. As the team leader of the department stipulates, the current project is very strategic and of high importance as non-compliance is a serious issue in the pharmaceutical industry so protecting licenses and maintaining compliance is strategically very relevant. Maintaining compliance also reduces the incidence of write-offs, out-of-stock and recall situations. Hence, it is a legally crucial, financial important endeavour, which has direct impact on the company reputation. For this the project has received a budget of €4 million, whereas the represented sales value is €4 billion. This project is planned to be complete within three years and finished by 2016.

Bayer Business Services – In-house Consulting

Bayer Business Services – In-house Consulting (BBS-IC) supports Bayer in administrative-, commercial- as well as scientific business processes and relieves the subsidiaries and divisions of workflows unrelated to their core businesses. Similar to any external consulting company, BBS-IC is a Bayer-owned consulting group supporting their own corporation in strategic matters. “In today’s constantly changing market environment, Bayer Business Services provides high-quality services and innovative solutions for the Group’s business processes. The service offering ranges from developing and operating systems solutions through business process outsourcing and taking charge of complete business processes to management consulting” (Bayer Business Services GmbH, 2014). The BBS-IC supports the corporation along the entire value chain ensuring competitive advantage on a process level. Among many ongoing projects, one larger project is concerned with the simplification, optimization and centralization of the Human Resource Organization. This includes its world-wide simplification of processes, standardized policies, concurring IT systems and updating the overarching operational model. To support the Corporate HR & Organization division of Bayer AG, Bayer Business Services has received a timeframe of 4 years to complete the project, with an overall budget of €120 million and a static workforce of 65 full-time Bayer employees. Within this large project, various sub-projects have emerged, such as the pre-study analysis and solution development for the Asia-Pacific (APAC) region. The ultimate purpose of this project is to provide a globally unified system that will reduce HR-Administration costs significantly and provides better and more time-efficient service to the customers of Bayer Corporate AG; the various sub-divisions.

Corporate Records Management (CRM) Department

The Corporate Records Management (CRM) department is located in the Bayer AG Headquarter in Leverkusen, Germany, along most highly strategic divisions of Bayer. It is a small department, comprising of 8 employees, responsible for the world-wide collection, retention and provision of legally required documents. Hence, the department is cross-linked to IT- as well as the legal department to ensure the presence

of an optimal IT system that allows all subsidiaries and branches easy access to required documents. However, this is not an easy endeavour, as laws and regulations constantly change. Consequently existing systems need to be adjusted and updated on a regular basis and available for the divisions and branches in a timely manner. Especially since FDA (Food & Drug Administration) are auditing Bayer on a regular basis, and strongly focus on document compliance. One of the current projects in the CRM department is the integration of the Merck Consumer Health unit into their system to ensure that their legal documents are appropriately stored. For this project, two Project Managers as well as (currently) one contractor are working on the project plan in order to kick off the project execution at the beginning of 2015. The full integration of the system into Bayer Corporation is planned to be complete by the end of Q2, 2015, with an unnamed budget and an expected workforce of five CRM employees as well as Merck contributors.

4.3.3. Tasks & Duties of the interviewed Project Managers

Although the interviewees came from various disciplines, departments, divisions and countries, their tasks, duties and responsibilities were mostly identical. Project Managers (PM) within Bayer all have their primary duties in planning, implementation, and controlling of project specifics. As only exception was the interviewee from Bayer Corporate - In-house Consulting, where project managers merely focus in supporting and consulting different project managers during their planning and execution on specific matters, such as process outsourcing, optimisation, etc. The core tasks of the interviewed project managers are non-relevant and non-related to the size, timeframe or the budget given to the different projects. Although only named by a few (2), all PMs interpreted their work as strategic, contributing in an exception, non-routine way to a higher cause rather than the simple revenue creation. "Given the nature of projects, they are usually non-routine and therefore often have a superior cause which contributes to the business in the long-run" (Senior Project Manager, ITi). Since projects are mostly long-term, respectively longer than six months, time-management is most frequent rated to be the highest priority of all. Following time-management, the motivation of their staff is perceived as second most important as they are the executers and "a project stands or falls with the integration and dedication of all people involved" (Project Manager, R&D^{special}). The third most frequently cited priority is the budget. Budget is perceived as important to achieve personal and project management related targets. However, since Bayer is multi-million Euro company, budgets are more flexible than most people would perceive, especially if the time-schedule is being followed and there is a plausible reason for the necessary financial extension. "Of course budget is one of the fundamental targets to hold on to, but as security relevant project, time and durability is of much higher importance" (Senior Project Manager, ITi).

Since projects are multidimensional and involve much consideration on various aspects, setting priorities on the work is a further crucial project management task. The Junior Project Manager indicates, that he observed that most projects are getting behind schedule and over budget because project managers do not plan genuinely. Their plans are mostly over-optimistic, also due to the pressure from superiors. This in return leads to a deficit in time and in turn leads to over-worked people, extra pay for over-hours, decreased quality and in some cases extra short-term hires, etc. which all pressures the given budget. A common source for this phenomenon is said to be the lack of available

information, not only at the planning stage, but throughout the project's execution as well. Additionally, senior project managers indicated that the prioritisation of tasks is a crucial part, so to ensure that the money is spend on the right tasks to stay on track. "Constantly working along a projects critical path is not what a good manager should do and is either a result of bad planning, poor execution or an unexpected turn of events" (Team Leader, CRM). This idea of work-distribution ties in with the communication aspect of projects. A project manager coordinates and controls the execution according to plan. However, this control is connected with the intra-project communication and information exchange. It has been noted that the Team Leader in the Special Projects R&D Department strongly emphasizes the communication with his workers. For this he takes an unusual amount of time to meet his people, talk to them and try to understand their current status, problems they face in their ideas and tries to support them in his best possible way. A co-worker mentioned: "He takes so much time for us, that he barely gets to do his own work. He participates always in meetings, supports us or other people, and as a result he has to show up for work at the weekend". As a result, this Team Leader is being perceived by various people, including 2 interviewees, as an exceptionally good, people-oriented manager. This relates back to the motivation of the staff, where six out of eight agree that including the project team in decisions, informing them and showing interest and attention to their tasks and progress, recoils in form of motivation and increased task performance.

A consolidated and comprehensive list of the received answers according to the task, duties and responsibilities of the interviewed Bayer project managers is applicable in Appendix 5. The table is grouped into the main phases of project management, and divided into the respective answers given. The list indicates the consolidated answers from all interviewees, without dividing them into their specific field of knowledge (e.g. IT, Legal) or department (e.g. O&I, CRM). This is derived from the general understanding, that projects are unique endeavours and consequently change after each assignment. However the project manager duties and responsibilities, although slightly different for each project, remain constant over projects, disciplines and departments. Henceforth the answers were all similar and the division in results is largely due to the depth of description provided by the interviewees. The given percentages indicate the number, out of the interviewed sample size of eight project managers, who explicitly indicated this task, duty or responsibility. Alike the filled fields in the results section visualize the answers in a non-numerical representation.

4.3.4. Dynamic Capabilities in Bayer Projects

Throughout the interviews, the questioned Bayer project managers did not relate to the topic of Dynamic Capabilities and their process on how to prepare or mitigate external influenced change. This is also evident as none of the interviewees explicitly mentioned a risk-analysis or mitigation plan. Additionally only two respondents (25%) could provide an instant explanation of what Dynamic Capabilities are. The remaining have never heard of Dynamic Capabilities, especially not in connection to project management matters, but seemed rather interested in the field, once briefly explained. Noteworthy is that about 1/3 out of the six participants, who are not familiar with Dynamic Capabilities, directly referenced to project flexibility, once they heard the explanation of Dynamic Capabilities. In contrast all project managers believe that

flexibility within projects is important. However, only 63% actually utilize the chance to adapt. The remaining 37% support the idea that project targets should be set at the beginning and changes avoided during the execution phase. “I try to define a good plan and then stick to it, but I also follow a process of continuous improvements, which means that sometimes the best action is to be flexible and change. But it shouldn’t happen often if you have planned properly at the beginning” (Team Leader, Special Projects R&D). Hence, the legitimacy for change strongly depends on the circumstances and the benefits the change will bring to the project outcome. The Senior Project Manager from the ITi department commented, that during the planning phase they have set the minimum requirements for their purchases, e.g. IT-hardware, at such a high level so that change in products will hardly be required. Supporting this statement, the PM from Bayer In-house Consulting summarises, that for an efficient and successful project outcome, the overall project objectives should never be subject of any change. Its character can be further defined during the project, but the overall goals must be fully ensured and tested for feasibility at the beginning. More accurate: “flexibility only works well if you have planned properly first. Changes should be as a consequence of new learning, not due to poor planning and design” (Project Manager, R&D^{special}).

According to the interviewees, Bayer seems to count an unusual low amount of project failure. This investigation explicitly excludes the research and development (R&D) on drugs, as they are not part of this study and would distort the findings. Out of all investigated participants, 75% cannot recall any known major failures in projects nor have been involved in one. The few named common reasons of project failures are increased budget and exceeded time-frame, which are linked to poor project preparation and documentation as well as sudden project scope change. One PM further reported that an internal power struggles, disputes and political issues of project stakeholders caused a project to fail. However, this is a rare occasion and stakeholders commonly work together harmoniously. Major contributors to the success of most projects are named to be the tight project monitoring of superiors as well as the (project) external project controlling and supervision. “The management commitment is very strong, especially in projects above a budget of 1 million, where each project has to undergo several criteria and validations prior their launch” (PM, In-house Consulting). This validation process indicates the feasibility, potential benefit as well as the importance of the project. If the project is not essential, it will be cancelled or postponed. Another important source of Bayer’s superiority in projects and project management are their pool of highly skilled and experienced project managers. It is perceived by a few interviewees (2), that Bayer has the unspoken law to hire highly skilled staff and emphasize quality over costs. Hence, most see the advantage of Bayer at the employment level and the above average skilled people. Further sources of competitive advantage are the pool of knowledge available to the staff, available training materials and guidelines as well as the resources the managers can draw from³.

Project Managers (100%) indicate that they do not seek actively for opportunities in the market to change their project. The interviewees imply that adjustments of the project during execution must be enforced top-down. This does not mean that project managers try to ignore change, but tend to avoid it, as it results in a chaotic adjustment and reconfiguration of the project. Still the interviewees agreed that they prioritise the company over their aversion towards project change during execution. “If I notice

³ More details in subsequent chapters: 4.3.5 and 4.3.5

something that might be of importance to the project or the company, I bring it up at the next team meeting or inform the department head, which might be interested in that knowledge” (Junior PM, O&I). Most project managers (63%) encourage their staff to inform them about possibilities to improve the project or adjust processes towards efficiency. To encourage this knowledge exchange, all interviewed project managers hold regular team meetings as well as individual meetings (termed: face-to-face) to foster communication and creative solution findings. While team-meetings are usually held weekly (5), every second day (3) or daily (1), face-to-face meetings tend to be rarer with an average of twice a month. Supplementing, all project managers investigated hold the ideology that they are always open for questions, discussions and meetings. Correspondingly Bayer fosters an open communication policy by providing centralized coffee-machines, lounges and kitchens where people can go and meet, discuss and share information and knowledge. Additionally, interaction is further encouraged through workshops and team events, where interaction and tasks are playfully targeted towards a problem, solution finding or knowledge extension. However, if there is a major concern regarding the project or specialist knowledge required, 100% of the interviewed project managers rely on the proficient opinion and experience of (external and internal) experts, respectively consultants.

The overall tendency of the interviewees was relatively neutral regarding project flexibility. While 37% of the project managers had a positive stance regarding flexibility in projects, 37% were relatively neutral and 25% against flexibility. As the Team Leader Special Projects R&D pointed out; “change is worth pursuing if it is a result of knowledge gain”. Additionally, supporting project managers pointed out that the best method to maintain flexible is to make decisions when needed and not before. These PMs believe that, although it is tempting to make decisions at the planning stage to avoid later deviation from the previous plan, it will work controversy for the final outcome. Decisions can be made at specific points during the project (e.g. milestones) or when needed. On contrary project managers related to IT (O&I, ITi & CRM) tend to the idea that project targets must be fixed and remain constant during the project. “Otherwise projects will never finish and exceed targets by far, if all the proposed changes would be implemented” (Team Leader, CRM). This is being explained by the Project Manager (ITi department), who states that changes in the execution phase, especially for programmes, are connected to enormous amounts of time and money to rectify. Within the O&I department, the project managers mentioned that ‘Agile Project Management Methodologies’ (APMM) are being utilized to ensure “so called flexibility”, respectively the best outcome. These APMM has clearly defined requirements, with which various ideas, models and prototypes are being explored and developed and tested with end-users. Through the possibility to test a range of prototypes and received feedback from end-users, the projects are typically highly successful. Other methods to foster engagement are applicable in Figure 6 (following page), indicating the spectrum of named facilitator for project flexibility as well as the responds count of the interviewees.

The Project Flexibility facilitators most commonly cited have a strong tendency towards communication. This include that all interviewees perceive clear targets, frequent and good communication within the project team and towards the outside as fundamental for good project execution and basis for flexibility. “We can only incorporate a maximum of information and ideas if all employees work together. We are in the middle of a market which tends to be extremely dynamic and fast, and for this we need

all possible information to assess if they are relevant or not for our project“(PM, R&D^{special}).

Communication & Knowledge Management

As communication, information, and knowledge sharing are crucial issues for the project and its flexibility, Knowledge Management is assumed to be an integral part of Bayer. However, several project managers (5) indicated that they are not aware of a corporate wide Knowledge Management (KM) strategy. One even highlights that Knowledge Management strategies are not being shared and henceforth are not applicable. Another interviewee notes that such strategies differ within the organization and are dependent on the department head or project managers. As example for Knowledge Management tools and processes, which are used organizational wide and are accessible for everyone, are named Microsoft SharePoint, Bayer internal wikis, intranet, world-wide-web, e-mails and telephone. For more project specific information the interviewees highlighted internal databases and expert integration (meaning consultant hiring). It has further been identified, that Bayer holds clear reporting structures and guidelines and that knowledge is shared through ‘regular’ communication channels, referring to regular reports, the intranet, mails and phone. The interviewed project managers became more specific on the topic about their personal communication and Knowledge Management strategy.

Most project managers use tools such as protocols, databases, mails, conferences and meetings to share information and stipulate that constant progress updates (=knowledge sharing) are being pursued. Most interviewees further use spreadsheets that track important steps and data during the project execution. A collection of basic spreadsheets is provided by Bayer and adaptable by each PM according to his needs. They are then shared through either the SAP system or the OPS platform with the team or stakeholders. The Project Manager O&I summarized the OPS system as a platform, where project documents are stored, timelines applicable, cash-flows observable and learning material available. Overall OPS it is a Bayer specific, SAP integrated Microsoft Project Management Software.

Knowledge exchange, solution finding and opinion gathering is further done through the personal interaction of Project managers to others, where the coffee-machine is the preferred place of 75% of all interviewees. Furthermore, it was referred also to unofficial project meetings to capture and spread knowledge such as “Stammtisch”-meetings, which might be described as a regular after-work meeting in a bar. Knowledge sharing happens beyond the project team in form of subsidiary-wide newsletters, presentations and internally available reports through their databases. Also the project is being summarized at its termination in form of a protocol and lessons-learned document for similar projects in the future. However, the Team Leader Special Projects R&D stresses that for “*our previous project named RAPS, we summarized the lessons learned for our senior management in a lengthy mail. But this has been totally ignored by all recipients*”. This is in line with the opinion of most PMs (75%) that closing reports are hardly ever looked at by peers. It has been further commented that due to the Silo structure of Bayer Health Care, including Bayer Consumer Care, communication external to the project team is not really effective. Project internally, it is agreed by all interviewees that communication and knowledge transfer is going relatively well. The PM (O&I) observes: “*communication is not something that has been enforced through*

corporate regulations and rules. We all trust each another and try to maintain an open, personal and honest communication within our team and service provides”.

Knowledge is defined by the interviewees as “*the information a person is aware of*”, “*understanding information*”, “*familiarity, awareness and understanding of something or someone*” and “*facts, information, and skills acquired through experience, education, perception, discover and learning*”. In relation, 100% of the interview participants agree that knowledge is the core to success and most fundamental to each project. Project managers highlight, that their most efficient people are usually not the smartest, but the once who know where to get the information and are open minded. The interviewees divided knowledge into two dimensions: internal and external. Internal knowledge is said to be essential for the planning of a project, the status report, the progress evaluation, the targets, and communication. On contrary, external knowledge is a source of information, which cannot be found Bayer internally, hence supplementary, for benchmarking purposes, to set (Key) Performance Indicators (KPIs), analyze the trend of the market, the customer or technological advancement. Another advantage is that “*external knowledge can bring in some benchmark information about how others handle the situation and which standards are employed for related processes*” (Junior PM). However external knowledge is most commonly cited as a source of information for an existing problem (7), respectively where experts can be found and hired (3). Such experts or contractors are commonly hired for the purpose to progress the project, get an alternative view and a well knowledgeable opinion. A few (36%) indicate and everyone (75%) consent, the interview participants indicated, that external specialists are further a valuable source for project planning, especially in Risk Management and as support to the project plan to ensure enough supplementary resource as security. “*It is funny that projects are much easier accepted and more resources tolerated, when a consultant is involved in the planning process*” (PM, Bayer In-house Consulting).

Resource Management in Projects

Projects are commonly passed top down with either clear target, provided objectives, a problem to resolve or an investigation to undertake. Project managers are then prompted to interpret, design and further investigate in the topic. Project planning is usually made in cooperation with the involved stakeholders, experts in the field and the project team members. Once the scope is give, objective is set, the target defined as well as phases and milestones established project manager must ensure that the tasks are allocated and synchronized within his team. The Team Leader R&D^{special} utilizes a spreadsheet containing most important information. All other project managers (7) utilize the OPS software as their main tool to manage the project status. The interviewees unanimously agree that communication is the most important and best facilitator to ensure task division inside the project team. The interviewees agreed that the project architecture does not influence the management of the project if communication is efficient. Furthermore, the project architecture depends largely on the projects and the project manager’s choice. Although the matrix form is most common, various other types are found within Bayer AG. Projects are regularly sub-divided into regions, products or value. A good example is the partition of Bayer Consumer Care, which is headquartered in Basel, Switzerland for the European market, in Hong Kong for the Asia Pacific region and Morristown (USA) for the Latin- and North American business. “Although we seem to have numerous regulations in Bayer, somehow project managers all seem to implement projects on their own distinct way” (Junior Project Manager, O&I). This is

evident in the ways project managers assemble and execute their projects. While most interviewees avoid changes in their projects, a few project managers (38%) mentioned that they regularly seek updates in the field of their current project. After further exploration, they revealed that they use techniques to identify opportunities in the market, not only to enhance the project execution but also the final output. A further technique disclosed, besides the previously mentioned feasibility study as well as schedule- and cost control, was SWOT analysis. A majority of the interviewed project managers agree that their most utilized tool to identify opportunities are regular and open communication, interest in the field of the project, an open mind and the incorporation of the team members into the project.

Bayer's project managers encourage and utilize a flat hierarchy in their teams, which enhances and empowers the staff to make own decisions. These teams are commonly clustered according to their functions and field of expertise. While on the one hand the Special Projects R&D is mainly a constellation of all-rounders, the ITi department consists of distinct experts with clear areas of specialization. This dissimilarity is reasoned with the types of projects and the involved tasks, where the R&D^{special} department resolves a broad range of problems while the ITi group is focused specifically on program integration projects. The Project Manager (ITi) further commented that they utilize a clear structure in their department where one head is leading, and depending on the size of the project, sub-managers or a steering committee is integrated, to ensure accurate execution. Additionally, the extension of the workforce has been named by 88% to be a straightforward endeavor as staff can be added as needed, if the budget allows the extra source of costs or the budget is urgent enough that senior-manager approve extra workforce despite the cost-inflation. Such additional workforce is named to be hired through three main sources: job agencies (8), external consulting firms (7), and in-house consulting (6). All interviewees admit that temporary workforce, such as contractors, are a convenient and efficient way to support their project over the needed period.

To ensure a good project implementation, all interviewees perceive planning at its core. However allocating time to the various steps and phases of the project is a difficult endeavor, and the questioned project managers provided a range of different strategies and approaches to planning. While most project managers would base the time-allocation to their experiences, other include an expert or their supervisor to ensure accurate planning. On their perceived outcome, 100% of the participants assign extra time-buffer for mitigation purposes. The project manager from In-house Consulting reveals, that experts commonly schedule the projects, provide scenarios and set milestones before being approved by other team members. Afterwards the worst possible project scenario is being selected as a basis and a buffer is added to each milestone. Similarly the ITi department plans their projects according to the given project parameters. In case a timeframe needs to be established the Senior Project Manager assembles a team that fits best to cover most project tasks. In a workshop he will let them work out the time and requirements of each task according to their expertise. The subsequent steps are to establish project phases, milestones, targets and KPIs. In contrast to these collaborative methods and most recommendations, the Special Projects R&D department Team Leader revealed that he does not actively plan a project through. Rather he works from case to case, respectively from milestone to milestone, as his projects are described as too problematic, turbulent and inaccurate, that planning would contribute much. On contrast to $\frac{3}{4}$ of the other interviewees, the team leader

requires status update, revision and group meeting on a weekly basis. Most other project managers (75%) feel that it is sufficient to revise the schedule once a month. For this Bayer internal procedures are written reports, monitoring (e.g. OPS system) and rarely a performance/target checklist (1). In case a project falls behind schedule, project managers named the following methods to remedy the leeway:

- Hire (temporarily) contractors
- Define-, analyze- and resolve problem
- Re-allocate resources to ensure recovery
- Incorporate superiors
- (Crisis) team meeting
- Creating synergies with others inside and outside the department
- Outsource tasks
- Skipping less important tasks/parts

Corrective actions are usually pressuring the project budget. For this reason, project managers commonly allocate a top-up of 10-20% contingency reserve on top of the calculated budget. “Budgets must be set at the beginning and there are many things that we do not know at the planning stage. To accommodate this uncertainty and keep the project flexible, a contingency reserve is commonly added on top of the calculated expenditures” (Project Manager, O&I). A further annotation provided by most interviewees is that budgets can be easily expanded, if there is a plausible reason for it. Superior manager or the project owner must approve such budget inflations. However, Bayer is a corporation that has large financial sources to draw from, and will do so if needed. Identical to time-management, budgets are revised regularly and are an integral part of the OPS (project management) software. Project owners, senior manager and the project management office (PMO) are all embraced in the regular budget evaluation and cash flow analysis. The aim is to ensure efficient allocation of corporate funds, the proper management of the project and the future return on investment (ROI) to the company.

5. Research Analysis

This chapter critically analyses the findings of the empirical study in combination with the concepts, theories and ideas of available literature. It aims to identify to what extent the theoretical inclinations corresponds to the practise of project managers within various divisions and departments in Bayer AG. It further analyses to what extent the concept of Dynamic Capabilities, as an organizational concept, can be transferred to a (strategic) project level. For this the two pillars of Dynamic Capabilities receive particular attention to comprehend which concepts are more utilized, stronger emphasized and more relevant to project managers as well as a summary of which tools, processes and procedures are employed.

5.1 Dynamic Capabilities in projects

Since Teece et al. (1997) wrote a striking article on Dynamic Capabilities and their organizational value through increased competitive advantage, various authors tapped into the research area and further explored and developed this idea. Consequently numerous definitions, concepts and models have emerged over the past decade. However, scholars agree that the notion on Dynamic Capabilities is still in its infancy, as theoretical concepts are not yet manifested and practical application not established (Zollo & Winter, 2002, p.340; Helfat et al., 2007, p.21; Teece, 2007, p.1319). Accordingly, hardly any of the interviewed project managers of Bayer AG were aware of the term: Dynamic Capabilities. At its core, Dynamic Capabilities is the ability to build, integrate and reconfigure assets, to accommodate organizational strategy in todays' dynamic markets. It is seen as an ability, respectively intangible capability or potential, to do something (Wang & Ahmed, 2007, p.18). Dougherty et al. (2004, p.3) see it as the choice, but not as an obligation, managers have to do something. Accordingly, project managers in Bayer AG are often faced with various choices during their project's execution.

The initial model of Dynamic Capabilities is based on Teece at al. (1997) and comprised of three components, which are partially found in project management practice. The first component 'adaptive capability' refers to identification and capitalizing of evolving opportunities within the environment (Rindova & Kotha 2001, p.1264). The interviewees responded that they scarcely adapt and modify their projects, since these are kept short-term, well planned with a strict focus on the blueprint during execution. Additionally, the investigated project managers indicated that they are not eager to accommodate to change due to the increased chance of failure and large amount of extra work associated. The second component of the initial Dynamic Capabilities model is 'absorptive capability' and denotes the value of information and process of Knowledge Management (Cohen & Levinthal, 1990, p.128). The interviewees strongly agreed to the importance and value of knowledge gained from internal and external sources, however half of them confess that they do not seek for additional information after the planning phase is completed. Additionally, many scholars stipulate that learning is central to the theory of Dynamic Capabilities. The last component 'innovative capability' suggests the refinement and adjustment of existing products as well as the adjustment of internal processes and procedures (Sher & Yang, 2005, p.33). Various scholars have different viewpoints on this capability and

performing project managers agree that their main duties are to update existing products, such as upgrading available IT systems, as well as adjust company-internal processes, e.g. the enhancement and simplification of the corporate HR (Wang & Ahmed, 2007; p.18).

Over the past decade, the theory on Dynamic Capabilities has altered and adapted. Hence, other models have emerged, among which Zollo and Winter (2002, p.420) provided their simplistic version. He structures the notion of Dynamic Capabilities funnel-like into three hierarchical layers; from learning (2nd level) to resource adjustments and reconfiguration (1st level) towards operational adaptation (0 level). Although this model is closely related to the previous concept, this version provides a more simplistic, hierarchical and logical view and is in line with the interviewees' beliefs that knowledge is the key-factor to success. Nevertheless, disputes on the basis of Dynamic Capabilities still exist and while Winter (2003, p.993) sees the concept as a structured process, other authors such as Rindova and Kotha (2001, p.1274) believe that Dynamic Capabilities is an emergent and evolving concept. Empirical studies revealed that project managers within Bayer comprehend project dynamics as a mix of structured and emergent processes: *"I try to define a good plan, and then stick to it; but I also follow a process of continuous improvement – this means that sometimes the best action is to be flexible and change course"* (Teamleader Special Projects R&D). While regulations and resources are provided and easily extendable, project managers repeatedly face unique situations requiring unexpected, spontaneous but conforming measures.

Project management literature stipulates that projects are tools to translate organizational strategy into practice, provide enhanced flexibility to the organization, are themselves affected by dynamic markets and are isolated from the organizational and consequently occasionally perceived as temporary organizations (Artto, 2013, p.596). Hence, it is not surprising that current markets experience a 'projectisation' of companies. Projects are a response to the volatile market, deregulations, shorter product life cycles, technological advancement and increased, international competition (Kahn, 2007, p.11). Also Bayer AG and its subsidiaries strongly relate on projects for their non-routine operations. Their projects come in various forms, sizes, significance and consist of unique features such as their given scope, targets to be achieved, available resources and timeframe given (PMI, 2014, p.3). This is confirmed by the interviewed project managers, which are all involved in strategic projects ranging from six months up to eight years and are individually affected by the dynamic market. Consequently Bayer does provide only loose guidelines and frameworks to work in, since projects within the company are vastly different. Nevertheless the Project Support Office (PSO) controls, approves and supervises all projects through their corporate-wide IT systems, which ensure a steady information transfer between projects and the PSO.

It is surprising that there is hardly any research investigating Dynamic Capabilities on a project level. Only recently authors started to investigate the nexus between project and Dynamic Capabilities and revealed that there are strong commonalities (Gardiner, 2014). Yet the interviewed project managers reject the idea of an increased market velocity as a central source of project failure or reason for constant project alterations (Cleland, 1999). Correspondingly, the Project Manager (O&I) comments that project timelines have become shorter, indicating that projects are kept short, are spread over numerous teams and undergo rigorous controls measures. Moreover, while a volatile

market, respectively the hypercompetitive market pharmaceutical companies are in, are letting believe that project management is an arduous endeavour, the interviewees reveal that projects within Bayer hardly fail. Reasons for this success are concerted to the available pool of knowledge and resources project managers can draw from. This is in line with the notion of Dynamic Capabilities, which stipulate that competitive advantage results out of learning, respectively Knowledge Management processes, as well as the ability to alter the resources to accommodate to change (Zott, 2003, p.108).

Although none of the project managers within Bayer is familiar with the term; Dynamic Capabilities, most of them are well aware of 'Project Flexibility' (De Toni & Tonchia, 2005, p.525). On average they perceive flexibility in their project as fairly important. However, more than 50% of the interviewees do not feel that flexibility is vital in their current projects. This is in direct contradiction to available literature on the overall topic of Dynamic Capabilities, which emphasizes that only through constant adaption along the whole project life cycle, competitive advantage can be achieved and maintained. However, Teller and Kock (2013, p.596) reveal that the collections of projects are an organizational flexibility enhancer, and that projects merely serve as a corporate tool for Dynamic Capabilities. Consequently, projects provide Bayer with organizational flexibility to adjust to market shifts, trends and emerging opportunities, while in itself are affected by the dynamic environment. Since the dynamic environment on projects is on a smaller scale and dependant on the project content, various degrees of forces are feasible (Arto, 2013, p.596). This is represented by the diverse answers of the interviewees where at one end the ITi department locks project objectives at the beginning without the intention to change, the R&D^{special} department keeps its project targets relatively open for late change.

One interviewed project manager emphasizes that flexibility should be a consequence of learning and not miscalculation. This is in line with the perception of Killen, Hunt and Kleinschmidt (2008, p.335) who stipulate that Knowledge Management, as part of it: learning, is the most important aspect of flexibility, respectively the core of Dynamic Capabilities. Further experts in matters of Strategic Flexibility and project flexibility add that knowledge is the base for every decision and ultimately the key for competitive advantage (Arash & Zahra, 2009, p.32). Flexibility is merely a facilitator to overcome uncertainty, the gap between knowledge possessed and needed, through the option to integration and development of resource (Sanches, 1995, p.135). Nevertheless a large amount of interviewees highlight that, although they perceive project flexibility as important, project targets should be fixed at the beginning and remain locked throughout the execution. Morris (1991, p.307) as well as Miller and Lessard (2000, p.15) confirm and further annotate that clear and detailed project definitions at the beginning is a main factor of project success. This includes clear targets on scope, time, cost and quality, which all work towards efficient execution of projects. However, Olsson (2004, p.68) highlights that there is often a compromise between project efficiency (do things right) and effectiveness (do the right things). Nevertheless the interviewees offset this contrasting occurrence by incorporating a contingency surplus into their project planning, such as a 15-20% addition on the estimated budget and time-buffers at milestones along the project life cycle.

5.2 **Learning and Knowledge Management in projects**

Knowledge is the result of learning and contemporarily perceived as key to competitive advantage and ultimately success (Easterby-Smith & Prieto, 2008, p.236). Or as one interviewee puts it: *“Knowledge is a familiarity, awareness or understanding of someone or something, such as facts, information, descriptions, or skills, which are acquired through experience or education by perceiving, discovering, or learning”* (Senior PM, Supply Chain Operations). Other interviewees refer to knowledge as information and facts individuals are aware of or data that holds meaning. While Pretorius and Steyn (2005, p.41) divide knowledge into explicit knowledge (transmittable through a kind of medium) and tacit knowledge (experience), the investigated project managers would rather divide knowledge into external and internal. Nevertheless, the interviewees agree that project management knowledge is not comprehensively transmittable (explicit knowledge) and therefore experience a valuable contributor to project success. While internal knowledge is perceived to be essential for project features and processes, external knowledge is used for specialist inputs and benchmarking purposes. External knowledge predominantly comes in form of consulting support and supplier collaboration, whereas data mining is not strongly practiced within the interviewees’ departments. This is connected with the viewpoint of Mathews (2000, p.78) who provides five main sources of company external knowledge: experts (consultants), customers, suppliers, competitors and partners. Accordingly, Mciver et al. (2013, p.597) stipulates that companies need to provide the right tools to their staff in order to effectively exploit and share internal- and external- as well as explicit- and tactical- knowledge. This is also picked upon by one interviewee: *“Knowledge retention and knowledge sharing is supposed to be part of the project, but will be difficult to realise without the right Knowledge Management systems (Junior PM, Inhouse Consulting)”*. For this most scholars agree that IT systems are a valuable source to search, acquire, filter, evaluate, store and retrieve information (Combe et al., 2012, p.1323). Accordingly Bayer provides IT tools such as ProPedia, as an overall project management tool, as well as department tailored systems, such as the OPS. For this also guidelines on best practice are provided to ensure efficient use.

Bayer AG, alike most companies nowadays, works with integrated IT-software to enhance data-sharing and knowledge exchange. The main tools named are SAP-based, where cross-functional information are linked such as ProPredia as a general project management tool. Knowledge databases and wikis, which provide access to internal and external conducted research, Intranet sites, Lotus Notes Groups as well as project specific software such as OPS and Microsoft SharePoint. Further tools the interviewees indicated which enhancing Dynamic Capabilities in projects are obtainable in Appendix 6. While there is a clear hierarchy within each project organization, which holds specific communication structures in forms of regular status reports, meetings and relevant documentations, project managers frequently enhance knowledge exchange with supplementary, unregulated software. As illustration: the O&I department utilizes the OPS system to trail the project progress in their current project, while the team leader R&D^{special} favours a spread-sheet, where important activities are tracked and documented. Furthermore, to support knowledge exchange within the project team, other tools are declared to facilitate the process. Most common are meetings, reports, database, collaborations, coffee- or lunch breaks, newsletters and in-house presentations. While researched literatures reveal a long list of tools (see appendix 1) linked to Knowledge Management, Bayer employs a moderate number of these. This is

due to the interviewees' preference to share information through personal communication. A justification might be that although explicit knowledge is obtained quickly, it is a static medium while personal communication is flexible and tractable. Additionally, through the vast amount of data available, information search might be difficult and a long-lasting undertaking.

Personal communication is most favoured by interviewees to share and acquire knowledge. Accordingly, project managers encourage knowledge exchange through an integrated work culture, trusting attitude, open communication and informal, but professional, work attitude. Additionally, the company is designed to encourage personal communication by providing open space offices, coffee-places, lounges and kitchen for employees to spend their time. Also, it was emphasised that in a more relaxed atmosphere at the unofficial project "Stammtisch" knowledge is transferred efficiently and problems are solved effectively. Continuous learning and information sharing is strongly emphasized in the corporate culture. This is visible in the current integration project of Merck pharmaceuticals into the Bayer Knowledge Management system. Hence O'Dell's (2004, p.3) reservation is refuted according the corporate culture fostering knowledge exchange and optimal utilization of information. Most project managers from Bayer consent that the information flow within the company is sufficient for projects and that knowledge is managed at an acceptable level. As main failure has been described the utilization of 'lessons learned' within projects, as these documents are perceived to disappear in an archive, never to be used again.

5.3 Resource Flexibility

Control over the project and information on compulsory project modification does not make a project dynamic (Zack, 2002, p.125)). Project managers need to be capable to relocate and adapt the available resources to incorporate the change in a timely and cheaply manner to realize a competitive advantage (Pandey, 2014, p.156). In this respect the observations showed that project managers deal with their resources in fairly different ways. Some plan the project and once approved insulate the project from change, disregarding any change and flexibility. In contrast, others plan roughly and follow a stage-gate model, following step-by-step milestones and continuously taking decisions when necessary. Also mixed approaches are used: "*Plan thoroughly, design well, keep an open mind, accept the concept of continuous improvement and adaption to change as a part of the project from day1 – as John Maynard once said: When circumstances change, I change my opinion – e.g. there is a difference between being determined (good) and being stubborn (bad)*" (Team Leader Special Projects). The way of executing a project is strongly linked to the type of project, where IT projects tend to get locked, rectification projects are more of a loose nature. Most project targets are fixed on the following two resources: budget and time. While time is mostly static after scheduling, budget becomes the principal source of flexibility. Hence, it is not surprising that project managers within Bayer calculate a project budget according to the worst-case scenario and add a contingency reserve on top. Within the monetary boundary, project managers are open to allocate according to their best judgement and necessities, such as to acquire additional staff (consultants or contractors). Following Teece's (2011) Dynamic Capabilities framework, the 1st level Dynamic Capability is concerned with the flexibility of resources – this is enhanced practically within Bayer's

strategic projects in diverse ways depending on the project as well as the project managers' attitude: While some refer to *“Team engagement in the project, IT development capabilities (agile methodology), keep focus, tight oversight of the budget”*, others refer to structural elements such as *“clear definition of responsibilities and trust in it, to make the right decisions”* or *“clear communication (channels), regular meetings to discuss project outcomes, low hierarchies to have a fast adaptation of ideas from project members”* as well as *“general open-mindedness”*.

A further promising theory in relation to resource flexibility is risk management (Chod & Rudi, 2005, p.533). It is an analysis of potential risks listed and mitigated according to their likelihood of occurrence and impact towards the project and the firm. While it is often believed to be an endeavour executed at the project planning phase and only controlled during the project, some scholars advise to make it a continuous planning-controlling process towards risk and preventing actions (Carvalho & Rabechini Jr. (2015, p.321). However, the interviewees simply utilize risk management on an elementary level, stipulating active analysis in the planning phase. To ensure risk control and a smooth project execution, project managers additionally rely on regular meetings, individually and in teams, to ensure that information is exchanged and further steps collectively planned and analysed. If a project falls behind schedule Bayer project managers generally analysed the root cause, hire consultants to catch up time and skip or defer less important project tasks. As the final project outcome is the primary objective, stakeholders, such as the final users or project owners, should be included in the project planning and control process to ensure his constant support and understood target (Hobday, 2000, p.873).

5.4 How Bayer enhances Dynamic Capabilities in their strategic projects

Interviewed project managers from Bayer AG endorsed the fact that Dynamic Capabilities is an important aspect of projects. However, it is difficult to grasp, since projects are unique endeavours (PMI, 2014, p.3), undertaken in every conceivable field, commenced in different environments with varying internal and external forces. Hence supporting tools to enhance Dynamic Capabilities very depending on various factors within the project. Therefore, identification and pinpointing explicit tools, procedures or activities to enhance Dynamic Capabilities in projects is difficult. This would justify the rare theoretical contribution within the field. Nevertheless during the investigation it became clear that knowledge, and its appropriate use, is crucial and subsequent actions are based on the quality of the information available. However, this has been picked upon by Bayer, which provides guidelines on how to best utilize available IT tools, to ensure an effective and efficient use for project managers and corporate-wide information sharing. In addition to this explicit knowledge-sharing tool, Bayer fosters a culture of good communication, integration and collaboration, to minimise singular control and maximise the variety of ideas knowledge, integration and collaboration. This ensures that explicit and tactical knowledge is easily distributed and acquired over the whole Project Life Cycle. The interviewees agreed that communication of knowledge is the number one tool to support success and enhance Dynamic Capabilities. Therefore, available IT software such as company specific SAP-modules or project specific software (OPS) as well as a communication encouraging culture, are top enhancement tools for Dynamic Capabilities within projects. Knowledge should be

enhanced at each stage of the Knowledge Management Life Cycle (Figure 3, page 32). Creating knowledge is done through basic tools such as the internet, while the storage of such data is often in databases, electronic archives, or partly even within the intranet. Retrieval happens through Intranet and Internet search engines, which are in place to keyword search available documents and acquires them according matching criteria. However, this process can also be through personal contact – communicating with someone to get available information – or through the PSO (Project Support Office) who provides help to project managers. On a more fundamental level, communication happens commonly through mundane tools, such as telephone, e-mail, meetings, (video) conferences and during a coffee- or lunch-break. Nevertheless the named tools are predominantly utilized throughout the Project Life Cycle, neglecting the importance of the project-planning phase, respectively Risk Management. A main focus of Dynamic Capabilities within projects is on the initial planning stage, since projects tend to get locked during execution, disregarding change. Project plans are based on five sources, which are concurrently tools: 1) past information on similar project(s), 2) available resources, 3) project manager experience, 4) expert opinions, 5) PSO control and approval. Hence, projects rely on available information, referring back to the Knowledge Management (IT-) systems, as well as the professional expertise of the project manager, the involved consultant(s) and the PSO invigilator. Hence, it is not surprising that all interviewees accentuate the vital importance of hands-on experience (tacit knowledge). If the experience in the project is marginal, the project manager can fall back on resources, such as consultants, advisors and experts. For this purpose Bayer provides its project-team within an add-on budget, to ensure their flexibility during execution. In addition to careful planning and continuous controlling mechanism, time-buffers are included in the project-schedule. Controlling is ensured in the first line through the respective project manager, but also through the PSO. If projects fall behind schedule, additional work force is temporarily hired to recover the delay.

6. Discussion and Concluding Remarks

This chapter will wrap up the investigation on Dynamic Capabilities within projects. This includes a look at theoretical as well as practical findings, implications and considerations in connection to the research question. Special attention will be on the related topics of Knowledge Management and Risk Management, as they are strongly related to this thesis and form the foundation of this investigation. Additionally, the findings are evaluated according to their significance and contribution to the theory. In a final sub-chapter, further areas of research are listed to offer alternative and potential fields that need investigation, and in turn which might support this study. This includes similarly an investigation on more structured projects, such as research and development (R&D), which have been neglected in this thesis.

6.1 Research Findings

This research followed the research question: *“How do project managers positively reinforce Dynamic Capabilities within strategic projects, by the pharmaceutical company Bayer AG, through means of Knowledge Management and Resources Management?”*

The theory of Dynamic Capabilities is still widely believed to be in its infancy. While the initial concept by Teece (1997) is focused on organizational wide measures to accommodate to the increasingly dynamic and competitive market, there is hardly any theory relating Dynamic Capabilities to projects and project management. Therefore, other ways to bridge the gap between Dynamic Capabilities on an organizational level down to project level had to be found. A promising synergy provided the notion of Strategic Flexibility (compare Johnson et al., 2003, p.77; Shimizu & Hitt, 2004, p.55; Singh & Oberoi, 2013, p.1444) which is a more researched topic and provides a direct link to projects through its sub-category: Project Flexibility. Additionally, both theories correspond strongly and overlap in many aspects. Also, “because Strategic Flexibility emphasises the flexible use of resources and reconfiguration of processes, it reflects on (...) dynamic capabilities” (Li et al., 2011, p.258). Hence, the notion of Project Flexibility is used to support the idea of Dynamic Capabilities within projects by providing a theoretical backbone to the notion and its ideologies. To be more precise: Strategic Flexibility is a more researched concept and hence provides ideas, tools and processes to enhance a project’s flexibility, and at the same time shows the same features as Dynamic Capabilities. Correspondingly, the interviewed project managers were more aware of the term “Project Flexibility” than “Dynamic Capabilities”.

While many definitions and concepts have emerged over the past decade, the theory of Zollo and Winter (2002) has been chosen for this thesis. It corresponds closely with the notion of Strategic Flexibility, respectively Project Flexibility. In Zollo and Winter’s (2002) model Dynamic Capabilities are structured in three distinct layers, funnel like towards project-operation adjustment. Level two: Learning implies that knowledge must be managed properly in order to create, store, find, acquire, use and learn from information. Level one focus on resources available to the project, which are scarce, usually employed and commonly hard to change. Level zero is the ultimate adjustment of the operations of the project or the company. However, many scholars, including this

thesis, do not recognize this level as part of Dynamic Capabilities, but as the ultimate and visible outcome (Dougherty et al., 2004, p.3).

While evaluating available literature on Dynamic Capabilities, it became evident that the levels of Zollo and Winter's (2002) model can be further developed and updated. The elaborated literature review signals that Dynamic Capabilities in projects are reflected and built upon two main pillars: Knowledge Management and Resource Flexibility, which are in correspondence to the 1st and 2nd level Dynamic Capabilities (Zollo and Winter, 2002, p.341). This notion recognises that an analysis of Dynamic Capabilities within strategic projects may only be achieved by elaborating on both components: Knowledge Management and Resource Flexibility. Knowledge Management is the enlarged version of learning, stipulating that a project should do more than just learn, such as providing learning outcomes to others and incorporating of IT systems enhancing the process (Killen et al., 2008, p.335). It encompasses the whole Knowledge Management Life Cycle comprising of: finding-, acquiring-, using-, learning-, creating-, and storing of information and knowledge in an efficient and effective way (Pandey, 2014, p.156). Knowledge is at the core of Dynamic Capabilities, however knowledge without the ability to implement learned into practice is in vain (Zack, 2002, p.125). Henceforth, theory suggests that available resource must be flexible enough to be relocated swiftly, cheap and easily in order to exploit emergent chances and retain or develop a firm's competitive advantage (Combe et al., 2012, p.1323). The outcome of the Dynamic Capabilities practices is visible through adjusted project operations.

The interviews with the different project managers from Bayer AG indicated that there are not many generic project- tools and procedures applicable that positively reinforce Dynamic Capabilities within their strategic projects. Most project managers applied their own toolset according to the specific needs of their project. This supports the notion that projects are unique endeavours, and confirms that project management theory is predominantly applied on a macro-level (PMI, 2014, p.3). Nevertheless the ideas of communication, collaboration and project management experiences are widely believed to be the ultimate characteristics to project success. Constant, open, honest, sincere and reciprocal communication with a wide, diverse group of people inside and outside a project, is said to enhance the awareness of current happenings and possibility to identify threats to the project. In a collaborative environment, project managers can work efficiently with multiple individuals collectively to achieve a desired status, mitigate an emerging risk or exploit an opportunity. For this project managers need to be multi-talented and experienced not only in project related matters or the field of project but also in emotional intelligence. Under these circumstances, project managers have the prospect to efficiently combat within the battle for competitive advantage within contemporary dynamic markets.

6.1.1. Knowledge as primary enhancer of Dynamic Capabilities

Theories as well as practical investigation indicated that knowledge, as well as its management, are strong contributors to success. Correspondingly various theories of Dynamic Capabilities hold learning, respectively Knowledge Management at its core. Also interviewed project managers accentuate the importance of knowledge and

continuous learning. For this projects have a variety of tools available to ensure that learning is a continuum and knowledge can be easily and quickly obtained. Basic tools utilized by most companies, including projects, are rules, regulations and guidelines. Project team member are often confronted with these at the start of their job or the project. Additionally, project managers indicated that these files are always applicable in project related folders or utilized IT-software. Likewise are project team members usually equally trained on project specific topics, so that a general knowledge prevails within the project. Another, commonly utilized tool are experts, which support a project manager in project planning and estimating, but also during execution. Experts can come from external sources, such as consulting firms, or from internal, such as Bayer own In-house Consulting division. However, experts can also be already within the project, due to the matrix structured project teams in some non-departmental projects. Nevertheless a majority of the interviewees from Bayer work in a specialized department with a fixed project team over multiple, similar projects.

In the initial project phase of their projects, the project managers commonly receive objectives and targets, which need to be understood and conceptualized. Subsequently ideas are being evaluated, execution process lay out and milestones set. During this initial project phase, the project team gathers regularly to evaluate new ideas and conceptualize the overall project plan. These meetings are a crucial part of learning, respectively knowledge exchange and development. While meetings are held on a regular basis, the whole project team, or project planning team, interacts with one another, shares knowledge, ideas, thoughts and opinions. It corresponds the notion of knowledge sharing and is attached to multiple elements of the Knowledge Management Cycle. So it is a process of acquiring knowledge, learning, using the learning, and documenting the findings in form of the project execution plan or a meeting summary. These documents can be transferred over time and distance, contributing to learning in numerous ways.

To enhance the process of learning and planning as well as other aspects supporting Dynamic Capabilities, Bayer provides his project managers with prevalent technology. This technology ranges from commonplace tools, such as telephone, e-mail, video-conference, internet, intranet, Microsoft Office, internal databases to project specific knowledge supporting tools consisting of software such as SAP modules, OPS (Bayer's own project management software) and Lotus Groups. The names tools are Bayer specific and confirmed through a majority of interviewees to be utilized on a regular basis. These tools support the project team throughout the project life cycle. Additionally, the technology provided support most aspects of the Knowledge Management Life Cycle from finding data through the unlimited sources of the internet, over the creation of information with supporting tools such as Microsoft Word to information storage in internal databases for future effortless retrieval. The study of project managers and theory on Dynamic Capabilities, as well as Knowledge Management clearly highlights the contributing effect of contemporary technology and IT software. Nevertheless it has been evident, that although commonplace technology should be available for everyone, IT systems are strongly related to the type of project.

A known shortcoming of IT systems is its limitation to transmit the full aspect of knowledge. While learning is a complex mental process based on various aspects and circumstances, its codification and transmission happens on a superficial level. Additionally it is a one-sided, static communication process commonly leading to

misunderstanding and misinterpretations. Hence, it is not surprising that most interviewees emphasize personal communication as a major tool to exchange knowledge. Correspondingly Bayer fosters a culture of listening and information sharing, which is perceived to be extremely valuable. Employees are encouraged to talk openly, honestly within a trusting and understanding environment, which is supposed to comfort the staff and provide a feeling of security and belonging. This culture in Bayer is applicable through the ability to spend time at common coffee-places, offered in-house presentations, open office spaces and the unspoken law of an open communication policy. Besides, the project managers all emphasize personal communication through regular personal and group meetings to discuss current project status, issues, problems and conjoint problem solving.

Project managers within Bayer enjoy a large degree of freedom to adjust their projects according to circumstances and best fit. However, repeatedly clear and frequent communication structures exist between project managers to their superiors including a strict and continuous external supervision and controlling of the project. Additionally, a project closing report, incorporating lessons learned, is a fundamental part of any project. While Bayer provides their project managers with a large degree of autonomy and the ability to adjust according to their discretion, the degree of Dynamic Capabilities within their projects is self-determined. Bayer provides various tools from available documentation for self-study, offered trainings, available consultants, available IT tools and technological devices to a communication nurturing culture of knowledge exchange. Nevertheless the degrees of incorporation of these tools to enhance Dynamic Capabilities are largely based on the utilization, integration and leadership style of project managers.

This is visible as a dominant part of the interviewed project managers highlight, that they plan predominantly at the planning stage, and try to avoid any form of project adjustments during the project execution phase. This indicates that these project managers are not eager to maintain and enhance Dynamic Capabilities outside their project plan. However, a strong correlation has been found between project managers indicating that their objectives and targets were clearly specified at the beginning, and the lack of project alterations during execution. On contrary projects with indistinct objectives have been noticed to be more open to continuous learning and change during the project. Correspondingly, they emphasize flexibility through continuous learning and frequent, open communication much more. Additionally, it has been noticed, that these project managers tend to execute their projects according to a stage-gate model; working in incremental steps towards the desired outcome. Consequently late decisions and continuous risk analysis are dominant features of their projects. Due to the strong corporate reliance in excellent (project) manager, an emphasis on constant project control, and the provided independence for project managers, Bayer has a surprisingly low project failure rate.

6.1.2. Resources as support of Dynamic Capabilities in projects

Knowledge Management is often at the forefront of theories on organizational strategy, and displayed as the unmitigated tool, promoting Dynamic Capabilities within projects (Mciver et al., 2013, p.597). Nevertheless knowledge functions merely as a filter,

evaluating information towards its relevance for the project. Significant encounters must then be translated into practice through the adaption and alteration of the project. Hence knowledge without the ability to turn information into practice is of no value (Zack, 2002, p.125)). Therefore a further, significant second step (but 1st level) in the process of Dynamic Capabilities within project is the ability for resource adjustments (Chod & Rudi, 2005, p.533). This involves various aspects including the awareness of available resources, the knowledge of employed resources, alternatives available and where to acquire further resources (Sanchez, 1995). However practical observations have shows that resources are only significant to a majority of project managers at the planning phase. Coinciding with the guidelines from the Project Management Institute (PMI, 2014), project managers tend to lock their projects from change after the planning phase. Nevertheless various scholars imply that change during projects is crucial to ensure an effective and successful project outcome. Yet project managers are more concerned with the efficiency of their execution.

Theory suggests, that there are multiple dimensions of change all influencing towards enhanced Dynamic Capabilities (Söderholm, 2008, p.84). Fine-tuning is an inevitable process, also within locked projects, since daily adjustments in the business are momentarily and cannot be planned beforehand. Yet revision of project targets and objectives deviating from the boundaries of project schedule, are often avoided. The interviewees evidenced, that projects with clear objectives and targets, plan more thoroughly at the initial stage but circumvent any further learning and project alterations once commenced with the project, compared to less detail-targeted projects. Additionally risk planning (front-end strategizing) is more distinctive with a deeper and broader analysis and more sophisticated mitigation plan (Gil & Tether, 2011, p.416). On contrary project with a stage-gate approach toward execution continuously revise their risk plan contributing in a more sound way towards their flexibility, respectively Dynamic Capabilities (Verganti, 1997, p.384).

Risk Management is a dominant notion within the idea of Resource Flexibility (Carvalho & Rabechini Jr., 2015, p.152). However interviewed project managers, do not explicitly agree to utilize any Risk Management tools. Nevertheless each analysed project had Risk Management tools employed. Correspondingly project managers aim to collaborate closely with their project owner, supervisors, suppliers and other relevant stakeholders to ensure a smooth project execution (Gil, 2009, p.114). Additionally an exhaustive project feasibility study is executed prior to project launch, which further is in line with anticipative capability (Verganti 1997, p.364). Although prototyping is barely employed in any investigated projects, except IT projects, the ability to re-plan quickly is a feature of project manager embracing change. Besides, during the project planning the interviewees designated that corporate best practice enforces them to conduct an analysis of potential risks, their likelihood of occurrence and potential severity of their impact (PMI, 2013, p.112). Resulting a risk mitigation plan and control strategy are being drafted, which sets aside necessary resources (mainly finances, extra time and controlling software) to counter the risk.

As a predominant tool, enhancing Resource Flexibility and consequently Dynamic Capabilities, corresponding literature as well as partitioning project manager named inflated budgets and extra time (Olsson, 2006, p.67). The budgets of a majority of project within Bayer are drafted according to the project plan. From there the worst-case project scenario is being selected as a base for the budget and a mark-up of 10-20% is

added. Project managers annotated that this is a common practice for projects in Bayer. Similarly the project agendas are being set according to the urgency of the assignment. As a rule of thumb project managers allocate buffer-time on milestones along the project schedule to ensure that they do not operate the project along the critical path. If projects deviate from the schedule, project managers have the freedom and ability, through their spacious budget, to add temporary human resources and accelerate the execution. Surprisingly project managers contradict to literature, that they do not perceive human resource as a primary flexible resource (Lampel & Shamsie, 2003, p.2192). Although the workforce is outlined to be most crucial for the project success, permanent staffs are hard to replace or relocate through their expertise, while additional contributors are easily obtained through short-term contracts.

It is crucial to annotate, that all project managers cohesively confirmed that project management is unique, depending on various factors such as the project objectives, the project-team, the environment, the project managers and the supervisors' experiences and preferences, etc. (PMI, 2014, p.3). Hence most answers to general questions on project management and the enhancement of Dynamic Capabilities are inclined to be answered with: "*it depends*". The project managers confirmed that expertise is the number one facilitator for flexibility and Dynamic Capabilities. Project management expertise goes beyond the ability to manage a group of people towards a target, but includes the right handling and understanding of its team, the sensing of markets, the ability to think critically and creative and to communicate well (PMI, 2014).

In conclusion Dynamic Capabilities within projects are enhanced in Bayer through the perpetuation of an open, communicative work culture. The company provides the adequate workspace to ensure efficient communication flows and contemporary technology to simplify interaction over time and space as well as data processing software contributing to knowledge creation. While Knowledge Management is widely perceived to be crucial, project managers have the freedom to adjust and adapt project handling towards their best intend. A majority of project managers have guidelines, rules, regulations and trainings as foundation for their project team. Additionally a collaborative nature within and outside the project team is pursuit. Through meetings, rapports and other means are knowledge shared on a constant basis, ensuring the involvement of all. To provide enough flexibility during project execution project managers have enlarged budgets and time-schedules to ensure timely delivery. As primary outside source are contractors used, to support in planning and execution through their expertise and as additional workforce. All these tools connected to the theory of Dynamic Capabilities support Bayer in contemporary projects and ensure the upkeep of the currently low level of project failure as well as the strong market position of the organization.

6.2 Theoretical Contribution

This research aims to shed light into the vaguely investigated notion of Dynamic Capabilities. While Teece et al. (1997) resurrected the topic of Dynamic Capabilities over a decade ago and motivated other scholars to contribute, the current state of theoretical and practical knowledge is still low. Additionally many scholars argue about the notion and the validity of different viewpoints of Dynamic Capabilities. Instead of

jointly striving for a developing and manifesting the theory, authors criticize, counter, argue and dispute one another. Consequently this thesis predominantly sided with the viewpoints of Zollo and Winter (2002), while critically analysing all available positions. Since the theory of Dynamic Capabilities is still in its infancy and barely researched on a project management level, other ideas and concepts are incorporated and utilized to support the investigation. Consequently this research contributes to the notion of Dynamic Capabilities, as well as Project Flexibility, Knowledge Management and Risk Management by on the one hand investigating a link between Dynamic Capabilities in organisations, via considering Strategic Flexibility and Project Flexibility, to Dynamic Capabilities within projects. Hence, a plausible bridge was created that might also encourage further research. On the other hand, this study has illustrated how project managers foster Knowledge Management and Resource Flexibility with their activities, and thereby enhance Dynamic Capabilities.

The research findings were based on theoretical stances and investigated a sample of project managers from Bayer AG. This sample is believed to be small in delivering a valuable contribution to theory; however, it provides a point of reference and practical linkage to the theory of Dynamic Capabilities and project management. The outcome, although clearly divided into the two pillars of Dynamic Capabilities, provides a possible solution of tools and processes to reinforce Dynamic Capabilities within strategic projects. While the interviewees indicated that communication is at the core, how is being communicated is very diverse and project specific. Additionally, efficiency and effectiveness in projects is believed to boil down to experiences, which is intangible.

In conclusion, the research findings show, that project managers perceive Dynamic Capabilities as important within projects: Even though they are mostly not aware of the term Dynamic Capabilities, the interviewed project managers follow management patterns leading to the reinforcement of Dynamic Capabilities within their projects. This is by means of Knowledge Management and Resource Management aiming on the encouragement of Resource Flexibility. This study found that Knowledge Management is strengthened through a knowledge infrastructure which consists of supporting IT systems and data bases, as well as a culture of knowledge sharing, communication, and collaborative learning. In contrast, Resource Flexibility is achieved through management practices encouraging vagueness and late commitment of resources – as an example serve over budgeting in the project planning phase or Risk Management practices such as the delay of decisions, and thus resource commitment, to late stages of the project.

6.3 Practical Implications

Although the findings aimed to analyse tools, processes and procedures, the outcome does not clearly pinpoint any specific actions project managers can take to enhance their Dynamic capabilities within Bayer and beyond. However, the research is believed to be universally applicable to the extent that projects are unique endeavour. This implies that no project is fully replicable and specific measures and processes are not available. However, global standards (PMI, IPMA, Prince2, etc.) are available to guide and support the project execution, incorporating measures to ensure Dynamic Capabilities. Additional available literatures provide a guideline for practicing project managers to

hold on to. This can be easily extended into other research fields, since projects are extremely diverse and multi-dimensional. Henceforth, this is research more a rough guideline, summarising available and related literature, and comparing it to practice. Actions advocated in articles are compared to reality within strategic projects in Bayer, narrowing the analysis to a specific company, a few industry sections and a type of projects. Additionally, it is based on individual believes, viewpoint and experiences and therefore unique in its findings. Concluding, this thesis analyses projects, which are on-going, evolving, changing and learning, and hence only repeatable to a certain degree. However, it provides an overview of current literature related to the topic as well as a practical insight.

6.4 Limitations and Future Research

This research followed the research question: *“How do project managers positively reinforce Dynamic Capabilities within strategic projects, by the pharmaceutical company Bayer AG, through means of Knowledge Management and resources management?”* It was limited to strategic projects as well as to Bayer, which is a big player in the pharmaceuticals industry. For further research it might be of interest to investigate different companies, as larger as or smaller than Bayer, within the same industry. Another option might be to research within companies of different industries. This research was limited to strategic projects, hence a comparative investigation on non-strategically essential projects might be interesting to identify differences between project managers behaviour on reinforcing Dynamic Capabilities in the different types of projects.

For this research a qualitative approach was chosen, hence for future research, a quantitative approach could be chosen with a stronger emphasis on transferability, maybe even for the results of this study. Also, this investigation rather had a momentarily focus and was conducted over a short timeframe. In contrast to the presented it would be interesting to conduct research on Dynamic Capabilities in projects among two dimensions: a) the importance of Dynamic Capabilities over the project management lifecycles and the several stages of project management; b) it might be interesting to measure the effect of Dynamic Capabilities on the project over time - and maybe express such in financial terms.

Considering the notion of Dynamic Capabilities the following questions might be used to guide further research:

- How strategic decisions constitute Dynamic Capabilities?
- How Dynamic Capabilities actually lead to change in the organization?
- How firms generate resilience and strategic flexibility to deal with external turbulences?
- How different levels (regional-institutional, organizational team, individual) interact in facilitating change?
- How individuals shape the firm's change agenda by issue-selling activities to overcome inertia?

- How defensive routines or cultural elements restrict the individual's influence towards change?

Finally, also the imposed constraints for the research will limit its outcome. This includes time-constrained, as the research had to be prepared, conducted, analysed, and written within a very short time-period. Hence, the research itself is limited in quantity and may not have the adequate breadth and depth to ensure comprehensiveness and transferability. Also the obtainment and examination of corporate non-public documents is restricted due to confidentiality issues with the organization. Likewise the background and skills of the authors is not specifically trained in conducting research and maintain an unbiased and open view on the topic.

7. Truth Criteria

This chapter is concerned with the presentation of truth criteria of this study's scientific methodology. "Scientific methodology needs to be seen for what it truly is, a way of preventing me for deceiving myself in regard to my creatively formed subjective hunches which have developed out of the relationship between me and my material" (Raimond, 1993, p.55) This issue is also referred to as reliability. Truth criteria usually contain two main concepts: Trustworthiness and authenticity. The two concepts were introduced to assess qualitative research in the 1980's (Lincoln & Guba, 1986) and will be discussed in the following.

7.1 Trustworthiness

Trustworthiness considers the criteria of credibility, transferability, dependability, and conformity (Lincoln & Guba, 1986, p.18). For credibility in qualitative research it is important to have extensive, in-depth contact with the phenomenon (Lincoln & Guba, 1986, p.18). Being aware of such, the authors throughout the research attempted to be as close as possible to the phenomenon itself. By travelling to the interviews and holding them face-to-face, and also sometimes extended beyond the official by thrilling and intensive in-depth discussions, the researchers gained a multi-faceted view on Dynamic Capabilities in projects. Such deep insights were only possible to be gained due to the choice of semi-structured interviews as research method. By conducting interviews with changing opponents, the researchers were able to cross-check and compare results in between the different interviews. This allowed them to identify patterns occurring between interviewees. Lincoln and Guba (1986, p.18) consider this as an important criteria of the research's credibility. If some issues remained unclear or were not named by all interviewees, the researchers repeated answers of other interviewees in order to ensure that other respondents were understood correctly, or to support and discuss a previously named issue; as a member check supporting credibility (Lincoln & Guba, 1986, p.19).

In order to allow the reader to assess the findings of the investigation, the researchers tried to create as exact descriptions of interviewees, project guidelines, and interview results as possible – this provides a good scope of the study on hand. Unfortunately, the interviewees did not agree to provide full details and preferred staying anonymously – obviously anonymousness was treated with the highest caution. To provide an overview of the findings, the researchers presented their findings to provide an overall scope of the study on hand. Lincoln and Guba (1986, p.19) state, that such presentation makes the qualitatively gathered results transparent as these might be compared with others conducted in diverse circumstances.

Also contributing to the trustworthiness of this thesis is the feedback it has received during the development of research and writing processes as thereby criteria of conformability and dependability are completed (Lincoln & Guba, 1986, p.18). Such feedback derived from guidance and support by our supervisor, as well as during progress seminars.

7.2 Authenticity

Authenticity considers the interpretation of the research in respect to principles of fairness, ontological, educative, catalytic, and tactical (Lincoln & Guba, 1986, p. 20). This investigation has been done in the authors' best faith, as they have always tried to present positive and negative aspects to provide a holistic on the discussed issues. Such presentation of the results is in line with what Schwandt (2007, p.13) names a transparent display of the investigation's data and findings – hence, it is fulfilling the authenticity fairness criterion.

Following the results of our interviews we have been able to present practical findings in respect to our theoretical framework. The findings are diverse, on the one hand supporting, while on the other hand contradicting. However, overall, the findings helped us to enhance our understanding of the dimensions of Dynamic Capabilities in projects. Such understanding is reflected in the study as a whole, but especially in the conclusions drawn. Hereby, it certifies educative authenticity of the investigation (Lincoln & Guba, 1986, p.23; Schwandt, 2007, p.13). In addition, throughout the interviewing and data gathering process the authors have followed principles of strict documentation. Following Manninger (1997, p.98) this underlines the objective of creating ontological authenticity.

For the investigation the researchers attempted to deal with those stakeholders that are closest to Dynamic Capabilities in projects: Project managers – because these are the ones who are able to provide the most holistic view on the issue. By doing so, catalytic authenticity is guaranteed as each respondent's contribution is included, also including the silent and weak into the findings (Lincoln & Guba, 1986, p.24). Additionally, even though the researchers have developed their interview guide based on the literature findings in a most objective manner and with the perception that all facets of Dynamic Capabilities in projects were covered, during the interviews the interviewees were encouraged to present their personal view on the investigated issues. Hence, the investigation was not lead as a patterns and facts confirming research, but instead allowed the interviewees involvement, and thereby providing them with a sense of control – ensuring tactical authenticity (Lincoln & Guba, 1986, p.24).

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9. Appendix 1: Summary of Knowledge Management Tools & Practices

KM Life Cycle Phase	KM Methods and Tools
1. Identifying the Knowledge	APO Knowledge Management Assessment Tool
	Knowledge Cafés
	Communities of Practice
	Advanced Search Tools
	Knowledge Clusters
	Expert Locator
	Collaborative Virtual Workspaces
	Knowledge Mapping
	KM Maturity Model
	Mentor/Mentee
2. Creating Knowledge	Brainstorming
	Learning and Idea Capture
	Learning Reviews
	After Action Reviews
	Collaborative Physical Workspaces
	Knowledge Cafés
	Communities of Practice
	Knowledge Bases (Wikis, etc.)
	Blogs
	Voice and Voice-over-Internet Protocol (VOIP)
	Advanced Search
	Knowledge Clusters
	Expert Locator
	Collaborative Virtual Workspaces
	Mentor/Mentee
Knowledge Portal	
Video Sharing	
3. Storing Knowledge	Learning Reviews
	After Action Reviews
	Knowledge Cafés
	Communities of Practice
	Taxonomy
	Document Libraries
	Knowledge Bases (Wikis, etc.)
	Blogs
	Voice and VOIP
	Knowledge Clusters
	Expert Locator
	Collaborative Virtual Workspaces
	Knowledge Portal
Video Sharing	
4. Sharing Knowledge	Peer Assist
	Learning Reviews
	After Action Reviews
	Storytelling
	Collaborative Physical Workspaces
	Knowledge Cafés

	Communities of Practice
	Taxonomy
	Document Libraries
	Knowledge Bases (Wikis, etc.)
	Blogs
	Social Networking Services
	Voice and VOIP
	Knowledge Clusters
	Expert Locator
	Collaborative Virtual Workspaces
	Knowledge Portal
	Video Sharing
	Mentor/Mentee
5. Applying Knowledge	Peer Assist
	Collaborative Physical Workspaces
	Knowledge Cafés
	Communities of Practice
	Taxonomy
	Document Libraries
	Knowledge Bases (e.g. Wikis, etc.)
	Blogs
	Advanced Search
	Knowledge Clusters
	Expert Locator
	Collaborative Virtual Workspaces
	Knowledge Worker Competency Plan
	Mentor/Mentee
Knowledge Portal	
Source: Hirakawacho, C. (2010), Knowledge Management Tools and Techniques Manual, Tokio: Asian Productivity Organization	

10. Appendix 2: Overview Hard- & Soft Approaches in Risk Mgm.

Dimension	RM Processes	Corresponding Sources
Soft Approach	Context, strategic approach to risks and uncertainties	Chapman & Ward (1997), ISO 31000 (2009)
	Risk communication and information	Kliem & Ludin (1997), Dorofee et al. (1996), ISO 31000 (2009), Bakker, Boonstra, & Wortmann (2010, 2012), Chapman & Ward (1997)
	Attitude, assignment, and relationship with stakeholders	Prasanta a&nd Ogunlana (2004), Bakker, Boonstra, & Wortmann (2010, 2012), Chapman & Ward (1997)
	Crisis management	Fairley (1994)
Hard Approach	Risk planning	PMI (2013), Bakker, Boonstra, a&nd Wortmann (2010, 2012), Boehm (1991), Raz & Michael (2001)
	Risk Identification	Boehm (1991), Kliem & Ludin (1997), Prasanta & Ogunlana (2004), Patterson, Neailey, & Kewley (1999), Dorofee et al. (1996), ISO 31000 (2009), IPMA (2006), PMI (2013), Fairley (1994), Bakker, Boonstra, & Wortmann (2010, 2012), Chapman & Ward (1997), Raz & Michael (2001)
	Risk Analysis	Boehm (1991), Kliem & Ludin (1997), Patterson, Neailey, & Kewley (1999), Dorofee et al. (1996), PMI (2013), ISO 31000 (2009), Bakker, Boonstra, & Wortmann (2010, 2012), IPMA (2006), Prasanta & Ogunlana (2004), Fairley (1994), Chapman & Ward (1997), Raz & Michael (2001)
	Risk Monitoring & Control	Boehm (1991), Kliem & Ludin (1997), Dorofee et al. (1996), PMI (2013), ISO 31000 (2009), Bakker, Boonstra, & Wortmann (2010, 2012), Fairley (1994), Chapman & Ward (1997), Patterson, Neailey, & Kewley (1999), Raz & Michael (2001)
	Risk Response	ISO 31000 (2009), IPMA (2006), PMI (2013), Prasanta & Ogunlana (2004), Fairley (1994), Chapman & Ward (1997), Patterson, Neailey, & Kewley (1999), Dorofee et al. (1996)

Source: Carvalho & Rabechini Jr. 2014, p.4

11. Appendix 3: Collection of project Risk Management processes

Nr.	Project Management Processes	Stage	Rank	Source
1	Checklist	Identification	36	Down, et al., 1997
2	Brainstorming		8	Lumsdaine & Lumsdaine, 1990; Xerox Corp, 1992
3	Risk Documentation Form		29	Dorofee, et al., 1996
4	Periodic Risk Reporting		24	Dorofee, et al., 1996
5	Risk Probability Assessment	Analysis	14	Boehm, 1991; Sisti & Sujoe, 1994; Dorofee, et al., 1996; Down, et al., 1997
6	Risk Impact Assessment		3	Boehm, 1991; Sisti & Sujoe, 1994; Dorofee, et al., 1996; Down, et al., 1997
7	Risk Time Frame Assessment		30	Dorofee, et al., 1996
8	Risk Classification		33	Carr et al. 1993; Dorofee, et al., 1996; Brassard, 1994; Brassard & Ritter, 1994
9	Raking of Risks		17	Boehm, 1991; Sisti & Sujoe, 1994; Dorofee, et al., 1996; Down, et al., 1997
10	Graphic Presentation of Risk Information		38	
11	Responsibility Assignment	Planning	2	Dorofee, et al., 1996
12	Planning for Risk Mitigation		12	Dorofee, et al., 1996; Brassard, 1994
13	Time-Limited Action Item List		9	
14	Cost-Benefit Assessment During Risk Planning		26	Xerox Corp, 1992; Arrow, 1988
15	Cause & Effect Analysis during Risk Planning		34	Lumsdaine & Lumsdaine, 1990; Xerox Corp, 1992; Scholtes, 1988
16	Project Preplanning for Risk Mitigation		21	Dorofee, et al., 1996
17	Revision of Risk Assessment	Monitoring	16	Dorofee, et al., 1996
18	Periodic Document Reviews		20	Dorofee, et al., 1996; Down, et al., 1997
19	Periodic Risk Status Reporting		19	Dorofee, et al., 1996
20	Periodic Reporting of Risk Mitigation Plans		25	Dorofee, et al., 1996
21	Periodic Trend Reporting		31	Dorofee, et al., 1996
22	Critical Risk Reporting to Senior Management		6	Dorofee, et al., 1996
23	Analysis of Trends, Deviations & Expectations	Control	27	Dorofee, et al., 1996
24	Project Re-Planning		23	Dorofee, et al., 1996
25	Procedures for Closing Risks		37	Dorofee, et al., 1996
26	Contingency Plans For Risk Mitigation Failure		32	Dorofee, et al., 1996
27	Cost-Benefit Analysis During Risk Control		28	Xerox Corp, 1992; Arrow, 1988
28	Cause & Effect Analysis During Risk Control		35	Lumsdaine & Lumsdaine, 1990; Xerox Corp, 1992; Scholtes, 1988
29	Prototyping		7	
30	Simulation	1		
31	Benchmarking	13		
32	Requirements Management	Background	10	Paulk et al. 1996
33	Subcontractor Management		5	Paulk et al. 1996
34	Configuration Control		4	Paulk et al. 1996
35	Quality Control		11	Paulk et al. 1996
36	Quality Management		15	Paulk et al. 1996
37	Training Programs		22	Paulk et al. 1996
38	Customer Satisfaction Survey		18	

Source: Raz and Michael, 2001, p.11

12. Appendix 4: Five Major Reactive Capability Mechanism

Title	Description	Tools	Benefit
Flexibility of the resources (Staff & Technologies)	Highly skilled staff that are specialized in a few areas but flexible enough to switch tasks when demanded. Additionally integrated technologies that can be swiftly reallocated to other tasks	Skilled Staff	For superior and smooth project execution
		Consultants	Broader view on project, alternative source of knowledge & alternative solutions
		Rapid Prototyping*	Trail of alternative solutions and its potential outcome
		Simulations	Trial in virtual environment and effects under multiple influences
		CAD (Computer Aided Design)*	Computerized design tool to visualize new project solution
		CAM (Computer Aided Manufacturing)*	Computerized manufacturing tool for assessment of possibility to produce alternative & swift change of production
		Data Management Systems	Computerized assessment of possibility to generate alternative solution
Communication	Mechanisms that accelerate integrated problem solving during project execution. These include team structures, communication tools and IT systems	Multi-Disciplinary Teams	Teams can execute multiple tasks in different disciplines -> easy relocation & broad knowledge
		Co-location	All involved departments under one roof -> Faster & easier knowledge sharing
		Regular (team) meetings	Regular knowledge transfer on status, problems, solutions
		Accessible information hub	Information available for everyone involved in projects and possibility to contribute
		Contracts	Suppliers / Distributor involvement and contractual flexibility to change orders / return goods / change delivery time
Overlapped development activities	Parallel execution of project concept design and implementation, and overlapping between product and process design	Parallel project executions	Allows instant reaction on current project (product) phase from various stages and possibility to resolve issues as they occur
Over allocation	Additional or suboptimal allocation of resources to lessen the impact of late problems	Multiple Design alternatives	Alternatives available, saves time to produce them during execution
		Budget reserves	Allows hire additional resources (consultants, material, etc.) when required without administrative hurdles
		Time reserves	Provides additional time to complete project on top estimated duration. Minimizes stress & pitfalls
Flexible Solutions	Flexible product technologies and modular product architecture, which restrict changes only to small modules	Modular Project Architecture	Parts or tasks are grouped and executed by experts. Singular modules can be controlled and given more resources.
		Modular Product Architecture*	Product has flexibility to adjust parts after completion for updates or alternative use

* Predominantly used in product creation projects

Source: Author, mainly based on Verganti (1999, p.369); Schreyögg & Kliesch (2007, p.914); Pasche & Persson (2012, p.5)

13. Appendix 5: Interview result - Project Management tasks, duties & responsibilities

Project Phase	Tasks, Duties & Responsibilities	Results	%
Planning	Define scope	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	75
	Collaborate with:		38
	• Senior Manager	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	25
	• Programme Managers	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	13
	• Project owners	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	13
	• End-users	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	13
	Create work-plan	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	88
	Create execution strategy	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	13
	Identify activities needed	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	38
	Sequence activities	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	13
	Prioritize activities	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	25
	Determine resources (time, money, equipment, etc.)	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	63
	Allocate resources:		
	• Time-Scheduling	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	63
	• Resource-Scheduling	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	50
	Review & Revise Schedule:		
	• With superiors	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	38
	• With involved	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	25
	Determine objectives	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	88
	Create measures / milestones / KPI (key performance indicators)	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	75
Staffing	Activity-mapping	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	63
	Staff planning (requirement analysis)	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	50
	Hiring (recruit, interview, select)	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	50
	Appropriate trainings provided	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	25
	Appropriate orientation provided	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	25
	Control work	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	38
	Evaluate work	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	38
	Motivate / encourage staff	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	50
Execution	Record & Report project activities	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	100
	Ensure information is appropriately documented & secured	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	75
	Monitor Progress		
	• Status	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	100
	• Time	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	100
	• Cash flow	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	100
	Monitor Process	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	63
	Adjust project plan	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	75
	Communication schedule:		
	• To co-workers / Project staff	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	38
	• To stakeholders	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	50
	Quality control	■ ■ ■ ■ ■ ■ ■ ■ ■ ■	63

	Testing	■	■	■	■	■	■	■	■	50
	Create manuals	■	■	■	■	■	■	■	■	38
	Train end-users	■	■	■	■	■	■	■	■	25
	Presentations (of progress/end-product)	■	■	■	■	■	■	■	■	63
Evaluation	Reporting	■	■	■	■	■	■	■	■	88
	Presenting	■	■	■	■	■	■	■	■	38
	Evaluate outcome	■	■	■	■	■	■	■	■	100
	Hand-over of product / outcome	■	■	■	■	■	■	■	■	50
Source: Authors, based on interview answers										

14. Appendix 6: Identified tools enhancing Dynamic Capabilities in Projects

Project Flexibility tools/processes/actions identified in interviews Sorted A-Z				
A	Accessible information hub	M	Microsoft Project	Simulations
	Advanced Search Tools		Microsoft SharePoint	Skilled Staff
	After Action Review		Modular Product Architecture	Social Network Services
	Analysis of Trends, Deviations & Expectations		Modular Project Architecture	Storytelling
B	Benchmarking		Multi-Disciplinary Teams	Subcontractor Management
	Blogs		Multiple Design alternatives	T Taxonomy
	Brainstorming	O	OPS	Time reserves
	Budget reserves	P	Parallel project executions	Time-Limited Action Item List
	Building Knowledge Clusters		Peer Assist	Training Programs
C	CAD (Computer Aided Design)		Periodic Document Reviews	V Voice and Voice-over-Internet Protocol (VOIP)
	CAM (Computer Aided Manufacturing)		Periodic Reporting of Risk Mitigation Plans	W Wikis
	Cause & Effect Analysis During Risk Control		Periodic Risk Reporting	
	Cause & Effect Analysis during Risk Planning		Periodic Risk Status Reporting	
	Checklist		Periodic Trend Reporting	
	Co-location		Planning for Risk Mitigation	
	Collaborative Physical Workspace		Procedures for Closing Risks	
	Collaborative Virtual Workspaces		Project Preplanning for Risk Mitigation	
	Community of Practice		Project Re-Planning	
	Configuration Control		ProPedia	
	Consultants		Prototyping	
	Contingency Plans For Risk Mitigation Failure	Q	Quality Control	
	Contracts		Quality Management	
	Cost-Benefit Analysis During Risk Control	R	Ranking of Risks	
	Cost-Benefit Assessment During Risk Planning		Rapid Prototyping	
	Critical Risk Reporting to Senior Management		Regular (team) meetings	
	Customer Satisfaction Survey		Requirements Management	
D	Data Management Systems		Responsibility Assignment	
	Document Libraries leading to a Document Management System		Revision of Risk Assessment	
E	Expert Locator		Risk Classification	
G	Graphic Presentation of Risk Information		Risk Documentation Form	
K	Knowledge Café		Risk Impact Assessment	
	Knowledge Databases		Risk Probability Assessment	
L	Learning Reviews		Risk Time Frame Assessment	
	Lotus Notes Group	S	Simulation	

15. Appendix 7: Interview Guide

Preparation / Background

- Personal Background
 - Name:
 - Working Title:
 - Which Department are you working for:
 - How long (years) are you working for Bayer:
 - How many years of Project Management experiences do you have:
 - Do you have any Project Management degrees/certificates:

- Project Background
 - What is your current project about:
 - What are your duties, responsibilities in your current project?
 - How *strategic* is your project?
 - What expected value does the project outcome bring to Bayer? (e.g. increased quality, reduced time in xyz, ...)
 - Who is the project-owner? /-beneficiary? (e.g. Bayer? Which department?)
 - How large would you rate the project? (small, medium, large)
 - In what value (monetary) range is the project?
 - How many people are involved in this particular project?
 - What is the timeframe given for this project?

Dynamic Project Capabilities

- Adaptive capability
 - How often do you change and modify your projects underlying value system, characteristics, or strategy?

- Absorptive capability
 - How (often) do you seek for opportunities in the market?
 - What are major sources of opportunities?
 - How do you prioritise the information gained about these opportunities? (please name, measures of priorities)
 - How (often) do you apply such knowledge in order to have your project benefit from an opportunity?

- Innovative capability
 - How do you encourage individuals and groups in your project to interact in order to create new learning from each other?
 - How do you recognise that external change is modifying your project internally?

- Project Flexibility

- How is the project structured & set up within the department?
(hierarchical, functional, operational)
- Acc. to your experience: do projects in Bayer fail often? -> yes/no
 - Why?
- What is superior to other firms?
- What are common causes of failure?
- Do you believe that this is connected to the volatile environment / market dynamics?
- Some experts believe: project targets must be fixed & should not be changed during project execution, while others promote flexibility & late decision making. -> what is your general stance?
- Do you think project flexibility is important?
 - For your current project?
 - In general for projects?
- Is Bayer AG especially affected by a need of flexibility, since they are within the pharmaceutical (=hypercompetitive) market environment?
- How do you, as a project manager, keep your project flexible?
- What aspects do you consider crucial to maintain/foster/enhance flexibility?
- Have you heard of the term: Dynamic Capabilities? -> if yes: briefly explain

Knowledge Management

- Knowledge
 - How would you define knowledge?
 - What role does (internal / external) knowledge play in your project?
- Knowledge management strategies
 - Which Knowledge Management-strategies are employed Bayer?
 - How is knowledge managed within Bayer?
 - Do you employ similar strategies in your projects? -> which?
 - Do you have any routines/processes in order to capture, store and spread newly acquired knowledge when executing a project?
 - Formal & informal events inside & outside Bayer?
 - Risk management plans: exploration & mitigation actions?
 - Specific platforms where knowledge can be shared / acquired?
 - Mentoring / Training / Learning?
 - Please give examples
- Do you have any routines/processes (best-practices) to re-use old knowledge / experience when starting a new project? If `yes`, please give examples.
- Knowledge dissemination
 - Does any general communication channels exist within the project/department/organization (PMO) ?
 - How is knowledge spread throughout the project / organization?
 - How do you encourage knowledge exchange?
 - How many resources are dedicated for educational purposes?
(Acquisition of: field studies, staff training, forecasts, analysis, consultancy)

- Which are further knowledge management processes you implement and exploit in your project?

Resource Flexibility

- Human Resource
 - How is the responsibility spread amongst the employees?
 - Flat / Steep Hierarchy
 - General / Functional Hierarchy
 - Employee involvement
 - How is the competence spread amongst the employees?
 - Flat / Steep Hierarchy
 - General / Functional Hierarchy
 - Employee involvement
- How easily are internal & external employees recruited (contractors- or consultants hired / internal experts moved)?
- Time Management
 - How do you plan time at the beginning of a project?
 - Example: Time reserve
 - In which frequency you analyse time- progress & update schedule?
 - How do you ensure timeliness?
 - What measure can you think of to take to catch up (once you are behind schedule)?
- Monetary Flexibility
 - How is the budget managed?
 - What do you do to keep it flexible? (e.g. cash-reserves)
- Scope Management
 - How are the project tasks synced, at the beginning and execution phase, with the employees?
 - How are projects architecturally designed? E.g. modularity
 - Which techniques do you exploit to identify opportunities/weaknesses of project outcome?
 - Which are further processes you exploit to keep your projects flexible?



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