Connecting Project Interdependency Management to Dynamic Capabilities
Police Scotland’s Transformation

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Abstract

This study investigates the relationship between the three levels of dynamic capabilities and the two most prominent project interdependencies, by comparing the practises of an organisation in a single case study.

An understanding of organisational change capacity in terms of dynamic capabilities (DC) is widely accepted in academic literature. Likewise, project management literature agrees that multiple projects that serve to implement change may interact amongst one another resulting in increased or decreased benefits compared to individual project execution. The study explores the so far neglected gap between these two areas.

This study follows an inductive path of a single case study, as the authors investigate the case of the transformation of service of Police Scotland. This organisation is unique, as it exhibits a far above average use of project (inter-) dependency management, specifically created for this situation of change. Semi-structured interviews of ten organisational members with different perspectives, roles, and experiences was employed to gain a full understanding of this complex situation and answer questions as to the “how” and “why”.

This study revealed that there exists a connection. It has found practises, which the organisation specifically employs to combine interdependency management and dynamic capabilities. The study also found there to be a distinct pattern that links knowledge interdependencies to first and partially to third level DC, and resource interdependencies to second and third level DC. This investigation also contributes to the understanding of the resource and knowledge based view of the organisation, by expanding the criticism of the former and establishing the use of the latter.

Keywords: project interdependency management, resource interdependencies, knowledge interdependencies, dynamic capabilities, Police Scotland
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Table of Abbreviations
DM  Dependency Management
DC  Dynamic Capabilities
KBV  Knowledge Based View
PS  Police Scotland
PIM  Project Interdependency Management
PPM  Project Portfolio Management
PM  Project Management
RBV  Resource Based View
SCA  Strategic Competitive Advantage
Introduction

1 Introduction

The aim of this introductory chapter is to familiarize a reader with the study’s background and main reasoning why the research was conducted. It highlights the importance of the study, positions it in literature and briefly describes the content of the entire document. The first section opens a discussion, which explains the importance of Dynamic Capabilities (DC) and Project Interdependency Management (PIM). The second section presents the research question and objectives of the study. The last section focuses on the researchers’ motivation and thesis disposition.

1.1 Background

Rapid changes in the environment have been recognised to continuously force organisations to rethink their business model (Burnes, 2012, p. 447; Frame, 2012, p. 10; Murray and Richardson, 2002, p. 5). As a response, the reconfiguration of resources and knowledge has long since been established as a way to maintain the Strategic Competitive Advantage (SCA). Resource centrism has been bundled in the Resource Based View (RBV) and suggests categories to identify the most strategic resources (Barney, 1991, p. 101; Peteraf, 1993, p. 179; Wernerfelt, 1984, p. 173). Knowledge centrism as an organisational priority is expressed in the Knowledge Based View (KBV) and focusses on the unique properties of knowledge as the most strategic resource (Kogut and Zander, 1996, p. 503; Grant, 1996, pp. 111). While these two perspectives offer partial wisdoms, Dynamic Capabilities (DC) promise to offer a more holistic solution (Eisenhardt and Martin, 2000, p. 1106). This stream of literature defines an organisation’s SCA in its ability to sense external changes, seize opportunities, and reconfigure assets – both resources and knowledge - according to the needs of the situation (Teece, 2007, p. 1319). The concept of the DC was first introduced in the end of the 1980’s by two of the most influential business thinkers and strategy researchers, Gary Hamel and Coimbatore Prahalad (1990, p. 80). Since then, landmark publications by experts in the field such as Teece, Pisano, and Shuen (1997) have established the topic with the most widely cited paper in business administration between the years of 1995-2005 (Ludwig and Pemberton, 2011, p. 230). These authors have differentiated DCs on three levels: sensing, seizing, and reconfiguring (Teece, 2007, p. 1319). Yet DCs remain relatively new to the field of business administration, and the continuously evolving challenges call for more explorative papers on the topic (Güttel et al., 2015; Pundziene and Teece, 2015).

As temporary solutions to unique organisational challenges (Packendorff, 1995, p. 319; Cleland, 2004, p. 64), projects are one other major organisational tool that has been used to facilitate change. Scholars have observed the dominance of projects in business activities to such a degree, that there has been a call for a “projectification of society” (Midler, 1995, p.172; Lundin and Söderholm, 1998, p. 451; Maylor et al., 2006, p. 664, Dahlgren & Söderlund, 2010, p. 381; Lundin, 2011, p. 45). Over the last 30 years, projects have been repurposed from the construction field, to a wider application, as they are used to manage not just “a change”, but “constant change” (Katalin et al. 2011, p. 254; DelGross, 2014, p. 4; Lefle & Loch, 2010, p.33). They provide a new directive for the organisational strategy and hence they have become a common tool for creating a SCA (Reyck et al., 2005, p. 524; Voss and Kock, 2012, p. 567) Pellegrinelli, 2011, p. 233; Shenhar et al., 2001, p. 700).

Project management has developed tools that allow coordination of a group of projects, called programme, and even a group of programmes, called portfolio for a common
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change objective (Görög, 2011, p. 17, PMBOK, 2013, p. 8). These are meant to provide flexibility inside organisations in a continuously changing environment (Laslo, 2010, p. 609). Yet these measures often ignore the effects that single projects, as agents of change, may have on the execution of the others (Perminova et al., 2008, p. 265). Project Interdependency Management (PIM) therefore measures and controls interactions between projects (Patanakul & Milosevic, 2008, p. 124). The rise in interdependencies has been observed, especially while project portfolio management (PPM) matures and projects' complexity increases (Görög, 2011, p. 17). The rise in complexity, as discussed in the beginning of this chapter has forced scholars to urge the further investigation of PIM. Following this call for papers, the standards for Project Management (PM) and PPM have devoted more and more space to discussing and explaining project interdependencies (PMBOK, 2013, p. 6). Nonetheless, many academics state that there is a lack of clear understanding and definition of project interdependencies (Killen & Kjaer, 2012, p. 555; Staudenmayer, 1997, p. 27; Rungi & Himola, 2011, p. 158). Even as many scholars present a lack of one clear definition of PIM in the literature and its tools and methods in practice, the same number of academics highlight its importance in many different fields of PM and PPM (Verma and Sinha, 2002, p. 452; Maio et al., 1994, p. 183; Collyer and Warren, 2009). Sanchez et al. (2009, p. 18) state PIM is part of the strategic agenda for organisations while Elonen and Artto (2003, p. 397) describe management of project interdependencies as one of the weak points of PPM that needs further exploration. In specific, this applies to the interdependencies between project resources and the interdependencies between project knowledge (Killen and Kjaer, p. 558, Niedergassel and Leker, 2010, p. 142; Teller, 2012, p. 600). These two types of interdependencies will be the focus of this study for two reasons: the above-mentioned call for exploration and being the most frequently cited type of Project Interdependency by peer reviewed articles (Blau et al., 2004, p. 233; Santhanam and Kyparisis, 1996, p. 382; Rungi, 2010, p. 102; Verma and Sinha, 2002, p. 451; Schmidt, 1993, p. 404).

This proposed gap between DC and PIM is highlighted from three directions in literature: DC, PIM, and project management in the DCs.

DC have not yet fully explored all the ways for organisations to modify their assets to meet new demands (Güttel et al., 2015; Pundziene and Teece, 2015). Its literary background in the RBV and KBV hints at DC’s strong focus towards resources and knowledge modification for SCA.

Similarly, PIM is a very new and scarcely explored sub-topic of project management that is increasing in importance, proportionally to the increase in complexity and speed of change. It too provides organisations with a SCA when implementing change, by studying and controlling the connections between resources (Santhanam and Kyparisis, 1996, p. 382; Blau et al., 2004, p. 233) and knowledge (Berends 2005, p. 98, Niedergassel and Leker, 2010, p. 142).

Overall, it becomes evident, that both topics are integrated into a common understanding of a dynamically changing reality and the need to manage resources and knowledge. The few studies that have explored general project management as a DC have agreed to this point, and also hinted at the need for further exploration (Daniel et al., 2014, p. 108). By searching for specific practises that are shared between DC and PIM this study strives to establish a previously unmade connection in literature. As the common ground of resources and knowledge has been made above, this study also attempts to contribute to the resource and knowledge based view of the firm from the unexplored perspective between DC and PIM. It also hopes to give managers examples of tools, which have
proven their usefulness in both areas, so that they can improve their reactions to change. This lack of description in literature of the relation between DC and PIM has been characterised as a “neglected, overlooked gap”, as researches concerning this exact topic has not been carried out before (Sandberg and Alvesson, 2010, p. 30).

The need for the increase in understanding about the connection between DC and PIM has been pointed out from literature in the areas of DC, PIM, and project management in the DCs. Overall, the authors deem this gap as relevant to investigate, because it provides organisations with a better understanding of the practises that react to the largest influence on business models, environmental change. Both DC and PIM are individual responses to this change and finding areas of combined practise could allow organisations to respond more efficiently. It will be examined in the single case study on example of Police Scotland, which is in an organisational change situation and which has a special unit responsible solely for PIM.

1.2 Research question

With regards to the discussion provided above, this thesis will focus on answering the following research question:

**How do practises connect knowledge and resource interdependency management to the three levels of dynamic capabilities in the example of Police Scotland?**

In order to answer this research question, the researchers will answer six sub-questions.

1a: Which practises connect 1st Level DC and Resource Interdependencies?
1b: Which practises connect 2nd Level DC and Resource Interdependencies?
1c: Which practises connect 3rd Level DC and Resource Interdependencies?
2a: Which practises connect 1st Level DC and Knowledge Interdependencies?
2b: Which practises connect 2nd Level DC and Knowledge Interdependencies?
2c: Which practises connect 3rd Level DC and Knowledge Interdependencies?

According to sub-questions the focus of this study is on practices connecting specific levels of DC and resource and knowledge interdependencies as shown in figure 1. As described in the background, the understanding of DC and PIM is based upon the most established authors in the field. In keeping with them DC is to be differentiated into three levels: sensing, seizing, and reconfiguring (Teece, 2007, p. 1319). By practice the authors understand “the actual application or use of an idea, belief, or method” (Oxford Dictionaries, 2015) which is described in literature, and found in the case. In order to understand if a connection between DC and PIM exists, the authors are looking for practices, which may be common for both of the fields.
1.3 Research objectives

The objective of this study is to investigate possible common practices between knowledge and resource project interdependencies and the different levels of dynamic capabilities, in order to increase the understanding of the connection between DC and PIM, as it has not previously been described in the literature. The outcomes of the study should identify practices in Police Scotland’s large-scale change programme and draw parallels to resource and knowledge interdependency management. As both, DC and PIM, started being used after the introduction of Police Scotland’s transformation, it means that both of those phenomena could be sharing common grounds to implementation. It is an important knowledge which can contribute not only to the fields of DC and project interdependencies but also will help to better understand an organisation in a change process.

This is a single case study that aims to exploit the unique circumstances of having an explicit dependency management unit inside an explicitly dynamic situation. By following Eisenhardt and Graebner (2007, p. 27) Police Scotland was chosen in order to highlight and extend possible relationships which can occur between DC and knowledge and resource interdependencies, as a single case study gives an opportunity to research phenomenon under uncommon or extreme contexts. Qualitative research methodology was adopted to deeply understand the point of view of participants and their interpretation.

1.4 Limitations

The following study is an inductive, qualitative, and exploratory study, which investigates the relation between two phenomena: DC and the resource and knowledge interdependencies, in Police Scotland. The study presents as case, which falls into the category of unique, according to Yin (1984, p. 15). This means that the circumstances under which this study is conducted were not available to the public before and may not be replicable by other authors trying to confirm the authors’ findings. This case can also be classified as extreme (Eisenhardt and Graebner, 2007, p. 25) meaning that it exhibits much higher levels of the phenomena than the authors were looking for or that can be reasonably expected in other organisation. Both of these case study classifications hint that the aim of this study is not the statistical generalization, as findings are not
representative for a large percentage of organisations. However, in order to explore a new field, like the neglected connection between DC and PIM, literature recommends it as favourable (Eisenhardt and Graebner, 2007, p. 26; Yin, 1984, p. 28) to increase understanding and infer theory. These benefits justify the authors’ selection of a research design with the aforementioned limitations. The individual strengths and weaknesses of the case study at Police Scotland will be discussed in the subchapter “Design” (3.3)

A general limitation of our study concerns the influence of organisational and national culture. While the influence of cultural norms on practises both in terms of DC and PIM calls for investigation, this study consciously excludes it from the scope.

However, it is relevant to mention at this point that although the influence of national and organizational culture on practises both in terms of DC and PIM may call for investigation. This study consciously excludes it from the scope, as the overall objective is not to compare but to understand which practices overlap in a case that is a unique one due to the existence of an explicitly named dependency management unit inside an explicitly dynamic situation.

1.5 Research motivation

The study is motivated by the authors’ internship at Police Scotland from the 13th of January until the 13th of February 2014. The internship familiarized the authors with a situation of combined DC and PIM and inspired the literature review that revealed the aforementioned gap. It furthermore put the authors in contact with Police Scotland, making it one of the potential choices for the single case study. The internship’s influence is described in detail in the subsection “Reasoning” (3.2).

Furthermore, both of the authors are students of Strategic Project Management thus were aware and interested in both DC and Project Management before selecting this topic. The last motivation factor was the individual work experiences in organisational change processes and marketing projects that allowed the authors to contextualize the results and strive for practical implications.

1.6 Disposition of the study

The following study consists of five main parts, which are: literature review of concerning topics, explanation of undertaken research methodology, data presentation and analysis, and finally, presentation of findings, and conclusions.

Part 1

The first part that is the literature review provides a reader with a short insight into following topics:

- The focus of the first sub-chapter will be to elaborate the three levels of Dynamic Capabilities. This includes the theoretical background of the Resource Based View and Knowledge Based View which leads up to and explains elements of both dynamic capabilities as well resources and knowledge for their respective interdependencies. Finally this chapter will outline best practise to provide a framework of behaviour for DC identification in Police Scotland.
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- The focus of the second subchapter is to explain Project Interdependency Management. This includes providing theoretical background in the form of Project, Programme and Portfolio Management, which also provides the framework for Police Scotland’s practise. A basic definition of Project Interdependencies and their relevance will lead a reader to an in-depth description of two kinds of PI: resource interdependencies and knowledge interdependencies, on which we focus our study and for which relation with DC we will look for.

Part 2

The part concerning methodology opens a discussion of the best choice of research methodology and argues for our choice of a single case study design and inductive exploratory approach. However, it also shows possible limitations. Most commonly single case studies use in-depth interviews as a method that allows to investigate phenomena (Bryman & Bell, 2011, p. 68). The data was collected through semi-structures interviews, which make it possible to focus on questions that could answer the research question best and at the same time it allows flexibility to ask supplementary questions exploring the field even deeper, when needed. In the end of this chapter, there is a brief introduction to the current situation in Police Scotland, which build bases for understanding importance of following data analysis and display.

Part 3

The part concerning data presentation and analysis opens with a description of template analysis and a presentation of a coding table as a coding method was used in order to analyse a large quantity of data that interviews provided us with. Similarly as literature review, information is divided into parts discussing successively each level of DC and chosen PI.

Part 4

The last part focuses on answering research question. It presents our findings concerning relation between the three levels of DC and resource and knowledge interdependencies. Further, it provides theoretical, societal, ethical and managerial implications of the research. The entire study in closed by a presentation of future research directions.
2 Literature Review

2.1 Overview

This study’s declared research objective is investigating a connection between DC and interdependency management. Both of these topics have so far only been discussed in separate streams of research. Goal of this chapter is not only to explain the background literature of each individual topic, but also to show that they exist within the same area of research. This common basis in literature will lend credibility to possible findings in practise.

Dynamic capabilities is a stream of research explaining a firm’s Strategic Competitive Advantage (SCA) in response to a changing environment. In literature many reasons have been cited for a firm’s superior performance, but the SCA is one of the most widely accepted and published. It can be further divided into two complementary schools of thought: market power and efficiency (Teece et al., 1997, p. 510). Market force compels a firm to seek its value in relation to other firms; a popular example of this is Porter’s competitive strategy (Porter, 1979, p. 137). Efficiency seeks to optimize a firm based on its internal mechanisms. The earliest and most popular example of the efficiency approach is the Resource Based View (RBV) of the firm, which perceives a firm’s SCA as a combination of valuable, rare, inimitable, organisational characteristics. A more recent development of the RBV is the Knowledge Based View (KBV). The KBV agrees with the premise of the RBV, but increases focus and depth to a singular resource, knowledge. The most recent development of this efficiency approach to the SCA is Dynamic capabilities. DC agrees with the premise of the RBV and KBV but adds, that the modification of the resources, especially knowledge, based on situations truly determines a firm’s SCA (Acedo et al., 2006, p. 622).

Project Interdependency Management is an emergent area of the Project Management research. Its focus are the logical relationships within the Project, Programme & Portfolio system. While literature has identified numerous interdependencies, the two most commonly cited ones are Knowledge and Resource Interdependencies. The use of interdependencies in these areas requires an elemental understanding of both resources and knowledge as interdependency management too promises to provide an SCA through more efficient project execution.

Figure 2: Literature Overview
2.2 Literature search strategy

Selecting the literature for this thesis was a multi-stage process to ensure that all relevant data was included. As this case study explores the connection between PI and DC within the context of the project organization it was clear that these three topics would form the cornerstones of our literature review.

The systematic literature review for all three was handled separately in the beginning. It was aimed at peer-reviewed articles, established online databases (e.g. EBSCO; Elsevier, and Google Scholar) and online databases from the universities that we attended (such as VISION VLE from Heriot Watt University; UmUB that Umeå University Library’s database; and BazEkon, a database from the University of Economics in Katowice). The time parameters were not limited as one of the aims of the literature search was to find any connection between DC and PIM. The literature search was conducted using multiple combinations of keywords within these fields: dynamic capabilities, project interdependencies, project dependencies, portfolio management, programme management, project interdependency management, knowledge interdependencies, resource interdependencies. The vast majority of journals in question are peer-reviewed, focussing on project management in general, and knowledge management and organizational behaviour in specific.

2.3 Dynamic Capabilities

This chapter presents an analysis of the relevant literature on the topic of dynamic capabilities, by showing it to be the logical conclusion to two classical theories of the firm, the resource-based view and the knowledge-based view. Within the context of our research question, this will allow later chapters to highlight parallels between literature about dynamic capabilities and project interdependencies.

2.3.1 Theoretical Background

2.3.1.1 Resource Based View

This subchapter will discuss the resource-based view as the origin of the knowledge-based view and the dynamic capabilities concept. This argument will form a framework for understanding the major assumptions and criticisms inherent with the topic of resources, leading the way understanding the second and third research objective.

The resource-based view (RBV) suggests the origins of a firm’s Strategic Competitive Advantage (SCA) to be found in the superiority of its valuable, rare, inimitable and organizational resources (VRIO) (Barney, 1991, p. 101; Kraaijenbrink et al., 2009, p. 351; Leiblein, 2011, p. 917; Mahoney and Pandian, 1992, p. 374; Peteraf, 1993, p. 179; Wernerfelt, 1984, p. 173). Wernerfelt was the first to describe the RBV as such, contrasting it to the complementary external market based explanation of SCA (Porter, 2004). The selected literature agrees on up to four common assumptions for the viability of the RBV: resource heterogeneity, ex-post, ex-ante limitations, and imperfect mobility.

The first assumption, resource heterogeneity, describes the unequal distribution of finite resources across firms (Peteraf, 1993, p. 179; Leiblein, 2011, p. 117; Wernerfelt, 1984, p. 171), prominently exemplified by Ricardian rents. Ricardo’s (1817) focus lay in unique and finite aspects of land: Control over one of the few areas with above average fertility would guarantee a constant advantage. Penrose (1995 widened the lens to include all tangible and intangible assets, which in a collection form a firm. The second assumption,
ex-ante limits to competition, offset rents compared to costs (Rumelt’s (1987) (Leiblein, 2011, p. 920)). The investments into resources as a strategic advantage can only happen, if the acquisition costs are below the future market value (Lockett et al., 2009, p. 11). In combination, these two assumptions suggest that resources are both uniquely distributed amongst organisations and hard to predict, recommends that human resources are strategic resources.

The third assumption, ex-post limitations to competition, allow firms to maintain advantages in resource alignment (Peteraf, 1993, p. 182; Barney, 1991, p. 112). Rumelt (1984) pioneered the concept, that superior resources are only sustainable, if other firms can be stopped from attaining them as well. Common limitations are entry barriers (Bain, 1956, p. 30) or path dependencies. Path dependencies describe an outcome that can only be achieved by following a certain process, i.e. learning, as opposed to being able to acquire them wholly (Bain, 1956, p. 32). These processes result in an organisations possession of superior knowledge. The fourth assumption, imperfect mobility, limits resource movement within firms (Priem and Butler, 2001, p. 24). This assumption urges organisations to focus on intangible factors. The overlap between knowledge and intangibility lays in organisational skills as key SCA resources.

In a RBV critique meta-analysis Kraaijenbrink (2009, p. 351) concludes that two arguments have a valid claim. Firstly, the use of the VRIO (Barney, 1991) framework to define a resource is not necessary or sufficient to cause a SCA. Literature suggests that additionally the selection and modification of resources has to take place to achieve SCA (Teece et al., 1997, p. 528). Secondly, there is a valid criticism that the definition of the term resource is tautological (Priem and Butler, 2001, p. 27). If an SCA can be created through amassing valuable and rare resources, and all that is valuable and rare is classified as a resource, than a SCA is, by definition, equal to resources. This does not add explanatory value, and can therefore not be considered a theory (Lockett et al., 2009, p. 16). To remedy, a closer definition of value in terms of organizational standards has been attempted (Makadok and Coff, 2002, p. 10). Some elements of literature have developed the idea that the RBV is more suited as a heuristic or a reminder for managers to consider than an academic theory (Kraaijenbrink et al., 2009, p. 357).

This subchapter concludes, that the literature considers human resources and skills the two most valuable strategic resources, because they respectively address the heterogeneity, ex-ante limits and the ex-post limits, and immobility. The literature also suggests that the RBV alone does not suffice to explain strategic advantages, as it does not account for the need for modification, the demands of tacit knowledge, and a clear definition of value. To address these gaps, we propose the KBV and Dynamic Capabilities. The KBV will provide the focus on a specific resources, that matches the desired human resources and skills. Dynamic Capabilities will also provide the skill focus as well as mend the criticism of modification. In terms of our research questions this subchapter highlights, that there is a theoretical connection between resource management, knowledge management, and dynamic capabilities. This subchapter also suggests that interdependencies in resources exist in the same sphere as dynamic capabilities.
2.3.1.2 Knowledge-Based View

This subchapter describes the Knowledge-Based View as the specialisation to the RBV. As such it is able to target some of the weaknesses, such as the unclear definition of resource, value and consideration of tacit knowledge. In doing so, it will discuss some of the basic properties of knowledge transfer. This will form a framework for the later understanding of knowledge interdependencies.

The Knowledge Based View (KBV) describes information as the most important resource in creating a firm’s SCA (Conner and Prahalad, 1996, p. 477; Kogut and Zander, 1996, p. 503; Grant, 1996, pp. 111). Focussing on one of the RBV’s critical resources limits this theory’s range, but enhances its depth and definability. It draws conclusions and applications from fields such as epistemology (Morgan, Smircich 1980), organisational (Grant, 1996, p. 114), and details of coordination within a firm’s boundaries (Acédio et al., 2006, p. 622).

Literature in the field of the KBV consequently cite Grant and Spender as their most important influences. Spender’s perspective on the KBV leans towards constructivism. He regards organisations themselves to have abstract characteristics (Spender, Levitt and March, 1988: 320). Grant more closely affiliates himself with positivism and the RBV (Acédio et al., 2006, p. 625). The decision, which direction to follow rests on epistemological fit. Grant’s theory fits closer to this the theoretical framework of the RBV, allowing a better comparison. Grant considers knowledge in two forms: tacit and explicit. Literature classifies tacit knowledge as processual, describing how methods are used, while explicit knowledge is factual, describing specific evidence. The use and SCA of either classification is determined by four dimensions (Grant, 1996, p. 112): Transferability, capacity for aggregation, appropriability, and specialization in knowledge acquisition.

The first dimension, transferability, states, that when individuals can transfer knowledge, joining in a firm gives them a SCA compared to solitude (Barney, 1991, p. 107). Explicit knowledge can easily be transferred through communication. Tacit knowledge can be revealed only through practise (Polanyi, 1962, p. 603), creating problems for firms. The second dimension, capacity for aggregation, states, that organisations can leverage generalizable, objective, or explicit knowledge, by summarising and then displaying large quantities of data at once. Statistics is a powerful tool in these situations, but is bound by the requirements. Tacit data’s idiosyncrasies (Hayek, 1945, p. 523) severely limits the transferability as well as its aggregation. Appropriability allows an organisation to determine the true value of a resource (Lockett et al., 2009, p. 12). Similarly, to all intangible components of the RBV tacit and explicit knowledge face difficulties in this aspect. The lack of transferability of tacit knowledge and the infinite transferability of explicit knowledge (Rosen 1991) render normal Return on Investment calculations useless. The final prerequisite of the KBV is, that due to limited capacity humans have to specialise in absorbing certain knowledge to become an expert. This requires firms to decide, how much general knowledge should be present in each employee and how much such be left to specialists, to be then shared:

The transfer of knowledge within the organisation can be facilitated by four mechanisms: Rules, Sequencing, Routines, and Groups; their effectiveness depends on the context of the shifting organisational systems: Rules formalise specialists’ explicit knowledge to maximise knowledge transfer to non-specialist (Van de Ven, A., 1975, p. 67). Sequencing optimises skill contribution between flexible individuals based on the fixed temporal
dimension (Blau et al., 2004, p. 228). Routines are triggers for automated behaviour based on the previous assessment of causal relationships. These mechanisms are designed to minimise interaction, as the previously described transfer of tacit knowledge is difficult. They are useful, because experts can formalise tacit knowledge into explicitly understood behaviour. This works well in predictable, stable, complex or simple environments. Group problem solving is a costly mechanism designed to facilitate the exchange of pure tacit knowledge, as it is sometimes required for solving multidimensional problems. Common knowledge like language, symbolic communication, common spec. knowledge, shared meaning increase adherence efficiency of mechanisms. This paragraph concludes that the structure of knowledge transfers has to be modified depending on the situation’s requirements.

This subchapter confirms the previous chapter’s notion of knowledge as a key strategic resource. It highlights that transferability is the key dimension of knowledge, as appropriability and specialisation depend upon it. This chapter also stresses that the modification of knowledge transfer methods is dynamically variable upon the current situation. For our structure, it means that literature supports a link between the RBV, the KBV, and ultimately the KBV. For our research question it means that within dynamic capabilities we have to consider knowledge’s special characteristics.

2.3.2 The three levels of Dynamic Capabilities

This chapter discusses the explicit research topic of dynamic capabilities. After giving a brief introduction, it will highlight why this broad topic is usually split up into smaller capabilities and why the three we selected are superior.

Dynamic capability (DC) is defined as ability to build (Teece et al., 1997, p. 515) and integrate (Eisenhardt and Martin, 2000, p. 1106) new forms of competitive advantage, including organisational-level capabilities that may change (ordinary) capabilities (Eriksson, 2014, p. 66; Regner, 2008, p. 567). The individual terms refer to the speed at which the relevant system changes (Nieves and Haller, 2014, p. 224; Teece et al., 1997, p. 515) and the focus on unique and inimitable skills. Winter (Winter, 2003, p. 991) contrasts them to operational capabilities, which are used to generate income. Accelerators for DC is regular use (Argot, 1999), minor (Sitkin, 1992), and major problems (Kim, 1998). The DC approach evolved from the RBV and still shares many aspects, such as the aim of SCA (Eriksson, 2014, p. 65; Eisenhardt and Martin, 2000, p. 1105) by focussing on efficiency based value generation in internal mechanisms (Teece et al., 1997, p. 528). It differs from the RBV by stressing the modification of VRIO resources (Regner, 2008, p. 582), instead of just acquiring them. Literature disagrees as to how many levels of DC exist (Ambrosini & Bowman, 2009; Danneeels, 2010; Pavlou and El Sawy 2011). For the purpose of this paper, we have selected Teece’s framework of the three levels of dynamic capabilities. Teece’s development has been the major influence on the DC perspective, prompting his 1997 article in the topic to become the most widely cited in the time period 1995-2005. Limitation to this model is that it focusses on internal antecedents, excluding external enablers (Eriksson, 2014, p. 66; Winter, 2003, p. 992).
1) to sense opportunities and threats
2) to seize opportunities
3) to maintain competitiveness through enhancing, combining, protecting, and, when necessary, reconfiguring the business enterprise’s intangible and tangible assets.

(Teece, 2007, p. 1319)

2.3.2.1 Sensing

Organisations exist in an ever changing environment. To be able to adapt the organisation has to sense incoming opportunities and threats created by the market place and internal developments. This first dimension of DC is thus the ability to recognise, understand and pursue these opportunities (Nieves and Haller, 2014, p. 225). Potential origins may be customers, suppliers, bodies of regulation with power over competition (Teece, 2007, p. 1323). While this is reminiscent of Porter’s five forces approach (Porter, 1979, p. 138), it differs in the perspective. While Porter stresses changes compared to competitors, and assumes internal capacity to do so, DC is more conscious of limitations. The shared aspects with RBV direct the attention towards a uniquely equipped firm whose transformation processes may be inspired by competitors’ actions, but whose reactions ultimately depend on internal capabilities.

For an organisation to execute sensing, a number of elements must be present: The distribution of information from the exterior to the person with decision making capabilities requires management with an accurate perception of knowledge. Multiple studies have proven a correlation between improved organisational knowledge and improved DC. Measures include a greater overall familiarity with organisational tasks (procedural knowledge) (Nieves and Haller, 2014, p. 229), more declarative knowledge (Nieves and Haller, 2014, p. 228), Management by walking about (Peters and Waterman, 1982, p. 15), links to stakeholders (Teece, 2007, p. 1324) can help.

2.3.2.2 Seizing

This subchapter will consider the necessary resources and capabilities for an organisation to exploit the opportunities presented by the first level DC. It requires answering the central business model questions of where, when, and how they create value (Teece, 2007, p. 1326). Literature suggests, that once these decisions have been made, it becomes a matter of selecting and committing to the appropriate infrastructure, process structure, and decision-making structure to fulfil these goals; each represents a number of capabilities required by an organisation:

Infrastructure takes account of machinery, IT, and location (Kim et al., 2011, p. 488), which have to be aligned to match internal and external customer requirements. In many industries, this is a key battleground with other firms: The commitment to one technology over the other is a difficult process, riddled with uncertainties due to the dynamism and growth inherent in them (Anand et al., 2009, p. 448). Compatibility becomes a key issue, as well as the creation of sustainable business eco-systems.

Decision-making structure aims to ensure, that once an opportunity has been discovered, the assets previously discussed are used in the most effective and efficient manner (Kay, 2010, p. 1213). The main hindrance and proponent of this is the incentive system and thinking biases. Classical agency theory explains the problems, which may occur when
remuneration becomes unhinged from value creation. In this context, it explains why some organisations do not seize all opportunities. Long-term payoff versus short-term costs and risks for the individual require value definition and measurement that can account for the temporal difference. Thinking biases and heuristics are a problem in every decision making aspect, but form an particular problem in a situation where the uncertainty is high, as it is in the assessing of future resource distribution (Kahneman, 2011). Biases may be simply be combated with increased awareness about them, as well as outside perspectives. It may also be advisable to select personal for a particular decision, whose interests are not directly affected by the outcome of the decision.

Process structures relate to designed ways to utilise the previously readied assets. Eisenhardt and Martin identify resource integrations such as product development (Nieves and Haller, 2014, p. 225; Regner, 2008, p. 568; Eriksson, 2014, p. 72) to be a key process. This requires managing bottleneck resources, ensuring continuous supply, and calibrating them to the specific needs of the situation. It also requires the decision to set the boundaries of an organisation. That is to decide to which extend value creating or value adding processes should remain inside the organisation.

2.3.2.3 Reconfiguring

As the first two dynamic capabilities are used to identify and exploit an opportunity, the third is about adapting organisational assets when the opportunity changes (Ambrosini et al., 2009, p. 9). Depending on the industry, changes may occur at different rates, and thus require a different adjustment by the organisation (Eisenhardt and Martin, 2000, p. 1106). A special capability is required for doing so, because the management systems established in the second DC are impervious to unnecessary change (biases), but have become likewise resistant to necessary change (Kay, 2010, p. 1213). One output of the second level might be a strongly hierarchical process and a reward system specialised at making efficient decisions towards the previous definition of value and the success this system has created in the past. These successes and the previous elimination of biases in itself creates a change resistant bias. Reconfiguration towards a new goal or a new opportunity as detected by the sensing capability takes a strong leadership and a powerful management with a high level of knowledge. Constantly re-examining requires three skills: cospecialisation, governance, and knowledge management.

Cospecialisation refers to the re-assembling of the previously discussed infrastructure. It demands the continuous adjustment of the systems, assets, and decision-making process to reach the strategic fit. Governance supervises the company from an internal perspective and in general has four main functions (Lahn et al., 2007): Operation, Strategy, Policy, and regulation related decision making. For the purposes of the context of the third DC, governance is to supervise the board to avoid complacency. It directs incentives to avoid aforementioned agency conflict based on changing goals. Knowledge management is an integral aspect of both the first and third level DC (Nieves and Haller, 2014, p. 226). While in the first it is related to gathering opportunities and threats from the outside and directing it to the inside, the third level concerns itself with readjusting information flows, knowledge levels and intangible assets throughout the organisation. This involves the introduction of learning and feedback processes, as well as intellectual property rights. In conclusion, organisations striving to maintain long-term alignment need to continuously examine and re-examine themselves. This means the organisation has to internally examine if assets still fit, if knowledge is proper, if both fit, and if the structures are sufficient.
2.3.2.4 Best practise

Best practice gives examples of how organisations can combine all three levels of dynamic capabilities to execute processes and adapt to a changing environment. The analysis of best practice in dynamic capabilities is based on Eisenhardt and Martin’s framework (2000, p. 1107). Because this thesis is adapted to the case of police Scotland, two examples have been selected: product development and resource integration.

In product development, the first level DC is needed for an organisation to select which new product should be considered. Because of the multitude of aspects of any product a similar multitude of stakeholders have to be considered informed and supervised. This requires dynamic sensing capabilities: customers have to be studied in the form of market surveys. Competitors, suppliers and barriers have to be analysed in the form of market research (Porter, 1979, p. 139). All aspects of the new product have to be in line with internal resources and capabilities. These are including but not limited to financial resources and necessary skills. Each decision has to be made by the appropriate person, and may change dynamically according to the product in question (Grant, 1996, p. 110). The communication within cross-functional teams is also one aspect that has been investigated by the literature (Teece et al., 1997, p. 517). The second level DC is necessary for both the product selection and product execution (Blau et al., 2004, p. 228). Product selection requires the analysis of the difference between the current and the necessary structure in decision-making, process and infrastructure. This capability is dynamic, because each new product will interact differently with the current portfolio of products and capabilities. Resources are often shared amongst products and processes, knowledge may be path dependent and skills might benefit from learning curves and produce synergy effects. Product execution requires the deployment of human resources from diverse backgrounds. The third level DC is necessary for new products to coexist among old products, which may have a different necessary system or definition of value (Rungi, 2010, p. 94). The reengineering of business values, and indeed definitions of values can only be facilitated by these DCs. In conclusion, all three DCs are necessary to develop, deploy and reengineer a portfolio of successful products (Voss and Kock, 2013, p. 847).

The second example of DC best practice is to resource gain and release (Eisenhardt and Martin, 2000, p. 1108). As observed in the elaboration of the RBV firms can be considered to consist only of valuable, rare in imitable and organisational resources, which provide the firm with SCA (Barney, 1991, p. 100). Their gain and release is necessary to happen in accordance to the business needs. In accordance with the previous chapter, these resources need to possess ex post and ex ante limitations (Leiblein, 2011, p. 912). Sensing capabilities required to identify which resources in the market can be acquired below future market price. Sensing capabilities also required to identify how these resources once integrated into the firm can be protected by ex ante limitations. Once the sensing capability has identified an appropriate resource in the market this season capability is necessary to integrate said resource into the resource portfolio, which makes up the firm. To make the best out of each resource infrastructure and systems are required. The third level DC is necessary to identify which of the resources within the firm no longer fits the strategic objective. The third level DC must then identify if the resource should either be modified or excluded from the firm’s portfolio. This process is most commonly observed with knowledge. Companies may use consultants or new employees to acquire tacit knowledge identified by the human resource department. Explicit
knowledge will bought in the form of market surveys, market reports, books, or access to databases.

2.3.3 Conclusion of Dynamic Capabilities

The number capabilities allow firms to adapt to ever-changing market by assessing the abilities to sense and seize opportunities and reconfigure existing assets to meet new demands. In doing so they manage both the arrangement of resources and general flow of knowledge in specific. However, the literature agrees, that the area is not fully developed yet in theory and empirics. Examples come from the British Journal of Management with its special call for papers and reputable authors such as Helfat (2007, p. 116).

2.4 Project Interdependency Management

The aim of this subchapter is to present an overview of Project Interdependency Management (PIM) which will start with a brief description of PM and PPM from where PIM originate. Subsequently, a significance of PIM will be showed alongside with different types of project interdependencies and its best practice.

2.4.1 Theoretical background

2.4.1.1 Project Management

This chapter exist, as literature review concerning PM is necessary in order to answer our Research Question, as Police Scotland is an organisation that uses projects to introduce their organisational changes.

Project management (PM) has developed from a management philosophy limited to a small number of functional units and regarded rather as something fashionable to have to an organisational Project Portfolio Management (PPM) system influencing every functional area of the organisation (Kerzner, 2013, p. 1). As during the past thirty years, projects have dominated a great number of business activities, some academics argue that we live in the era of “projectification of society” (Midler, 1995, p.172; Lundin and Söderholm, 1998, p. 451; Maylor et al., 2006, p. 664, Dahlgren & Söderlund, 2010, p. 381; Lundin, 2011, p. 45). A growing number of project-based organisations are seen as a result of high competitiveness, high complexity of organisational activities, and the growing popularity of PM tools (Cleland, 1999, p. 29; Webb, 1994, p. 356).

Nowadays organisations tend to base most of their functions on projects (Shenhar et al., 2001 p. 699, Reyck et al., 2005, p. 524; Voss and Kock, 2012, p. 567). They became a common way of developing and marketing new products and services, introducing organisational change, implementing business strategies, creating competitive advantage, developing innovation and delivering meaningful benefits for project stakeholders (Voss and Knock, 2013, p. 847; Morris & Jamieson, 2005, p. 5; Pellegrinelli, 2011, p. 233; Shenhar et al., 2001, p. 700; Winter et al., 2006, p. 701; Newell et al., 2007, p.33). The visible sign of projectification is a fact that decisions concerning project investment became essential to the realisation of organisational strategy (Maylor et al., 2006, p. 283; Thiry and Deguire, 2007, p. 72). According to PMBOK (2013, p.3), which is a book representing global standards, guidelines and rules for PM, projects are short-term ventures undertaken to generate unique product, service or results. In other words, the
main aim of the project is to produce deliverables, which have business value, short or long-term (PMBOK, 2013, p.14, Kerzner, 2013, p. 5). Similarly, most literature defining project states that they are temporary organisations initiated to achieve pre-specified objectives, within a constricted period of time, and in a relatively autonomous way, stated by an organisation’s rules and routines (Newell et al., 2007, p. 33). It leads to what Engwall (2003, p.789) describes as ‘lonely phenomena’ of projects. According to him and a few scholars (such as: Brown and Eisenhardt, 1997, p. 6; Eskeröd, 1998, p. 128; Hobday, 2000, p. 874), PM is dominated by its isolated perception, usually discussed from a single project manager perspective. As a result, the project has a tendency to be considered individually and consequently its success or failure factors are considered only to the specific project (Löwendahl, 1995, p.348; Morris & Hough, 1987, p. 28; Pinto & Prescott, 1990, p. 319). In the similar manner, other scholars argue that there exist a specific ontology in which projects are understood as a discrete, specific entities, and that is considered as one of the weaknesses of PM (Chia, 1995, p. 585, Lineham and Kavanagh, 2006, p. 503; Pellegrinelli, 2011, p. 7).

As PM has gained on popularity and from its engineering and construction roots widespread on more diverse organisations various approaches and methodologies toward initiation, planning and execution of project were developed (Whitty, 2011, p. 523; Ghosh et al., 2012, p. 4). There do not exist a common agreement which methodology is the best one however it is possible to differentiate the most popular approaches: the traditional approach, PRINCE2, agile project management and critical chain project management (Kousholt, 2007, p. 60; Whitty, 2011, p. 520). The traditional approach, also called “waterfall” project management focuses on five stages on a project: initiation, planning, execution, controlling and completion. This approach is most commonly used for large development projects (Wysocki, 2011, p. 57). PRINCE2 (PRojects In Control Environments) is a flexible but structured process-based PM standard (Ghosh et al., 2012, p.11). It focuses on defining and delivering products. Inside this methodology projects are output-oriented. It puts importance on change control and quality requirements. PRINCE2 is the standard for government agencies in the UK (Ghosh et al., 2012, p.11). Furthermore, PRINCE2 can refer to the certification, which prove accredited qualifications (Young, 2011, p. 50). Agile project management focuses on adaptability to constantly changing environment, regular feedback and constant human collaboration. This approach constantly tests projects during its development. Similarly as “waterfall” project management, most commonly agile is used for project concerning software development (Opelt et al., 2013, p. 89). Critical chain project management, also called critical path, differs from previously presented approaches by focusing on schedules and tasks. This methodology mainly focuses on issues regarding solving problems concerning resources (Leach, 1999, p. 40).

To sum up this part, PM has grown on importance and strongly developed during the past decades however a dynamic environment and increasing complexity of projects caused that PM is just a part of a bigger system, which is described in the next subchapter.

2.4.1.2 Programme and Project Portfolio Management

This subchapter will define programme and portfolio management to be the result of grouping commonly themed projects together and forming the base for PIM.
The increasing popularity and growing number of projects resulted in grouping and managing together projects, which aims to accomplish specific strategic goals (Görög, 2011, p. 17). Such a group of projects, which can obtain advantages not accessible from managing them separately, is called programme management (PMBOK 2013, p. 8). Projects inside the programme are strongly interconnected during their implementation process (Görög, 2011, p. 17). Furthermore, its management and coordination is noticeably more complex and challenging than the implementation of single projects (Maylor et al., 2006, p. 120). According to the PMBOK (2013, p. 8) projects within one programme are linked through the jointed outcome or common capability. In a case where projects are connected only through a common client, seller, technology or resource they out to be managed as a portfolio of projects. Project interdependencies are one of the focuses of programme management, which make it possible to define the best approach for managing them (PMBOK, 2013, p. 8). In the past decade, the importance of Programme and Portfolio Management increased as it is regarded as one of the methods of aligning projects with strategy, providing suitable resourcing for projects and encouraging organisations in various industries to extend their PPM competences (Crawford, 2006, p. 38; Maylor et al., 2006, p. 128). According to Petit (2012, p. 539) traditionally the aim of PPM is seen as providing support of selecting and undertaking the right projects. PPM can be defined as successful if it carries a benefit of evading inefficient project and intensifies project success rate in an organisation. In the literature benefits of effective PPM are broadly discussed; scholars stress PPM’s role in creating financials benefits (Cookie-Davies, 2007, p.234). They notice that effective PPM helps not only to avoid unfavourable investments but also provide flexibility within organisation in constantly changing environment (Laslo, 2010, p. 609) and in a long-term perspective it allows organisations to remain sustainable (Elonen & Artto, 2003, p. 395). Killen and Kjaer (2012, p. 554) emphasises that PPM requires analyses of numerous aspects and the ability to predict alternative consequences in the future in order to effectively support and improve strategic portfolio decision making.

Recently scholars started to broadly recognise that projects do not exist in isolation but are strongly affected by uncertainties of their own environment, other projects in the portfolio and also, by uncertainty of those projects (Killen and Kjaer, 2012, p. 554; Rungi & Hilmola, 2011, p. 147; Hamidovic and Krajnovic, 2005, p. 679, Hossain and Ruwanpura, 2008, p. 421). Even as a great majority of PPM tools provide a portfolio level view for making decisions, projects are still treated as an isolated entity. While PPM matures, project complexity and interdependency increase and it is no longer sufficient to apply traditional PPM tools that consider projects as independent of each other (Perminova et al., 2008, p. 265). In project portfolios many interdependencies exist and they need to be understood in order to conduct effective decision making (Blau et al., 2004, p. 138; Verma and Sinha, 2002, p. 450). According to Ariture et al. (2009, p.34) already in PM interdependencies are complex and difficult to predict, however in PPM they became even more challenging and it becomes necessary to manage them properly. Scholars mutually agree that already managing a portfolio of projects with its uncertainty, constantly changing environment, and complexity pose a multi-dimensional challenge, which is amplified by the presence of interdependencies (Collyer and Warren, 2009, p. 56; Perminova et al., 2008, p. 265). Furthermore, the management of interdependences is an area of weakness for PPM that needs further improvement (Elonen and Artto, 2003, p. 87).
2.4.2 Introduction to the Project Interdependency Management

After establishing the current state of project, programme, and portfolio management and their need for PIM, this subchapter will discuss definitions and relevance of PIM.

2.4.2.1 PIM’s Definitions

Interdependencies widely described in literature to the extend, that some sources are calling for a new paradigm of connection and high interdependence (Covey, 2006, p. 136). Even as they are precisely described in many fields, such as human resources, construction, ecology, medicine, and risk management, literature still identifies a literature gap concerning interdependencies in PM (Staudenmayer, 1997, p. 2). In Project Management literature there exists a high level of vagueness and confusion regarding the concept of interdependencies, they tend to be discussed from different point of views and are related to different fields (Staudenmayer, 1997, p. 3).

Project Interdependency Management (PIM) is most commonly applied, when estimating a projects accurate value creation (Santhanam and Kyparisis, 1996, p. 393), by recognising the costs and benefits that emerge, when multiple projects are executed at once. Likewise Schmidt (1993, p. 403) described interdependencies as interactions in the PPPM system (Santhanam and Kyparisis, 1996, p. 380; Blau et al., 2004, p. 229) with a problem solving capability. Interdependencies have mostly been studied in an empirical background (Rungi, 2010, p. 95; Schmidt, 1993, p. 403), noting their high importance and broad application (Verma and Sinha, 2002, p. 451; Blau et al., 2004, p. 231). To accommodate this, several subgroups of interdependencies have been recognised by a majority of authors: Internal interdependencies such as resource interdependencies (Santhanam and Kyparisis, 1996, p. 382; Blau et al., 2004, p. 233; Verma and Sinha, 2002, p. 451; Schmidt, 1993, p. 404), financial or outcome interdependencies ((Blau et al., 2004, p. 233; Schmidt, 1993, p. 404). Technology (Santhanam and Kyparisis, 1996, p. 382; Verma and Sinha, 2002, p. 452; Schmidt, 1993, p. 404) or knowledge interdependencies (Rungi, 2010, p. 96) represent very similar relations under different names. Externally there are market interdependencies (Verma and Sinha, 2002, p. 451; Rungi, 2010, p. 102).

2.4.2.2 PIM Relevance

This part will focus on arguing for the importance and benefits of PIM in organisations. The importance of PIM is discussed in standards for PM and PPM, such as PMBOK (2013, p. 6). Nevertheless, many scholars argue that there exist a lack of clear understanding and definition of PI (Killen & Kjaer, 2012, p. 555; Staudenmayer, 1997, p. 27; Rungi & Himola, 2011, p. 158). Furthermore, in the literature there is a common agreement that management of implementing a project programme or portfolio is much more complicated and complex than management of a single project (Görög, 2011, p. 19; Maylor, et al. 2006). As PPM develops, a level of project complexity and interdependency increase thus application of traditional PPM tools is not enough. Especially as majority of PPM tools focuses on each project separately (Görög, 2011, p. 22; Staudenmayer, 1997, p. 17).

Management of project portfolios itself is a sophisticated multi-dimensional challenge on strategic importance which is only increased by present of project interdependencies (Görög, 2011, p. 22; Collyer and Warren, 2009, p. 361; Perminova et al., 2008, p. 75; Stummer and Heidenberger, 2003, p. 178). In such circumstances PI need to be identified
and comprehended in order to have an effective and balanced decision making processes (Blau et al., 2004; Killen & Kjaer, 2012, p. 554; Verma and Sinha, 2002, p. 461). Consequently, well-managed PIM effects in well-selected projects whose completions’ success rate is higher (Rungi, 2010b, p. 1). What more, as influences between projects are identified it accelerates obtaining project’s outcomes (Verma and Sinha, 2002, p. 451) and allows faster and easier problem solving (Patanakul and Milosevic, 2008, p. 124).

Furthermore, implementation of PIM is recommended in development of highly complex products or services requires management simultaneous of multiple projects together, which are often distributed across the whole organisation and may, or may not, occur at the same time (Newell et al., 2008, p. 34). Other scholars highlight the importance of PI in a situation when interconnected projects occur in very diverse periods of time (Verma and Sinha, 2002, p. 452; Maio et al., 1994, p. 183). Chinovsky et al. (2011, p. 172) argues that thanks to PI project managers are provided with a critical capability to recognise misalignments that can cause project vulnerability and hinder project effectiveness. Similarly for the importance of PIM argues Sanchez et al. (2009, p. 18) who states that it is a strategic matter for organisations.

However even as literature highlights the importance and effectiveness of PIM still there exist a lack of sufficient understanding of both: PIM’s definition in the literature and its methods and tools in practice (Collyer and Warren, 2009, p. 359; Söderlund, 2004, p. 659). Furthermore, Elonen and Artto (2003, p. 397) describe PIM as one of the weak point of PPM. One field that explores interdependencies deeply is the construction sector, but with a focus on tasks or activities and not on the project level (Kjølle et al., 2012, p. 81).
2.4.3 Resource Interdependencies

This subchapter will give an overview of the literature concerning resource interdependencies to establish the setting for introducing best practice in resource dependency management. An overview of recent dependency management best practice can allow the empirical study to identify processes that fall into the category of resource dependency management and identify if and how these practices have been used.

This paragraph will introduce resource interdependencies and make an argument why they are relevant to be studied. Resource interdependencies concern the effects of sharing assets among various projects, so that their implementation together will need fewer resources than each project separately (Santhanam and Kyparisis, 1996, p. 382; Blau et al., 2004, p. 233; Verma and Sinha, 2002, p. 451; Schmidt, 1993, p. 404). Literature identifies three prominent parallels to the RBV: Both seek a Strategic Competitive Advantage (SCA) by increasing efficiency (Rungi, 2010, p. 102; Wernerfelt, 1984, p. 173). Both concern the effects of common units (Staudenmayer, 1997, p. 29), though RBV more in general and resource interdependencies more in specific. Both try to optimize the distribution of VRIO resources, such as uniquely skilled human resources, IT hardware (Santhanam and Kyparisis, 1996, p. 394), and the creation of learning curves (Blau et al., 2004, p. 233) through projects. The ability to be yield tangible benefits, in the form of cost savings and portfolio optimisation have lead it to Resource Interdependencies being heavily featured amongst the interdependencies.

Literature on the topic of resource interdependencies is both rich and diverse: Rungi’s empirical studies revealed knowledge and resource interdependencies to be in the consciousness of 91% (Rungi, 2009) of companies. Practise of these interdependencies was present regardless of size and industry (Rungi, 2010, p. 100). His studies demonstrated, that resource and knowledge interdependencies were also linked with higher project success rate (Rungi, 2010, p. 101), at a higher cost especially in the case of R&D projects. Rungi couldn’t explain this phenomena, but linked it to human motivation and the need for post positivistic (i.e. quantitative) approaches. Patanakul and Milosevic (2009, p. 229) list interdependency management and the more general inter project process as two of their three deciding factors for multi-project management. They highlight the importance of resource allocation. Teller et al. (2012, p. 600) considered interdependencies in general and resource interdependencies in specific as an indication for project complexity and as such a relevant predictor of project outcome. Santhanam and Kyparisis (1996, p. 382) consider resource interdependencies in the project selection stage. Their perspective is to select the best project based on a realistic estimation of costs and benefits. Weingartner’s (2012, p. 600) approaches the topic from a capital budgeting background. His definition of resources for the calculation of resource interdependencies is of a purely financial kind. Thompson (1967) described physical resource interdependencies as inverse interdependencies because their distribution to one project would necessary result in the denial to another project. Rinaldi et al (2001, p. 11) specified resource interdependencies to infrastructure interdependencies and understands four sub-categories: Physical, cyber, geographical and logical. Physical and cyber interdependencies treats the flow of tangible and intangible assets, respectively. Geographical interdependencies regulate physical effects in physical press proximity. Logical interdependencies are more related to task than to resource management. In conclusion, literature paints a diverse picture of resource interdependencies that is very
closely related to how the authors define the term resource. The focus on cost savings through synergy effects however, can be observed in almost all instances.

**Best practise and tools in Resource Interdependency Management**

Schmidt, one of the pioneers of complex interactions in portfolios, considered quantitative modelling for multiple characteristics the best way to select and predict the behaviour of multiple projects (Schmidt, 1993, p. 404). His approach to resource interdependencies was not so much based on their management, but on their integration within a complex system of interactions that could lead to a suboptimal decision making process. However, his matrixes depend on a quantifiable world and a total predictability of outcomes and probabilities of success. Similarly, to select a project under the most realistic conditions Santhanam and Kyparisis (1996, p. 382) utilise nonlinear programming and an ambiguous resource definition. Weingartner (1966, p. 485) improves upon this approach, by expanding the methods of programming (linear, integer, and dynamic programming, nonlinear utility functions and expected value maximisation) under different circumstances (Lorie-Savage, Interdependent Projects with and without budget constraints, uncertain / probabilistic considerations, R&D project selection), as well as specifying the resource to be purely financial. These models allow what-if scenarios and are superior to simpler scoring and ranking in ensuring resource feasibility, but are too quantitative to include a complex world.

Patanakul and Milosevic (2009, p. 229) mention that, while scheduling algorithms may be useful at times, their rigidity is misplaced in a dynamic environment. Instead, they suggest to start by connecting multiple projects via shared functional resources and time and then plan the schedule around that. For them an ideal model will be as simple and practical as possible. The authors also focus on stressing the need for a project manager with fitting competencies, such as multitasking and leadership. Killen and Kjaer (2012, p. 557) suggest resource interdependencies to be tackled with scheduling optimisation systems, which practitioners consider ineffective, due to their large requirements (Coldrick et al., 2005, p. 185). They suggest visual representations to increase usefulness. While single matrices like the Dependency Structure Matrix are only used for single project activity interdependencies (Shi and Blomquist, 2012, p. 503), a combination in a domain mapping matrix can allow two projects’ resource and information flow to be linked (Danilovic and Browning, 2007, p. 301). Killen and Kjaer (2012, p. 564) conclude that visual mapping is a key tool for providing understanding. The concept of graphic mapping and matrix as a tool has also been developed in the context of project selection, as applied by Darvish at al (2009, p. 617). Their selection process has to consider a number of factors, resource consumption and savings being key among them. Shakelford and Corne (2001, p. 1131) focus on the management of resource interdependencies from a practitioners point. They highlight the need to consider resource interdependencies when planning, to ensure a smooth transition, early finish, and cost minimisation, especially in large-scale portfolios. The authors suggest a combination between using software tools, which do a bulk of the scheduling work, and integrating the master planners tacit knowledge and awareness for factors outside the software’s capabilities, such as informal interdependencies, urgency, customer satisfaction issues, environmental issues, resource skills, and political issues. To ease data access for planners, the authors recommend using only Gantt chart and Resource Profile for first data access. In conclusion, the second set of authors highlight the need for a mixed approach with some quantitative elements, but with enough space to include the complexities of reality.
Verma and Sinha (2002, p. 451) primarily highlight resource interdependencies. They suggest, that the two reasons resources are not present in projects are, that they don’t exist in general in the organisation, in which case they have to be developed, or because they are tied up in another project. In both cases, this causes a discontinuity in the project execution (Verma and Sinha, 2002, p. 460). To mitigate such effects they suggest organisations to identify their own capabilities and to decide which phases of the project execution are possible in-house. If the resources are available, early planning and periodization is necessary to guarantee continuity. If they are not, outsourcing is necessary. In both cases, Verma and Sinha suggest interdependency modelling. Blau et al’s (2004, p. 244) perspective on resource interdependency was comparable to Verma and Sinha’s as the article stressed the need for resources to ensure project continuity. The approach differed by using a quantitative scheduling optimisation model to ensure correct alignment. The best results however were yielded when determining which stages to outsource. They also highlight the use of charts, especially bubble charts, to increase understanding about project resource use and prioritisation. In conclusion, the third stream in literature focused on creating an understanding for a strategic perspective.

2.4.4 Knowledge Interdependences

This subchapter will discuss knowledge related interdependencies. It presents its definitions and the diverse understanding in the literature related to the interdependencies’ importance, advantages, practical application and hinders.

As generation of a new knowledge increased its speed, there exist a growing number of specialist working only on particular projects. Information became one of the most valuable item and interdependencies related to knowledge collecting, recording and sharing became an object of researches (Berends 2005, p. 98, Niedergassel and Leker, 2010, p. 142). It shares a theoretical foundation with the Knowledge Based View (KBV): Both stress the importance and uniqueness knowledge in a firm’s strategy.

Even as the importance of information and knowledge sharing, organisational learning and lesson learned are numerous mentioned in the PM literature (Cooper et al., 2001, p. 248; Killen et al., 2008; Kim et al., 2011, 482; Killen and Kjaer, 2012, p. 558) interdependencies related to knowledge in the field of PM have not received much attention from the scholars. While resource-based interdependencies are differentiate by all scholars which follow interdependencies typology by nature (Schmidt, 1993, p. 404; Santhanam and Kyparisis, 1996; Verma and Sinha, 2002, p. 451; Zuluaga et al., 2007, p. 27; Killen and Kjaer, 2012, p. 560, Teller et al., 2012, p.600) only three of them describe interdependencies directly related to knowledge.

Teller (2012, p. 600) distinguishes knowledge interdependencies, which he describes as the ones that appear when the knowledge developed in one project is significant for another project. He stresses the benefits of transferring process knowledge among projects and sharing knowledge among project teams (p. 598).

Verma and Sinha (2002, p. 451) differentiate two interdependencies connected with knowledge: technology and market interdependencies. They describe technology interdependencies as those which appear as an outcome from leveraging the same technology among different projects. The authors indirectly highlight the importance of cross-sectional team members working on interdependent projects in order to facilitate
knowledge sharing process. The second interdependency type, related to knowledge is market interdependency, which occurs from introducing a novel product into already existing market place or from using existing product’s market knowledge for introducing new product for a different market.

Killen and Kjaer (2012, p. 560) under a name of learning interdependency describe a very similar one to Teller’s knowledge interdependency: the one which appears when there is the necessity of using the capabilities and knowledge developed through another project.

As it is shown, there do not exist one clear term describing interdependencies connected to knowledge or learning. For the use of our thesis for further references to knowledge and learning related interdependencies, we will follow Teller’s name and definition of knowledge interdependencies.


Also other scholars agree that management support in encouraging collaboration, information sharing, lesson learned practice and creation of cross sectional team members has an important influence on successful outcome of project knowledge interdependencies (Jonas, 2010, p. 820, Aritua et al., 2009, p. 73). The learning cycle plays a significant role in managing interdependencies between projects and in avoiding the same mistakes as it allows lessons learned to be seized and transferred to the present interdependent project or to be used in the future (Davies and Brady, 2000, p. 940; Kerzner, 2004, p. 62). Williams (2007, p. 23) argue that thanks to the right culture and the right processes an organisation can learn from the past and avoid reinventing the wheel. Similarly, Verma and Sinha (2002, p. 451) argue that having knowledge-related interdependencies significantly facilitate or accelerate projects. Also, in case when all of team members lack experience and knowledge in a specific field, through the synergies with interdependent projects, inter-project learning can occur and facilitate the project. The authors (p. 460) emphasise importance of a project team which has a good knowledge and experience in technology already used by the company as it allows to leverage this knowledge and facilitate planning and allow to solve problems when they occur. It allows faster and cheaper achievement of project outcomes. Verma and Sinha (2002, p. 451) conclude that technology interdependencies leverage existing knowledge, which has a positive effect on projects, and improve inter-project learning.

Nevertheless, inside an organisation there exist barriers, which hinder learning and knowledge transfer. One of this impediment is a nature of project itself, as project has a temporary structure which create a tendency of knowledge caught in knowledge silos and consequently, not shared among other projects (Brady et al., 2002; Lindkvist et al., 1998, p. 935). According to Zika-Viktorsson et al. (2006, p. 386) human resources are obstacles toward leveraging knowledge. They argue that people involved in too many projects and without a break between various assignments show a decrease in motivation and working performance which has a negative impact on knowledge sharing process, especially tacit knowledge one (Tiwana, 1999, p. 51). Most of the challenges related to knowledge management also occur in management of knowledge dependencies. Similarly, there exist difficulties with collecting, storing and sharing data connected to knowledge (Tiwana, 1999, p. 76).
2.4.5 Conclusion of Project Interdependency Management

To sum up the chapter concerning project interdependency management it is necessary to highlight its usefulness in managing projects and benefits which it provides, such as: acceleration of achievement of project outcomes, facilitation of project management or saving money through more efficient usage of resources. In literature the most widely described are resource interdependencies thus they also seem to be the most relevant, as they offer practitioners immediate results in time and budget. Best practice illustrated that the most commonly planned for resource is HR, which matches it with literature’s conclusions from the RBV. The spectrum of practices ranges from very quantitative, such as linear programming, to quantitative aids, such as scheduling tools, to qualitative tools, like visualisation. In the literature they do not exist one common about the name and exact description of interdependencies related to knowledge however many different authors describe their benefits using for them different names. In terms of knowledge interdependencies, what most authors stress is a need of an open organisational culture, which encourage learning and information sharing in order to manage knowledge interdependencies.

2.5 Research Diagram

The literature review chapter discussed the two concepts that form the basis for answering the research question, dynamic capabilities and project interdependencies, as well as their theoretical background, the RBV, KBV, and PM.

The theoretical diagram in figure one demonstrates how three functions in the dynamic capability approach, sensing, seizing, and reconfiguring, are grouped together in three levels. The diagram furthermore shows which practices can be found in organisations that incorporate dynamic capabilities, i.e. environmental scanning, infrastructure building, and cospecialisation. On the flipside, this figure also incorporates the nations of interdependencies as grouped together into resource and knowledge interdependencies. In continues by illustrating the practices, which are most commonly found in organisations that consider PIM, such as quantitative modelling and shared technology. The diagram concludes by showing the case study as the middle of both streams, as this study investigates the connections between the two in the case of Police Scotland.

This figure will serve as an overview of theoretical streams both to conclude the literature review, but also to highlight our choices in the chapters “Analysis” and “Discussion”.
Our research question is about exploring the connection between different interdependencies and levels of dynamic capabilities. This chapter provides a deeper understanding of their origin, value, and level specific practises. These will form a framework for identifying and relating observations at Police Scotland.
3 Research Methodology

This chapter will argue for our choices within the research methodology, by narrowing down from our overarching philosophical stance, to our reasoning, to our research design and finally our research methods. The selection process has been largely influenced by our research question, but tries to acknowledge personal bias.

3.1 Philosophy

This subchapter will discuss our research philosophy in terms of both ontology and epistemology. This will provide a perspective for the decisions we made regarding research methods and analysis of our findings. In both cases, we will first provide insight in what influences our position and then relate it to the relevant literature. The selection of the researchers’ philosophy is of essential importance as it underpins the later selection of research strategy and research methods (Saunders et al., 2009, p. 108). In the context of this study, the selection of ontology and epistemology are the primary concern.

Ontology describes the nature of social reality (Long et al., 2000, p. 190). It is essential to discuss ontology, because its perspective creates a world from which to draw assumptions about knowledge and the correct use of methods. According to Burrell and Morgan (1979, p. 22) it can be conceived as a spectrum from objectivism to constructivism. Objectivism would suggest that social constructs are real and exist outside of the participants’ perception. Facts can be assigned to describe these repeatedly and independently of the observer (Bryman and Bell, 2011, p. 16). Subjectivism, or in other sources constructivism (Fosnot, 1996, p. 66) suggests that social constructs are constantly re-envisioned by the participants. Facts about social constructs are dependent on a non-repeatable observation. One example of such a perspective is the study by Thomas and Linstaed (2002, p. 71), who analysed the objective characteristics of middle-management and found them to be highly dependent upon the individuals’ position. Literature agrees that neither extreme is entirely fruitful, but that most authors can be found somewhere along this axis. One position that developed in the middle ground is that of realism, as described by Bhaskar (1998, p. 22). In the literature, there exist a distinction between two main forms of realism: direct realism and critical realism. Direct realism states that background and experiences provide a researcher with a precise perception of the world thanks to what reality can be understood by the usage of suitable actions and measures. Critical realism is an ontological stance where individuals do not perceive the world directly. It implies that researchers experience only a part of a greater picture (Bhaskar, 1989, p. 2; Saunders et al., 2009, p. 115). To sum up, critical realism support the view that truth is what we perceive through our background and experiences as reality. Similarly to positivism it assumes an objective perception of the world (Saunders et al., 2009, p. 114).

The suitable ontology was selected based on the research question and a critical analysis of the researchers’ own bias. The discussion of dynamic capabilities is rooted in the idea, that organisations can possess certain abilities. Furthermore, our theoretical foundation is the RBV and the KBV. The RBV’s assumptions require different organisations to be heterogeneously composed of certain elements. This would speak towards an organisation with objective set of characteristics, independent of individual perception. The KBV suggested that tacit knowledge is intransferable and bound to the individuals. This would lead towards a subjective reality as defined by the organisational members.
and their knowledge. Combining those two perspectives leads to ontology on neither end of the extreme, but leaning towards critical realism.

Epistemology concerns the nature of knowledge itself and has been characterised to range from interpretivism to positivism (Morgan and Smircich, 1980, p. 492). Interpretivism takes its cue from philosophers such as Weber and his idea of understanding (verstehen). To arrive at an understanding of reality, one has to be familiar with the meaning of social interactions and link them together in a causal way. Positivism is an expression of modernism’s orientation to the scientific method (Saunders et al., 2009, p. 113). It aims to describe the world, in which only phenomena exist which can be linked causally by the laws of nature. Both extremes have been critiqued by Hume’s truism (Smith, 2006, p. 195). It dictates that the social reality can never have repeatable circumstances that are strictly necessary for positivistic approach. At the same time, the complete abandonment of objective rules nullifies the explanatory power of the interpretive approach. The only viable approach under the circumstances is that of realism (Bhaskar and Archer, 1998, p. 24). It proposes a nondeterministic notion of causality to allow imperfect knowledge to make imperfect predictions and comparisons about the social reality. Realism as epistemological stance allows the researcher to be biased by cultural experiences, background and world views (Saunders et al., 2009, p. 114).

The suitable epistemological stance was based on the research question and the researchers’ bias. Our research question discusses interdependencies, the causal relationship between two aspects of projects. To predict any kind of interaction, reality must abide by certain set principals. This perspective excludes pure interpretivism. Yet the notion of knowledge as the intransferable property of organisational members draws attention towards the interpretivistic trends in our perspective. To include the two extremes this paper will use the perspective of realism.

### 3.2 Reasoning

#### 3.2.1 Consideration of prior research

As discussed in the subsection “Motivation” our research is inspired by an internship conducted by the authors at Police Scotland. To give context for further discussion and decisions, this subsection will outline its content and influences.

Both authors were part of a team of students selected for Police Scotland’s Dependency Management unit from the 13th of January until the 13th of February 2014. The main aim of the internship was to critically review a common approach for Dependency Management, resulting in useful practices in Police Scotland’s Transforming the Service (TTS) portfolio. To achieve this aim it was necessary to exactly define the term “dependency”, followed by a diagnosis of Police Scotland’s “common approach” for Dependency Management and finally, to provide recommendations. In the first two weeks of the internship not all students had received an official disclosure, which enables working with Police Scotland’s database. The first two weeks were dedicated to academic research during which students found definitions of dependency, differentiated it from product/deliverable, found meanings and approaches toward dependency management in other fields of science and became familiar with a case of Police Scotland’s reform through articles in the press. In the end of the second week all internship’s participants received a disclosure which enabled them to visit Police Scotland Business Change
Research Methodology

Department and work with internal data. Students visited Police Scotland’s Headquarters three times: on Monday 27th, Tuesday 28th and Thursday 30th of January. While being in the Police Scotland Business Change Department they became familiar with internal information about the change process and conducted interviews with people from the Dependency Team. Based on previously gathered information from both research of the literature and interviews, during the fourth week students were reviewing Police Scotland’s common approach toward a Dependency Management, preparing operational recommendations, strategic recommendations and finding the best practices. The internship was completed with two presentations in which students demonstrated the results of their internship. The first presentations took place in the Police Scotland’s Headquarters on 12th of February in front of the officers from the Police Scotland. The second presentation was at Heriot-Watt University on 13th of February with students, professors and people from other industries as an audience. The study leads the students to specific and general findings.

The specific findings concerning definitions and improvement of dependency management were not used any further for this study, as they were not framed by sufficient academic understanding of PIM and were not investigating any connections to DC. Furthermore, the recorded interviews were not included in the data collection, as they were not executed according to the same interview guideline and general standard of quality. In conclusion, no specific piece of information gathered in the internship was used for this study.

The general findings, concerning a lack of academic research on the topic of “dependency management” in the field of project management as a response to changing environments however can be credited as the inspiration for this study. This curiosity about this connection is the essence of the later research question. In detail, this means that after completing the internship, the authors were interested in the topic of dependency management and independently studied the literature. It was at this point that the connection to the term “Project Interdependency Management” was made as the academic term referring to the observed situation. The context of changing environments that was first discovered in Police Scotland’s transformation processes inspired the interest in the organisational capability to respond to dynamic environments. Further studies in this field quickly lead to the topic of DC. In conjunction, the topics were found to be individually well studied but remained as unexplored in connection as it had first seemed. This loose literature research lasted from the middle of February until the beginning of the fall semester 2014. The overall output of internship and loose literature review were the keywords used in the main literature review, as described in the literature strategy.

3.2.2 Inductive and Deductive

The research approach highlights which direction logical reasoning follows (Saunders et al., 2009, p. 124): deductive and inductive. This subchapter opens a discussion concerning both of them and argues why in our studies the authors decided for a mainly inductive approach.

Deductive argumentation is connected to laws and long-range theory (Acedo et al., 2006, p. 32). They build upon this existing knowledge to develop a hypothesis and test it empirically (Bryman, 2012, p. 24). The deductive approach searches for the causal
relationship between variables and is therefore often used in combination with a positivistic research philosophy. Inductive argumentation is connected to observation of social interaction (Bryman, 2012, p. 25). Inductive approaches finalise their hypothesis after their first observation. The major contact to long-range theory here is the output of the raw data analysis, namely the theory construction (Saunders et al., 2009, p. 126). The inductive approach searches for understanding of non-mechanistic research subjects and are often used in combination with an interpretivistic research philosophy. These “how” and “why” questions can often only be answered by qualitative methods, because they are more closely related to an ambiguous approach (Saunders et al., 2009, p. 127). However, literature recognises that the strict dichotomy can often be misleading (Hakim, 2000, p. 149, p. 127): A mixed approach is often possible and strongly based on the case.

As shown in figure 4 the reasoning in this study is based upon a nine-step process divided into the internship and the study. As discussed above, the output of the internship and the ensuing interest was the discovery of a research gap related to a set of keywords in PIM and DC. This process fits the above mentioned description of an inductive approach to research.

In step three, the main literature review provided a framework for understanding the situation as well as outlining the size of the possible research gap. The deep evaluation of literature to guide further research is a deductive element.

In step four, the selection of an appropriate research design, based on step three, hints at a deductive approach.

Step five concerns a pilot study conducted by the authors. It was conducted after the initial literature review into the topic of PIM and DC, two weeks before the main study. Two organisational members (Respondent 1&2, see Chapter 5.3 “Overview of Respondents) were randomly selected to test the strength of our interview guide and review which elements of the literature review would be most relevant in this study in step six. In response, the interview guide was simplified as e.g.: respondents had problems with understanding what exactly term “resources” mean. Similarly, it was discovered, that the literature review of resource interdependencies should include more “best practise” examples to identify practises at Police Scotland more easily. Taking deep insights from data to refine a study points into the direction of inductiveness. Pilot study and response will be mentioned again in the chapters “Selection of Respondents” (3.5.1) and “Collection of Data” (3.5.2).

Finally, the analysis and inferring of theory from the main study in steps seven, eight and nine are classical elements of the inductive study as well. In conclusion, our research
approach is mixed, due to the complexity of the situation. Inductive elements however are both at the beginning and the end, suggesting dominance.

3.3 Design

The aim of research design is to create a structure describing a method of data collection (Bryman and Bell, 2011, p. 69; Creswell, 2009, p. 233). The use of research design reflects the authors’ research philosophy as well as intent of the study.

One possibility to classify a study’s intent is their prioritisation between the weighted goals of explanation, exploration, and description (Barney and Clark, 2007, p. 138). Explanatory elements seek to prove of statistical correlation or causation between several variables. Exploratory elements pursue putting problems or phenomena into new light in order to understand them more clearly. Descriptive elements give accurate accounts of a situation and form the forerunner for explanatory research. It is important to keep in mind, that most studies and designs reflect multiple interests. The five most commonly cited research designs elaborated in table 1:

<table>
<thead>
<tr>
<th>Case study</th>
<th>Case studies, but are usually said to be the intense analysis (Eisenhardt and Graebner, 2007, p. 25) with the unit of analysis including organisations, relationships (Easton, p. 118) or the contemporary descriptions of recent events. Case studies are predominantly answering “what”, “how”, and “why” based research questions (Yin, 1989, p. 8), with a strong focus on a distinct perspective or circumstance. Case studies have been described to have “fuzzy” (Gerring, 2004, p. 345) borders, because their widespread use. Different authors have argued for the value of scale single case studies (Easton, 2010, p. 15) while others have promoted the value of multiple case studies (Eisenhardt and Graebner, 2007, p. 25). Furthermore, case studies have been demonstrated to produce both qualitative and quantitative data (Bryman and Bell, 2011, p. 68).</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-sectional</td>
<td>Cross-sectional research designs often employ survey strategies to obverse a single phenomenon at a particular time (Saunders et al., 2009, p. 155). This research design has been connected to quantitative methods in order to provide a strong explanatory conclusion about the correlation among multiple individuals, while limiting the influence of time on biasing research results. Qualitative data has been linked to cross-sectional research designs through the use of content analysis for documents and interviews of multiple sources (Bryman and Bell, 2011, p. 59).</td>
</tr>
<tr>
<td>Comparative</td>
<td>Comparative research design uses a similar method in two or more contrasting cases (Bryman and Bell, 2011, p. 63). Its purpose is the logical conclusion by comparison of meaningfully contrasting situations. This research design is commonly used when answering cross-national and cross-cultural research questions which have in last decades of globalisation experienced a strong growth (Hantrais, 2009,</td>
</tr>
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30
Longitudinal research designs aim to explore, explain, or describe the development of a subject individual or organisation over an extended period of time (Saunders et al., 2009, p. 155). Long term engagement allow researchers to identify and control the effects of multiple variables to a high degree of reliability while reducing the effect of a single outlyi[217x619]ng moment (Pettigrew, 1990, p. 267).

The experimental design allows the research a maximum amount of control over variables and subjects in order to explain the cause and effect relationships. This research design is most prominently linked to quantitative data, i.e. in the form of time and motion studies (Bryman and Bell, 2011, p. 45) and objectivist philosophies.

Table 1: Research Design Overview (Bryman and Bell, 2011, p. 68):

The selection of a single case study as the most appropriate research design for this study was based on conclusions from our philosophy, reasoning, and research question.

Our research question calls for the exploration of the relationship between two phenomena, dynamic capabilities and specific project interdependencies. As described in the literature review and introduction, this intersection is a previously undiscovered topic. The argument of methodological fit as described by (Edmondson and McManus S., 2007, p. 1160) argues that nascent research fields are most suitably explored closely to phenomena and interviews. The authors also relate the field of nascent theory to Eisenhardt and Graebner (2007, p. 26), who describe case studies to fit inductive, theory driven research questions, because they can offer insights into complex social processes. Saunders et al. (2007, p. 146) confirms that case studies are ideal for answer “how” questions in the exploratory direction. Yin especially confirms this to be true for context driven research. Eisenhardt and Graebner (2007, p. 27) argue that the unique context of case studies is well equipped for choosing a scenario that can trigger the unique and novel subject of the study. Stake (1995, p. 3) adds that case study research is used as an instrument for understanding this particular phenomenon. This study answers a “how” question to explore a new area. It is driven by the phenomena observed in a very specific context combining both dynamic capabilities and interdependency management. Yin describes this context as a “revelatory” case (1989, p. 44) and likewise assigns it to the single case study.

The research reasoning also had a strong impact on our selection of the single case study. As described above, the inspiration and first contact with the topic came from a single case. The authors acknowledge that this is likely to have biased the selection. However, upon deciding for the topic our investigation confirmed the aforementioned uniqueness and context specificity that fits to the case study’s characteristics. The selection between a single and multiple case study, was based on a focus of exploration in favour of explanation. While single case studies can be used to generalize (Easton, 2010, p. 15), the
studies focus is more in the exploration of possible overlaps than in statistically significant implications.

Finally, the research philosophy had an impact on our choice of design. The position of critical realism suggests, that the social world is governed by laws, which govern the relationships between social constructs, making it approachable to the generalisation from findings, as suggested by single case study (Smith, 2006, p. 192). However, the immeasurability of these laws, as defined by critical realism deviates from the perception required by objectivist designs such as the experiment. Authors, such as Easton (Easton, p. 118) set a strong academic precedent in this connection.

3.4 Data
The type of data obtained in a research study can range from qualitative to quantitative (Creswell, 2009, p. 12). Qualitative data may consist of text, words, and images, so long as they are not pre-structured. It often assumes the ontology of an open social world that cannot be captured in a laboratory environment (Morgan and Smircich, 1980, p. 495). This argumentation draws on anthropological arguments and allows process data about why and how changes happen. Quantitative data may equally consist of text, words, and images, but only if researchers are able to categorize and code all possible responses (Bryman and Bell, 2011, p. 151). The underlying thought is, that social responses are objectively measurable and situations controllable, like a laboratory. By studying quantified observations, the (social-) scientist may learn about elementary lawful regulations in the world (Morgan and Smircich, 1980, p. 496).

There exist two reasons, which link this study more closely to qualitative data, than to quantitative: research question and methodological coherence. The research question tries to answer how project interdependencies are connected to dynamic capabilities. We strive to analyse words and text with an open mind to discover new theory, making quantification of answers impossible. Secondly, while mixed methods and pragmatism are becoming increasingly popular (Morgan, 2007, p. 65), there is a strong argument linking an inductive theory building to qualitative data (Edmondson and McManus S., 2007, p. 1160).

3.5 Methods
This subchapter will illustrate by which means we obtained the data for our empirical study to best answer our research question and maintain validity.

3.5.1 Selection of respondents
The selection of a research subject in answering an exploratory research question is dependent on its unique and valuable perspective. As argued by Stake (1995, p. 6), the opportunity to discover new findings is the primary target. Eisenhardt and Graebner (2007) argued that the best selection for a case study is to find an extreme example representing the extreme of phenomena. Thus to explain the connection between dynamic capabilities and interdependencies management our primary aim was to find an organisation exhibiting both to a high degree in a unique setting. As described in our research approach, we had been exposed to the situation at Police Scotland before
selecting this topic. This opens the question of a biased selection. However, we conducted an in depth study of the explicit use of project interdependency management, to the extend of dedicating a department to it without results. Upon asking, we were also able to identify, that we were the first research institution that had been allowed access to the inside of this change process. To confirm, if our organisational selection was appropriate and to increase our validity, we conducted a pilot study including two respondents. Their answers to our first question structure confirmed that we would be able to gather both unique and useful data. The use of a single organisation corresponds to the characteristically small sample size of qualitative studies (Miles and Huberman, 1984, p. 23).

Our selection of the unit of analysis is the activity configuration. To analyse the practise of interdependency management within the context of Police Scotland’s large scale change with a high degree of validity we had to have enough members of the organisation in focus to observe their network of interdependency measures and the unique perspectives and practises. Activity configurations describe a certain combination of actors, structures, and practises in a dynamic environment (Peteraf, 1993, p. 574) introduced this unit of analysis in the context of dynamic capabilities and exemplifies its usefulness in a change context.

In order to increase the validity within the organization respondents were selected in a way to reveal as many perspectives on dependency management as possible. For this reason, we selected members of the dependency management unit as well as the manager of the dependency management unit as well as members of strategic planning and programme support were purposefully sampled. Purposeful sampling allows researcher to select the respondents that can yield the highest benefits (Teddlie & Yu, 2007, p.81). Similar to the unique case study, the focus is on . Given the size of the organization and the number of departments after ten respondents we saw a rapid decrease in usefulness, as we had sampled a nearly 20% of members. This correlates with what literature calls “theoretical saturation” (Fowler, 2009, p. 43) after the relative size of sample in relation to the size of the population.

### 3.5.2 Collection of data

*In order to fully understand the complicated situation and the detailed use of interdependency management we used semi structured interviews as well as primary and secondary data from the organization.*

To collect data in a qualitative case study, Saunders *et al.* (2009, p. 19) lists four ways: primary data through interviews, primary data through observation, secondary data, and primary data through questionnaires. Because we follow an inductive reasoning, our goal in data collection was to be as open as possible. For this reason, we employed all methods, but the questionnaires, as they are not as suited to open ended answers. In the following, we shall explain in which ways we used the remaining three methods to collect data:

Primary data through interviews was selected as our main data input, as interviews can provide researchers with extensive amounts of data for answering research questions for many different purposes (Saunders *et al.*, 2009, p. 320). Through different interview types, different kinds of data can be gathered, but the most common are structured, semi-structured, and unstructured interviews (Bryman and Bell 2011, p. 205). Structured interviews allow interviewers to gather pre-coded data from respondents, while
minimizing bias and maximizing reliability. Some sources refer to them as interviewer-administered questionnaires (Saunders et al., 2009, p. 320) and their responses can be easily quantified. Semi-structured interviews predetermine a general list of topics or questions to be covered, but allow the nature of the dialog to influence the direction and content. These interviews are non-standardised and generally more qualitative. Unstructured interviews follow no predetermined structure and are entirely exploratory and qualitative.

Our research approach description highlighted, that our investigation was an iterative processes between literature and empirical data that was started by unstructured interviews. Robson confirms this approach, especially for exploratory studies (Robson, 2011, p. 58). These raised the issue of interdependency management in connection with dynamic capabilities. Our main data collection used semi-structured interviews. This allowed us to gather in depth information and regard the individual perspectives by modifying the structure and content. Following from the detail and perspective oriented goal, two interviewers guided one interviewee through the process. This allowed the interviewers to specialise on a topic, guide the conversation, and closely observe at the same time. The interview outline treated the topics of project interdependencies and dynamic capabilities separately, and at no point did we directly indicate that we were looking for overlapping practices. Only if the interviewees would explicitly mention something direct questions would be asked. This strategy was employed to avoid bias. The use of more than one interviewer has been established by Bechhofer, Elliott, and McCrone (1984, cited in Bryman and Bell 2011, p. 206), to be helpful in unstructured or semi-structured interviews. Furthermore, after a pilot study with two officers we rephrased the questions in order to avoid academic terms. Especially the word “resource” caused problems, until it was replaced. Furthermore, we shortened the questions to make them more open ended and to not stress the interviewee. Our questions were in some part based on existing questionnaires, i.e. by Nieves and Haller (2014, p.229) for the subtopics. Directly after the interview, transcription followed.

Figure 5: Interview Guideline (See appendix A for interview questions)
Primary data was also obtained via observation. Since we conducted our primary interviews via Skype Video Chat, we were able to record and analyse our participants’ body language in response to our questions. The data only served to supplement already made observations in the semi-structured and unstructured interviews.

Lastly, secondary data was integrated into this study, by getting access to the Organisational Change Database and the Project Management Newsletter. Both of these sources were accessed independently of the interviews. In some instances, such as in the visualisation charts and project plans these documents allowed us to gain deeper insight into a topic of which we were already aware. The use of multiple sources to increase depth has been labelled triangulation (Creswell, 2009, p. 213; Denzin and Lincoln, 2005, p. 443) Kanter, 1977, quoted in Bryman and Bell 2011, p. 397)

3.5.3 Measurement Properties

One of the main attributes characteristics of research value is its credibility that reduces probability of obtaining biased answers (Saunders et al., 2009, p. 156). Credibility consists of two factors: reliability and validity, which are discussed below. According to Saunders et al. (2009, p. 156) reliability is defined as an extent to which data collection and analysis methods result in persistent and logical findings, validity refers to an extend to which data collection and analysis measure properly what they were designed to measure.

Reliability

Reliability reflects the extent to which the design of the reassert allows to repeat the research and obtain logical findings. Most commonly, it is assess by answering the question if results can be the same in different period or if there exists transparency in withdrawing conclusions from collected data (Easterby-Smith et al., 2008, cited in Saunders et al., 2009, p. 156).

LeCompte and Goet (1982, cited in Bryman and Bell 2011, p. 395) divide reliability into external and internal. External reliability defines the extent to which a research can be retaken, which is challenging in social setting, which are under constant changes. Internal reliability focus on an extent what was heard and seen by researches and what was said and happened in reality. Reliability is an arguable concept in qualitative methods, strongly embedded in quantitative research (Silverman, 2006, p. 282). Its worthiness is questioned in qualitative research, as it is focus on social world, and not as quantitative on natural.

According to Robson (2002, p.102) there exist four main challenges threatening the reliability of the research: participant bias, participant error, observer error and observer bias. To ensure reliability Yin (2003, p. 34) suggested undertaking an appropriate measures. If case study is in question, to ensure reliability, Yin proposes to create a case study database. It should include all collected data; the importance of transcription of interviews or questionnaire responses is highlighted here. This should enhance reliability of the research. Guba and Lincoln (1994, cited in Bryman & Bell 2011, p. 398), in case of qualitative research proposed to focus on dependability instead of reliability. Similarly as Yin, they state that to achieve it, researchers ought to keep records of each phrase oft he research and make it accessible to others.

To guarantee the reliability of qualitative research it is needed to have prolonged period with an investigated phenomena. Extended engagement is necessary to understand the
phenomena and create in-depth questions and considerations about the phenomena (Lincoln & Guba, 1986, p. 18). As before conducting the research we had a possibility to have an internship in headquarters of Police Scotland we had a direct contact with the described phenomena involving PI and DC. Additionally, nearly half of the interviews who conducted was with police members that we already knew from in person thanks to our internship.

**Validity**

Validity states if a research measure what it was design to measure and if the findings target at what they supposed to focus (Saunders *et al.*, 2009, p. 157). Similarly as with reliability, according to LeCompte and Goet (1982, cited in Bryman & Bell 2011, p. 395) there exist two types of validity: external and internal. External validity, also called generalizability, is an extent to which findings can be extent to the less specific criteria, outside the research context. Internal validity defines how well empirical observations fit to the theoretical framework of the research.

According to Silverman (2006, p. 304) and Saunders *et al.* (2009, p. 158) in case of qualitative research external validity is arguable as qualitative methods by its nature are focuses on “contextual uniqueness” (Bryman and Bell 2011, p. 398). However, Silverman (2006, p. 304) goes further and argues that qualitative methods can be generalizable to a certain point, if an adequate sampling technique is applied. Internal validity defines is findings are answering what they were design to answer, if they are trustworthy to actors involved in the research and independent readers, and also if the findings are logic and consistent (LeCompte and Goet, 1982, cited in Bryman and Bell 2011, p. 395; Miles and Huberman, 1994, p. 278). In case of this study, the internal validity was ensured by clarifying the concepts that were investigated (which can be seen in literature review) and by consulting an external auditor, which is the research supervisor of this thesis.

3.6 Research Ethics

Diener and Crandall (1978, p. 128) identified four principles to guide ethical behaviour in social research: They are to avoid invasion of privacy, deception, or harm to participant and promote informed consent. Other authors agree with this list, and add the promotion of accuracy (Porter, 2004, p. 140).

Privacy of respondents somewhat conflicting with the case study’s objective of using the specific and unique context to draw conclusions. In order to mitigate the effect we anonymised the respondents name but maintained a detailed description of their roles and responsibilities. Combined with the fact, that positions at Police Scotland are not publicly available, multiple people occupy most positions, and police officers quickly change positions, we can guarantee privacy. Harm to participants did not occur, as the study was relying on Skype interviews and did not require any further participation. Since we asked subjects to tell us about their perceptions of the organisational change process, honest and negative answers could negatively impact officers reputation at their workplace. In effect, protecting their privacy shielded the participants from harm.

Avoiding deception is to state the purpose of the research clearly (Bryman and Bell, 2011, p. 136). In some cases, a controlled amount of deception is necessary to maintain accuracy, as prior knowledge could influence the outcome of studies (Bryman and Bell, 2011, p. 137). In our case we maintained a balance, by clearly informing the participants about the nature, topic, and method of the interview. We did not deceive respondents, but
Research Methodology

we also did not give them the questions ahead of time to avoid pre-prepared answers and obtain an honest response. In the same move as informing the respondents about topic of our research, we also obtained explicit informed consent. All respondents went so far as to agree to publish their name, for the reasons mentioned above, we did not.

Our research question is about exploring the connection between different interdependences and levels of dynamic capabilities. This chapter explains the authors’ decision to select an inductive, qualitative, study, focussing on interview data and adapting a critical realist perspective. Their implications will be seen in chapter five.
4 Police Scotland

This chapter will provide the context for the analysis and discussion. To do so, it will outline the organisation of Police Scotland and its current programme for change.

4.1 Programme for change

The Police and Fire Reform Act 2012 created a new model for delivering police services in Scotland. The Scottish Government set three main objectives for the reform. The first one is to improve and protect local services despite financial cuts, which should be achieved by stopping duplication of support services without cutting the frontline. The second objective is to create an equal access to specialist support and national capacity, when and where they are needed. One example would be the murder investigation team and firearms teams. The third objective is to reinforce the contact between police services and communities. This should be obtain by creating a new formal relationship with all 32 regional councils, creating opportunities for more local members to have, in their area, a formal voice in police service, posing a better integration with communities planning partnerships.

The effects of the Act brought together the eight territorial police forces: Central Scotland Police, Dumfries and Galloway Constabulary, Fife Constabulary, Grampian Police, Lothian and Borders Police, Northern Constabulary, Strathclyde Police and Tayside Police, and the specialist services of the Scottish Police Services Authority and the Scottish Crime and Drug Enforcement Agency into two new national bodies. These are the Police Service of Scotland and the Scottish Police Authority (SPA) (Police Reform, 2013, p. 5; Outline Business Case, 2011, p.7). The merge of the eight forces into a single Scottish police service was one of the biggest reforms in Scottish public sector since devolution in 1998 and the most significant change in policing since 1967. The Police Scotland in its present form was created on 1st of April 2013. This date is widely recall as the Day 1.

One of the main drivers of the reform, although not a started objective, was to save money. According to the Scottish Government previous structure with eight police forces was unsustainable of public sector spending reduction (Police Reform, 2013, p. 5). The government expects £1.1 billion savings by 2026, however it has not been specified how these savings will be achieved (Police Reform, 2013, p. 6; The Economist, 2013). The reform transferred shifted approximately around £1.1 billion of annual spending and more than 24,000 people, including 17,496 police officers. What more, it moved responsibility for policing to central government from local government.
4.2 Police Portfolio Structure

The aim of this subchapter is to introduce reader to the structure of Organisational Change Unit which is the unit responsible for Project Interdependency Management.

Police Scotland is an organisation that employs Project Portfolio Management (PPPM), supported by PRINCE2 methodology. Nevertheless this methodology is adapted to their own needs and requirements. As in case of our thesis we are focus on Business Change (since April 2014 Organisational Development) unit we will focus on the insightful description of that unit and its PPPM strategy.

On a day of 16th of November 2014 Organisational Development unit was working on 67 projects. They all are inside a portfolio, which is named Transforming the Service (TTS). Inside the portfolio projects are divided into Developing Portfolio that contains 24 projects and Approved Portfolio which has 43 projects.

Inside Organisational Development unit there exist three subunits: Portfolio Management, Change Management, Strategic Planning and Development. Inside each subunit there exist supporting teams that offer help to Project Managers in every stage of the project and assist with any required documentation. Portfolio Management provides programme support and coordination. Change Management delivers Assurance & Integration, Programme Assurance, and Change Communications. Strategic Planning delivers annual plans and developments. (Organisational Development Newsletter, May, 2014, p. 1)

As a part of Police Reform’s processes a team of four police officers was created, called the Day 1 Team. The purpose of this team was to deal with daily issues that could potentially threaten the delivery of Police Reform. They tend to deal with resources conflicts (which can be recognise as logical interdependencies) and scheduling problems (logistics interdependencies). As the team proved their usefulness and interdependencies occurred to play an important role in PPPM, after the 1st of April 2013 the Day 1 Team was transformed into a Dependency Management Unit.
According to Police Scotland’s internal documentation (National Police Reform Programme, Dependency Management Process) the Dependency Management (DM) process was one of the National Police Reform Programme’s processes whose aim it was to improve effective local services, enhance the efficiency of Police’s service delivery, modernise and simplify strictures and guarantee long-term finance sustainability. Even as the primary documents differentiate both dependencies and interdependencies (National Police Reform Programme, Dependency Management Process) later on it becomes clear that Police Scotland use only term “dependency” to refer to both dependencies and interdependencies.

4.3 Dependency Management Practice

This subchapter contains a brief introduction to PIM practice in Police Scotland, which give bases for deeper understanding of conducted interviews and importance of the findings.

The dependency management was introduced to support projects within the National Police Reform Programme. According to the internal documentation of PS the necessity for dependency management occurs when one project depends on the results of other activities within the organisation. Dependencies could be raised on products, activities or milestones outside the control or delivery responsibility of the programme or project manager who is raising the dependency. A failure in recognising and communicating dependencies is seen as a contributory cause of project failure.

In PS dependency is understood as “any activity, deliverable or product or an associated attribute of a product not resourced or funded by a Project upon which the Project is dependent to meet its own objectives” (National Police Reform Programme, Dependency Management Process, p. 4). Furthermore, dependency management is internal procedure for PS, thus not used for e.g.: external suppliers, or external factors like legislative. PS highlights importance of identifying all dependencies that affect all the projects. Besides, requirements for meeting dependencies need to be defined and accepted. Also, potential failures and its consequences need to be recognised. According to PS’ internal documentation thanks to dependency mapping project risk can be identified and recorded.

Our research question is about exploring the connection between different interdependencies and levels of dynamic capabilities. This chapter provides the context for answering these questions. The Scottish programme for change necessitates dynamic capabilities, the police portfolio structure shapes organisational behaviour, and the dependency management practices represent the final response to these circumstances.
5 Data Presentation and Analysis

This chapter will explain the three steps in the analysis phase: selection of framework, coding based on research question, and presentation of data in the selected categories.

5.1 Template analysis

One of the outcomes and biggest challenges of semi-structured interviews are large quantities of rich data, which need to be analysed (Waring et al., 2008, p. 85; Bryman & Bell, p. 94). Likewise, it is necessary to create an analytical strategy inside the interpretive process to make it clear that the research is coherent and valuable. (Waring et al., 2008, p. 86). In past decades template analysis popularity rose as a tool for dealing with large volumes of textual material from field notes and transcript from semi structural interviews. Template Analysis displays some similarities with the grounded theory however, they emerged during the 1990 and shortly after gained wider credibility in the USA and Europe (King, 1998, p. 120; King, 2004, p. 256; Waring et al., 2008, p. 86).

Template Analysis includes coding a large quantity of text thanks to which segments, which focus on a specific topic, and can be collected in an interpretative process (Crabtree and Miller, 1999, p.53, King, 2004, p. 56; Waring et al, 2008, p. 86). This dualism of objective categories and subjective interpretation is a reflection of our critically realistic research philosophy. In our thesis, we will use a framework presented by Nigel King, the leading researcher in the field of template analysis in Europe. According to King (2004, p. 260) the complete analysis include:

1. Creation of a code or coding pattern
2. Coding the text from primary data collection (see appendix B)
3. Categorisation of segments in order to obtain all similar text in one place
4. Analysis of the segment and making connections that are afterwards corroborated and legitimised.

As the interviews were conducted to answer the research question, the following thesis codes for all the three levels of DC, resource interdependencies and knowledge interdependencies. Furthermore, as our research questions connect different levels of DC with two different types of PI the coding patterns for which we have searched are two-dimensional. For each level of DC we are looking for mentioned suggesting existence of knowledge of resource project interdependencies. The coding pattern is presented in a table below.
### 5.2 Coding

#### First Level DC

<table>
<thead>
<tr>
<th>Environmental Scanning</th>
<th>Codes</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managing by walking about</td>
<td>WAL</td>
<td>Stakeholder links</td>
</tr>
<tr>
<td><strong>Knowledge Facilitator</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perception of knowledge</td>
<td>AccPer</td>
<td>Organizational knowledge awareness</td>
</tr>
<tr>
<td>Procedural knowledge</td>
<td>PrcH</td>
<td>Declarative knowledge know what</td>
</tr>
</tbody>
</table>

#### Second Level DC

<table>
<thead>
<tr>
<th>Infrastructure</th>
<th>Codes</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Machinery, Location</td>
<td>MAL</td>
<td>Sustainable business eco-systems</td>
</tr>
<tr>
<td>IT</td>
<td>IT</td>
<td></td>
</tr>
<tr>
<td><strong>Decision making</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unbiased</td>
<td>UNB</td>
<td>Rational</td>
</tr>
<tr>
<td><strong>Process structures</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Managing bottleneck resources</td>
<td>BOT</td>
<td>Calibrating processes</td>
</tr>
<tr>
<td>Ensuring continuous supply</td>
<td>CS</td>
<td></td>
</tr>
</tbody>
</table>

#### Third Level DC

<table>
<thead>
<tr>
<th>Governance</th>
<th>Codes</th>
<th>Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cospecialization</td>
<td>COSP</td>
<td>Iterative Learning</td>
</tr>
<tr>
<td><strong>Resource Interdependency Management</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Quantitative Modelling</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonlinear Programming</td>
<td>NLP</td>
<td>What-If simulations</td>
</tr>
<tr>
<td><strong>Qualitative</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shared functional resources</td>
<td>SFR</td>
<td>In-house out-house considerations</td>
</tr>
<tr>
<td>Scheduling optimization</td>
<td>SO</td>
<td>Interdependency modelling</td>
</tr>
<tr>
<td>Master schedulers knowledge</td>
<td>MSK</td>
<td>Considering RI when planning</td>
</tr>
<tr>
<td><strong>Increasing understanding</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bubble charts</td>
<td>BC</td>
<td>Gantt chart</td>
</tr>
<tr>
<td>Resource charts</td>
<td>RC</td>
<td>Prioritization</td>
</tr>
<tr>
<td><strong>Knowledge Interdependency Management</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shared Technology</td>
<td>TECH</td>
<td>Culture promoting knowledge sharing</td>
</tr>
<tr>
<td>Using capability or knowledge developed in a different project</td>
<td>UsKnw</td>
<td>Accelerated projects because of similar situations</td>
</tr>
<tr>
<td>Faster achievements of project outcomes</td>
<td>Fast</td>
<td>Cross-sectional team members</td>
</tr>
</tbody>
</table>

Table 2: Coding Structure
5.3 Overview of respondents

Respondent 1  Constable Continuous Improvement
Respondent 1 recently joined the Change Management Division. On a daily basis, she interacts with executives and project managers by coordinating and documenting projects. She is also responsible for the project manager newsletter.

Respondent 2  Sergeant Organisational Change
Respondent 2 joined organisational change and dependency management with a 17-year background in the Criminal Investigations Division (CID).

Respondent 3  Inspector Programme Coordination
Respondent 3 joined organisational change 18 months ago, after 23 years of operational experience, looking for further improvement options. He now fulfils a high level strategic function.

Respondent 4  Sergeant Strategic Planning
Respondent 4 has a diverse background in crime prevention, licensing, and resource management. His current primary concern is the creation of value in Police Scotland as well as the long-term planning.

Respondent 5  Project Manager
Respondent 5 has recently moved towards a position of supervising the revision of criminal investigation processes.

Respondent 6  Project Manager
Respondent 6’s primary task is managing the renewal of Police Scotland’s intelligence system. In his secondary task, he is coordinating and linking a number of staff members in the areas of procurement and IT.

Respondent 7  Project Manager
Respondent 7 is facilitating organisational change by improving leadership knowledge, engaging in finance, adapting security standards and managing the International Development Unit.

Respondent 8  Project Manager
After years of operational policing, Respondent 8’s objectives are projects that improve Police Scotland’s internal alignment within the change process. She focusses on the development of intelligence systems as well as the personnel development.

Respondent 9  Sergeant Strategic Planning
Respondent 9’s function in the strategic planning division is the environmental scanning of terms of both opportunities and risks. He also provides a comparison of the annual strategic objective with the actual behaviour.

Respondent 10  Portfolio Support Manager
Respondent 10 facilitates business change in a variety of ways from a strategic perspective. His methods include design and implementation of
new procedures, models, solutions, and standards on project, programme, and portfolio level.

5.4 Data Presentation

5.4.1 First Level DC: Sensing

Links to stakeholder

A majority of the interviewees suggested, that their work is focussed on internal project management and they don’t have much contact with people from outside the Police Scotland. This became especially evident when asked whom they considered to be their customer, only three responded with “the public”. The other seven considered their managers and other higher in a hierarchy supervisors). However, a few of the interviewees mentioned theirs connections with stakeholders. One of the interviewees, Respondent 7, mentioned partnerships with international organisations and he judged it as very beneficial as it “allows Police Scotland to create value”. Also, ”dependence with European Union” was mentioned as “EU puts out tenders for large organizational development projects”. Another issue linked to stakeholders is the freedom of information act, which also was reported by Respondent 7. It is the law regulating the behaviour towards companies or individuals who wish to obtain more information about Police Scotland.

Another interviewee, Respondent 9 who works in strategic planning and whose main task is environmental scanning mentioned Scottish Government’s engagement with Police Scotland. He regarded both the overall governmental impulse in starting the centralisation, as well as the more frequent changes in laws and regulations.

Knowledge facilitator

“There is always an outgoing support. Project managers can just pick up the phone anytime a day to speak to Organisational Development unit and from Dependency Management point of view we normally tend to speak to Project Managers probably on daily bases.” Respondent 10

Inside the topic of “Knowledge Facilitator” literature differentiated four subtopics: accurate perception of knowledge, organizational knowledge, procedural knowledge, and declarative knowledge. However, interview analysis in this case revealed, that all three types of knowledge are very strongly connected thus we discuss them together.

According to the interviews in the Police Scotland there exist a number of elements proving an easy access to knowledge and constant expert help in case of any doubts or lack of procedural or declarative knowledge. Organisational newsletters, monthly project managers meetings, Change Champion, IT Police System and PM Centre Database improve organisational knowledge level, allow equal and almost instead access to the information. As Respondent 10 the Inspector Programme Coordinator noted, “when someone seeks advice or guidance, somebody that might be new to this environment, we instantly give them a quick overview of the business”.

According to interviewees and documentation, every new person in the Department is provided with workshops conducted by Superintended Brian Rogers, the Deputy Head of
Organisational Development. The workshops are designed for “first line project managers as it was identified that there was a knowledge gap”. There is also another course for project managers, which is conducted by Respondent 10 who differentiated the two courses as follows: “Brian does an introduction explaining people what they can expect from different departments and what we expect back. My workshop is more an introduction for starting a work on a project. Mine is more technical.” In the past each new project manager were sent to Prince2 course, but it turned out to be very costly and time consuming. As project managers change very often, Police Scotland decided it didn’t bring back enough value and started its own courses. Respondent 3 reported that courses organised by Police Scotland are even more valuable as they “provide more specific Police Scotland knowledge and learning.”

According to interviewees, the Organisational Change Unit always “provides clarity to each of the project managers”. Furthermore, project managers can make an appointment with Organisational Change Unit. In such a situation, one person from Organisational Change Unit is delegated to help project manager over a dependency mapping which shows all the dependencies within the project. According to Respondent 3, its main aim is to provide support and expert knowledge of processes inside Police Scotland to project managers.

Interviewees uniformly reported, that one of the best tools providing accurate perception of knowledge, procedural knowledge, and declarative is IT Police System. It is divided into the parts, which are accessible to all the police members and PM Centre where all project members are involved. Seven correspondents mentioned its advantages and usefulness, stating that it helped them to gain a deeper understanding about projects and people involved into projects. Respondent 1 described it as “an internal IT system where it is possible to keep track all projects. We see which projects have been improved and which are developing”. Nonetheless, six correspondents mentioned some problems or issue connected with lack of knowledge. According to some interviewees who have a position of project managers it sometimes happens that “people don’t know key data concerning projects”. Respondent 3 mentioned “a lack of understanding about the organisation” and lack of “staff with a very good knowledge of Police Scotland and projects within Portfolios”. Nevertheless he noticed that Police Scotland is already started developing a new process to overcome this issue. To solve this problem a position of a Change Champion was created, as “an individual who has experience already from the past and knowledge about policing”. Respondent 1 raised another type of lack of organisational knowledge. Even as she was familiar with IT Police System and praised benefits of PM Centre didn't know where are stored information related to previous projects however she said that she it would be “that would be useful to have to learn about previous projects” so she will learn more about it.

5.4.2 Second Level DC: Seizing

Location

The topic of location and changes in location are seen as an important point by multiple sources. The merger of eight Scottish police forces requires members from all parts to work more closely together, both in terms of content and geographical situation. The demand for cooperation has not yet been fully realised and leads to some instances of redundancies. Police Scotland deals with this in several ways: Some of our interviewees
still predominantly work within one local office. Others work in a mixed situation, combining long distance management with local support staff. Others attempt to completely decouple physical interaction from interdependency management with one “virtual control room” (Respondent 2). Our respondents were motivated, not only, because of improved processes, but also, because aside from internal problems national security is strictly tied to changes in location.

“I work in a satellite office just about five miles away from my home. So I come to a small police station, I have my room with the computer in a separate room for videoconferencing (…) I have several members of staff working for me in this building full-time and in Glasgow in about half a dozen people in various places in various percentages of the time.” Respondent 3

Information technology

Respondents constantly highlighted the both to which extent they already use IT to facilitate the change process, and what needed to be done to maximise outcomes. Historically Police Scotland has always had an integrated database, which is a supporting factor in this change process, as well as basic IT tools. Respondents especially praised the interlinked databases between data entry and law enforcement, in comparison with the systems in England and Wales, which “don’t talk to each other” (Respondent 6). Respondents often stated using an additional set of software to support the change. This ranges from online packages like their intranet learning platform to an elaborate hardware and software feedback system to fine tune project work.

However, interviewees also expressed disappointments about IT performance, citing it frequently as a cause for project problems. Project delays were reported in internal and external communication, as well as to factors such as training delivery, due to a lack of IT availability. Particularly impressive was the uniform IT focus, when asked which single resource could improve performance.

“A dedicated ICT technician (…) That might sound really basic and straightforward, but you know that would be real possibility to improve the work that were doing. ICT first I would have to say.” Respondent 6

Creating sustainable ecosystems

The interviewees reported two main features contributing to their development of sustainable ecosystems in this change process: The long-term HR strategy and the modification of IT infrastructure. The HR strategy is trying to fix the current, unsustainable ecosystem. Police Scotland’s two-class system of employees described to be the source of some problems in this transformation process. Civilian staff can stay long-term in managerial tasks and build up knowledge, whereas officers, due to their rotations have a better grasp of the field. Their rotation however interrupts project cycles and takes key knowledge away from the situation. To create a sustainable system Respondent 3 suggested improving “longevity of staff”. According to Respondent 8, this could be achieved by adjusting the rotation cycles to match project live cycles. According to Respondent 10 improving efficiency by matching the right human resource, with the right situation would be key, as well as reducing administrative set up costs. IT resource modification was reported to create a sustainable ecosystem, by predicting current and
future staff requirements. Systems were made to be “future proof” (Respondent 6) based on user requirements.

**Decision making structures**

To implement their change processes correctly, interviewees reported three decision-making structures: Decisions about strategic changes were made by committee, decisions about budget changes were made based on pre-established rules or logic, and future decision making was outlined to integrate programming. Firstly, strategic level respondents were especially highlighting multi-functional teams to make decisions. Respondent 10 described his meetings to always include members from each of the strategic branches “our technology, our people, our organizational support, our finances”. Discussions and decisions were always made in this group, and he reported a high awareness of what is going on in all of these areas. Secondary, the budget focus of this change programme resulted in a majority of respondents mentioning a special decision making form for financial decisions. In these cases not a single committee, but rather formally designed rules, guidelines, and logic that were used. Finally, one respondent, whose speciality was the implementation of a new intelligence system, outlined the future of decision making. These will be able to include budgetary considerations and linear programming solutions: Respondent 6 pointed out, “the system will suggest the next decision for you, by linking both criminal and administrative systems to reduce mistakes. All of these decision-making systems reported being aware of biases to some extent. Respondents reported that the overall goal of saving resources pressures project managers to judge situations differently. Optimism bias was reported to encourage benefit realisation, sometimes at the cost of quality.

> “is quite a challenge to get access to that (budget). But of course you have to spend money to save money in the long term. And so long as you can actually prove this logic, you will get your funds.” **Respondent 9**

**Bottleneck resources and continuous supply**

Interviewee’s responses pointed out, that both bottleneck resources and continuous supply in Police Scotland was largely overlapping, due to their focus on human resources. The bottleneck resources to facilitate change in Police Scotland were answered almost uniformly with a call for specific skills in the form of human resources. Respondents would strongly prefer to ask a colleague with a specific skills for advice or help, rather than accessing formalised knowledge. This lead to a bottleneck in the specialists’ schedule and, according to Respondent 2 “projects suffer slightly of time delays”. Their continuous supply is in high demand and was reported to be disrupted by simple things, such as holiday plans. Officers replied, that change management combated these problems on a strategic level, by analysing the interdependencies between project elements and assigning key people to the right position. On an operational level, interdependency management would often function as a team of “ambassadors” (Respondent 3) deescalating conflicting demands.

> “the resource management and logistical dependencies, is very much about identifying where a particular role or a particular skill is needed. Identifying whether there are any chokepoints in predicting where priorities lie.” **Respondent 10**
5.4.3 Third Level DC: Reconfiguring

The interviewees’ responses regarding the third level of dynamic capability were split three ways: The reconfiguration of resources, systems, and knowledge.

The respondents identified adaptation of human resources, IT resources, and budget resources to fit the demands of a changing environment. Human resources in different departments of the organisation were reconfigured to match learning curves. One respondent identified that progressing through the change process required different people at different positions at different times, as well as different levels of strategic involvement. IT resources were reconfigured depending on changing demand of the situation. In the strategic planning department this meant adapting Excel tools from previously using “no electronics” (Respondent 4). Budgetary resources were modified, to be only used when absolutely necessary. Increasing flexibility and planning by constantly asking “Are the right resources being used at the right time?” (Respondent 10).

“looking back even three years ago (...) we had lots of staff and took a very gradual level of every single project. Now we are operating on a much lighter touch. Much more strategic level.” Respondent 3

The reconfiguration of systems followed a newly adapted structure of governance. One example from multiple respondents is the stage plan, which integrates the aforementioned resource focus with a system of planning and supervision. The stage plan system forces a project to be planned in several phases, with each phase attached to a specific goal and equipped with specific support. Respondent 10 reported, that so for every level of governance that project will go through it will go with the stage plan attached. If things didn’t progress according to the plan these changed governance systems could “ask for complete stop on the project and freeze on a project to give a time to asses it, and start again.” (Respondent 2) These systems of governance were connected on a high strategic level with interdependencies to all 65 projects, the corporate strategy, and the board. Members of the strategic planning section, reported to use this top down perspective to make “sure that the entire organization is a line is taking is pulling the same direction.” Nevertheless, they noted that the use of governance systems came with more hierarchy and bureaucracy, creating a “bad mood amongst officers.”

Knowledge management (iterative learning)

During the interviews nine correspondents mentioned elements and aspects of iterative knowledge reconfiguration within Police Scotland. Nearly all of them mentioned successful knowledge management nonetheless six interviewees also mentioned small flaws and issues, which could work more effectively.

At the beginning of 2014 new tools and processes were introduced to Police Scotland, which allow capturing, developing, sharing, and using knowledge. The most important and significant of them are: Lessons Learned, monthly project managers meetings, Stage Planning, Change Champion, monthly newsletters and databases, such as: IT Police System and PM Centre. Additionally, there are organised special events, for example an event called KTV Technology, where projects thanks to modern technology (each participant is given an iPad) are anonymously discussed among all the people involved into PM. According to Respondent 3 and Respondent 10 those meetings are very interactive, produce lots of feedback and increase organisational knowledge. Another worth mentioning workshop which allows to capture knowledge is Speed Dating. Nearly
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all interviewees mentioned fulfilling reports as an obligatory part of their work. According to answers, if problems or doubts occur, they tend to return to those reports to learn about the previous projects. Under this circumstance, the “Lesson Learned” were frequently mentioned. Respondent 3 described it as an outgoing process where project managers have constant support and supervision from Organisation Development Unit.

What more, Lessons Learned are always identified together by project manager and a member of Organisational Development Unit. As Respondent 3 noticed, they are very helpful as Lesson learned “helps a lot with identifying issues before they arrives and allow to make a room for mistakes and to learn from those mistakes”. Furthermore, as Police Scotland became a part of Association of Project Managers (APM), assigned police members collaborate with APM’s knowledge management groups. As Respondent 10 said “this should bring back learning how Police Scotland can better manage knowledge across all departments” and create “real tangible benefits”. The proof of a good knowledge management is a fact that three of correspondents were able to give examples of projects where captured and developed knowledge from previous project allowed them to achieve faster their project or to avoid old mistakes.

“"I think we really didn't get here our advantage yet that we have records and materials concerning all past and outgoing projects."” Respondent 10

Yet small flaws still exist in knowledge management in Police Scotland. People still prefer face-to-face contact and interaction as the main source of knowledge. According to interviews, it happens that sometimes people fail in avoiding mistakes from the past as they checked Lessons Learned or reports too late. Finally, a knowledge management in Police Scotland is hindered by constant rotation of staff; Police’s members tend to be project managers only for duration of one project, sometimes even for a shorter period. One of the interviewees Sergeant Organisational Change, Respondent 2, reported that she is not aware of “any formal frame of feedback” for what her tasks nonetheless, she added that is probably because of her position and the fact she doesn’t work on any specific project. The fact remains, that even as she was not aware of any formal form of feedback she reported to use verbal and informal type of feedback. To conclude, as Respondent 10 who is a Portfolio Support Manager noticed, most of the processes connected to knowledge management were developed recently and according to him, Police Scotland seems to be on a good way to obtain an advantage from it and he hopes to “see some real tangible benefits come out of that.”

5.4.4 Resource Interdependencies

Quantitative modelling

Overall respondents seldom reported the use of quantitative modelling and linear programming tools in interdependency management. Quantitative methods only reported in data sampling, statistical evaluation, and outlines of future use.

“We of the time and motion study with measured that nine minutes and 44 seconds and we needed so many people to reply to us to a 99% confidence interval. To check that we
are to the time and motion study for similar degree of confidence that turned out nine minutes and 48 seconds, so we concluded that this process was right. “Respondent 6

Qualitative modelling tools

Interviewees reported a variety of qualitative resource interdependency modelling tools to aid planning efforts, while lower level operational respondents reported fewer uses.

One commonly used tool by project managers and planners were the bubble charts. Bubble charts were reportedly used to highlight internal and external dependencies towards stakeholders and resource givers. On an operational level, they are used as a reminder for project managers when executing their project not to forget any one party. On a strategic level, dependency managers use their knowledge advantage to direct the planning process using them. Dependency managers, especially in the portfolio support area report high use of resource charts to visualize, plan, and steer future resource usage. Lastly managers, like Respondent 3 report using Gantt charts as well as the online tool Viseo, because “it is much easier to manipulate”. The tools act as an assurance of project completing time and required resources across and between a number of projects.

“These charts have allowed tracking the resource usage over the past 12 months. We have started forecasting it in some areas (...) This will allow us to plan around bottlenecks, and if I know what the priorities are.” Respondent 10

Resource Interdependency Planning

Shared functional resources

Shared functional resources have been reported to be applied to human resources (HR), IT resources, and budget. Respondent 10 reported the functional sharing of officers between different projects, such as the Commonwealth games. Respondent 1 mentioned that different members of the organisation interact and modify their behaviour to “get contact with the person you need to need in order to progress”. She also mentioned that the sharing of specialists between these pieces of work is a key concern for management. The sharing of IT resources has been reported for both IT support, sharing many characteristics with normal HR support, and sharing knowledge structures. These resources include the Police Scotland Database and the PM Centre specifically for project staff. Finally, interviewees report the sharing of financial resource to occur in the sharing of decision-making power over a limited budget.

Scheduling optimization

From the interviews, two methods of scheduling optimization came into focus: formal and informal. Formal methods of scheduling optimization focused on the use of scheduling tools, most prominently the stage plan. Respondent 6 described, that one of his stage plan intervals was originally planned with more time, than turned out to be necessary. In response, he optimized the schedule and assigned resources by going through the hierarchical structure. Informally schedules are being optimised based on experience and communication of project managers. Weekly meetings were reported by four respondents to be used for exchanging information and rearranging resources according to what was learned.
“I submitted my report and after some fine-tuning, it was agreed that that was a good plan. The schedule optimization via stage plan happen every three months, because “that keeps her right and keeps you focused.” 

**Respondent 6**

**In-house out-house considerations**

Two respondents mentioned comparing the use of in-house vs out-house resources when planning. Respondent 6 was describing, that when designing new systems he prefers to do so in-house, as that means not wasting resources on external consultants, “if we can be doing it ourselves”. For tasks that exceed his organisation’s capabilities, he reported accepting outside help, such as in programming the system. For the in-house out-house consideration of knowledge resources and training Respondent 3 reported that Police Scotland started by training their staff externally in project management courses, such as Prince 2, but after gaining enough experience he shifted it in-house. Respondent 7 later described the implementation of such a training programme.

“it (out-house) is very expensive, very time intense, and I tend to find that is an investment we don’t have enough value from.” 

**Respondent 7**

**Resource prioritization**

Resource prioritization has been reported by three respondents in different ways. Respondent 10 described using resource prioritization by analysing resource interdependencies and prioritizing the most demanded resources in order to “predicting where priorities lie”. The focus here was clearly set on prioritizing people, which he managed. Respondent 9, a strategic planner, used resource prioritization based on time. He identified the priorities as determined by his superiors and then assigned his own resources and subordinates to match these goals. The focus here was set on managing himself. Respondent 1, the constable continuous improvement, used resource prioritization based on outcomes. She identified which colleague needed which kind of support, requiring which kind of her own resources.

“Prioritizing based on resources and time. Nothing better than that.” 

**Respondent 9**

**Resource consideration**

The consideration of resources in planning processes is prominently featured in all interviews, because respondents identify it as the central goal behind of the organisational change. This reflects in general meetings, in which, according to Respondent 10 Resource Management and HR Management are always present. It also reflects in the motivation of advancing the savings, because as Respondent 3 put it: “not because we want to go through this change, it is because we have to save 1,1bln pound”. It also reflects in the strategic planning officers, such as Respondent 4, who mentioned. Finally, the resource consideration is even part of training delivery.

“You have to have effective resource management so that the organization has the resources where they need to be. I don’t understand anything else.”

**Respondent 4**
5.4.5 Knowledge Interdependencies

Culture promoting knowledge sharing

As knowledge interdependencies cannot exist without an appropriate organisational culture that promotes knowledge sharing and learning one of the themes differentiated for interdependencies concerned this issue. Seven correspondents mentioned an organisational culture that promotes knowledge sharing and learning in a positive way. According to answers from the interviews, some aspects of the learning friendly culture are developed while some others, even if already implemented, they are still in development. Thanks to Lessons Learned, organisational newsletters, monthly project managers meetings and constant support from Organisational Change Unit in Police Scotland created a culture that highlights an importance of knowledge sharing and learning. One of the correspondents reported that after a centralisation “there was a problem with cultural change”. Other interviewee, Respondent 7 mentioned that a culture promoting learning and knowledge sharing is especially important to “make sure nobody feels left out geographically or information wise” as other way there may occur problems with an acceptance of the training process among police members.

Currently, if project managers report any problems or doubts Dependency Management team or Organisational team will get involved. According to Respondent 3 “They are like ambassadors, they are trying to solve problems and they not allow problems to escalate any further.” Existence of culture promoting knowledge sharing and learning is Police Scotland is supported by a fact that eight correspondents declared that projects’ progress, problems, weaknesses, opportunities and key milestones are discussed regally as “it is a part of a hierarchical structure”. On the other hand four correspondents mentioned small problems, mostly with communication, which most probably can have a negative influence on organisational knowledge sharing. For example, according to Respondent 7 whose main task is improvement and delivery of national training, at the moment it is not possible for him to “communicate on mass”, as a consequence each day he needs “to write every email address separately” and he communicate with around 300 people. Another example was raised by Respondent 2, who stated that it happens that people “are not aware of many projects”.

Cross-sectional team members

“I have noticed that while speaking with different people from different areas of Police Scotland I can bring benefits out of it, whatever function they have.” Respondent 1

Cross-sectional teams make it possible to improve learning. Team members from different fields can share their knowledge and learning to improve their work in their workplace after a project is finished.

According to interviews there do not exist cross-sectional teams inside Organisational Development unit. However there exist many specialists who are working “are working at numerous projects at the same time”, such as “technical architects from an ICT”. Normally, people from the same field or business are assigned to one project. As Respondent 10 said, it “brings a unique expert knowledge of their business area to a new project new environment”. What more, project managers are being appointed to this position “due to their previous knowledge in their daily job and not because of previous knowledge of being project managers”. There also exist “the central team” which actions
and decisions have influence “across the whole police Scotland (…) and impact its different areas”.

However, even as cross-sectional teams do not exist in Police Scotland one of the interviewees, Respondent 1, admitted that “from time to time” she could obtain benefits and knowledge from talking with people from different field.

**Using capability or knowledge developed in a different project**

> We are getting by on our knowledge. At the moment, we can talk to each other and share our experience. Whereas going forward, we will have to be more organized about recording all this information into databases because it needs to be serviceable. To be honest, I think we got away with it because we are fairly young.” **Respondent 9**

During the first interviews analysis inside “using capability or knowledge developed in a different project” also two other themes arise which can be seen as its result: faster achievements of project outcomes and facilitation of a project. However as after deeper analysis of the interviews it wasn’t possible to clearly differentiate if after using capability or knowledge developed in a previous project a new project was delivered faster or if its delivery was just facilitated we have decided to analysis both of those cases together.

All interviewees agreed that there exist formal processes to transfer knowledge or learning from one project to another. Among those processes, Change Champion and Lesson Learned were mentioned. Change Champion is still in its development phrase. Change Champion is an individual who focuses on projects in their key stages and “will use experience and knowledge to keep the organisational learning and move forward our knowledge.”

> “We took a knowledge from the lessons learned and implemented it to a new project.” **Respondent 2**

Nearly all interviewees mentioned Lesson Learned as a tool for using knowledge from a previous project in a new one. Besides, nearly all correspondents remembered a situation where mistakes in a previous project helped them to avoid a similar mistake later on. Only one of the correspondents, Respondent 4 recalled a situation where transfer of knowledge was unsuccessful and mistakes were repeated, because he noticed too late that a similar situation already took place or a similar situation happened in a different location.

**5.5 Conclusion**

The data presentation followed the outline of the template analysis by coding, sorting, and summarizing the interview and text data. In conclusion, two facts emerge: differences between knowledge and resource interdependencies and overlaps between the topics. Just by looking at the distribution of data along the coding patterns, it becomes clear that respondents were able to clearly identify many practises related to resource interdependencies, but with very little depth. In respondent’s answers, knowledge
interdependency practices were fewer, but almost every respondent had some experience with them. The second very strongly emergent fact was the repetition of practices and phenomena between DC and the interdependencies. The applicability of both interdependency and DC codes points towards a connection, and thusly towards an answer to the research question. The ability to make these observations is credited in part due to our research philosophy. Critical realism allows the researchers to observe underlying principles within social constructs while acknowledging that these our study cannot perfectly capture any such connections.


### 6 Discussion of findings

This chapter will reflect on our research findings by relating them to our theoretical conclusions. We will do so, by discussing differences and similarities with the ultimate aim to answer our research question. To answer our research question, this chapter will compare and contrast the research findings with the literature review. In doing so, it will address the individual crossing points between the three levels of dynamic capabilities with the two types of interdependencies:

![Figure 8: Structure of Discussion according to research sub-questions](image)

#### 6.1 Sub-question 1A: Connection between the 1st level of DC and resource interdependency

Topic 1A connects the first level of dynamic capabilities with resource interdependencies. For the purpose of the discussion that means that we are looking for practises in Police Scotland, which reflect increased efficiency through connection of resources (Blau et al., 2004, p. 233) and the sensing of opportunities (Nieves and Haller, 2014, p. 225). Upon carefully analysing the interview data and secondary materials, we selected the three most promising examples: awareness of resource scarcity, the use of databases, and the areas of strategy.

Careful examination reveals that all participants display a strong underlying awareness of resources scarcity. Resources are specified to include financial components such as budget limits, as well as human resources, such as colleagues with specialised skills. Awareness means that respondents considered the topic to be the driving factor behind the organisational change and it influenced their decisions on a smaller and larger scale. On a larger scale high level respondents considered the effects of shifting a large amounts of policemen to safe budget, while on a small scale officers prioritised their work to safe time. The distribution of uniquely skilled human resources suffices Santhanam and Kyparisis’ (1996, p. 394) use of resource interdependencies. Avoiding project delays due to lacking resource supply are characteristically identified by Verma and Sinha (2002, p. 451) as effects of lacking resource interdependency management. This makes a sufficient case for the use of resource interdependencies in this case. Using the awareness of resource scarcity as a basis for decision-making gives evidence for first level DC. It is the organisations way of transmitting the demands of external stakeholders, like politicians, down to every level (Teece, 2007, p. 1323). Respondents use their awareness of resources
Discussion of findings

scarcity to define what an opportunity is. This is the most prominent characteristic of a first level DC. Concluding, awareness of resource scarcity is a practise that fulfils requirements and serves as a connection.

The second observed practise and possible connection is the use of databases. The current state of affairs, as reported, entails numerous different databases as physical IT assets, which are providing the links between geographically separated individuals. Police Scotland has recognized the problematic connections between these IT systems and has set into place the demand for a new product that represents the opportunity of saving time in the future. This makes it a valid example of a resource interdependency. It functions well as a first level dynamic capability because the connection of databases will increase the access formalised knowledge (Nieves and Haller, 2014, p. 229). This however raises the important point, that the benefits and practises connected to databases are almost completely knowledge and information based and are more closely related to knowledge interdependencies.

The last common argument displayed by our respondents in favour of connecting first level DC and resource interdependencies is the strategy. As previously described, it is split into “our technology, our people, our organizational support, our finances”. Members of these four areas are key in decision making, and meet regularly to exchange information, including external communication and internal opportunities. Simultaneously, three out of four elements can be described as resource centric. Interdependencies between these areas are openly discussed in meetings and are the source for much innovation. However, this argument might be weak, because it is hard to discuss this use of “resource” without becoming exchangeable with “knowledge” or “information”. This highlights the main criticism of the resource based view, as expressed by Kraaijenbrink (2009, p. 351): A vague and open definition does not lend itself to practical use.

In conclusion, only one of the three possible arguments for a connection between resource interdependencies and the first level DC holds true. There is strong evidence that the first level dynamic capability is more closely related to the topic of knowledge interdependencies.

6.2 Sub-question 1B: Connection between the 2nd level of DC and resource interdependency

Topic 1B is concerned with police practises, which use both the analysis of resource interdependencies and the second level of dynamic capabilities. This level concerns the seizing of opportunities by answering the business model questions of where, when, and how they create value (Teece, 2007, p. 1326). Literature (Kim et al., 2011, p. 488; Anand et al., 2009, p. 448) suggests afterwards, it becomes a matter of selecting and committing to the appropriate infrastructure, process structure, and decision-making structure. Careful observation and analysis of data reveals four possible connections between the two topics: the new IT system, the changing HR configuration, the use of charts and the use of prioritization.

The first observed practice identified in interviews and text is the creation of the new IT infrastructure. Participants from all levels described IT as one of the most critical resource and highlighted ways of improving it. High-level members noted this
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opportunity and committed a project to design and develop a new system that meets these needs. If implemented it will have major effects on the decision-making processes, the process speed in which data is sanitized and a number of criminal investigations related topics. It was decided to design the project in house and develop it out of house. This consideration is directly relatable to Verma and Sinha’s (2002, p. 460) recommended resource interdependency practise. Understanding the links and potential savings of the new infrastructure utilized resource interdependency skills, while the method of implementation was taken from the second level DC. It therefore aptly fulfils both criteria and can be seen as a valid example.

The second observed practise combining resource interdependencies and second level DC is in the use of prioritization. We could observe such behaviour both as a personal tool for scheduling as well as a portfolio tool for managing both bottleneck and functional resources. Police Scotland previously mentioned first level awareness of resource scarcity serves as an opportunity to use prioritization to still maintain an efficient organisation. Officers manage to prevent choke points in predictive resource profiles. These tools are part of the resource interdependency toolkit, as described by Blau et al. (2004, p. 244). They draw upon linkages between individual resources, such as specialised HR, IT, and budget. Their use reflects the seizing of opportunities and the averting of threats, characteristic for the second level DC pioneered by Teece et al. (2007, p. 1326).

The third practise prominently featured, especially in organisational documents, are visualisation tools. On every organisational level some degree of visualisation tools were required as part of the routine project documentation. Interdependency visualisations (see appendix C) highlight the relationships between functional resources and stakeholders, which follows Blau et al.’s (2004, p. 244) recommendation for resource interdependencies. IT supported Gantt charts for easy access and modification allowed every member of the organisation to plan and schedule tasks by having a quick overview over the amount of resources available at every stage of the project. This confirms Shackelford and Corne’s (2001, p. 1131) suggested resource interdependency practise. The use of visualisation methods as part of the routine process reflects process structures connected with the implementation of decision in a way to minimize errors. This reflects second level DC practise as outlined by Kay (2010, p. 1213) and Kahneman (2011, p.12). This arguable fits the best practise examples of resource interdependency tools, but also the process and decision-making structures of the second level DC.

The last argument in favour of a connection between resource interdependency management and second level dynamic capabilities relates to the Police’s HR configuration. Interviewees made it evident, that both on a strategic and operational level the movement of staff was a major concern in this change programme. New training programmes were put into place to increase skills, new positions and departments were created to fulfil new demands, and new concerns for staff continuity issues were aptly addressed. This hints both at the creation of processes to fit the organisation’s needs, which is reminiscent of what Eisenhardt and Martin (2000, p. 1107) defined as essential for second level DC. The use of interdependencies in these processes to optimize the use of HR and save budget meanwhile becomes evident when considering the increased used and schooling of police officers in favour of civilian staff. This new decision making structures, which are similar to those described by Kay (2010, p. 1213) are based upon first level DC that informed the organisation of the financial benefits attached.

In conclusion, there are four strong arguments in favour of the police’s connection of these two areas.
6.3 Sub-question 1C: Connection between the 3rd level of DC and resource interdependency

This intersection is discussing, if police practices give sufficient evidence, matching both third level DC and resource interdependencies. Third level DC require an organisation to align its assets to meet changing environmental requirements (Teece, 2007 p.1335), by means of cospecialisation, governance, and knowledge management. Among the interviewees, it was possible to identify four common topics that have the potential to fit both categories: stage planning, HR, strategic alignment, and improved flexibility.

The first observed practice that may fit this intersection is the stage planning tool, as mentioned by three respondents. High-level project managers suggested it as the soon-to-be recommended instrument, because it allows committing resources to specific time periods with certainty. While the stage planning tool has the basic characteristics of a second level DC tool, like the assurance of resources to achieve a predicted opportunity, its defining characteristic, the stages, is much more geared to the iterative improvement and realignment of these commitments. After every project stage, the plan and its attached resources and tasks are re-evaluated and re-aligned to the organisational goals and the individual capabilities. In doing so it considers which their interdependencies to the special human resources are. These considerations are what Santhanam and Kyparissi (1996, p. 394) define as resource interdependencies. Reporting to a governance system connects this practise to Teece’s threefold perspective of the third level DC (2007, p.1340). However, the iterative resource practise also fits Teece’s concept of cospecialisation (2007, p.1341).

The second observed practise is the use of iterative HR processes. HR iteration differentiates itself from the second level DC practises, in that it is not the reaction of new HR training programmes and so on, but rather the modification of already committed resources based on the responses of a changing environment. As an example serves the re-evaluation of the dependency team itself. In the beginning of the change project, the demands were very operational and low level. At that time a first level DC recognized the demand and a second level DC responded by putting in a large portion of staff to address the problem. Later on in the project, however a first level DC recognised that demands had changed. Organisational members had learned how to take care of the operational duties by themselves and the dependency team was needed to respond to strategic challenges with less manpower. Resource interdependencies were used to track here the largest impact and demand for the redundant staff was, and it was relocated. This process stopped the waste of money in the dependency team, redefined its role and thus improved the overall situation.

One of the departments subunits, strategic planning, fulfils the role of strategic alignment, which is a characteristic for the third level DC. However, its practise in Police Scotland integrates key factors of resource interdependency management. Members of the unit described their alignment process as heavily depending on understanding of organisational effects, as well as resource planning tools.

The last practise we found to be was a strive for improved organisational flexibility
6.4 Sub-question 2A: Connection between the 1st level of DC and knowledge interdependency

Similarly as topic 1A this section presents a relation between the first level of DC with and knowledge interdependencies. To link together those two parts we focus on practises in Police Scotland, which expose connections between first level of dynamic capabilities and knowledge interdependencies, such as usage of the same technology among different projects (Verma and Sinha, 2002, p. 451) and culture promoting learning and knowledge sharing (Killen and Kjaer, 2012, p. 561), which in Police Scotland result in accurate perception of knowledge and higher level of organisational, procedural and declarative knowledge. What data analysis revealed is the fact even as literature differentiates those three different types of knowledge in practice they are very strongly connected and most commonly appear together.

Similarly, for the first level of DC, which is sensing a high level of organisational knowledge, procedural and declarative knowledge is required (Nieves and Haller, 2014, p. 228-229). In Police Scotland those conditions are met and improved thanks to characteristics of knowledge interdependencies, such us: the culture promoting knowledge sharing and usage of the same technology, processes and databases among different projects.

To start with examples how Police Scotland’s practice uses the same technology and contributes to a higher level of organisational, procedural and declarative knowledge it is necessary to mention in a first place: IT Police System and PM Centre. Those are the main databases, which contains all information concerning each outgoing project. The first one is available to all police members while the second one to all people involved into projects. In those databases are stored all information who is responsible for each project and task. Furthermore, all dependencies are included into those databases and each person involved into project can raise (add to a databases) new dependency (all new dependencies are inspected by Organisational Development Unit).

Another tool which is used in Police Scotland and which increase all the three previously mentioned level of knowledge is Lesson Learned. What more, an important fact is that Lessons Learned couldn’t exist if there had not exist a culture promoting knowledge sharing and learning. Lessons Learned are the most important learning outcomes, which are identified in the end of a project, together by a project manager and a member of Organisational Development Unit.

Other tool which is an outcome of a culture promoting knowledge sharing and which not only increase all the three level of knowledge but also improve and provide accurate perception of knowledge is Change Champion. It is also a significant tool from a point of view of knowledge interdependencies as this individual use knowledge developed in previous projects and transfers it to new ones (Killen & Kjaer, 2012, p. 560; Teller, 2012, p. 600). According to documentation and interviews Change Champion is an individual, which will have a deep knowledge about policing and project management inside Police Scotland. Additionally, this position is specially created to spread this knowledge and expertise from one project to another.

Additionally, an element from Police Scotland’s practice, which connects first level of DC and knowledge interdependencies is a constant support from Organisational Development Unit. It is a part of a learning and knowledge sharing friendly culture, which provides accurate perception of knowledge. All project managers always can count for an immediate help and clarity of information from Organisational Development Unit.
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According to interviews it not only clarify doubts of project managers but also provide them with more detailed knowledge about Police Scotland and know how.

Next issue to discuss are cross sectional teams. This aspect mentioned both in the literature concerning the first level of DC (Teece et al., 1997, p. 517) as well as knowledge interdependencies (Jonas, 2010, p.824, Aritua et al., 2009). According to the interviewers there do not exist cross sectional teams. Nevertheless, there exist groups of specialists who work on different projects at the same time and can easily transfer knowledge and learning. Furthermore, our correspondents agreed that thanks to communication with people from other fields they increased their knowledge.

To conclude, it is visible that there exist a connection between knowledge interdependencies and the first level of DC. However, there are aspects of the first level of DC which do not find a clear reflection in knowledge interdependencies. First of those are workshops which provide future project managers with organisational, procedural and declarative knowledge of Police Scotland and PM. This issue can be discussed as a part of a knowledge friendly culture, yet the connections are not straight forward. Similarly, the first level of DC describes environmental scanning and organisation’s connection to stakeholders (Teece, 2007, p. 1324), which are not described in the literature concerning knowledge interdependencies.

6.5 Sub-question 2B: Connection between the 2nd level of DC and knowledge interdependency

This part presents relation between the second level of DC and knowledge interdependencies. The second level of DC focuses on the business model of an organisation and how its value is created (Teece, 2007, p. 1326). In more detail, elements that compose on the second level of DC are the suitable infrastructure, process structure and decision-making structure (Kim et al., 2011, p. 488; Anand et al., 2009, p. 448). The literature review do not indicate any common points between the mentioned the second level od DC and knowledge interdependencies which are focuses on transferring knowledge and its benefits (Killen & Kjaer, 2012, p. 560; Teller, 2012, p.602). Likewise, after analysis of practise in Police Scotland no common points of reference concerning those two topics were found.

To conclude, there do not exist any clear relation between the second level of DC and knowledge interdependencies, neither in the literature nor in practice. The second level of DC focuses on recourses and tangible elements thus it turned out to be impossible to indicate any clear relation with knowledge interdependencies, which focuses on intangible aspects inside organisation.

6.6 Sub-question 2C: Connection between the 3rd level of DC and knowledge interdependency

The following subsection will focus on presenting relationship between the third level of DC and knowledge interdependencies. As it is mentioned already in a Topic 3A there exist evidences of tight relation between resource interdependencies and the third level of DC. The previous topic discussed links between resource interdependencies and cospecialisation and governance. The practise in Police Scotland did not show common
points between those two subtopics of the third level of DC and knowledge interdependencies. Nonetheless, it showed connection between knowledge interdependencies and knowledge management. This subsection will provide evidences of those links through: identifying and capturing both learning and knowledge; and through developing, sharing and using this knowledge.

First of all, Police Scotland’s practise emphasises importance of recognising and capturing knowledge and learning. According to Nieves and Haller (2014, p. 226) the third level of DC focuses on learning and feedback processes. Literature state that those processes are also the key elements of knowledge interdependencies, as they make it possible to, in a formal way and on a big scale, not only identify knowledge but also transfer it to another project (Killen & Kjaer, 2012, p. 560; Teller, 2012, p.600). Regular project managers meetings, Lessons Learned and special events where comments and learning are shared anonymously are one of the methods how Police Scotland capture knowledge and learning.

Secondly, developing, sharing and using knowledge are inherent elements of Knowledge Management (Davenport, 1994, p. 124). Also, knowledge interdependencies cannot exist without those processes as one of their most popular definition states that knowledge interdependencies appear when knowledge and capabilities developed in one project is use in another (Killen & Kjaer, 2012, p. 560; Teller, 2012, p.600). In Police Scotland knowledge and learning are developed and shared through already mentioned Lessons Learned, their databases: IT Police System and PM Centre, Change Champion, organisational newsletters and special events which focuses on knowledge sharing and developing, such as KVT Technology.

To conclude, on an example of Police Scotland there exist evidence that there is a link between the third level of DC and knowledge interdependencies. Knowledge Management practise was introduced to Police Scotland recently. According to the interviews it is obvious that the organisation has not been able in such a short period of time to obtain all the benefits from it. At this moment in Police Scotland still occur common mistakes described in the literature as evidences of lack of knowledge interdependencies or bad Knowledge Management (Williams, 2007), e.g.: despite Lessons Learned the same mistakes were repeated. Nevertheless, the current practise shows that the Police Scotland is on a good way in a further its Knowledge Management practise can result in real tangible benefits.
7 Conclusion

This chapter concludes the entire study. It starts with answering the research question. It will be followed by the presentation of the theoretical, managerial, societal and ethical implications. Further, strengths, limitations and authenticity of the research are discussed. The study is close with a discussion of possible future research directions.

7.1 Research Question

Our internship at Police Scotland in January, concerning only PIM, inspired our interest in PIM under dynamically changing conditions. In the time between this first view and the large scale study our reflections and literature readings showed a call for the exploration of the connection from the perspective of DC, PIM, and projects as DC. The need for providing organisations with a better understanding of the practices that allow reactions to the largest influence on business models, environmental change. Both DC and PIM are individual responses to this change and finding areas of combined practice could allow organisations to respond more efficiently. This lead to formulating our research question and sub-questions in the following way:

*How do practices connect knowledge and resource interdependency management to the three levels of dynamic capabilities in the example of Police Scotland?*

- 1a: Which practices connect 1st Level DC and Resource Interdependencies?
- 1b: Which practices connect 2nd Level DC and Resource Interdependencies?
- 1c: Which practices connect 3rd Level DC and Resource Interdependencies?
- 2a: Which practices connect 1st Level DC and Knowledge Interdependencies?
- 2b: Which practices connect 2nd Level DC and Knowledge Interdependencies?
- 2c: Which practices connect 3rd Level DC and Knowledge Interdependencies?

In order to answer the research question, our study began with a broad literature review, covering topics related to both project management including PIM and DC. Given the fact that our research is a single case study, a researched field is emerging, and the research took place after our investigation in Police Scotland, an inductive approach was adopted. Case study research strategy allowed usage of multiple data collection method and obtained in-depth study. Further, ten semi-structure interviews were conducted.

The comprehensive answer to the research question is presented in the following discussion that includes: theoretical, societal, ethical and managerial implications. In order to answer the research question the possible practices’ overlapping of the three levels of DC and chosen project interdependencies were investigated. It has to be noted that it is a single case study that aims to research special situation of having an explicit dependency management unit inside an explicitly dynamic situation. As it is the single case study of inductive nature, it purpose is to develop a hypothesis or a model of phenomena, rather than to negate or prove already existing theory.
7.2 Theoretical Implications

As the primary benefit of our study, we found several relations between the three levels of DC and the two chosen types of interdependencies:

On the first level of DC, we found connections to knowledge interdependency. This answers research sub-question 2a by finding practises such as Lesson Learned, Change Champion, common usage of the same databases such as PM Centre and IT Police System use. While this builds on descriptions of both individual dimensions, confirming authors such as Teece (2007), Nieves and Haller (2014), and Aritua et al. (2009), the connection has previously not been made, contributing to theory. It should be noted, that not all practises fitted description for these two categories. Our findings in research sub-question 1a in terms of human resource management, IT infrastructure management, and strategic alignment may fall into the terms of resource interdependencies and first level DC, according to Blau et al. (2004) and Santhanam and Kyparisis’ (1996), but are all hinting at the sensing facilities needed for knowledge interdependencies. Connecting as facilitators to knowledge interdependencies on the first level of DC is also a new implication for theory.

Answering research sub-questions 1b, we found connecting practises between resource interdependency management and the second level of DC, such as: IT infrastructure creation, HR configuration, prioritisation, and visualisation. We were able to connect the two dimensions, because we identified them based on categories by authors from who support qualitative perspectives as expressed by Verma and Sinha’s (2002, p. 460) and Blau et al (2004, p. 244) and contradict strictly quantitative planning tools, as argued for by Schmidt (1993, p. 404), Weingartner (1966, p. 485), and Santhanam and Kyparisis (1996, p. 382). Our findings suggest that even in a strongly budget motivated changes like that of PoliceScotland financial decisions are made independently from project execution, so that resource interdependency management is mainly used to optimise predetermined situations. The planning and executing of changes to an organisation’s value creating proposition require the understanding and use of its resources in a structured and complex way. The execution of any change has far reaching impacts that can greatly add benefits if understood by looking at resource interdependencies. While there are many practises connecting resource interdependency management to the second level of DC, and answering research sub-question 1b, we found no practises connecting knowledge interdependency management to this level. This leaves no answer for research sub-question 2b.

To answer research sub-question 1c, we found practises in the areas of cospecialisation and governance to incorporate literature’s concept about third level DC (Teece, 2007, Ambrosini et al.’s, 2009, p. 9, and Eisenhardt and Martin’s, 2000, p. 1106). The literature so far has not considered resource interdependency’s ability to facilitate the changes in the third level, especially through practises such as stage planning, and HR iteration. They enhance the renewing capacities of cospecialisation by providing decision makers of the organisation with an understanding of the effects of their actions. This is comparable to Shakelford and Corne’s concept of the master planner, but adds a more systematic element. Resource interdependency management practises are also inclined to provide governance systems with the right connection to organisational resources, such as HR. Answering research sub-question 2c, knowledge management, the subpart of the third level of DC, has a strong connection with knowledge interdependencies. Furthermore, tools and processes of the third level of DC reinforce knowledge interdependencies practice and vice versa.
Conclusion

In combination, these research sub-questions provide a complex answer to the main research question: practises in knowledge interdependencies connect to the first and third level of DC, while resource interdependencies connect to the second and third level. Furthermore, our research match with a literature showing that in a complex and dynamic environment isolated management of single projects is not enough. Such a situation requires PIM for a more effective and competent management. Our research allowed us to have an insight into an organisation which has a formalise PIM. A case of an organisation with formal processes concerning project interdependency management is not widely described in the literature. Even as our study does not focus solely on PIM it gives some important insights into it.

This thesis also offers some tangential perspectives on the theoretical foundation upon which we base our findings: the resource based view (RBV) and the knowledge based view (KBV). Our study can offer two insights into the resource based view. First that even in firms that have no direct competition, the conclusions of the concept of valuable, rare, inimitable, and organisational (VRIO) resources as SCA defining still hold true. Human resource and knowledge has been identified by the respondents as the most valuable, rare and inimitable organisational resources. This confirms Lockett et al. (2009, p. 11) and Leiblein’s view (2011, p. 920). It expands the initial view on the RBV as described by Wernerfelt (1984, p.173). Secondly, our study has revealed that there is a possible overlap in combining these two resources in the form of uniquely skilled people. This would confirm implications made by both Bain (1956) and Priem and Butler (2001, p. 24). Our study can also offer new insights into the knowledge-based view. From our literature review on the topic, we concluded that dynamic capabilities have to consider the special characteristics of knowledge to function. Based on this case, we can propose further research on adding to Grant’s (1996, p. 112) and Barney’s (1991, p. 107) categories for SCA in firms based on knowledge a dynamic element that the combination of 1st level DC and a knowledge interdependencies suggest.

7.3 Social and Ethical Implications

Police Scotland is a law enforcement agency charged with the protection of the public and funded by taxpayer money. Their current change programme tries to improve service and decrease taxpayer cost. Our support and recommendations in this case may help both agendas. An improvement in the use of resource interdependencies is by definition linked to a decrease in resource usage, in this case public funds. An improvement in knowledge interdependencies concerns the overall organisational communication and thus service quality. In a small way, we hope that our analysis and recommendations may help Police Scotland to better fulfil their duties and achieve these goals.

As discussed in our research methodology subchapter we ensured the protection of our respondents’ rights. For the ethical implications of the overall study, we considered transparency, accuracy, objectivity, and conformity with the law. We were openly conducting this study in cooperation with Police Scotland and we are aware that individuals may have been biased to give positive account of events. We tried to maintained accuracy by interviewing ten organisational members from very different positions. We furthermore tried to reduce interviewee’s preparation by not giving the questions in advance. We cross-referenced information given by individuals with other interviewees and asked critical questions. The objectivity of the secondary data we obtained is above tempering for this study, because it was self-selected and not produced for outside use.
7.4 Managerial Implications

From a managerial perspective, we cannot state that the study offers the best practice solution how to deal with the dynamic capabilities and project interdependencies for every situation. Mainly, because it is an exploratory study focusing on finding relation between two topics that so far have not been studied together. However, thanks to our study and findings we can offer some ideas how to improve current practice at Police Scotland.

The first implication concern PIM. Police Scotland is an organisation with a varied and rich project portfolio. Our case study was focused on programme level yet already here PIM was introduced as a tool that allowed more effective and efficient management of various project. Within one year, PIM arose into a strategic level process. PIM is not yet a popular tool however the case of Police Scotland shows that it is effective. It is a real life example of successfulness of this management approach that others can follow.

Secondly, our study shows that the practice of specific levels of DC connect to practices of knowledge and resource interdependencies. The first level of DC’s practice connects to knowledge interdependencies, the second level of DC to resource interdependencies, while the third level of DC to both kind of interdependencies. With the common background of SCA provided by PIM and DC, the authors suggest that PS managers can improve organisational efficiency in two dimensions (PIM and DC) via single practises, which were found in both DC and PIM. Managers can use knowledge interdependencies to sense their changing environment by connecting information storage units, such as databases. These can then transfer formalised Lessons Learned to other projects, which will in turn increase their ability to identify changing opportunities or threats. Our study suggests that under these specific circumstances, managers did not have to regard resource connections in so far they did not relate to knowledge infrastructure. On the second level of DC our study suggests, that PS managers can use visualisation tools and choke point prediction to highlight key interdependencies between resources and simultaneously support the seizing of opportunities in the same step. At this point, managers should make considerations for especially skilled human resources. On the third level of DC, the iterative planning tools that are currently used are very well suited for managing the change. Faster renewal cycles, for example a bi-annual plan update could improve adaptation speeds to changing environments even further.

In conclusion, Police Scotland managers can react and adapt to changing environments faster by focussing on the key practises, which simultaneously heighten DC and PIM.

7.5 Limitations and Strengths

The aim of this research was to conduct a primary examination on how does the knowledge and resource interdependencies connect to the DCs on the example of Police Scotland. As our study is a single case study applying it is inevitable connected with most of the limitations of this research type. However, it also provides our studies with all the strengths of a single case study. This chapter will discuss those weaknesses and strength in order to better understand our study, findings and its possible shortcomings.

As in all studies, despite applied mechanism some bias could occur. The case study research strategy and a nature of qualitative methods might have caused double hermeneutics, which is common for social science studies, and consequently bias in findings. Even as research and data triangulation was applied our study can be criticised
Conclusion

for a limited evidences as our study rely on a limited number of interviews (ten interviews were conducted) and restricted access to the organisational documentation. What more, applied semi-structures interviews might provoke concerns link to reliability. Additionally, the research process and interviews were in English, which is a native language for respondents but not for researches. All the interviews were conducted via Skype, which sometimes were interrupted by technical issues. Those two factors might lead to misunderstanding and biases in findings.

As limitations and possible weaknesses of our thesis, we also would like to outline strength points of our thesis. Thanks to our work experience in Police Scotland we gained an access to the organisation and we could understand processes that have had place inside it. Police Scotland is a unique organisation where Dependency Management is one of the most important processes around which organisational change is based. It gave a unique opportunity to conduct a research how a selected project interdependencies influence levels of DC. A case study allows investigating multidimensional social units, which consist of various variables of possible importance, in order to understand a specific phenomenon (Flyvberg, 2006, p. 228). This precisely overlaps with our experience at Police Scotland. We researched a unique phenomenon to give bases for future studies. Police Scotland is in a very dynamic situation, going through a change process thanks to which its dynamic capabilities were created and because of what Police Scotland has decided to use formalised DM. This leads to propose future researches, as it would be interesting to understand if knowledge interdependencies are fundaments of the first level of dynamic capabilities. Another strength connected with a nature of our research method is a fact that case studies proved to be especially useful in applied field’s processes and in improving practice. Our research’s findings indeed will find an appliance in practice and might improve future Police Scotland’s practice.

7.6 Future research directions

This subpart presents possible research directions and ideas for future studies. As our study is an inductive, exploratory, single case study exploring for the first time a relation between two phenomena; the first part of this subchapter focuses on alternative studies, which can be conducted to research the same phenomena, while in the second part more general approach for the possible future studies direction is undertaken.

As our study is an exploratory case study aiming at discovering relation between two phenomena: DC and the chosen project interdependencies: resource and knowledge. It is the relation which have not been described in the literature ever before. It means that alternative studies, employing different research methods than those chosen in this study, aiming at exploration of connection between these two phenomena should be conducted.

Secondly, given the specific strengths and limitations of qualitative studies, we would recommend further studies concerning this topic to be quantitative. Principally, quantitative studies would be relevant, as they are perceived to be more objective than qualitative. What more, quantitative studies would result in measures such as correlations of analysis. It would provide explanatory aspects of the current study.

Furthermore, as the presented study is inductive, preferably the future studies should have deductive approach. Our study is conducted on a very specific organisation, where both dynamic capabilities and project interdependencies have place. Thus, future studies are
recommended to explore relation between the two phenomena in different sectors or countries in order to understand importance of this study for other companies and fields.

To discuss future studies directions regarding the relation between the three levels of dynamic capabilities and chosen project interdependencies it is important to remember that our study proved that this relation exist. As such, future studies should focus on understanding the exact nature of those relations. For example, as there is an overlapping practice between knowledge interdependencies and the first level of dynamic capabilities it would be interesting to examine if those specific project interdependencies are foundation for the first level of dynamic capabilities. Similarly, a research examining if resource interdependencies are basis for the second level of dynamic capabilities would be interesting. Furthermore, a research explaining if on the third level of dynamic capabilities must exist both knowledge and resource interdependencies would add an important contribution to the field. Such studies would require a large-scale quantitative researches with random sampling that would allow enable statistically generalizable results. Additionally, as our study showed some practices used in project interdependencies overlaps with practices of specific level of dynamic capabilities, a study focusing on exploring deeper those practices would be interesting. Moreover, as there exist further, if less prominent, project interdependencies than just those chosen by us, future researches could examine if there exist relation between other project interdependencies and the dynamic capabilities. What more, as the presented study was conducted in the organisation based on PRINCE2 methodology it would be interesting to conduct similar research in organisations with different approaches toward project management. Finally, as the conducted study was in Police Scotland, which is a Scottish organisation with its own organisational culture interesting, future studies should research if culture, especially organisational culture has an influence on connections between DC and chosen project interdependencies.
References

8 References


Bain, J. (1956), Barriers to new competition: their character and consequences in manufacturing industries, Harvard University Press, Cambridge, MA.


References


Easton, G. (2010), *One case study is enough*, Lancaster University Management School.


References


References


Managing Successful Projects with Scrum, Wiley.


Peters, T. and Waterman, R. (1982), *In search of excellence: Lessons from America's best-


Pinto, J.K., and Prescott, J.E., (1990), “Planning and tactical factors in the project 


Porter, M. (1979), “How Competitive Forces Shape Strategy. Awareness of these forces can help a company stake out a position in its industry that is less vulnerable to attack”, 


Newton Square, Pennsylvania: Project Management Institute, Inc.


Runig, M. (2009), “Interdependency Management: Survey Comparison between Small, Medium and Large Companies,” *Proc. 9th EURAM Annual Conference, Liverpool, UK*


References


Williams, T. (2007), “Post-project Reviews to Gain Effective Lessons Learned”, Project Management Institute, Newtown Square, PA.


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9 Appendices

9.1 Appendix A: Interview Questions

General Questions
1. What do you do in your daily work?
2. How do you manage dependencies / Contribute to dependency management?
3. Which resource is the most important to you?

Sensing: Awareness of customer, market, organization
1. What comes to mind when you hear the word: Customer
2. With how many people from work do you talk each day? Are you aware what they are doing? Do you know what they are doing? Can you give an example?
3. How do you sense opportunities

Seizing: Selecting right projects and executing them correctly
1. For this new situation, have you ever been involved in creating new rules / guidelines?
2. How do you get the resources you need for your project?
3. How do you make decisions?
4. Which tools do you most frequently use?

Improving: Learning processes, resource adjustment, target adjustment
1. From before vs after the change in Police Scotland, what is the biggest difference? => Procedures, resources, knowledge?
2. Can you give an example of a past project, when circumstances/ people/ location were changed? How did you react, what did you do? How often does this happen? How often did you do it?

Resource Interdependencies
1. Were you ever involved in more than one project at a time? => how do you manage when you are where
2. Can you give one example when you planned the resources for a project? Which tools do you use? How do you select a project? How do you know if you have enough resources?
3. Do you have any situation where you had to apply for a resource for more than one project.

Knowledge Interdependencies
1. Did you ever notice that people were selected to a specific project because of the previous experience?
2. Can you remember an occasion that you learn how to do your job better from a colleague from a different field?
3. Do you capture learning from the milestones review and end-of-projects review? How the knowledge is collect? Do they exist any knowledge databases?
4. Do you consistently use formal processes to ensure that learning and information from projects is transferred to dependent projects?
5. What informal mechanisms are regularly used to transfer learning and information to dependent projects?
6. Do you have access to relevant data from previous or concurrent projects? = If you have a question regarding a new project is there anyone in a team who has a previous similar experience or do you need to ask someone else?
7. Do project processes help you to learn from past mistakes and to avoid making the same mistakes again? = Do you remember when last time mistakes from previous projects helped you to avoid mistakes on later projects?
8. Do you have strong continuity among project managers/dependency managers? = Do project managers change often?
9. Do project managers openly discuss their projects' weaknesses and failures in order to share lessons learned and to improve future projects? = Do you discuss about projects weaknesses and problems? => they exist, but not used
9.2 Appendix B: Transcription & Coding Example

Now to go right back to resource dependencies: how do you see their importance? Where do they come into play for you?

I think there's a number of things that come into play. We have tracked our resource usage over the past 12 months. We have started forecasting it in some areas, but we were actually tracking what was being used so to speak. My view and what the senior management agrees with is that we have seen a lot of resources and I mean people working on the approved projects and developing projects. But in some areas we are seeing very little productivity, actually things being delivered. Is that the best use of our resources? Is that the most efficient or effective way of the right resources being used at the right time? So what I'm doing right now is finding mechanisms to predict how much resources we will need, but being flexible enough to put them into the requirement when we need them. As opposed to having them come through a very lengthy recruitment process, which can take anything up to three or four months sometimes, based on various issues in the organization. The resource management and logistical dependencies, from my perspective is very much about identifying where a particular role or particular skill is needed. Identifying whether there are any chokepoints in predicting where priorities lie. To give you an example: Our organization has five technical architects from an ICT perspective. They are working at numerous projects at the same time, so we are working on identifying their current workload and their future demands. This will allow us to plan around bottlenecks, and if I know what the priorities are, I know what to put those five resources.

One more question from my point that goes more into the change. You were saying in the past there was not as much consideration of these resources, as there is now. Could you explain how this resource management can move into focus?

What we have seen over the last 10 months, we have reported resource usage to the senior portfolio board. So since the beginning of the year that has been broken off into police officers and civilian staff. We have seen a steady increase in the number, but we have also seen some departments. You may have heard of the Commonwealth games in Scotland in July; well, a number of police officers that were working on projects were extracted, to work on the Commonwealth games. So we have seen a drop in resource usage, there and then a rise of resource usage at the end of the games. And then a steady rise afterwards. They never seem to decrease, my question for the board meeting next week is: we are on schedule hitting resource costs in the order of 7 million pounds. We have spent a lot of resource on projects and we are not satisfied comfortable with, I want us to start thinking about two kinds of projects: project success (you deliver what you say you will deliver you know, time, cost and quality, and so on). The other part for me is project management success, how well you handle your projects. We need all projects to forecast better and at the root of that, better planning, better structure at the beginning because we understand what we will be delivering the project. The products and activities that are assigned and the resources. So we need to start building that in a bit of an earlier stage. At the board next week, my recommendation is that stage plans will become a mandatory use throughout the programs in portfolio. So for every level of governance that project will go through it will go with the stage plan attached, so we can actually see when project resources are required and what people are working on. So that we can actually get some measurement of productivity coming out of projects. This will allow us to adhere to the dimensions of time, cost and quality. So we are really starting to venture into more technical analysis of the way we behave in our projects.
9.3 Appendix C: Bubble Chart example on portfolio level