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Assessment of enterprise portal benefits

DISSERTATION THESIS

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Abstrakt

Cíle předkládané disertační práce je ukázat, jak poskytnout těm, co rozhodují o investicích do IS/ICT více informací. K demonstraci navrženého přístupu byla vybrána specifická technologie, podnikové informační portály. Výsledky této disertace vycházejí z využití kvalitativní analýzy sekundárních dat, která jsou tvořena výzkumy, které se zaměřují na problematiku podnikových informačních portálů. Kvalitativní analýza dat umožnila demonstrovat, jak konkrétní funkce podnikových portálů vytváří přínosy, které mají vliv na výkonnost podniku. Výstupem této disertační práce je konceptuální model, který reprezentuje taxonomii přínosů informačních systémů a dotazník, který může být využit jak výzkumníky, tak i konzultanty z praxe pro hodnocení přínosů podnikových portálů a pro sběr požadavků uživatelů podnikových informačních portálů.

Abstract

The purpose of this dissertation is to show how to provide more information to the decision makers about IS/ICT investments. A specific technology, Enterprise Information Portals (EIPs), was chosen for demonstration of the approach. The results of this thesis are based on qualitative analysis secondary data which consist from EIP research. The qualitative analysis showed how specific EIPs features support functions which create benefits and business value through supporting processes. The main outputs of this dissertation are conceptual model which represents a taxonomy of benefits of information systems and a questionnaire that can be subsequently used by researchers and consultants. The practical use case of the questionnaire is intended mainly for evaluation of EIP benefits and for gathering of user requirements.

Klíčová slova

Podnikové portály, nehmotné přínosy, kvalitativní analýza, hodnota informačních systémů, taxonomie

Keywords

Enterprise Information Portals, intangible benefits, qualitative analysis, information system business value, taxonomy

„Prohlašuji, že jsem disertační práci Hodnocení efektivnosti podnikových portálů vypracoval samostatně pod vedením doc. Ing. Radoslava Škapy, Ph.D. a uvedl v ní všechny použité literární zdroje a jiné odborné zdroje v souladu s právními předpisy, vnitřními předpisy Masarykovy univerzity a vnitřními akty řízení Masarykovy univerzity a Ekonomicko-správní fakulty MU“.

V Brně dne 15. 10. 2018 Michal Krčál

Na tomto místě bych chtěl vyjádřit svoji nezměrnou vděčnost svým rodičům, kteří mě skvěle připravili na cestu (nejen) akademickým světem a celou dobu mě na ní podporovali, stejně vytrvale a bez zaváhání, jako celý můj život. Mami, tati, díky za všechno!

Contents

Introduction

Not everything that can be counted counts,
and not everything that counts can be counted.
William Bruce Cameron

The idea for this research emerged during informal talks with executives from IT companies and during studying various IS literature. Not visible on the first sight but occasionally reoccurring the need for really identifying (not guessing) the IT business value of projects considered for investments and thus make proper decisions emerged as a problem. The status quo of evaluating IT investments is using financial methods regardless their actual information, added value, or real usability. Pre-sales consultants tend to "promise the moon" to decision-makers with the help of high ROI (Return on Investment) calculations in order to win the implementation project and worrying about the disappointed and frustration of customers later.

Rephrasing the problem in the language of economy, identification and evaluation of benefits (i.e. knowing the value) belong to one of the basic economics activities and affect decisions of subjects in economic transactions. Knowing the value of outcome of the economic transaction is crucial during deciding if the transaction is worth to be engaged in. To know the value of anything, information are necessary (Mankiw and Taylor, 2010, p. 822). Although the theoretical model of pure competition assumes, that all agents in the market (transaction) have ideal information, in reality, asymmetric or partial information are much more common (Mankiw and Taylor, 2010, p. 823). When we assume that the likelihood of optimal decision is positively correlated with the amount (to certain extent) and quality of obtained information, it could be concluded that the more information we want to obtain, the more expensive the obtaining process is (if we were even able to obtain the information at all) (Mankiw and Taylor, 2010, p. 823).

Managers usually decide without ideal information. Having asymmetric or partial information about new strategic investments is considered as normal. Then, "leap of

faith" (Small and Chen, 1995), "act of faith" (Irani and Love, 2000), "gut feel" (Bannister and Remenyi, 2000), or trust have more weight than quantifiable measures (Gibson and Arnott, 2005). When resources are limited, not every investment project can be selected, and therefore, estimations and approximations of benefits of the projects are usually the main criterion. But being able to objectively decide between investments projects such as IS/ICT implementation, marketing campaign, internal training program, product and service innovation, and production capacity increase is near to impossible due to completely different nature of benefits of each project. The difference between these investment projects is different ratio between tangible and intangible benefits, where tangible benefits are financially measurable and intangible benefits are not financially measurable (Kim et al., 2007, p. 591). Thus, the managers face a problem of how to literally compare incomparable.

Investments in IS/ICT can be regarded as strategic decisions which are probably the most important and the most difficult decision challenge that every enterprise (manager) faces. Although nowadays popular view on IS/ICT in enterprises includes IS/ICT usefulness and its benefits and IS/ICT is undoubtedly viewed as a necessary step towards growth, efficiency, or innovation, in the past, doubts and serious questions about IS/ICT productivity rose in a phenomenon called "productivity paradox" (Brynjolfsson, 1993), underlined by statement from Solow (1987): *"You can see the computer age everywhere but in the productivity statistics"*. Although the macroeconomic nature (market or economy level) of the productivity paradox does not provide any evidence if such problems occur at the enterprise level, past studies suggest that it could be a case. Nevertheless, IS/ICT investments can yield undoubtedly high returns (see one of many recent studies Saunders and Brynjolfsson, 2016). However, when omitting or poorly assessing intangible benefits, the (IS/ICT) investment projects with high ratio of intangible benefits can be falsely dismissed as uneconomic compared to other more "tangible"investment projects (Marsh and Flanagan, 2000; Kim et al., 2010, pp. 425, 221). Therefore, under an assumption of limited resources, managers may do wrong decisions about the projects they will invest in and thus hinder the prosperity of the organization they manage.

To help the managers with strategic IS/ICT investment decision, this study focuses on justification (appraisal) of IS/ICT investment projects. The goal of this study is to

review the existing approaches to IS/ICT justification and to show how to develop an approach for a specific IS/ICT that would provide managers more information that would increase the quality of their investment decision, lower the time needed for the decision and lower the costs that are needed for obtaining the needed information for the decision. More details about the research problem, theoretical concepts, and methodology of this research could be found in Chapter 2.

Due to the rapid development of information technology, many companies are facing paralysing information overflow that makes it difficult to use the available information properly (Dias, 2001). Moreover, *"our society can be characterised by information boom. The most pressure lies on managers and executives. The requirements on quality, validity, reliability and quantity of exchanged information are rising. The focus is on strategy. For all these things, adequate tools are needed."* (Tvrdíková, 2000, p. 11). One of the main characteristics of information age is information overflow (see (Toffler, 1980)). In this context, when manager is facing strategic decision, having as much information as possible is not the same as having the needed information. This thesis shows how in which structure and format the needed information could be produced.

Although the purpose of this research is to show how to provide more information to the decision makers about IS/ICT investments, it cannot be shown on all the technologies. Therefore, for this study, Enterprise Information Portals (EIPs) were chosen. I considered the fact that the technology should have a high ratio of intangible benefits to tangible benefits. During my master studies on Faculty of Informatics and Faculty of Economics and Administration, I focused in my two master theses on Enterprise Information Portals (EIPs). Indeed, EIPs can be used as a mean for lowering information overflow (Dias, 2001) through the support of knowledge management processes (Benbya et al., 2004), information management processes (Detlor, 2000), collaboration (Chang and Wang, 2011), or e-business workplace (Vering, 2001) and more. All of the mentioned effects are typical examples of intangible benefits, such as synergy from collaboration, faster knowledge and information retrieval, knowledge retention, or higher productivity. Therefore, they are a suitable technology to be used for developing a justification approach for dealing with intangible benefits.

For the purpose of development of the method, Resource Based View (RBV) (see section 1.6) and Dynamic Capabilities Theory (see section 1.7) were used. In fact, the

results of this thesis are not only usable for providing more information for decision making but they also extend both theories. As a method, Systematic Literature Review (SLR) research strategy combined with qualitative content analysis of identified relevant articles was employed. The reason for using secondary data was a natural first option choice as it should be logical to firstly try if any usable data for a particular research goal exist. When I was initially reviewing EIP literature, it was clear that the already existing research could be enough to produce enough data that can serve as grounds for EIP benefits evaluation method. Consequently, using qualitative analysis was the only choice as detailed mechanisms of how EIP generate business value needed to be thoroughly grounded in the data.

The content of this thesis is divided into seven chapters. Chapter 1 contains theoretical background that is relevant for research problem and methodology. Chapter 2 discusses research methodology, research problem (section 2.1), and research design of this study (section 2.2). The first step was to narratively review the literature that focuses on IS justification and IS business value research to identify and analyse the existing approaches and to try find those approaches that will prove to be suitable for further use. However, no useful approaches were find. The second step was to systematically review EIP research and conduct qualitative content analysis of relevant EIP studies that deal with EIP functions and benefits. Then, the results of EIPs content analysis and identified measures from ISBV and IS justification review were used to create Taxonomy of Information Systems Benefits for Enterprise Information Portals (TISB4EIP). The taxonomy was shown how it can be used during EIP justification processes as it can enhance the process with additional information regarding the intangible benefits. The content of the thesis is described in more details in the following paragraphs.

Chapter 3 contains results of a narrative literature review of IS justification and evaluation research and methods. The review was based mainly on literature review studies (section 3.1), and the recent research development in the area (section 3.2). From these three sections, measures that could be used in the content analysis for designing the coding scheme were identified and described (section 3.3) and subsequently used in section 5.3.

Chapter 4 contains the first part of results of a systematic literature review of EIP re-

search, namely discussion of definitions of EIPs and it shows the various characteristics of this technology (section 4.1).

Chapter 5 presents descriptive and analytical results from the content analysis of relevant EIP research articles. It describes theories and concepts that were partially used for creating categories and concepts (section 5.1). Then, the main descriptive part of the content analysis shows portal functions (section 5.2) and benefits (section 5.3) that were identified, conceptualised, and categorised during the analysis.

The final output of this research is introduced in Chapter 6 where a new artefact is described. The main result of this research is called Taxonomy of Information Systems Benefits for Enterprise Information Portals (TISB4EIP). The taxonomy (section 6.1 shows how benefits and functions of EIPs are related to each other and how they can create business value for an organisation.

The results are then put in the context in Chapter 7. This chapter discusses impacts and benefits of this research (section 7.1), limitations of this research (section 7.2), and directions and suggestions for further research (section 7.3).

Chapter 1

Theoretical Background

Before describing the research design, concepts that delimits the theoretical borders of this study are discussed in this chapter. Two following theoretical frameworks, together with several concepts, and their definitions relate to the research problem and constitute the theoretical base of this research. They served as a conceptual guide during designing the methodology of this study. Some concepts (e.g. justification, EIPs) that are directly connected with this research are discussed more thoroughly in both literature reviews in further chapters. Therefore, for the clarity of the methodological design described in the next chapter, following sections discuss all theories and concepts that shaped the creation of the methodology and the coding scheme used for the content analysis.

This chapter starts in the first two sections with brief definition of information systems and description of the object of this research, i.e. Enterprise Information Portals (EIPs). Then, introduction into areas of benefits of information systems, information system business value (ISBV), and information system justification follows. After that, in two sections, two crucial theories, Resource Based View (RBV) and Dynamic Capability Theory, are discussed and it is explained why this research is based on them. This chapters closes with two section dedicated to Information Management (IM) and Knowledge Management (KM) concepts which are closely related to EIPs.

1.1 Information Systems

Although ISICT can be defined broadly as in Glossary of Alliance for Telecommunications Industry Solutions: "*The entire infrastructure, organization, personnel, and components for the collection, processing, storage, transmission, display, dissemination, and disposition of information.*" (ATIS, 2016), this study will focus rather on components than

on the general concept of ISICT. However, as the following terms constitutes the basic vocabulary of the whole discipline, it is needed to explain them.

Especially because terms such as information systems (IS), information technology (IT), or information systems and information and communication technology (IS/ICT) are very close to each other. This study uses the term IS for "*what emerges from the usage and adaptation of the IT and the formal and informal processes by all of its users*" (Paul, 2007, p. 195). Another definition of IS from

The term IS differs from the term IT which stands for "*collection of devices, software and accessories*" (Paul, 2007, p. 195). Clearly, IT is a more specific term than IS which means that IT can be regarded as a subset of IS. Difference between IT and ICT lies then in adding communication technologies to information ones. When referring to other studies or theoretical concepts (such is IS or IT Business Value), the exact term used in the respective study remains unchanged in the text of this study.

1.2 Enterprise Information Portals

A particular type of IS/ICT, Enterprise Information Portal (EIP), will be the object of this study. In the context of this thesis, EIP definition was amalgamated from various definitions (see a detailed discussion in 4.1) into an integrated definition of EIP:

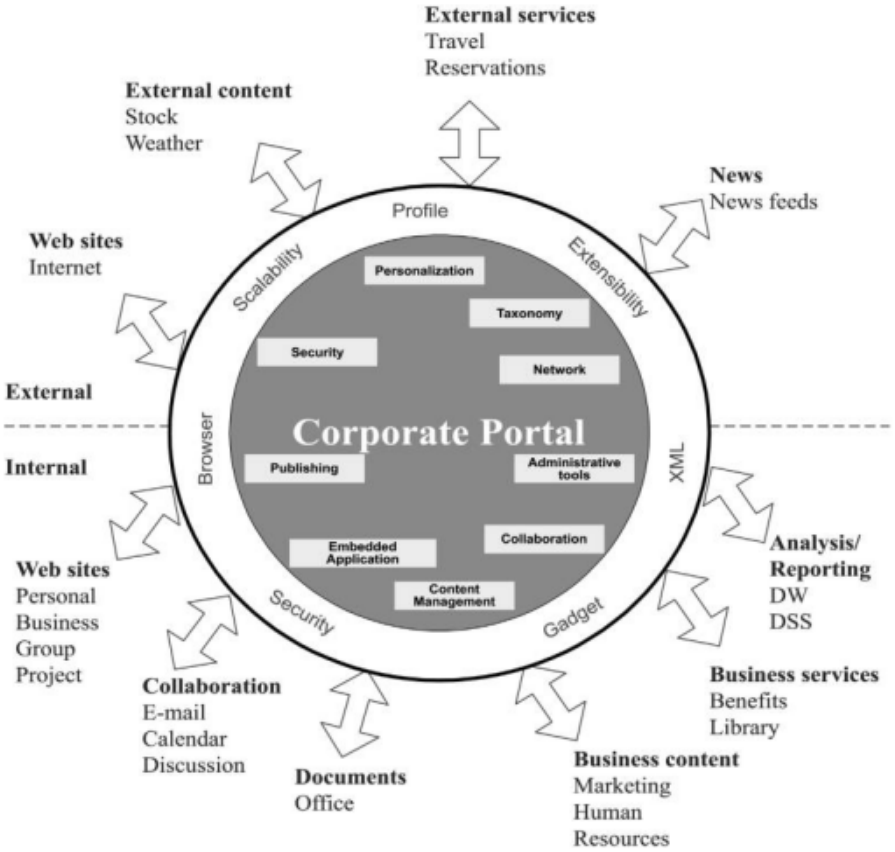
> *Enterprise Information Portals are a web based interface that provides integrative secure customizable single point of access for employees to information, knowledge, applications (e.g. Business Intelligence), and processes.*

Portals emerged around 1998 when public My Yahoo portal was introduced (Raol et al., 2002) and very quickly this concept got an enormous amount of interest during 1999 and 2000 (White, 2000). The introduction of EIPs to larger audience was done by Shilakes and Tylman (1998) (in White, 2000). Soon after that, business solutions quickly emerged, e.g. Portal Essentials (Oppong et al., 2005) from Sun Microsystems (today's division of Oracle). Since then, EIPs spread into a corporate environment extensively. In the sample of 293 Israeli companies, around 53% of them implemented EIP and another 20% were implementing EIP at the time of the survey (Fink and Neumann, 2009, p. 94). According to Gartner (as stated by Remus, 2007) by 2009 EIP market was

expected to grow to $7.1 billion with a five year overall growth by 27%, whereas the expectations in 1998 were at $178 million and in 2001 at $740 million (Raol et al., 2002).

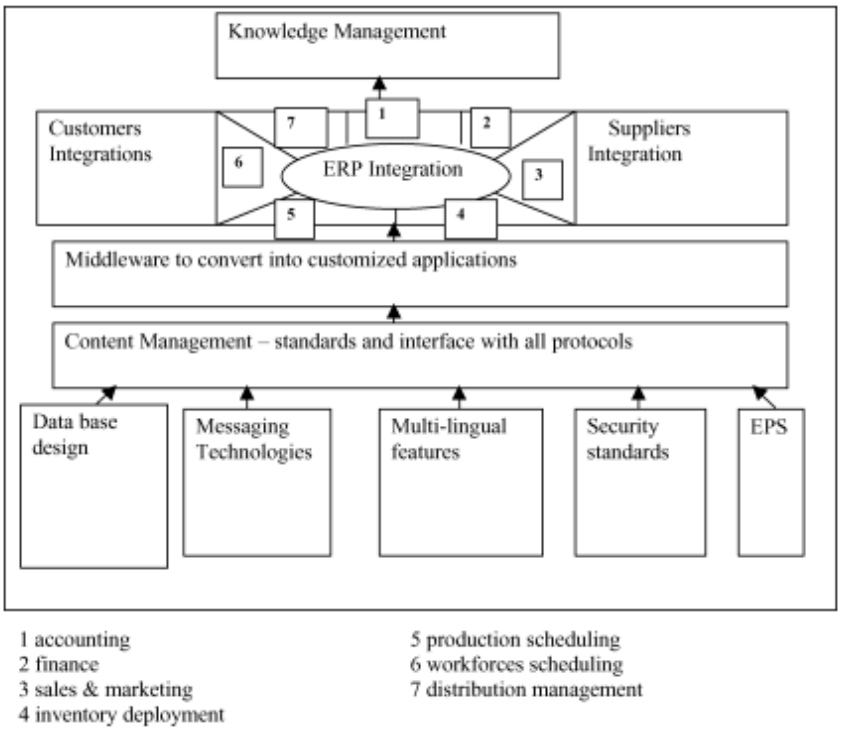
As the definition of EIP suggests, portals are so broad concept that they are better characterised by their attributes. Early in the EIP history, Aneja et al. (2000) identified portal features and functions and designed corporate portal framework (see Figure 1.1). Subsequently, the views on EIPs functionality evolved, which can be illustrated by the framework presented by Sharma et al. (2006) in Figure 1.2. Although the notion and functionality of EIPs evolved, the main merit stayed the same, portals are viewed as a core infrastructure (Chan and Liu, 2007) in information systems of organisations. As highlighted by Tojib and Sugianto (2006), in some organizations, an employee portal is the primary tool through which employees do their work.

Figure 1.1: Corporate portal framework by Aneja et al. (2000) taken from (Raol et al., 2002).



Thorough discussion of EIP features and functions that allows to create a better understanding of what EIPs are can be found in section 5.2.

Figure 1.2: E-commerce portal framework by Sharma et al. (2006, p. 145).



1.3 Information System Benefits

IS/ICT are usually complex systems and they have impact on organisations on all levels: operational, tactical, and strategical. Moreover, IS/ICT are generating various benefits not only immediately after their implementation but throughout their entire life-cycle. The visibility of IS/ICT benefits differs, as they can be hidden, intangible, tangible, direct, indirect etc. Intangible assets can be defined (Lev, 2000, p. 5) as

> *Assets are claims to future benefits, such as the rents generated by commercial property, interest payments derived from a bond, and cash flows from a production facility. An intangible asset is a claim to future benefits that does not have a physical or financial (a stock or a bond) embodiment. A patent, a brand, and a unique organizational structure (for example, an Internet-based supply chain) that generate cost savings are intangible assets.*

Many IS benefits have intangible nature (e.g. improved knowledge management, better decision-making, improved team work). Gunasekaran et al. (2006, p. 959) conclude that "identification and measurement of intangibles and other non-financial performance measures relevant in IT/IS justification is problematic and often neglected".

Irani and Love (2002) relate the level of planning to the nature of benefits, suggesting that strategic benefits are often intangible and non-financial, and operational benefits tend to be tangible and financial. Early IS provided mainly operational (easily assessed) benefits (e.g. automation, labour force reduction) but with the development of IS, the nature of benefits (and of course their evaluation) became more complex (Gibson and Arnott, 2005). Modern IS are being implemented mainly due to strategic reasons, therefore they provide mainly intangible benefits and the companies are challenged by intangible benefits identification and assessment (see Irani and Love (2000), for MRPII; or Gibson et al. (2004), for BI).

All challenges associated with intangible benefits (as it will be clearer in the next two sections) affect the usability of justification and evaluation methods. Therefore, the insight into IS/ICT benefits types and categories is crucial (hence the attempt of this research to establish a taxonomy of benefits see Chapter 6). A broader discussion of the IS benefits can be found in section 3.3, where various studies that tried to classify IS benefits or IS business value are reviewed. Not only knowing which benefits might be enabled by ISICT but also how they can be evaluated is crucial. Therefore, introduction into disciplines related with IS business value and IS justification can be found in the next two sections and in Chapter 3).

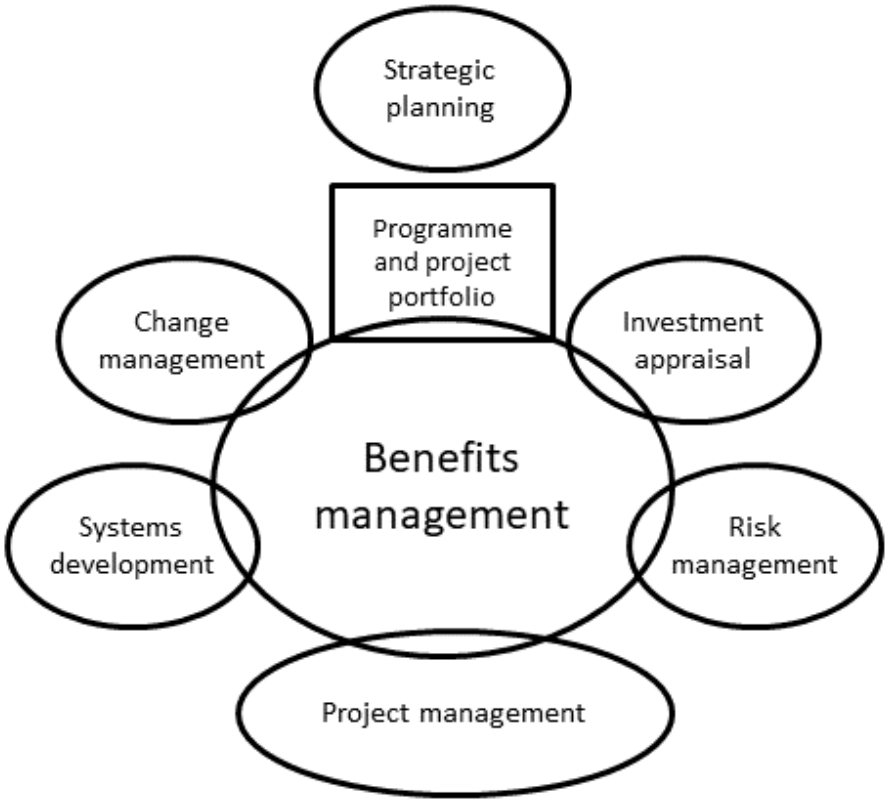
1.4 Information System Business Value

Because this study focuses on IS benefits, it could relate to the field of research that is called IS Business Value (ISBV). Defining this research field is not easy, as it progressed throughout the time and different concepts such as *values, benefits, outcomes, worth, organizational performance, economic impact* were investigated (Schryen, 2010a, p. 141). The general definition of this concept could be (Schryen, 2013, p. 141):

> *IS business value is the impact of investments in particular IS assets on the multidimensional performance and capabilities of economic entities at various levels, complemented by the ultimate meaning of performance in the economic environment.*

The broad perspective of ISBV is also based on its inherently multidisciplinary context. In practice, the management of ISBV could be represented by Benefits Management approach, which can be described as: "*the process of organizing and managing such that the potential benefits arising from the use of IS/IT are actually realized*" (Ward and Daniel, 2012, p. 8). Benefits Management is multi-disciplinary management approach that spans between several managerial disciplines (see Figure 1.3).

Figure 1.3: The context of Benefits Management Ward and Daniel (2012, p. 66)



This thesis deals with particular part of ISBV (or Benefits Management) that is mostly called as investment appraisal, ex-ante evaluation, or IS/ICT funding. This process is defined and discussed in the next section.

1.5 Information System Justification

However, the terminology associated with IS justification is far from being unified. Usually, the terms justification, appraisal, or ex-ante evaluation are used. In some cases, other keywords such as IS/IT investments, IS/IT measurement (Frisk, 2007), IT value management (Maes et al., 2011), or IT funding (Peffers and Santos, 2013) are used in articles. Generally, these terms are connected with finding the impact of IS on

corporate performance. In this paper, the term justification is used by the author of this study as a main term to describe the "process of estimating the future impact of an information systems investment before the implementation that employs set of metrics (qualitative and quantitative) in order to provide information for decision making" (based on Irani and Love, 2002; Raschke and Sen, 2013). Generally, justification happens before the decision about an investment is made and it consists of a process of identification and analysis of benefits of a considered investment in IS.

IS justification can be considered as a subset of ISBV (IS/ICT evaluation). According to Symons (1991), evaluation of information systems can be regarded as part of the organizational change. Using view by Pettigrew (1985) on studying organizational change, Symons (1991) claims that evaluation of information systems can be studied through the Content, Context, and Process (CCP) model. Avgerou (1995) describes the content as "criteria used to assess a proposed or an implemented change of information systems", the context as "the organizational and broader socio-economic environment", and the process as "actions, reactions, and interactions of interested parties involved in the information systems evaluation". Specifically, the CCP model defines several elements connected to IS/ICT evaluation: purpose (why), the subject and criteria (what), time frame (when), methodologies (how), and people (who) (Song and Letch, 2012). Hence, from CCP perspective, IS justification is a subset of IS/ICT evaluation specified in "when" (ex-ante) and "what" (information systems) perspective, and can be treated and studied in the same way as IS/ICT evaluation.

Consequently, IT funding research (IS justification) might be distinguished from ISBV as described by Peffers and Santos (2013) on evaluation timing, level of aggregation, and the object of evaluation, thus ISBV focuses in practice mainly on ex post measurement, while IT funding addresses ex ante estimation. Particularly, project justification is a process that is performed before the project is undertaken whilst project assessment is a process that is performed after the deliverables of the project are used. However, the business value constructs are estimated during the ex ante evaluation (Peffers and Santos, 2013), therefore the topic of ISBV was included in the review of justification research.

1.6 Resource Based View

Most of the IS business value research is based on RBV (discussed in Wiengarten et al., 2013). Edith Penrose is believed to establish the grounds for the Resource Based View theory in 1959 by labelling the firm as "a pool of resources" (Penrose, 2009, p. 132) which represents the basic idea of the concept. However, the term Resources Based View (RBV) was proposed by Wernerfelt (1984) much later. RBV builds on the premise that valuable or rare resources are the main driver that provide a competitive advantage (Wade and Hulland, 2004) or firm performance (Ravichandran and Lertwongsatien, 2005). Resources are intangible or tangible assets, such as brand name, knowledge, personnel, contacts, machinery, procedures (processes), capital (Wernerfelt, 1984, p. 172). Nevertheless, exact definition of resource is unclear, as different authors are using different meanings, e.g. competencies, skills, strategic assets, stocks (see Wade and Hulland, 2004).

RBV theory allows the researchers to show that IS/ICT resources and capabilities can have impact on organizational performance or create a competitive advantage. However, only general RBV relations between IS/ICT resources and capabilities were confirmed. Liang and You (2009) conducted a meta-analysis based on 42 IS/ICT research papers using RBV and tested, whether a relationship between IT resources (in general), organizational capabilities, and firm performance exists. In their model, two relationships were supported: impact of IT resources on organizational capabilities and impact of organizational capabilities on performance. However, RBV lacks explanation, which specific IS/ICT functions or features support which business processes or organizational capabilities and thus how the specific resources can increase organizational performance and create competitive advantage. Even the current qualitative research that focuses on RBV in the IS/ICT context uses as a basic analytical unit for IS/ICT resources a particular technology (e.g. Integrated Shipping Management System, Global Positioning System) (see Pan et al., 2015).

Therefore, in this thesis, IS/ICT resources are understood as a deeper concept than general set of all the types of IS/ICT, or specific IS/ICT applications. For the purpose if this thesis, IS/ICT resources are a collection of specific IS/ICT functions (features) and specific processes that are supported by these functions (features). The basic premise

of RBV that through specific IS/ICT resources a company can achieve a competitive advantage will be used for the structure of conceptual model and at the same time, the detail of the conceptual model will extends RBV and will provide the needed detail which specific features (and how) of EIPs creates the business value and achieve the competitive advantage. This point of view is complementary to the concept of "systemic capabilities" which was formulated by Cao et al. (2016, p. 562) and it explains that capabilities are exhibited only at the level of the whole system but not by the individual elements.

1.7 Organizational and Dynamic Capabilities

Extending RBV, Teece et al. (1997) formulated the concept of dynamic capabilities upon the idea that resources alone cannot ensure the long-term competitive advantage in dynamic environment. Thus, dynamic capability can be defined as "*a firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments*" (Teece et al., 1997, p. 516). The idea behind the theory can be summarized in this statement: "*organizational processes, shaped by the firm's asset positions and moulded by its evolutionary and co-evolutionary paths, explain the essence of the firm's dynamic capabilities and its competitive advantage*" (Teece et al., 1997, p. 518).

In general, (organizational) capabilities can be understood as "*an ability of an organization to perform a coordinated set of tasks, utilizing organizational resources, for the purpose of achieving a particular end result*" (Helfat and Peteraf, 2003, p. 999). They can be divided into operational and dynamic capabilities, where operational differ from the dynamic ones in the fact that they produce a good or provide a marketable service, while dynamic capabilities do not directly affect output of an organization (Helfat and Peteraf, 2003).

Organizational and dynamic capabilities will be used, together with RBV framework, in this research as part of the final conceptual model. Dynamic and organizational capabilities are using IS/ICT resources and at the same time enabled by them in order to sustain the competitive advantage in a long term. One of the example of a dynamic capability is an absorptive capacity of an organization which is tightly connected to Knowledge Management processes. This was studied e.g. by Limaj et al. (2016) on

Social Information Systems (general label for EIPs).

Chapter 2

Methodology

This chapter contains description of methodology that was followed during this research. The first section extends description of the research problem and the context discussed in the introduction. Besides the research problem, theories that serves as a theoretical underpinning or frameworks are briefly described together with definitions of the key terms. The last section of this chapter describes the research design and all its phases in detail.

2.1 Research Problem

Research in IS/ICT field seems almost as progressive as the development of IS/ICT itself. More sophisticated and complex IS/ICT are implemented by organisations (Ward and Daniel, 2012, p. 2). Some organisations are dependent on IS/ICT in a way that any disruption in IS/ICT functioning can be damaging (Peffers and Santos, 2013) or make their business activities impossible to perform (Schryen, 2010b). However, the speed of development, the high level of dependability, and the complexity of IS/ICT implicate the need for increasing levels of (managerial) skills, in order to deliver the promised benefits (Ward and Daniel, 2012). This complexity and fast development of IS/ICT also affect the ability of practitioners (and researchers) to strive for more detailed understanding of the phenomena leading to only shallow knowledge (research) and understanding of the technology they are investing in.

Although, much has been investigated in the field of IS/ICT justification, it seems that this effort yields insufficient outcomes. Organizations still struggle with finding reasons why to invest (or not to) in IS/ICT and what benefits such investment will bring. Researchers report lack of knowledge and use of IS evaluation methods (Bernroider and Schmöllerl, 2013). Moreover, “leap of faith” (Small and Chen, 1995), “act of faith”

(Irani and Love, 2000), "gut feel" (Bannister and Remenyi, 2000) or trust have more weight than quantifiable measures (Gibson and Arnott, 2005). These "methods" are considered by practitioners as viable decision methods for IS/ICT projects, although the higher level of using the multi-criteria decision methods for IT projects evaluation is positively associated with the decision effectiveness (Bernroider et al., 2014) and thus likely considering meaningful and beneficial investments as uneconomic only because of the lack of data (Small and Chen, 1995; Marsh and Flanagan, 2000; Gunasekaran et al., 2006).

Traditional (financial) methods for IS justifications have been heavily criticised from researchers since the IS justification attracted their interest (see Symons, 1991; Irani and Love, 2000). However, about one third of current research is still focused on financial and economic methods (Song and Letch, 2012). Therefore a question could be raised, why nothing has dramatically changed over the past two decades (and possibly even longer). Renkema and Berghout (1997) stated that too much focus is given to designing new evaluation methods instead of building on existing knowledge. More recent review study of Song and Letch (2012) revealed that 43% of reviewed evaluation studies in past 25 years focused on development of evaluation methods in contrast with only 12% of studies validating existing methods. This could be the reasons why managers either do not know the methods or do not use them (Bernroider and Schmöllerl, 2013; Bernroider et al., 2014) because they are not standardised.

In order to decrease an *"excessive emphasis on the technological and financial aspects of evaluation"* (Song and Letch, 2014), it is clear that more qualitative and intangible aspects of IS justification are needed to explore. As most of the IS justification research is exploratory or descriptive (Song and Letch, 2012), explanatory and confirmatory research seems to be neglected. This fact is likely causing that most of the developed methods and knowledge are too general. According to Nijland and Willcocks (2008, pp. 50-51), on the one hand academicians are developing sophisticated methods and improving the existing ones but on the other hand managers are reporting problems with evaluation (justification included) process and researchers and consultants are reporting the low level of usage of other than traditional methods. The solution for this problem could be in employing qualitative in-depth research that would unify the various approaches and methods by producing a common taxonomy of IS/ICT benefits and

showing how they can be achieved through specific IS/ICT functions.

The more the technology supports strategic processes, the more it is difficult to by justified because it generates intangible benefits (Irani and Love, 2002). Inherent non-financial nature makes intangible benefits complicated to be incorporated by ROI and other financial metrics, because they do not lead to identifiable effects on company accounts (Kim et al., 2010, p. 221). Therefore, *"the traditional cost benefit approaches to evaluating effectiveness [of IT] are now generally regarded as inadequate"* (Remenyi et al., 2007, p. 179), because projects with higher ratio of tangible benefits to intangible benefits can be inequitably favoured during the selection process. When the effects of IT are intangible (more than efficiency improvement), traditional approaches tend to underestimate the value of IT investments (Silvius, 2006). This fact is crucial because intangible benefits can seriously contribute to organizational success (Remenyi et al., 2007, p. 29). However, when omitting or poorly assessing intangible benefits, such project can be falsely dismissed as uneconomic (Marsh and Flanagan, 2000; Kim et al., 2010, pp. 425, 221). This was explained by Ward and Daniel (2012, p. 2): *"The prevailing focus of many organizations on achieving a short-term financial return from their investments prevents many of the longer-term benefits of a coherent and sustained IS/IT investment strategy from being achieved."*

Consequently, the whole enterprise can suffer through discriminating projects with many intangible benefits. Although *"intangible benefits may often be quantified by using measuring instruments such as questionnaires, it is quite difficult to make a creditable connection between what can be measured with such devices and the impact on the corporate financial results"* (Remenyi et al., 2007, p. 29). Therefore, the main issue of intangible benefits is not in their identification but in the mechanism by which they are achieved. Thus, it is important to find the route causes of what and how creates the intangible benefits and how they create value for an organization. Only then they can be incorporated into decision-making and corporate performance measurement.

Justification process of IS/ICT investments that is not based on proper information can have also negative impact on costs. Low success of IS/ICT projects (see *CHAOS Report 2016: Outline*), undelivered expected benefits (Ward and Daniel, 2012) may result in spending unnecessary costs and unusable functionality. The ineffective and inefficient justification process of IS/ICT projects is believed to be one of the reasons that too

many IS/ICT projects fail (Ward and Daniel, 2012).

Concluding, the research problem focuses on justification approaches and methods of Enterprise Information Portals at a project level. This thesis shows that the current body of knowledge of justification approaches, methods and processes is in general not sufficient for solving the practical problems of organizations that are deciding whether to invest in EIP or not (i.e. it lacks solutions for justification of intangible benefits of EIP implementation projects). Therefore, this study attempts to analyse the current state of the knowledge, identify and categorize the current approaches and measures used for justification, and use this categorization together with data obtained through content analysis of past research focused on EIPs for showing how organizations can identify which business value an investment into EIP can bring.

Thus, the goal of this study is to provide managers more information that would increase the quality of their EIP investment decisions, lower the time needed for the decision and lower the costs (and efforts) that are needed for obtaining the needed information. And thus to help them to make better decision. The formulation of this goal was based on several arguments that emerged from existing research. These arguments show that decisions about IS/ICT investments are not optimal, justification methods have problems with addressing intangible benefits, and RBV and Dynamic Capabilities Theory currently do not provide enough details that would show which specific IS/ICT resources (and how) create business value.

2.2 Research Design

Although measuring IS value at the firm level shows that IS is having a positive impact on a company performance (e.g. Saunders and Brynjolfsson, 2016), it helps a little to understand how IT provides value (Peffers and Santos, 2013). Moreover, it is also important to distinguish different IS assets, because *it appears that firms benefit unequally from their different IT investments* (Bharadwaj et al., 1999, p. 1020). This could be achieved by studying business value at the level of the individual projects (Schryen, 2013). Most of the research is focusing on higher or different levels respective to the project level such as market level, organisational level, user level (discussed in Maes et al., 2011). Therefore, this study will focus on the individual project level of a partic-

ular technology (EIP) and will show how to add the needed detail in the distinction of various IS assets.

To tackle the research problem described earlier in this chapter, firstly, EIPs were needed to thoroughly analysed. Therefore following aims needed to be fulfilled:

1. to analyse the body of knowledge of EIPs;
2. to characterise EIPs;
3. to identify EIP functions, processes that EIPs support, and benefits that EIPs create;

Besides, the theory of ISBV and IS justification needed to be analysed too. Therefore, the following two aims must be fulfilled:

1. to investigate the practice, reasons and impacts of currently used justification methods for EIP projects and;
2. to identify relevant methods of IS/ICT project appraisal (justification) with focus on EIP;
3. to suggest an approach or a method that would generate more suitable information for EIP project justification.

After fulfilling these aims, the main goal of this thesis with the use of the results of the content analysis that was used for analysing the body of knowledge, could be reached:

- by showing how to provide more information to the decision makers during EIPs justification process.

In the following sections, two phases of the research are described. In the first subsection, methodology of EIPs systematic literature review is described. In the second subsection, methodology of ISBV and IS justification literature review is described.

2.2.1 EIPs literature review

To my current knowledge, the only literature review that focused on EIPs was produced by Dias (2001) early after portals were introduced. Since then, many new studies

were published which increased the need for a thorough and contemporary systematic review of the EIPs body of knowledge. Unlike in the case of reviewing research of justification methods (see 2.2.2), thorough systematisation and content analysis of relevant EIP research demands using a different approach than a traditional (narrative) review. Therefore, this literature review was conducted as a systematic (research) literature review (SLR), which is considered as a *"systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of completed and recorded work produced by researchers, scholars, and practitioners"* (Fink, 2014, p. 3).

Thus, SLR enables the researcher to produce such a review that is not subjective and idiosyncratic (Fink, 2014, p. 14), and free from authors subjective opinion's (Petticrew and Roberts, 2008, p. 6). In this way, SLR is regarded as a counterpart to a traditional (narrative) review in terms of style (structured approach vs. variety of styles), method exactness (rigorous method vs. no defined method), and analysis (synthesis, meta-analysis vs. no specified analysis) (Jesson et al., 2011, p. 11). Moreover, SLR is characterized by a clear stated purpose (aim), a question, a defined search approach, stated inclusion and exclusion criteria, and qualitative appraisal of articles (Jesson et al., 2011, p. 12).

Because SLR is considered as a separate research (Okoli and Pawlowski, 2004; Tate et al., 2015; vom Brocke et al., 2015), aims and research questions needs to be discussed before proceeding to description of the SLR protocol. The aims of this SLR were to:

- find and review methods for EIPs evaluation (both justification and assessment),
- categorize EIPs from different perspectives (definitions, features, benefits, capabilities),
- develop conceptual model that can be used for designing the evaluation method.

Following the narrative review of IS evaluation methods, reaching the first aim helped with identification studies that introduced EIP specific evaluation methods. This built the basic overview of what was researched and where are the gaps. Reaching the second aim created an input for developing the conceptual model, which was the final objective of the EIPs SLR.

The aims were elaborated into research questions that helped to guide the procedure of SLR and especially of content analysis. SLR tried to answer following research ques-

tions:

1.1 What definitions of EIPs do exist?

1.2 What features (functionalities) EIPs do have?

1.3 What capabilities are enabled by EIPs in enterprises?

1.4 What benefits are generated by EIPs in enterprises?

1.5 What methods are used for EIPs evaluation?

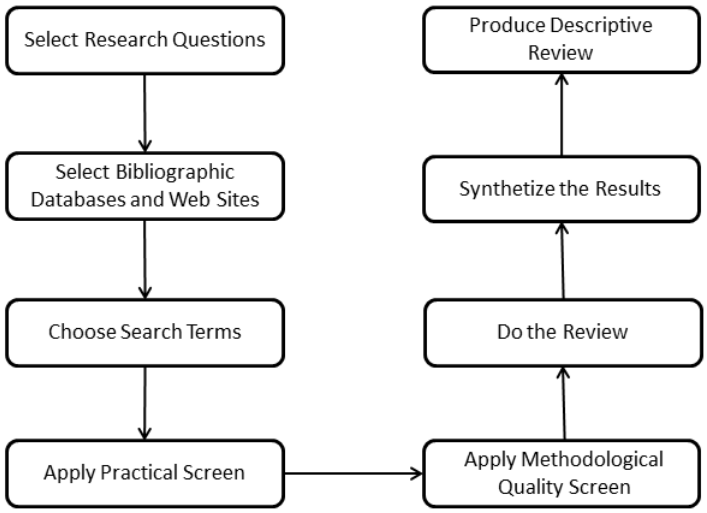
In order to answer the first four questions content analysis will be used in order to code definitions, features, capabilities and benefits of EIPs in literature and thus generate their categories. Then, EIPs will be categorized, comparing their definitions, features, enabled capabilities and generated benefits. Answer on fifth question will serve as starting point for second literature review.

Besides general guidelines for SLR, which originates mostly in non-IS disciplines, more discipline specific guidelines could be found. The special issue of Communication of the AIS focused solely on literature reviews in IS (see Tate et al., 2015) and it helps with tailoring the SLR methodology to the needs of this thesis. In this case, systematic does not only mean a rigorous way to find and assess the reviewed literature (most cases) but more importantly methodologically rigorous way how to analyse and interpret the literature. The predominantly used analysis in systematic research literature reviews was quantitative meta-analysis (Okoli and Chabram, 2010) as most of the early sources come from the health research discipline (e.g. Fink, 2014). However, social sciences can utilize more colourful analytical palette. Tate et al. (2015, p. 105) mention following examples of analytical methods: discourse analysis (Wall et al., 2015), grounded theory (Wolfswinkel et al., 2013), soft systems analysis (Sylvester et al., 2013), and stylized facts (Houy et al., 2015). This thesis used qualitative content analysis that produced conceptual model of EIP features, supported process, capabilities, benefits, and business value.

Being systematic assumes the existence of a protocol, which varies (comparison in Figure 2.1) from more granular approaches (such as Fink, 2014) through more straightforward guidelines (e.g. Jesson et al., 2011) to a very general phase structure with detailed description of particular process (see vom Brocke et al., 2015). In this thesis the approach presented by (vom Brocke et al., 2015, section 5) is used because it was de-

scribed in the context of IS discipline and more importantly, it provides simple basic structure while providing detailed guidelines for each step. Thus, the rest of this section is divided into three following parts which describes the procedures conducting during extraction, analysis, and synthesis of the literature. The fourth phase, writing the review, is not crucial to be described from the methodological reasons.

Figure 2.1: Steps of systematic review (Fink, 2014, p. 4)



Extraction of relevant literature

Introduced by vom Brocke et al. (2015) and subsequently tailored and published for a different SLR (Krčál, 2017), the set of guidelines presented in Table 2.1 was followed during the extraction of relevant literature. The presented guidelines are not in a sequential order in which they were performed, however, the helped during the whole process of extracting the relevant articles that were subsequently analysed.

	Activity	Descripion	Procedure
1	Develop an understanding	Especially for novice researchers, it is important to understand the phenomena they are researching.	This thesis is a result of conducting two diploma theses. Moreover, I reviewed the seminal papers regarding EIP in the research proposal.

2	Justify the purpose	To merely conduct SLR should not be a self-sufficient reason.	No review focusing on EIPs was found and the main output of the review is a conceptual model. Using already existing secondary data was therefore preferred before a complicated gathering of empirical data.
3	Define the search scope	Systematic means to have a scope and to specify the nature of the search.	This SLR was sequential and used citation indexing services (WOS, Scopus). The search coverage was comprehensive, however, analysis not fully comprehensive.
4	Develop search terms	Search terms define the population of the sample which will be reviewed.	Portal terminology is straightforward, thus selecting the keywords and effective search term was not difficult. The search term was refined after reading few randomly chosen articles.
5	Backward and forward search	As not every relevant article might content necessarilly the keywords in search terms, backward and forward citation search is needed to be performed.	Backward citation search was performed during the analysis process when coding the articles. The forward citation search was performed after the first round of coding.
6	Sample size	In the case that not all the articles could be reviewed, SLR can be kept manageable by limiting the sample size.	Because the number of articles to review was too high, the analysis was reduced only to journal articles. Conference articles were excluded.

7	Document the search	As every other research study, SLR should be reproducible and thus documented thoroughly.	The steps of the review and decisions regarding the number of relevant articles were documented and are presented in Figure 2.2. The article database was stored in Zotero (see Appendix A)
8	Evaluate the articles	Search results do not mean they are relevant articles. Therefore, they need to be evaluated for an analysis suitability.	First, the articles were evaluated according to the content of the abstract. Second, the articles that were inconclusive, were evaluated according to scanning the full-text. Third, suitability of the articles was evaluated although during the coding.

Table 2.1: Guidelines for literature extraction. Source: vom Brocke et al. (2015).

The final search term consisted from the following keywords that were inclusively joint and enriched by the asterisk symbol.

```
"enterprise portal*" OR "enterprise information portal*" OR
"corporate portal*" OR "knowledge portal*" OR " *employee portal*"
```

The particular search terms were derived from this general search term. The search term in WOS targeted all databases, and included only articles in English and articles that were :

```
TS=("enterprise portal*" OR "enterprise information portal*"
    OR "corporate portal*" OR "knowledge portal*"
OR "*employee portal*")
Refined by:
LANGUAGES:(ENGLISH)
AND DOCUMENT TYPES:(MEETING OR ARTICLE OR REVIEW)
```

The search term in Scopus included only articles written in English and was limited to conference papers, journal articles, reviews and articles in press.

```
TITLE-ABS-KEY ("enterprise portal*" OR "corporate portal*"
  OR "enterprise information portal*" OR "knowledge portal*"
OR "*employee portal*")
AND (LIMIT-TO( LANGUAGE, "English"))
AND (LIMIT-TO (DOCTYPE, "cp") OR LIMIT-TO (DOCTYPE, "ar")
    OR LIMIT-TO(DOCTYPE, "re") OR LIMIT-TO(DOCTYPE, "ip")
```

The last search in databases was performed on January 22th 2018 and yielded 662 unique results altogether. More detailed information can be found in Figure 2.2.

The procedure of evaluating articles was performed with the help of citation management tool Zotero. First, the search results were automatically exported from both citation index databases to Zotero. Second, the results were merged in order to avoid duplicities. Thirdly, the relevancy of articles was reviewed according to the content of their abstract. Every decision about inclusion or exclusion of the article was documented by tagging the article with a proper category.

Qualitative appraisal of articles

Qualitative appraisal of articles was done during content analysis, therefore, initially, more articles were analyzed than was the final number of articles used for result analysis. First, the quality of language of abstract alongside with the completeness of information about the article was assessed. Then, the article was evaluated from methodological perspective. If the methodological part was not presented, thus the article being merely an essay, it was excluded from analysis. If the methodological part was presented but lacked significant information about the procedure of the research, the article was also excluded from analysis.

Analysis of relevant articles

Content analysis was used for analyzing the content of relevant articles in order to answer investigative questions and categorize EIPs. Krippendorff (2013, p. 24) defines content analysis as *"a research technique for making replicable and valid inferences from texts to the context of their use"*. More specifically, Elo and Kyngäs, 2008 state that *"qualitative*

content analysis provide broad description of the researched phenomenon and the outcome of the analysis itself might be a conceptual model or map". The categorization was developed as a conceptual model according to emerged codes during content analysis. The conceptual model can be found in Chapter 5 together with emerged codes.

According to investigative questions, full texts of articles were coded. After coding first ten articles, initial categories started to be established. The coding procedure continued iteratively. During this process, parts of texts were recoded as definitions of categories were changed and, new categories were made and some categories were merged. After coding the articles, relationships between codes were established. All quotations used for categorizing were distinguished according to their level of grounding in the data. Namely, every quotation was assigned by a code based on the origin of information: result (coded information was grounded in the primary data), cited (coded information was grounded in the secondary data), opinion (coded information was grounded in author's opinion).

The coding scheme was developed and based according to section 3.3. The theoretical concepts from ISBV and IS justification review were used for creating the main structure of the codes, however, the hierarchy of the respective codes within their structure (feature, capability, benefit) emerged inductively during the process of coding and analysis. The coding scheme with definition of the codes can be found in appended Atlas.ti project file (see Appendix A. The main categories were developed in an implication chain: features -> tools (groups of features) -> processes (org. performance is moderated by business process efficiency) -> benefits -> business value.

2.2.2 Justification literature review

This literature review was conducted as a mix of narrative (traditional) review and systematic literature review and has inductive nature. Although narrative review lacks rigour, transparency, and repeatability by others, it allows more flexibility and exploration of researcher's ideas (Rojon et al., 2011; Jesson et al., 2011). Narrative review can lead to idiosyncrasy and thus omit important research that can contradict authors beliefs (for more detailed discussion see subsection 2.2.1). Because the topic of IS/ICT evaluation is broad and inconsistent in terms and keywords, it would be difficult to find and establish some borders and limit the search query in advance. Therefore,

“pure” deductive systematic literature review would be inefficient for accomplishing the purpose of this review.

However, in order to minimize the risks of narrative review, thorough backward and forward citation analysis was used during the review. Although this process can reveal “hidden” (for author) topics, completely different context or viewpoint will be missed. However, systematic literature review approach is not resistant to this problem either. The systematic part of the review consists of detailed description of search process. The narrative part of the review is represented mainly by the qualitative analysis of identified articles representing current research in IS justification and by the evaluating of relevancy of articles during backward and forward citation search.

Firstly, analysis of review studies of IS evaluation was performed in order to establish key terms, concepts, and taxonomies of IS justification field. As IS justification forms a part of IS/ICT evaluation discipline (see section 1.5), not every relevant research is aimed solely on IS justification. Therefore, IS/ICT evaluation reviews, which deal with IS justification in any form, were included in the initial analysis. The search started with finding articles in Web of Science that were focused on IS justification or IS appraisal. Initial query was designed as: "information system*" AND "project" AND ("appraisal" OR "justification"). After the search, combinations of other search queries and backward and forward citations searches were performed. This procedure revealed 12 studies that could be considered as literature reviews that deal (not solely) with IS justification (see analysis of reviews in section 3.1).

Secondly, forward and backward citation search in Google Scholar and SCOPUS database was employed in order to find possible articles that would bring answers for research questions. The forward citation search was not restricted by the year of publication as it was necessary to review or confirm the conclusions of the cited articles. The backward citation search was limited for the purpose of analysis of current IS justification research to the publication year 2006, when the latest IS justification review (Gunasekaran et al., 2006) was published. For the purpose of the search, keywords “justification”, “appraisal”, “value”, “evaluation” were used. In some cases, the backward citation search was used for finding older articles. However they were not used for the analysis of current research but for the purpose of confirming already found concepts and theories. The point, when I stopped acquiring more articles was, when

most of them were repeating and no new topics were found.

2.2.3 Content Analysis

The coding procedure that was employed during the qualitative analysis was done in the following way. First, all the articles were openly coded in the first round of coding. Second, axial coding was used in the next round as some categories were changed, and new categories were created. Third, selective coding was employed to chose the categories that were best explaining the taxonomy. During this phase, some articles were even excluded from the analysis.

The whole coding procedure can be described in Figure 2.3. In the picture, the white rectangles are quotations which are part of the text that was found as important or explaining well something that relates to EIP features, tools, functions, benefits or business value. Then, the quotation was either related to some initial code (category) or was left uncoded for later. If the quotation had some relationship explained in the text, the relationship was coded also. In Atlas.ti, such relations can be coded by a link which is special entity that bounds two quotation together.

In the subsequent phase, quotations with codes and links were used for creation relationships between codes (i.e. on more abstract level). Quotations that did not have a code were coded. During this phase, restructuring of the coding scheme (i.e. creating new codes, merging some codes together, renaming, or deleting) was done for the first time.

After that, all codes for every article were analysed again if there are any redundancies or quotations without codes. The surrounding of all quotatoins was also checked, if anything new can be coded because during the process of coding, the research can find new relations or categories that were not known in the time that the specific article was coded.

Finally, all the relations from all the articles were used for creation of hypotheses that subsequently constituted the conceptual model that represents the taxonomy which is the final output of this thesis.

In the chapters that discuss the result of the content analysis, many pictures of codes, quotations, and their relations are depicted. Besides that, some tables and networks

with quantitative information is displayed too. In these figures that depicts models of relations between codes (categories that characterises concepts) the quantitative data embedded in them has a meaning. Letter G stands for grounded and it shows how many quotation the code has, in a loose sense it can be understood as a frequency of occurrence of the code. Letter D stands for density and it shows how many relations the code has, in a loose sense it can be understood as an importance of the code because it affects other categories or concepts.

Figure 2.2: Protocol of selecting and evaluating relevant articles

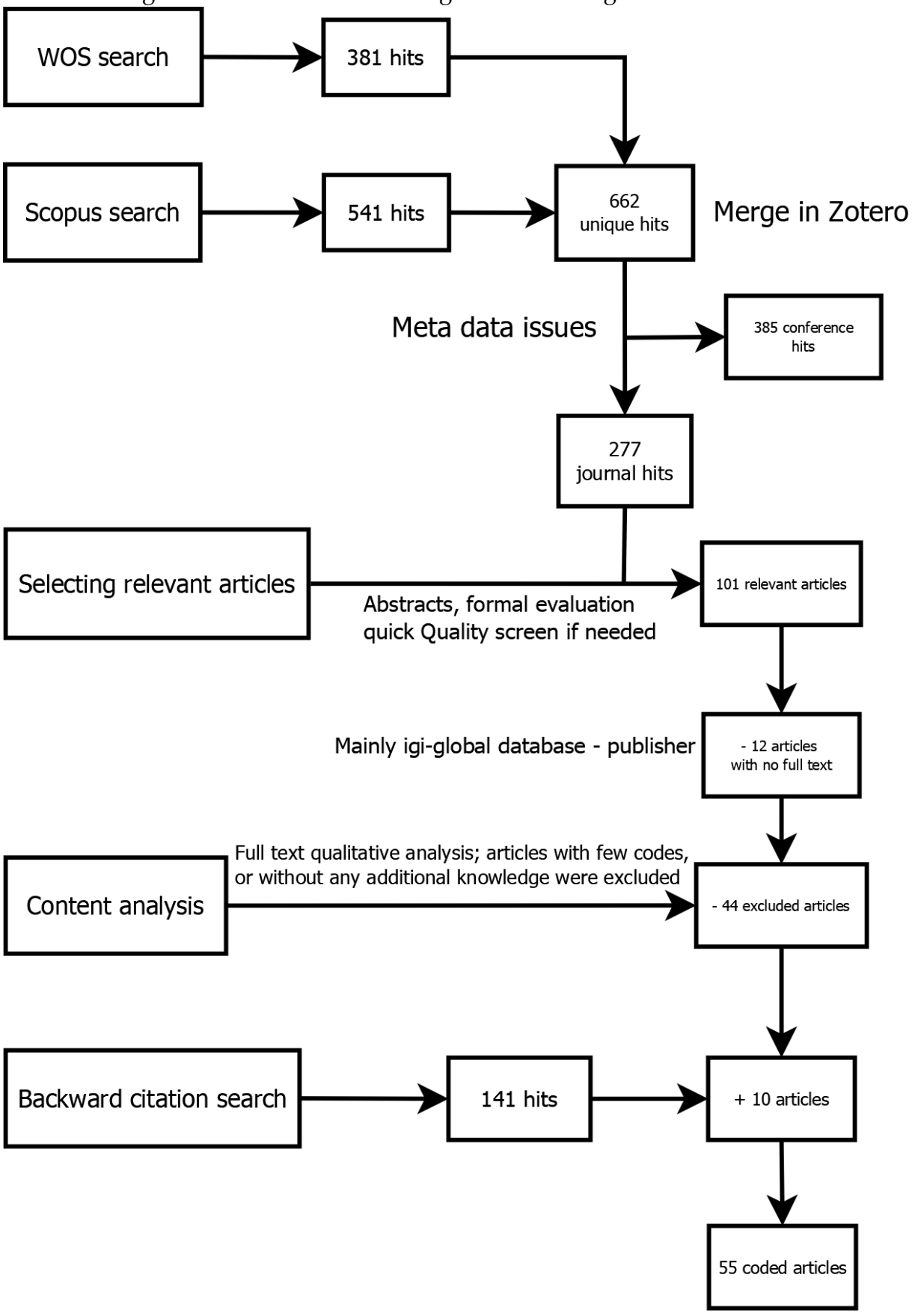
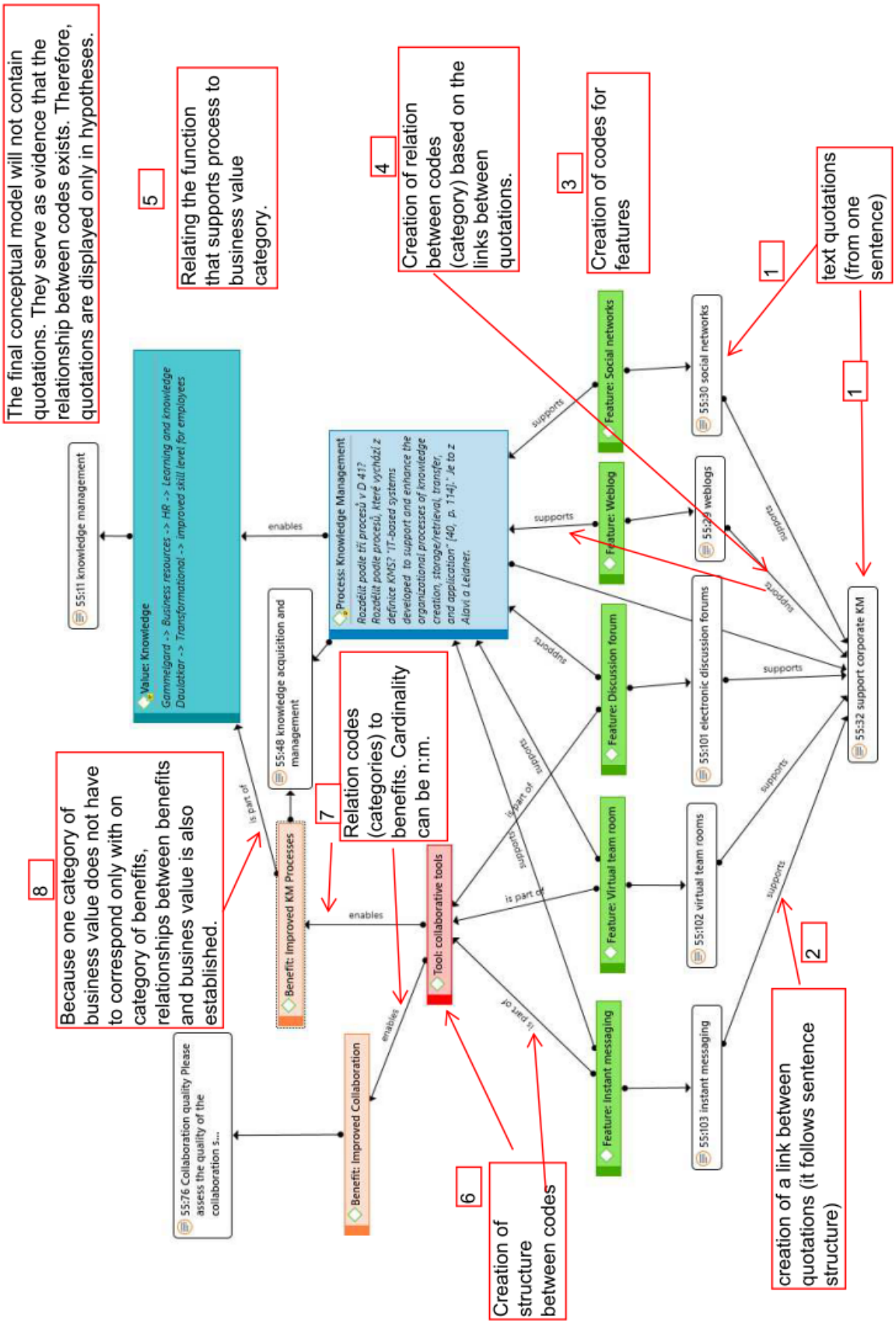


Figure 2.3: Description of coding procedure



Chapter 3

Information system justification

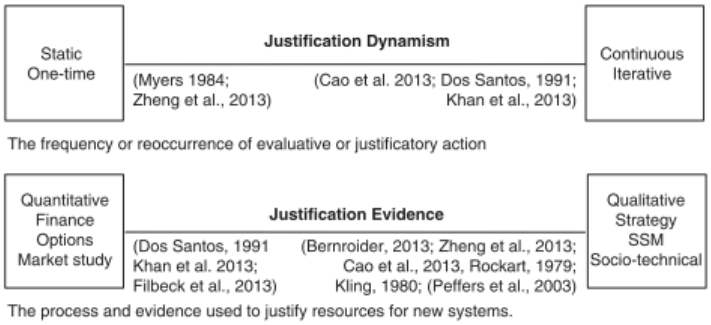
Focusing the review only on IS justification was complicated as it is usually investigated within or together with the scope of IS business value. Moreover, navigating through the landscape of IS justification methods is a difficult challenge. In practice, plethora of methods exists and is used. Nelson (2005) lists almost 60 of them and regards the list incomplete. However, most of them are not easily (or not at all) usable, as they were developed primarily for commercial use by consultant agencies and thus the public description is missing (Nelson, 2005). Researchers are not helping with synthesising the knowledge about existing methods, as they are rather developing new methods and measurement constructs than validating the existing ones (Song and Letch, 2012). To complicate the matter even more, although the decision makers know part of the available methods, they do not tend to use them (Bernroider et al., 2014).

Nevertheless, the need and importance of IS (any project) justification is frequently stressed and discussed. PRINCE2 project methodology considers continued business justification as the first principle of its methodology (Office of Government Commerce, 2009, p. 24). Deciding about an IS investment, which involves identifying and estimating the benefits and costs, is a big challenge (Peffers and Santos, 2013).

Traditionally, justification methods were focused on financial appraisal because early IS implementations were replacing clerical and information workers which could be evaluated by labour costs savings (Peffers and Santos, 2013). However, the purpose of IS has changed from the early era of computing. The nature of the changes in IT funding process were synthesized by Peffers and Santos (2013) in Figure 3.1.

The rest of this chapter reports findings from the narrative literature review focused on IS justification. The first section describes the analysis of IS justification review studies. Then, current research trends in IS justification research is discussed in section 3.2. It

Figure 3.1: Development of IT funding process (Peffers and Santos, 2013, p. 132)



follows with review of justification and evaluation studies that focused specifically on EIPs. These three analyses were used in section 3.3 for developing a list of possible measures that would be suitable for IS justification and were used in developing the coding scheme for content analysis.

3.1 IS justification reviews

Reviewing literature is best to start with existing literature reviews. Twelve literature reviews aimed on IS evaluation (or IS business value in general) were produced during recent two decades. The scope and topics of these reviews vary to the extent that no structured comparison is possible, as the definition of IS business value concept differs (Schryen, 2010a). Table 3.1 provides overview of the analysed review articles and contains information about each study such as scope (Evaluation or Justification), source (Journal or Conference), researched concept, methodology, main outcome of the review, and number of reviewed articles (Referred or Analysed).

Authors	Scope	Source	Used term	Methodology	Outcome	Sample
Symons (1991)	E	J	Evaluation	None (narrative)	Implications for practice	46 R
Renkema and Berghout (1997)	J	J	Evaluation at the proposal stage	None (narrative)	Categorization and comparison of methods	76 R
Irani and Love (2002)	J	J	Ex-ante evaluation	None (narrative)	Taxonomy (six categories)	75 R

Melville et al. (2004)	BV	J	IT Business Value	None (narrative, synthesis)	Synthetized integrative model; questions and propositions for further research	170 R
Rainer and Stix (2004)	J	C	Appraisal	None (narrative)	Comparison and implications for use	37 R
Gunasekaran et al. (2006)	J	J	Justification	Search description, narrative	Classification of literature	78 R
Frisk (2007)	E	C	Evaluation	Search description, narrative	Perspectives of research	105 A
Arviansyah et al. (2011)	E	C	Evaluation	Systematic literature review	Descriptive analysis of previous research	99 A
Song and Letch (2012)	E	J	Evaluation	Search description, quantitative scientometric	Descriptive analysis; research gaps; suggestions for further research	176 A
Ahmad et al. (2013)	J	C	Justification	None (narrative)	Conceptual model of decision factors	9 A

Peffers and Santos (2013)	J	J	Justification	Preview to special journal issue	Dimensions of IT funding process; suggestions for further research	50 R
Schryen (2013)	BV	J	IS Business Value	Search description, narrative	Synthesis; research gaps; suggestions for further research	327 A

Table 3.1: IS evaluation and IS business value literature reviews.

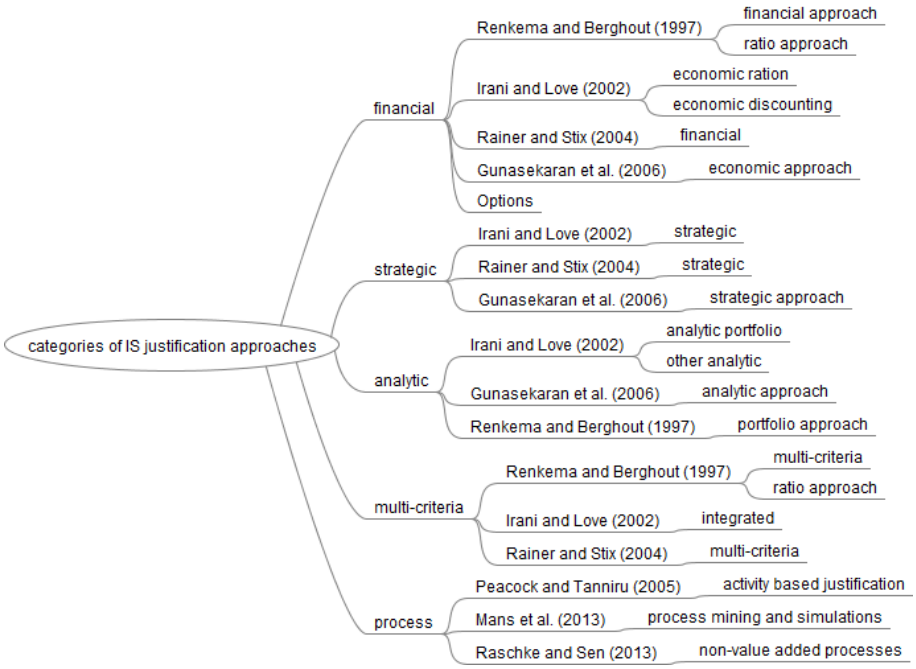
Although the literature review is considered as a standard research methodology, the majority of literature reviews contains no methodology description at all, the rest of them contains only limited description of the methodology or article identification procedure. Two main approaches to conducting the literature review in IS justification area were generally used: narrative (traditional) review and systematic (research) review (see section 2.2). Apart from Song and Letch (2012) study, reviews were performed with the use of narrative literature review, although the methodology was not explicitly stated and described. Sampling and search procedure and method of article content analysis should be present in the literature review studies in order to verify the reliability and validity of the review. However, about a third of IS business value reviews analysed by Schryen (2010a) did not presented the protocol for literature search, therefore the incompleteness of literature reviews is not a rare phenomenon. The most detailed, but still insufficient methodology description was produced by Song and Letch (2012), reviews from Frisk (2007) and Gunasekaran et al. (2006) provided at least search description and thus the basic means to assess the credibility of the review.

The outcomes of the reviews have mostly descriptive nature and the reviews provide various categorizations and taxonomies. Although discovering categories is one of the

valid objectives for qualitative research (and literature review as well), mostly no other outcomes such as concepts and models were produced. Besides study from Schryen (2013) and from Song and Letch (2012), the other reviews lack direct identification of gaps in the literature and directions for future research. No review produced detailed suggestions for future research such as hypotheses or research questions, which a qualitative research would be assumed to produce.

Naturally, traditional (financial, economic) methods are present in all taxonomies. However some inconsistencies, mainly in terms of ratio approaches, occurred, resulting in assigning the ratio approach to financial and multi-criteria approaches, as they compare the outcomes of these approaches. Besides study by Renkema and Berghout (1997), strategic approach is considered as separate category by all studies as well, including using of the same term. The last category of methods was difficult to establish, because the distinctions between analytic and multi-criteria approach are not clear. According to definitions and descriptions of approaches in analysed studies, multi-criteria approaches can be considered as a special case of more general analytic approaches. The three categories and the studies that introduce their variants are shown in Figure 3.2.

Figure 3.2: Categorization of IS justification approaches



3.2 Current research development in IS justification

New research in IS justification field seems to be shifting from static and one-time justification efforts to continuous or iterative approaches and from traditional justification methods towards qualitative, strategy focused, and socio-technical methods (Peffers and Santos, 2013). However, traditional approaches are still present in current research but new trends and concepts are emerging. The following text discusses the current trends in IS justification research.

3.2.1 Traditional methods

Despite the critique of using traditional methods for IS justification, the research in this area is still active. Auer (2013) introduced real options analysis for SOA projects as a *"complementary approach to traditional Net Present Value valuation"*.

3.2.2 Process oriented approaches

With advances in Business Process Management (BPM) and Activity-based Management (ABM), possibilities of activity-based IS justification has started to be investigated. Peacock and Tanniru (2005) introduced an approach which is using activity-based costing for justifying IT investments. Other researchers continued with the research in this directions, e.g. Raschke and Sen (2013) introduced value-based approach focused on measuring reduction of non-value added activities by the information system being justified; Mans et al. (2013) introduced process oriented methodology for IS justification and evaluation combined with process mining.

3.2.3 Strategic alignment

When IS stopped to be *"just"* quick operating efficiency optimization means and their functionality moved more into the support of strategic initiatives, the problem of strategic alignment of IS gained more importance. The development of Balanced Scorecard (see Norton and Kaplan ODKAZ) initiated customization of this concept into the IS world (e.g. (Silvius, 2006)).

3.3 Information system evaluation measures

For the purpose of the content analysis, the coding scheme had to be developed. Although, it was mostly developed inductively during the course of the analysis, general code groups and some particular codes were derived from literature. Moreover, the content of this whole chapter, and especially of this section increased the theoretical sensitivity which helped during the content analysis and category refinement.

3.3.1 Benefits and business value

Daulatkar and Sangle (2016) synthesized IT business value (ITBV) benefits from Mirani and Lederer (1998) and Gregor et al. (2006) into four categories: strategic, informational, transactional, transformational, and infrastructure ITBV benefits which where re-conceptualized into following categories: strategic, transformational, alliance, utility ITBV benefits (see definitions in Table 3.2). In this research the categories of EIP benefits were built inductively, however, the conceptualization of each category in measure items was used for code refinement during the content analysis. The items are presented in Figure 3.3.

Figure 3.3: List of ITBV benefits from (Daulatkar and Sangle, 2016)

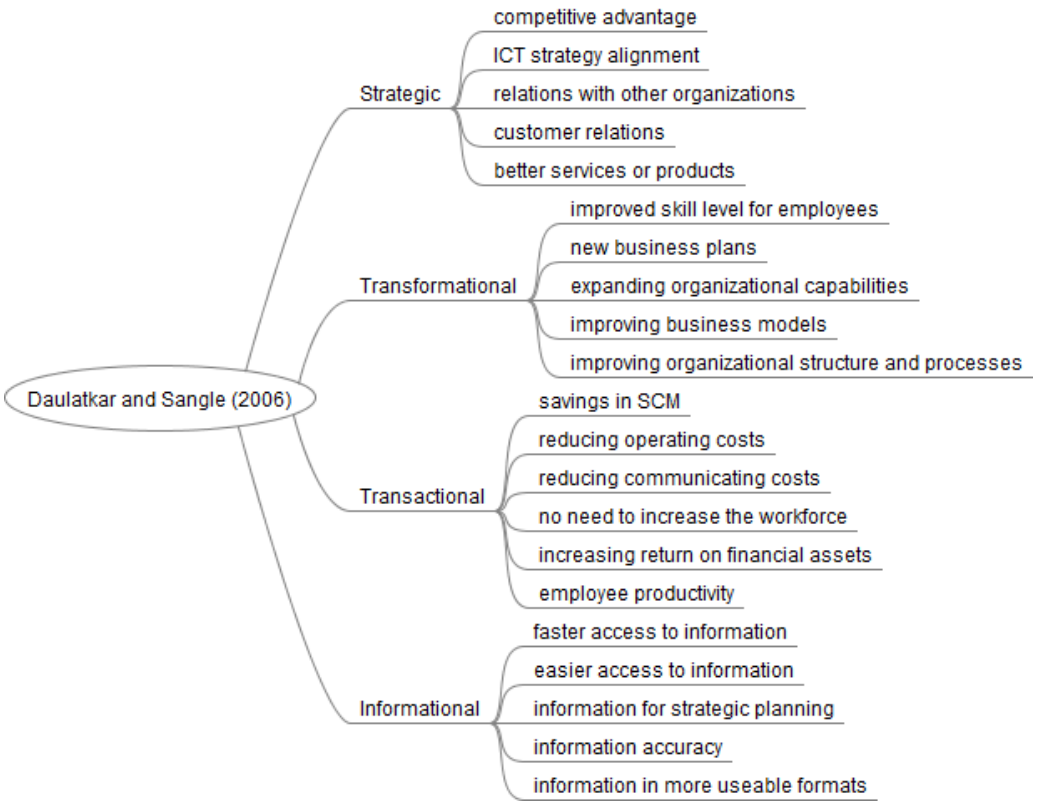
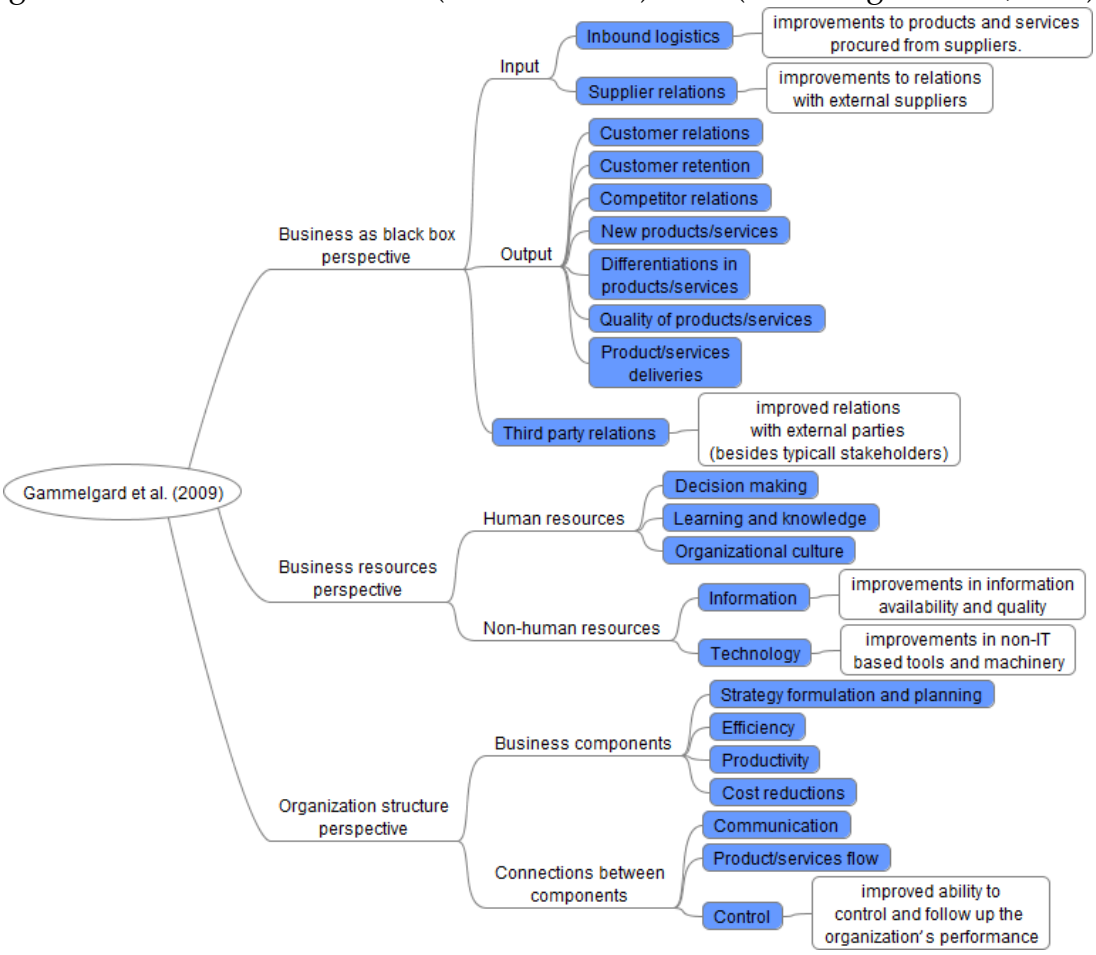


Table 3.2: ITBV benefits according to Daulatkar and Sangle (2016)

Synthesized categories	Reconceptualized categories
Strategic benefits change an organization's product or the way in which the organization competes	Strategic vision benefits help achieve its strategic vision of changing organization's product or the way it competes by changing new (innovative) markets through partnering with its business partners
Transformational benefits result of changes in structure and capacity in a firm that may accompanying investment in IT	Tranformational benefits result from the IS championing process and product innovation as a result of changes in structure and capacity in a firm through infusion of new knowledge
Informational benefits provides the information and communication infrastructure of the organization	Alliance benefits help the business build alliances with other business and IS partners to both support existing business operations and identify and utilize opportunities for new products and services
Transactional benefits supports operational management and helps cut costs	Utility benefits help an organization achieve increased efficiency by cost reduction through business being supported by most economical vehicle for the provision of IT-enabled producst and services

Besides study from Daulatkar and Sangle (2016), another attempt to categorize benefits from IS investments by Gammelgard et al. (2009) resulted in identifying 25 categories of benefits which are displayed in Figure 3.4 (most of their names are self-explanatory, where needed, description was added).

Figure 3.4: List of ITBV benefits (in blue colour) from (Gammelgard et al., 2009)

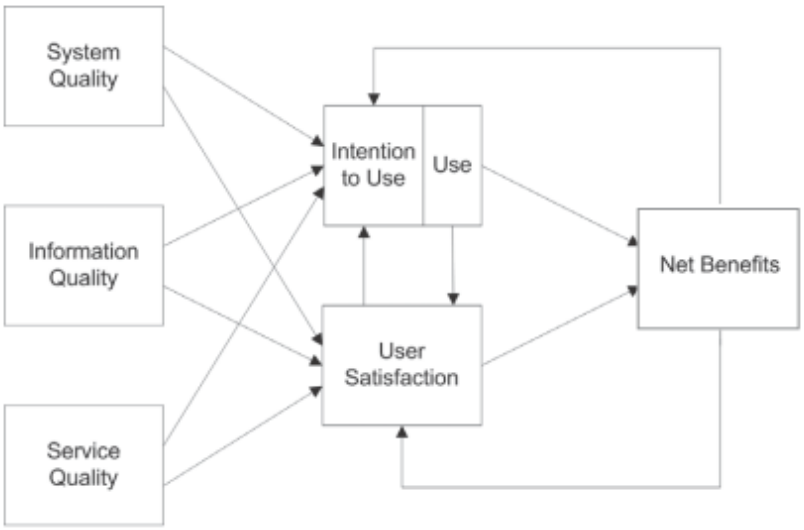


.

Based on results of literature review of appraisal of IS investments, Schryen (2013) identified a less structured list of following measures that were used in research studies: productivity, capacity utilisation, product quality, customer satisfaction, production efficiency, productive efficiency, consumer welfare, profit ratios (e.g. return on assets), and Tobin's Q. These measures are covered in the mentioned taxonomies, therefore they were not used during the conceptual model design.

Although the concept of IS success represented mainly by DeLone & McLean IS Success Model (see DeLone and McLean, 1992; DeLone and McLean, 2003; Petter et al., 2013) investigates net benefits of IS, it is explained by the quality of the system and not by the functionality of the system, i.e. by resources (see Figure 3.5).

Figure 3.5: DeLone and McLean IS Success Model (DeLone and McLean, 2003)



3.3.2 Processes

Although benefits of IS are clearly connected with firm performance, the mechanism how IS investments impact the firm performance is less clear. Processes and their performance are considered the link between IS resources and organizational performance (Melville et al., 2004). Processes performance is not the only mediator of the impact of IS resources (investments) on firm performance. According to Schryen (2013), IS business value research investigates the mediating role of internal capabilities, IS capabilities, and socio-organisational capabilities.

Chapter 4

Definition of Enterprise Information Portals

Enterprise Information Portal (EIP) is an established and intensively used technology (discussed in section 1.2. However, in accordance with Urbach et al. (2010), the companies are facing a challenge of limited IT budgets and thus the need to justify investments in portals and assessing the benefits should be focused by research and practice. However, publications focusing on EIPs are more an object of consultants and practitioners than academicians (Daniel and Ward, 2006, p. 114). This uneven attention, although the benefits of EIPs were demonstrated few times (e.g. Al-Busaidi, 2012; Michaelides and Papazian, 2007; Urbach et al., 2010), could cause decision makers problems to see and evaluate the EIP benefits (Fink and Neumann, 2009, p. 99).

This chapter introduce the first results of systematic literature review because before conducting a thorough content analysis, literature was needed to be analysed. The employed methodology is described in subsection 2.2.1. The content of this chapter focuses on defining EIPs. This was needed because any clear definition of EIP have not been established yet and several issues and challenges regarding meaning of EIP occurred during this research. The review, respectively this and the next two following chapters, was based on the sample of articles listed in Table 4.1.

4.1 Definitions

Finding agreement on EIP definition is difficult (Scheepers, 2006) because naming various types of this application is considered by portal vendors as a political process (Firestone, 2003). This problem is amplified by the fact that organizations could evolve their portal from one type to another (Tsui and Fong, 2012, p. 42). Davies (2007) con-

Table 4.1: EIP systematic literature review sample

ID	Article	Portal type	Methodology	Quotations
1	Al-Busaidi (2012)	Corporate	Quant	87
2	Bargas-Avila et al. (2009)	Intranet	Quant	24
3	Benbya et al. (2004)	Corporate	Qual	124
4	Bessis et al. (2011)	Knowledge	Qual	9
15	Chan and Liu (2007)	Corporate	Quant	57
16	Chang and Wang (2011)	EIP	Mixed	58
17	Chau et al. (2006)	Knowledge	Design	16
18	Chou and Chou (2002)	Information	Design	28
5	Daniel and Ward (2006)	Corporate	Qual	30
6	Daniel and White (2005)	Corporate	Mixed	38
7	Davies (2007)	Library	Qual	15
8	Detlor (2000)	Corporate	Review	51
9	Dias (2001)	Corporate	Review	72
10	Elsner and Krämer (2013)	Corporate	Mixed	16
11	Feng et al. (2010)	EIP	Review	41
12	Fenz (2012)	Corporate	Design	18
13	Fink and Neumann (2009)	EIP	Quant	35
14	Hotho et al. (2001)	Semantic	Design	21
19	Jain and Joseph (2013)	Knowledge	Quant	138
20	Khalifa et al. (2008)	Corporate	Quant	17
21	Kreng and Wu (2007)	Knowledge	Quant	19
22	Lee et al. (2009)	Knowledge	Quant	66
23	Michaelides and Papazian (2007)	Corporate	Qual	49
24	Musgrave (2004)	Community	Qual	18
25	Oppong et al. (2005)	EIP	Review	13
26	Prescott et al. (2010)	EIP	Qual	22
27	Raol et al. (2002)	Corporate	Review	46
28	Remus (2007)	Corporate	Mixed	21
29	Ruta (2005)	HR	Mixed	15
30	Ryu et al. (2005)	EIP	Design	21
32	Scheepers (2006)	EIP	Qual	41
31	Sharma et al. (2006)	E-commerce	Design	27
33	Teo (2005)	Knowledge	Qual	48
34	Teo and Men (2008)	Knowledge	Quant	27
35	Thatcher et al. (2011)	University, knowledge	Quant	4
36	Tian et al. (2012)	EIP	Quant	16
37	Tojib et al. (2008)	Employee	Quant	52
38	Tripathi et al. (2012)	Government	Quant	15
39	Tsui and Fong (2012)	Knowledge	Mixed	112
40	Urbach et al. (2010)	Employee	Quant	84
41	Van Baalen et al. (2005)	Knowledge	Qual	15
42	Wang et al. (2009)	Knowledge	Design	8
43	White (2000)	EIP	Review	46
44	Wu and Wang (2012)	Knowledge, corporate	Design	16
45	Yang et al. (2005)	EIP	Quant	15
46	Yang and Huh (2008)	Knowledge	Design	9
47	Zhang and El-Diraby (2012)	Knowledge, information	Design	17

cluded that different types of portals (library and institutional) are complementary to each other and thus can coexist in one information ecosystems. Moreover, some authors are mixing different names or are labelling different portal types with the same name. For example, Oppong et al. (2005) consider EIP and knowledge portal as the same application while Tsui and Fong (2012, p. 41) differentiate EIP from Enterprise Knowledge Portals. (Ryu et al., 2005) see EIP as a tool that can manage not only information and knowledge but also data. Besides the number of different EIP definitions and names, the opinion about basic nature of EIPs can differ and some authors do not even distinguish Intranet from EIP (more in subsection 4.1.1. Therefore, this chapter solves the issue of missing EIP unified definition and presents discussion of different definitions and categorizes EIPs regarding their characteristics included in the definitions.

As an initial overview of the most frequent key words that are occurring in the EIP definitions Figure 4.1 displays them in the form of a word cloud (with threshold of ten occurrences). The most frequent words show that the debate if portals are information portals or knowledge portals or both is linked into definitions.

Figure 4.1: Word cloud from quotations of EIP definitions

Table 4.2 provides a list of several definitions that are being frequently used in the EIP literature or are distinct in terms of portal type. The evolution of definitions clearly shows a trend towards supporting Knowledge Management.

Paper	Definition	Portal type
Shilakes and Tylman (1998) in Dias (2001)	Amalgamation of software applications that consolidate, manage, analyze and distribute information across and outside of an enterprise (including business intelligence, content management, data warehouse and mart and data management applications).	EIP
Detlor (2000)	Single-point Web browser interfaces used within organizations to promote the gathering, sharing, and dissemination of information throughout the enterprise.	Corporate portal
White (2000)	Software that provides user-customisable access to information and applications through a Web browser.	EIP
Benbya et al. (2004)	Personalized workspace that integrates firm's most relevant sources of information and the underlying connections that make this information valuable to users in a single point of access.	Portal
Carden (2004)	Allows its users to access a wide range of meta-data and actual content from a range of sources through a single interface.	Library portal
Ruta (2005)	This worldwide entry point is rolled out to every subsidiary around the world, connecting employees who can access corporate information, personal data, services, HP resources, and execute internal transactions.	Employee portal
Ryu et al. (2005)	Only if members of the EIP actively transfer their own knowledge to other members and receive knowledge from others can the EIP become a true knowledge portal instead of a simple Web site that posts information.	Knowledge portal

Daniel and Ward (2006)	Secure web locations, that can be personalised, that allow staff and business partners access to, and interaction with, a range of internal and external applications and information sources. Uses of the portal may include: improved access to information, increased collaboration, greater use of existing applications and effective integration between applications.	Corporate portal
Davies (2007)	Single all-encompassing solution, able to meets any conceivable user need for any type of information across an entire organisation.	EIP
Michaelides and Papazian (2007)	It is customisable, searchable, provides publishing and categorisation services and more importantly has the capability to automate workflows. It has a single point of control for securing internal business content plus external/internal business intelligence whilst providing collaboration and groupware capabilities, including delivery and notification services.	Portal
Urbach et al. (2010)	Browser-based user interface providing access to personalized information, resources, and applications.	Employee portal
Chang and Wang (2011)	Platforms for the integration of knowledge management and information technology.	EIP
Tripathi et al. (2012)	India portal is supposed to serve as a one-stop non-stop destination for public access to information on various aspects of government functioning. It is also to serve as a single window for delivery of government services.	Government portal

Jain and Joseph (2013)	Integrated knowledge management system that facilitates knowledge management's important activities in a comprehensive manner consisting of knowledge storage, retrieval, creation, transfer, sharing and application. It provides timely information/knowledge from a single window. It is user-centred and has features to personalise and customise the portal.	Knowledge portal

Table 4.2: Portal definitions

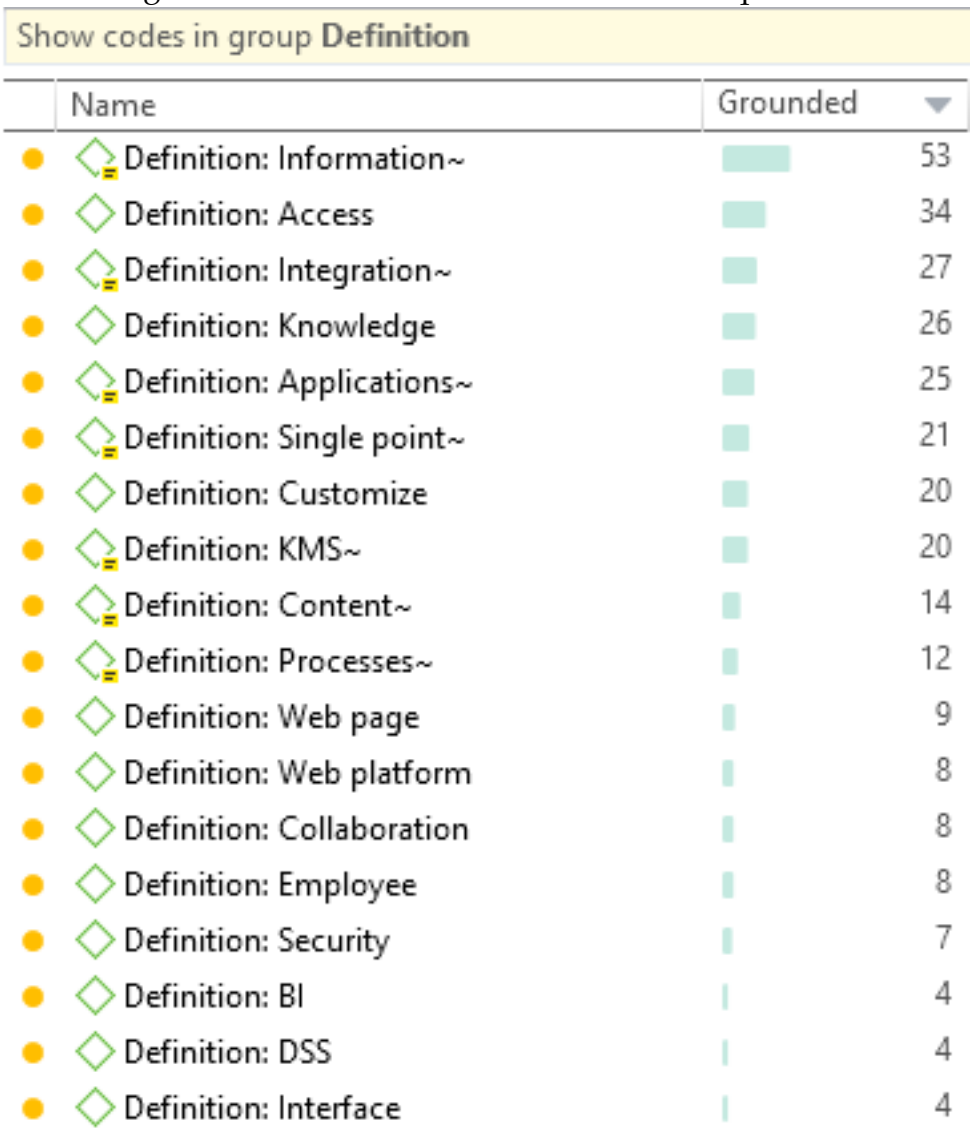
A closer look on the various meanings and attributes of the respective definitions is provided by the results from the content analysis that analysed 108 definitions or fragments of definition. The qualitative analysis identified labels and terms that emerged from the definitions and distinctively characterise portals. Only concepts that were found more than three times (see Figure 4.2) are discussed in the following text. The rest of the definitions and definition fragments can be found in an appended file (see Appendix A).

By comparing the most used portal characteristics with the types of portal (see Table 4.3) they are labelling few patterns can be seen. Employee portals (besides not being specifically cited in the literature) tend to be defined the most specifically. Their purpose lies mainly in helping employees with customizable access to information, applications and processes. While definition of EIPs and corporate portals strongly focus information and integration aspects. Contrary, definitions of knowledge portals (logically) focus knowledge aspects and the portal function to be a Knowledge Management System. However, taking into consideration the historical development of portal concept, an unified definition of EIPs could be created. Therefore, in the context of this thesis, EIPs are defined as follows:

> *Enterprise Information Portals are a web based interface that provides integrative secure customizable single point of access for employees to information, knowledge, applications (e.g. Business Intelligence, Decision Support Systems), and processes.*

Using the name EIP for portals was a pragmatic choice as it is the most frequent term

Figure 4.2: Main EIP characteristics with frequencies



that is used in research studies with connection to portals. Moreover, about two thirds of the world's portal implementations are enterprise or corporate portals (Tsui and Fong, 2012, p. 40). However, some authors (e.g. Benbya et al., 2004; Lee et al., 2009) are making direct links between EIPs and Knowledge Management Systems (KMS) (for KMS definition see Alavi and Leidner, 2001). In the most general sense, EIPs can be considered as Social Information Systems (see Limaj et al., 2016).

4.1.1 Web sites, Intranets and portals

Defining EIPs can be done also by showing what EIP is not. Distinguishing web sites, Intranets, and portals should be crucial, however, many times not only the organizations but also researchers are mixing these terms together. The main reason is that

Table 4.3: Co-ocurrence table between definition characteristics and portal types

	Corporate portal	EIP	Employee portal	Knowledge portal
Access	33%	21%	50%	22%
Applications	25%	21%	25%	13%
BI		9%		4%
Collaboration	8%	6%		9%
Content		15%		13%
Customize	8%	12%	38%	22%
DSS		3%		9%
Employee	8%	9%	63%	
Information	42%	56%	50%	26%
Integration	33%	32%		26%
Interface	8%	0%		9%
KMS	17%	12%		39%
Knowledge	17%	29%		57%
Processes		15%	25%	4%
Security	17%	6%	13%	9%
Single point	17%	18%	13%	13%
Web page	17%			4%
Web platform	25%	3%	13%	4%
# of quotations	12	34	8	23

web sites, if used internally, can be regarded as Intranet and furthermore Intranet were often developed into EIP. As noted by Musgrave (2004), in the context of community portals: "different community web-sites calling themselves portals, but the evidence shows that not many work effectively as community portals", this issue does not concern only enterprise portals but also different types of portals. Although Intranet is a different technology than EIP they share some features and can support some similar or same processes. Several authors (e.g. Urbach et al., 2010; Jain and Joseph, 2013) see Intranets as predecessors to EIPs. Jain and Joseph (2013) suggest to universities that they should develop their “extended web sites” into knowledge portals as only 10 % universities in the studied sample could be regarded as operating knowledge portal.

Although most of the authors dealing with portals are using term portal with some prefixes, some authors (e.g. Bargas-Avila et al., 2009) are using inaccurate term Intranet for portals that is defined as “network of linked computers to which only a

restricted group of an organizations members have access". However several items in their questionnaire are referring to portals, as they are asking about workflow support, or communication and collaboration support. Therefore, no clear boundary between Intranets and portals could be found. Another example of misusing the term portal is research by Sivakumar et al. (2014) where they describe a web-based tool which allows them to arrange meetings and store notes from the meetings.

Chapter 5

Results of content analysis

The elements of the conceptual model that is presented in the chapter are were retrieved from coding scheme created during the content analysis. It consists from categories of features, tools, functions, benefits, and business value. Relationships between these categories and their elements are then presented in the next chapter. The detailed coding scheme was developed inductively as the main categories were grounded in theory (i.e. in analysed articles that have either theoretical or empirical background). This was done because no single theory was able to be used for the whole model. Therefore, different categories (e.g. function) can be related to different studies or theories. The same holds for relationships between the main categories.

In the text of this chapter, every section and subsection contains the results and findings for the respective category. As these findings emerged from the qualitative analysis, the text, together with tables and diagrams, tries to approximate how and why the categories were created in the way they are. Because the analysis produced more than 1700 quotations, it was not possible to present everyhing in the text of this dissertation. Therefore, export of all quotations and also the whole Atlas.ti project bundle are attached to this dissertation as an electronic appendix.

5.1 Theoretical foundations

Creation of IS business value taxonomy and identification of benefit's antecedents require a hierarchy of relations between these antecedents. The following categories in subsequent sections stand on an universal idea that functions of an information system support users during performing tasks that are parts of business processes in a way that they are beneficial for performing these tasks and it results in a situation where IS creates additional business value (benefits). However, identifying basic theoretical

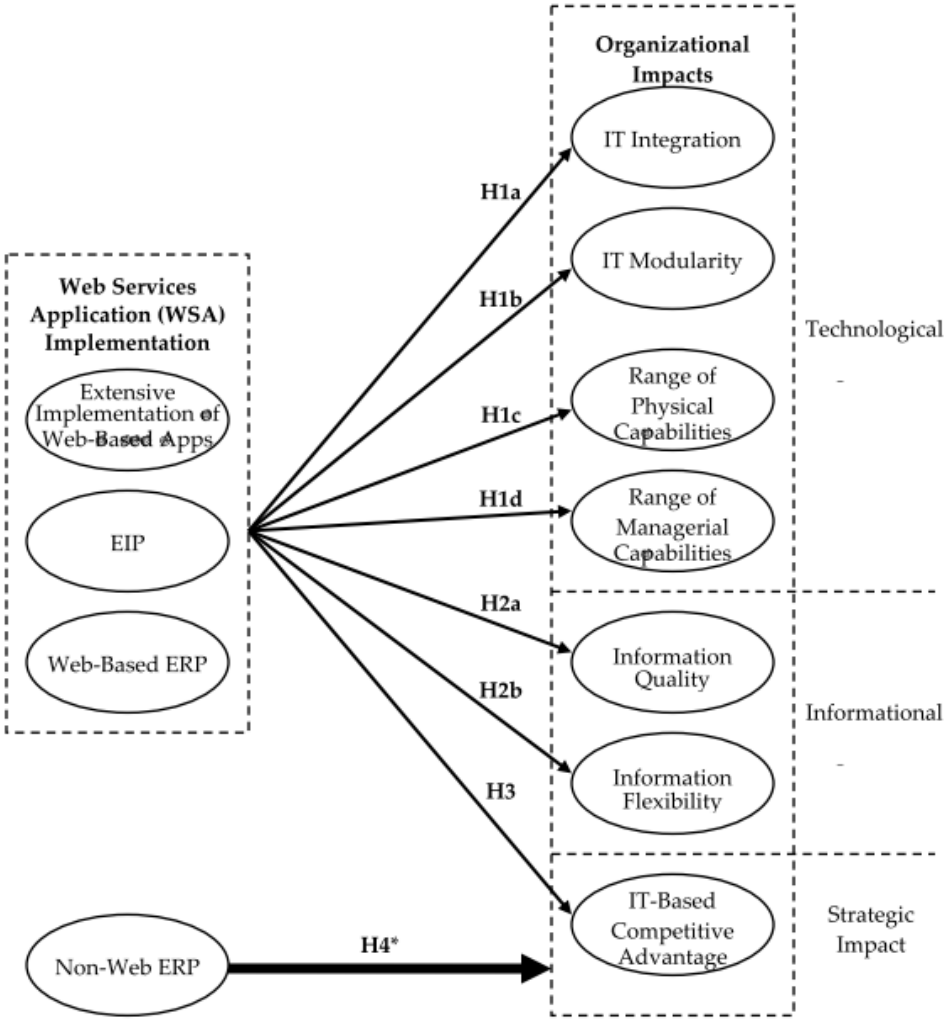
concepts (categories and variables) that could be used as a structure for the taxonomy was difficult from various reasons. First, no taxonomy, categorisation, framework, or model that could hierarchically explain various relations between features, functions, benefits, and IS business value exists. Second, the terminology covering this issue is scattered because various authors mix different terms together when they should be distinct.

Probably the most confused situation is in the area terminology explaining features, functions, and capabilities that provide grounds (the lowest level) of the taxonomy. Benbya et al. (2004, p. 206) understood capabilities as a sub-set of features: "portal's features can be classified in three categories: core capabilities, supportive capabilities, and web services". On the contrary, Musgrave (2004, p. 263) uses term *portal feature* for labelling attribute in the following way "personalisation as a portal feature (that is, tailoring the information presented to an individual based on their personal, social or geographical characteristics) is a recent attribute that characterises the thick portal gateway term". Thus, functions and features are fairly difficult to define separately because they may have inter-related macro and micro level components Raol et al. (2002, p. 391).

For the purpose of this study, feature is understood as a part of EIP that user can interact with. Subsequently, function is the purpose or reason why the feature exists (i.e. it does something). Difference between these two terms is similar to a difference between the purpose of a bicycle and its equipment. Bicycle is used for getting from the point A to the point B (function) and a cyclist is using pedals, handlebars, wheels, saddle, frame (features). This means that a single function can be enabled by several features and at the same time, one feature can enable several functions.

To set the functions and features into the theoretical context, their meaning is comparable in the context of RBV to (IS) resources. Therefore, this part of taxonomy deepens the basic idea of RBV theory, which is that resources and their combination creates a competitive advantage (see section 1.6). From the perspective of IS theory and theory of ISBV (see section 1.4), according do Liang and You (2009) IS resources influence organisational capabilities and they have direct impact on organisational performance. Another view on this issue is provided by Melville et al. (2004) who add processes as means that can be used for explaining how IS resources and IS capabilities affect organ-

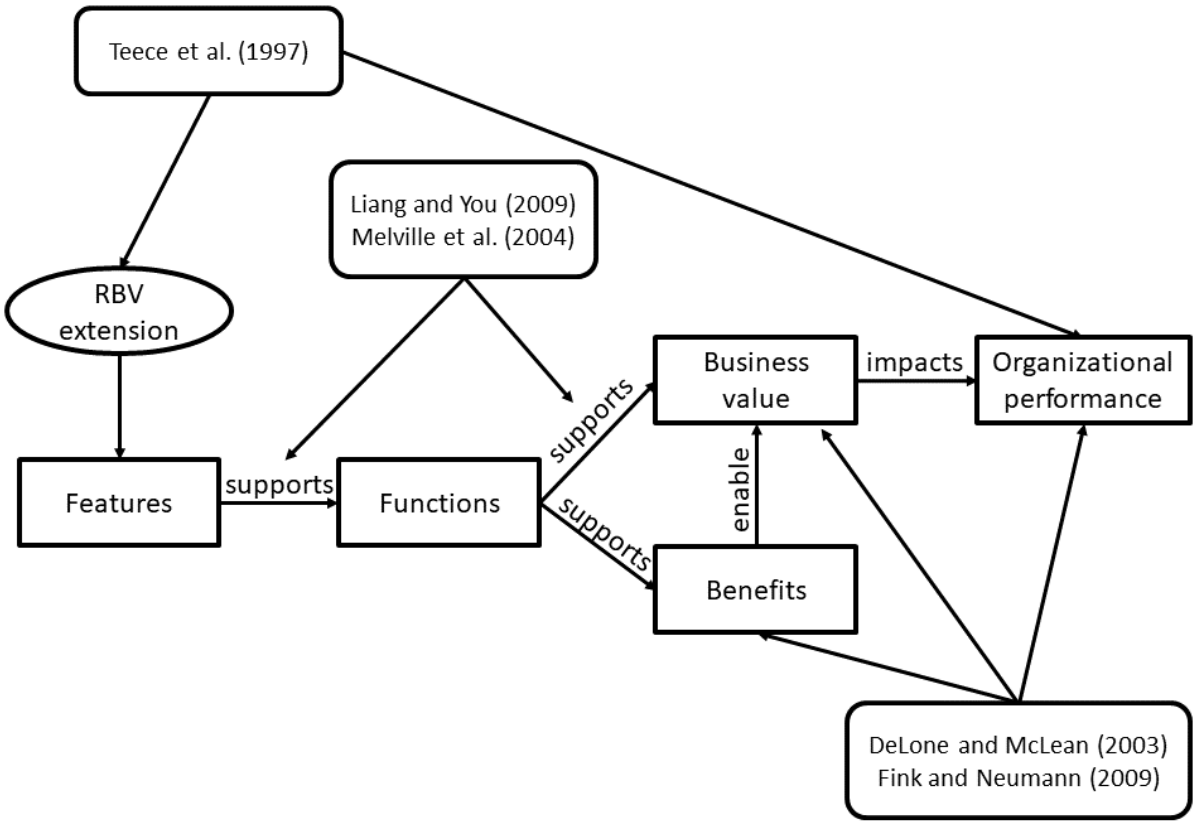
Figure 5.1: Research model by Fink and Neumann (2009)



isational performance. And according to ISBV (e.g. DeLone and McLean, 2003; Peffers and Santos, 2013), organisational performance can be partially explained as an impact of IS benefits that create business value.

The relations between various parts of the taxonomy can be explained as follows: "*The essence of competences and capabilities is embedded in organizational processes. [...] But the content of these processes and the opportunities they afford for developing competitive advantage at any point in time are shaped significantly by the assets the firm possesses*" (Teece et al., 1997, p. 518). At a higher level of abstraction, these assets are IS/ICT. However, as was explained in Chapter 1, section 2.1, and Chapter 3 the main problem in contemporary ISBV research is the lack of detail of what is behind these general IS/ICT resources. Therefore, this study tries to go deeper and provide more granularity into RBV in the context of ISBV.

Figure 5.2: Theoretical foundations of the conceptual model



For an illustration of what the taxonomy which will be introduced in the next chapter should represent can be used a research model (see Figure 5.1) that was produced by Fink and Neumann (2009, p. 91). This research model can be considered as a typical example of quantitative research that focuses on a surface. The research based on the model tries to show how web applications, EIPs, and ERPs can affect organisation impacts. However, it treats all EIPs, ERPs, and web applications as an uniform application. However, as was shown in previous chapter, EIPs differ from each other extensively. And the same hold for web applications which are even fuzzier concept than EIPs. In this study, the organisational impacts (i.e. business value) will stay on the same level of detail, however, the application part will be dissected into every function and the hypotheses will try to show exactly, how the specific function enabled through features and processes which specific benefit or business value.

To provide an overview how the analysis was grounded in theory, Figure 5.2 depicts details of the used categories, their relations and theoretical underpinnings.

The coding was initially based on these concepts: functions that are supported by features, benefits which are supported by functions, and business value which is either directly supported by a function or was enabled by a benefit. Functions and benefits were sometimes categorised into subcategories. Features represent the detailed operationalisation of IS resources which corresponds with RBV theory. Functions aggregate processes that are the vehicle that impacts business value. Benefits represent the impact that the IS resources (features and functions) have through the processes on organizational performance that is represented by IS business value categories. These concepts show how the specific features of EIPs can influence performance of an organization.

All the categories that are used in the following text are displayed in Table 5.1 and Table 5.2. For every analysed article, number of quotations that were coded by some code from the category (in columns) can be found in the table. Detailed statistics for every important subcategory are then presented in respective chapters.

5.2 Functions of EIP

Only early studies of EIPs focused on features and functions. Raol et al. (2002) and Benbya et al. (2004) published portal features, functions, and capabilities frameworks which were based on corporate framework developed by Aneja et al. (2000). However, the usability of both frameworks without alterations is low as part of their content aged and in the case of the framework from Raol et al. (2002) definitions and descriptions of the features are missing. Lee et al. (2009) identified seven functional categories of knowledge portals (see Figure 5.3). These studies were used as an initial knowledge during the coding procedure and an input how to label some codes, nevertheless, final taxonomy of EIPs features was developed inductively.

In the following text, description of all identified features and their aggregations into categories is presented. The categories were labelled as tools. Pictures depicting models of relations between codes (categories that characterises concepts) have some quantitative data embedded in them. Letter G stands for grounded and it shows how many quotation the code has, in a loose sense it can be understood as a frequency of occurrence of the code. Letter D stands for density and it shows how many relations the code has, in a loose sense it can be understood as an importance of the code because it

Table 5.1: Overview of number of quotations for every document and category

	Fe	To	Fun	Ben	BV	Tot
D 1: Al-Busaidi (2012)	1	2	25	10	19	57
D 2: Bargas-Avila et al. (2009)	6	3	7	1	1	18
D 3: Benbya et al (2004)	24	10	40	8	7	89
D 4: Bessis et al (2011)	6	3	5	0	0	14
D 5: Daniel and Ward (2006)	0	0	12	5	1	18
D 6: Daniel and White (2005)	0	0	7	6	1	14
D 7: Davies (2007)	2	1	5	1	0	9
D 8: Detlor (2000)	5	2	24	8	1	40
D 9: Dias (2001)	10	0	32	3	12	57
D 10: Elsner and Krämer (2013)	0	0	5	0	3	8
D 11: Feng et al. (2010)	0	0	18	3	2	23
D 12: Fenz (2012)	5	2	6	0	0	13
D 13: Fink and Neumann (2009)	0	0	8	7	2	17
D 14: Hotho et al. (2001)	5	1	9	0	0	15
D 15: Chan and Liu (2007)	10	3	17	8	6	44
D 16: Chang and Wang (2011)	3	2	13	11	3	32
D 17: Chau et al. (2006)	3	3	9	3	0	18
D 18: Chou and Chou (2002)	2	1	11	2	6	22
D 19: Jain and Joseph (2013)	20	6	36	9	4	75
D 20: Khalifa et al. (2008)	0	0	8	0	2	10
D 21: Kreng and Wu (2007)	2	0	9	0	0	11
D 22: Lee et al. (2009)	16	5	29	1	0	51
D 23: Michaelides and Papazian (2007)	4	0	12	6	11	33
D 24: Musgrave (2004)	2	1	5	0	0	8
D 25: Oppong et al. (2005)	1	0	2	0	1	4

affects other categories or concepts. More details about qualitative coding and analysis can be found in subsection 2.2.3.

5.2.1 Search

The main goal of the search function is to find resources that users specify in their search query. General overview of this function can be seen in Figure 5.4. This section is also structured according to this overview as search function characteristics, tasks and tools are described and discussed.

Table 5.2: Overview of number of quotations for every document and category

	Fe	To	Fun	Ben	BV	Tot
D 26: Prescott et al. (2010)	9	0	7	0	1	17
D 27: Raol et al. (2002)	3	1	21	0	3	28
D 28: Remus (2007)	0	0	2	0	0	2
D 29: Ruta (2005)	3	1	5	1	1	11
D 30: Ryu et al. (2005)	2	1	5	0	0	8
D 31: Sharma et al. (2006)	6	1	14	0	0	21
D 32: Scheepers (2006)	2	0	10	0	0	12
D 33: Teo (2005)	9	6	18	3	5	41
D 34: Teo and Men (2008)	0	0	8	0	0	8
D 35: Thatcher et al. (2011)	0	0	2	0	0	2
D 36: Tian et al. (2012)	0	0	4	0	2	6
D 37: Tojib et al. (2008)	3	2	14	4	4	27
D 38: Tripathi et al. (2012)	0	0	3	0	0	3
D 39: Tsui and Fong (2012)	17	5	30	8	7	67
D 40: Urbach et al. (2010)	6	0	16	6	13	41
D 41: Van Baalen et al. (2005)	1	2	1	1	0	5
D 42: Wang et al. (2009)	0	0	2	0	1	3
D 43: White (2000)	4	1	10	0	4	19
D 44: Wu and Wang (2012)	2	0	8	0	0	10
D 45: Yang et al. (2005)	0	0	0	0	1	1
D 46: Yang and Huh (2008)	0	0	2	0	2	4
D 47: Zhang and El-Diraby (2012)	6	2	10	0	0	18
Totals	200	67	546	115	126	1054

Figure 5.4: Search function overview

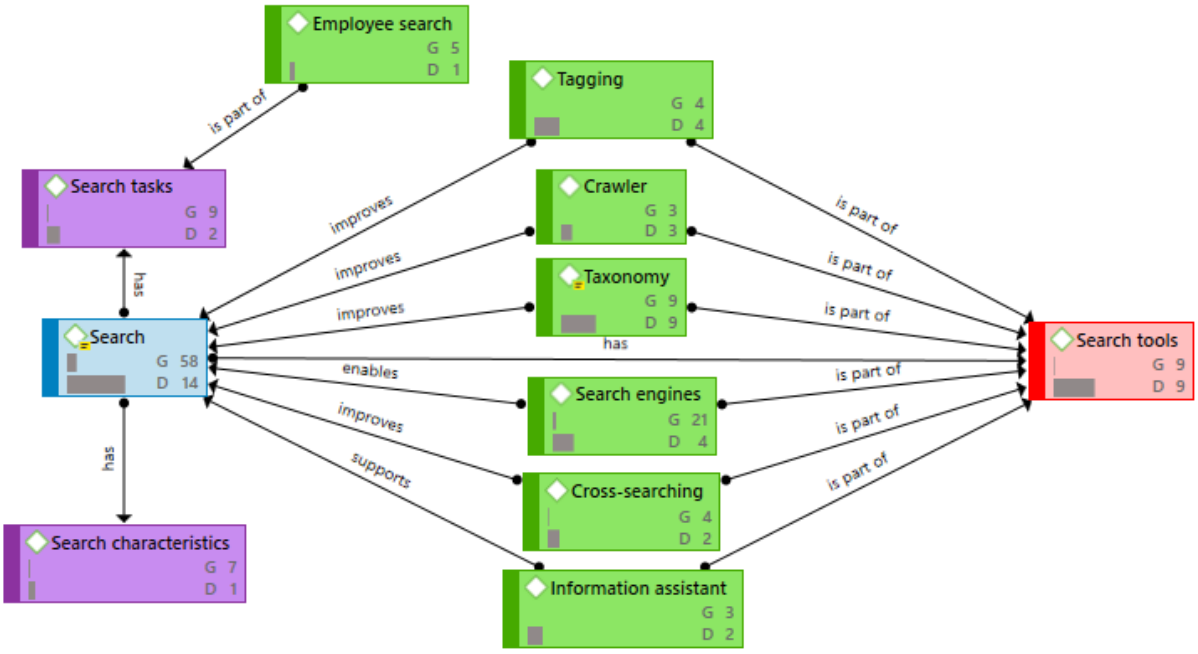


Figure 5.3: Functional categories of knowledge portal (Lee et al., 2009)

Category	Descriptions	Functions
Communication	Supporting internal and external communication among members for sharing and transferring knowledge	Asynchronous communication Threaded discussion Intranet Extranet
Collaboration	Technologies are used for sharing ideas, sharing creation, and sharing a work space	Collaborative space for team work Virtual meetings on the Web Simple telephone conference call functionality Screen sharing
Contents	Organizing and structuring knowledge to enhance its use and to guide users to available knowledge resources	Knowledge map, domain ontology Knowledge repository Structuring and navigating knowledge
Coordination	Maintaining consistency within a work product or managing dependencies between activities	Calendar Work scheduling Work control and progress monitoring Routing of information
Customization	Searching knowledge and delivery of more relevant knowledge to users	Discovery service Push service to provide filtered delivery of knowledge
Community	Building and managing communities to activate communication and sharing among researchers	Member management Asynchronous communication Threaded discussion Availability and scheduling
Connection	Creating and managing knowledge networks, and finding relevant experts	Experts' directories Finding people Mapping people to knowledge map

As will be shown below, the search function relates to several other functions. When users enter search query, the search function plays a role of a gateway towards information and knowledge that is a direct content of EIP or is stored in databases and repositories that are integrated with EIP. It serves also as a tool that connects people

and influences collaboration and communication functions.

Search function highly depends on technological and architectural solutions. Algorithms used for federated meta-data based searching (Davies, 2007), machine-to-machine interfaces (Musgrave, 2004), advanced searching techniques and cross-repository searching (Sharma et al., 2006) are an object of a specialised computer science research. From this reason, any deeper analysis into categorization of search tools was not followed.

Search tasks

Tasks that are supported by search function help users with finding resources such as information for user's tasks (Daniel and White, 2005). Besides searching for information, users can use search for finding knowledge in knowledge bases or repositories (Lee et al., 2009; Teo, 2005), finding people (co-workers, knowledge experts) (Bargas-Avila et al., 2009; Benbya et al., 2004; Lee et al., 2009), or even knowledge documents (Teo and Men, 2008). If these resources are categorised (e.g. by taxonomies or tagging, see below) users can search by categories (Raol et al., 2002). Search function can also store search history (Raol et al., 2002) so users do not have to create the same search queries again. Search function usually reach further than to finding the resources it can also retrieve the resources (e.g. document) (Tojib et al., 2008). Content of relevant quotations can be found in Table 5.3.

Table 5.3: Overview of search tasks quotations

Name	Document	Quotation Content
I+K for job tasks	Daniel and White (2005)	find the information and knowledge that they need to do their job
specific and exact information requests	Detlor (2000)	specific and exact information requests
search service	Chan and Liu (2007)	search service
?nd information	Chang and Wang (2011)	find information
search history	Raol et al. (2002)	search collection replication
search by category	Raol et al. (2002)	search by category
search knowledge	Teo (2005)	search across all the knowledge databases in KnowIT
query to knowledge documents	Teo and Men (2008)	Easy access to knowledge documents in all formats, either by query or by navigation.
search and retrieval processes	Tojib et al. (2008)	search and retrieval processes

Search characteristics

Search function incorporated into EIP should be integrated into the portal (Raol et al., 2002) so the users can access the search function directly (Detlor, 2000). The search can be made easy for the users by customisation of the functionality (Chau et al., 2006). Consequently, users can access the needed information easily (Jain and Joseph, 2013). Search should be also secure, respectively the search results (mainly links and retrieved documents) should be secured (Raol et al., 2002) because EIPs, when properly integrated, can find information regardless its physical location across many repositories (see more in search tools below) and databases (Detlor, 2000). Quotations associated with search characteristics can be found in Table 5.4.

Table 5.4: Characteristics of the search function

Name	Document	Quotation Content
regardless of its physical location	Detlor (2000)	find information regardless of its physical location
directly search and browse	Detlor (2000)	allow users to search and browse for information directly from individual desktops
customized search capabilities	Chau et al. (2006)	customized search capabilities
easy to search and access information	Jain and Joseph (2013)	easy to search and access information
integrated search capability	Raol et al. (2002)	integrated search capability
secure search results	Raol et al. (2002)	secure search results
find needed information	Tian et al. (2012)	working environment where users can easily navigate in order to find the information they specifically need

Search tools

Search function is directly supported, enabled, and improved by search tools that encompass various technologies associated with e.g. search engines, taxonomies, tagging, cross-searching, and advanced search tools and features. The goal of search tools and features is to help the user to navigate through the vast databases and repositories.

The search engines can provide federated search (Tsui and Fong, 2012) and they are usually embedded in EIP (Raol et al., 2002). This allows EIPs to search the whole content and when properly integrated also external sources. Meta-searcher components can even retrieve documents that match user's search query (Chau et al., 2006), dis-

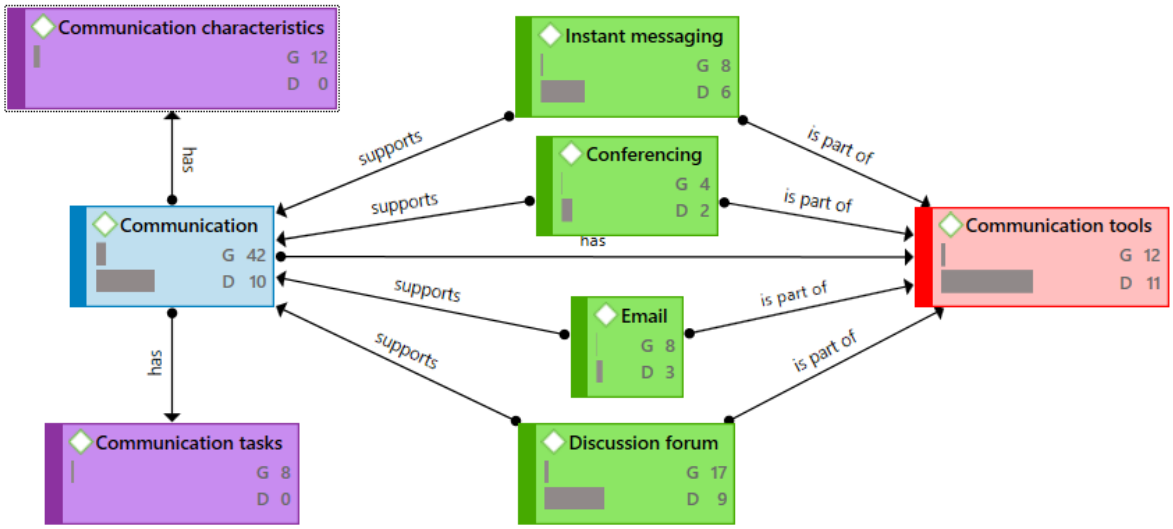
playing them together with information with the use of information assistant (Dias, 2001). When entering a search query, search engine can suggest appropriate keywords through suggester functionality (Chau et al., 2006).

Taxonomies improve search abilities of EIPs by automated or semi-automated creation of categories. For automated creation, semantic profiling (Zhang and El-Diraby, 2012) or crawlers (Hotho et al., 2001) can be used. Whereas tagging can be used for manual labelling of documents that is conducted by users that create categories (Benbya et al., 2004). Tagging can be also connected either to social web tools (Zhang and El-Diraby, 2012) or document management (Bessis et al., 2011). Taxonomies and tags are meta-data, therefore they can be search too with the use of meta-data search (engines).

5.2.2 Communication

Communication function can be characterised as "a set of tools used for portal users to communicate with each other, it includes web-based email, discussion boards, chat tool and instant messaging" (Benbya et al., 2004, p. 212). The function fulfils several tasks and is described together with the most important tools in subsequent text. Initial overview of different categories can be viewed in Figure 5.5.

Figure 5.5: Communication function overview.



Communication tasks

The main goal of the communication function is to support direct and indirect communication between employees (Ryu et al., 2005). They need to have opportunities and

means to discuss work related issue (Tojib et al., 2008). This can happen due to creation of online relationships (Oppong et al., 2005), communication networks (Urbach et al., 2010), and using communication tools such as discussions (Teo and Men, 2008). The content of communication is naturally an exchange of information that can have several purposes or origins (Tripathi et al., 2012). For that, communication tools crucially support managing projects (Benbya et al., 2004). More advanced and sophisticated tasks that are supported by communication function relates to Knowledge Management (for more see below).

Table 5.5: Communication tasks overview.

Name	Document	Quotation Content
communication between individuals and work groups	Daniel and White (2005)	communication between individuals and work groups
online relationships	Oppong et al. (2005)	build, maintain, and improve online relationships
direct and indirect communication	Ryu et al. (2005)	supports direct and indirect communication between its members
participate in discussions	Teo and Men (2008)	The ability to collaborate and participate in threaded discussions online.
medium of communication	Tojib et al. (2008)	portals act as a medium of communication among employees and between employees and their organizations.
discuss work with colleagues	Tojib et al. (2008)	discuss work or project issues with my immediate work colleagues
Communicate with colleagues	Urbach et al. (2010)	Communicate with colleagues
Network	Urbach et al. (2010)	Network with colleagues

Communication characteristics

Portals could serve as communication hubs that facilitate (mainly) internal communication in an organization between its members (Ryu et al., 2005; Khalifa et al., 2008). Portals should provide information and communication channels that allows employees to communicate. Communication in EIPs can serve also to suppliers or customers (Wu and Wang, 2012). This makes communication quite complex function that has wide reach.

For example discussion forums can be used for posing questions and share experiences (Teo, 2005). Communication is especially important for Communities of Practice (COP), as communication function can link people with common interest together

(Tsui and Fong, 2012). Furthermore, it can provide space for negotiating collective interpretations and shared meanings (Detlor, 2000), thus, enabling knowledge sharing and transfer (Ryu et al., 2005).

Table 5.6: Communication characteristics

Name	Document	Quotation Content
communication channels	Al-Busaidi (2012)	communication space to provide channels for conversation and negotiations
internal communication	Bargas-Avila et al. (2009)	internal communication
organizational communications	Detlor (2000)	organizational communications
information channels	Detlor (2000)	information channels that help users engage in conversations and negotiations with others in the firm so that shared interpretations can be made.
facilitate communication	Khalifa et al. (2008)	facilitate communication throughout the organization
communication facilities	Lee et al. (2009)	communication facilities
common and shared information exchange	Michaelides and Papazian (2007)	common and shared information exchange
information and communication	Tsui and Fong (2012)	information and communication
communication channels	Wu and Wang (2012)	communication channels for the employees, suppliers, and customers

Communication tools

In general, electronic communication can be divided into asynchronous and synchronous communication (Van Baalen et al., 2005). Asynchronous tools that are used for communication in EIPs are e-mails and discussion forums (or threaded discussion groups). They can be either native functionality of EIPs or they can be integrated into EIP (based on EIP's architecture) as a third-party application. Synchronous tools used in EIPs are instant messaging or chatting and different multi-media conferencing systems. Using communication tools in EIPs rather than as a standalone applications helps to achieve one of the main purpose of EIPs which is to integrate (see subsection 5.2.5).

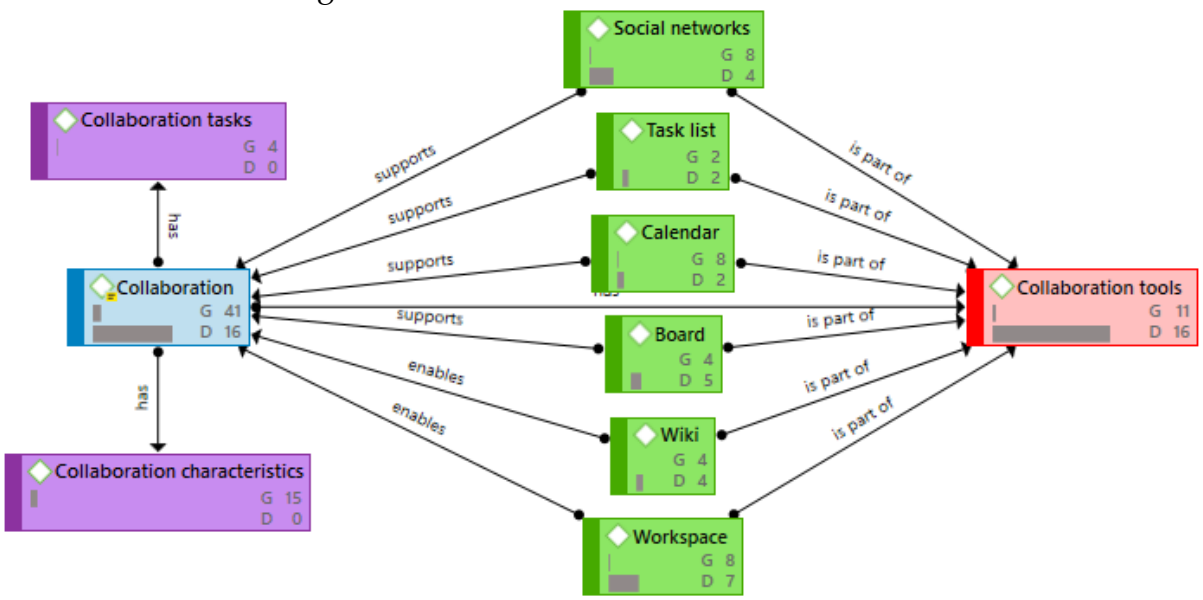
Communication tools are closely related with collaboration tools (Jain and Joseph, 2013; Chang and Wang, 2011). In some cases communication tools are considered as part of collaboration tools, however, sometimes they are referred to as groupware (Lee et al., 2009; Ryu et al., 2005) which is usually a label for collaboration applications.

However, for the purpose of EIPs, merging these two categories together will be too much as the synthesized category would be too large.

5.2.3 Collaboration

Collaboration function provides EIP with the infrastructure to facilitate collaboration (Teo, 2005) and can be characterised as an "ability to create a shared community because they present a natural forum for online collaboration by assembling a set of content and services to which members of a group have special accesses" (Benbya et al., 2004, p. 211). The functions supports several tasks and uses tools that are presented in the following text. General overview of concepts related to this function can be seen in Figure 5.6.

Figure 5.6: Collaboration function overview.



Collaboration characteristics

Collaboration function enables employees to work together (Davies, 2007), especially when they are organised into geographically dispersed teams (Elsner and Krämer, 2013). The goal of collaboration through EIPs is to provide collaborative environment that fosters interoperability among departments (Feng et al., 2010) and creation of communities (Tsui and Fong, 2012). Collaboration focuses on groups of heterogeneous users (Jain and Joseph, 2013), experts (Wu and Wang, 2012), and business partners (Feng et al., 2010) or members of supply chain (Dias, 2001). Therefore, collaboration support both inter-organisational and intra-organisational cooperation (Daniel

and Ward, 2006).

Although communication is an important part of collaboration, communication function and tools were described and analysed separately (see subsection 5.2.2 as communication is not a subset of collaboration because part of its tools serve different purpose than to collaborate.

Collaboration tasks

Collaboration function in EIPs support various tasks. Most of the tasks are connected to working with documents, specifically users can edit the documents (Tsui and Fong, 2012), similar to e.g. Google Documents or MS Office 365 functions, including versioning (Prescott et al., 2010). More advanced feature supported by collaboration function is cooperation on product design (Feng et al., 2010). Another area in which collaboration function can help is project management as EIP can support sharing information about project tasks and support project collaboration (Tojib et al., 2008).

Collaboration tools

Collaboration can be supported by rather simple tools like task lists or calendars but also by sophisticated tools such as workspaces or social networks. Functionality such as calendars or task lists is very similar to the applications that are provided for example by Google GSuite service or some other similar services. Users can collaborate on everyday tasks and sharing calendars and task lists saves their time and lowers errors (e.g. by omittance).

Board feature (Chan and Liu, 2007; Michaelides and Papazian, 2007) allows users to share different things and use this functionality in a similar way how they would use physical white board or notice board. But with the difference that this one is online and accessible by anyone from anywhere who has the rights to access it or collaborate on it. More complex features that provide more intensive collaborative functions are wiki pages, workspaces and social networks.

Wiki pages are technologically similar to online Wikipedia, i.e. users can edit any text which is posted in wiki pages. The changes are tracked and stored so users can see all versions and discussion about the changes. According to Tsui and Fong (2012), wiki pages provide collaborative environment for editing documents. Wiki pages enable

Table 5.7: Characteristics of collaboration

Name	Document	Quotation Content
definition (collaboration)	Benbya et al (2004)	ability to create a shared community because they present a natural forum for online collaboration by assembling a set of content and services to which members of a group have special accesses
distance	Benbya et al (2004)	Enables multiple arties to share and collaborate on applications at a distance. Includes web-based meeting facilitation
intra-organisational collaboration	Daniel and Ward (2006)	intra-organisational collaboration
inter-organisational collaboration	Daniel and Ward (2006)	inter-organisational collaboration
information among SCM	Dias (2001)	deal with information from the traditional supply chain, stored and manipulated by corporate applications, as well as information produced by groups or individuals out of this chain.
geographically dispersed employees	Elsner and Krämer (2013)	collaboration of geographically dispersed employees
business partners	Feng et al. (2010)	enable collaboration and interaction with the external network of business partners
interoperability among departments	Feng et al. (2010)	facilitating internal collaboration and promoting interoperability among the different departments within an organisation
collaborative environment	Chan and Liu (2007)	providing a collaborative environment
among heterogeneous users	Jain and Joseph (2013)	Collaboration among the heterogeneous portal users
ubiquitous	Khalifa et al. (2008)	ubiquitous collaboration and interaction
collaborating on documents/versioning	Prescott et al. (2010)	collaborating on documents such as work?ow, check-in/check-out, and versioning
provides the infrastructure to facilitate collaboration	Teo (2005)	provides the infrastructure to facilitate collaboration
community	Tsui and Fong (2012)	link together a group of people with common passion and interest
experts and peers	Wu and Wang (2012)	collaborate with experts and peers

more benefits as will be shown in the text below.

Another complex feature that supports collaboration are various workspaces. They supports team interaction (Lee et al., 2009) in various areas such as document editing and virtual meetings (Prescott et al., 2010), project management activities (Tsui and

Fong, 2012), or support for virtual teams (Urbach et al., 2010). In some ways, social networks are similar to workspaces, as they provide users (teams) a space that they can share, interact with each other, and work on documents to some extent. Social networks are used mainly for creating networks (Jain and Joseph, 2013), virtual meetings (Benbya et al., 2004; Chang and Wang, 2011), or as collaboration sites (Prescott et al., 2010).

Sometimes the above described collaboration tools are called as groupware (Ryu et al., 2005). This general label is hard to define and is usually used in very different meanings in different contexts.

5.2.4 Security

This function of EIPs needs to deal with internal and external security. The internal security deals with authentication and authorisation of employees (Dias, 2001), the external security focuses on customers, suppliers, and partners (Chou and Chou, 2002). The security is needed because EIP can contain highly sensitive data (Daniel and White, 2005), for example knowledge and know-how, information about customers or products. This is especially crucial because EIPs should ideally serve as a single gateway to the whole organisational content. Thus being able to bypass EIP's security means to get access to everything. This makes portals equally highly vulnerable as they can be the first target and efficiently securable as the organisations needs to focus only on one security danger and use most of the resources to defend EIP.

Besides standard IS and network security tools such as protocols (e.g. LDAP, Active, Directory, SSL) or firewalls, no special features were identified in the literature.

5.2.5 Integration

Integration was the most difficult function to grasp and distinguish from the other functions as it encompasses, interacts with or affects most of the other key portal functions. Integration cannot exists without context, i.e. the function which it integrates. And EIPs, as an infrastructural and integrative application (Musgrave, 2004), help with integration in the following functions such as data management (Michaelides and Papazian, 2007; Tripathi et al., 2012), information management (Al-Busaidi, 2012; Benbya et al., 2004), knowledge management (Chang and Wang, 2011; Dias, 2001; Khalifa et al.,

2008), applications (Fink and Neumann, 2009; Michaelides and Papazian, 2007), and process management (Feng et al., 2010; Chang and Wang, 2011; Tripathi et al., 2012). Not only different functions can utilize integration but it connects people (employees) and provides them with common and unified view.

By integration of resources (information, applications etc.) from different internal and even external sources, EIPs can connect departments together (Feng et al., 2010) and even support Supply Chain Management processes (Chang and Wang, 2011). This can happen because EIPs can link internal and external databases (Al-Busaidi, 2012), amalgamate various technologies (Detlor, 2000), and communicate with other applications and systems (Dias, 2001). This makes the integration function one of the most typical characteristics of EIPs. More insight into the various parts of this function can be found in Table 5.8.

5.2.6 Access to Applications

Previous subsection showed how EIPs integrate various components of information system. Through this function they can provide access to any application that was integrated into EIP. Applications are embedded into EIP (Raol et al., 2002) via portlets (or other technology based on architecture of the portal technology). Applications that occurred in the analysed literature were mainly transaction processing systems such as Enterprise Resources Planning systems (Benbya et al., 2004; Michaelides and Papazian, 2007), Supply Chain Management systems (Feng et al., 2010; Chan and Liu, 2007), and Customer Relationship Management systems (Fenz, 2012; Sharma et al., 2006). All systems intensively use forms (e.g. creating new sales order) that can be embedded into EIP.

Another applications that were frequently mentioned were Business Intelligence and various self-service applications. Business Intelligence can be used in EIPs mainly for presenting various reports, analyses, and searching data (Dias, 2001). Self-service applications provide users an opportunity to perform tasks such as leave request, online pay stubs, personal information changes (Benbya et al., 2004; Scheepers, 2006). These application are often provided by Human-resources portals (Feng et al., 2010).

More details about different applications that EIPs provide access to can be found in Table 5.9 that contains the most relevant quotations associated with the function.

5.2.7 Customisation and Personalisation

These two functions are conceptually almost similar as their main goal is to flexibly and dynamically change the look and behaviour of EIP to suit the individual needs of each user. Difference between these two approaches is similar to pull and push principle (White, 2000) or to supply and demand (Scheepers, 2006). Therefore, personalisation means that for example delivered content to the user is tailored accordingly to his role,

Table 5.8: Ilustrative quotations characterising integration function

Name	Document	Quotation Content
repositories	Al-Busaidi (2012)	consolidation and synchronization of corporate repositories
I+K internal and externaly	Al-Busaidi (2012)	integrate and combine information and knowledge from internal and external sources
uni?ed view	Benbya et al (2004)	present a uni?ed view of corporate information that integrates information from different organizational repositories instead of having corporate information spread across many sources within the organization
disparate sources	Daniel and White (2005)	integrating disparate information sources
business events	Feng et al. (2010)	integrate business events across existing information systems and departmental boundaries
data and apps	Fink and Neumann (2009)	seamless integration of organizational applications and data
operation processes	Chang and Wang (2011)	integration of internal and external operation processes
SCM processes	Chang and Wang (2011)	integrate business processes electronically with other supply chain members
apps and content	Michaelides and Papazian (2007)	Aggregation of applications and content, structured and unstructured, into a single view or workplace
data from multiple sources	Michaelides and Papazian (2007)	Integration of data from multiple sources and formats
application integration layer	Musgrave (2004)	application integration layer, enabling interfacing of front-o?ce web services with back-o?ce systems and databases
data integration	Tripathi et al. (2012)	Data integration is an issue of combining data residing at different sources and providing the user with a uni?ed view of this data
process integration	Tripathi et al. (2012)	For inter-organizational integration the necessity for process integration increases. Different processes are developed for every level of government organizations
communication integration	Tripathi et al. (2012)	Communication integration comprises the use of electronic computers, computer software and computer networks to convert, store, protect, process, transmit and securely retrieve information

Table 5.9: Selected quotations for access to applications function

Name	Document	Quotation Content
advanced applications	Bargas-Avila et al. (2009)	advanced applications such as transaction processing systems, management information systems, decision support and expert systems
Self-services applications	Benbya et al (2004)	including pay stubs, update address and contact information and review benefits statements online
ERP systems	Benbya et al (2004)	ERP systems
BI	Benbya et al (2004)	Business intelligence
PM software	Detlor (2000)	project management software, expense reporting and travel reservation applications
BI	Dias (2001)	integrate search, report and analysis capabilities in its business intelligence component
external services	Feng et al. (2010)	incorporate external services from business partners such as travel reservations.
SCM and CRM	Feng et al. (2010)	support supply chain management and customer relationship management for both businesses and customers
BI	Fenz (2012)	business intelligence
EDI	Chan and Liu (2007)	Electronic Data Interchange
transaction-based processes	Michaelides and Papazian (2007)	streamline transaction-based processes such as quotations, purchases, invoicing
embedded applications	Raol et al. (2002)	extensibility/embedded applications
generate reports	Ruta (2005)	generate reports (e.g., headcount, salary listings, time reports), examine employee activities (transfers, promotions, terminations, etc.)
CRM	Sharma et al. (2006)	CRM
ERP	Sharma et al. (2006)	ERP
transactional tools	Scheepers (2006)	transactional tools (access to systems, data bases)
HR applications	Scheepers (2006)	leave and pay details
various applications	Thatcher et al. (2011)	knowledge portal provides access to such applications as online registration, course information, tuition payment, databases, calendars, Google applications for education, a syllabus repository, and student-hosted online communities

preferences, information in user's profile (Jain and Joseph, 2013; Musgrave, 2004), user does not initiate it thus this is the pullsupply part of this function. On the other hand, customisation is initiated by the user and usually have form of customisation of interfaces, changing look and feel, subscription to various information, Key Performance Indicators (Benbya et al., 2004; Jain and Joseph, 2013; White, 2000).

However, this distinction is not followed consistently. Several authors (e.g. Dias, 2001; Chou and Chou, 2002; Jain and Joseph, 2013; Raol et al., 2002) mix the terms and create confusion. Nevertheless, both approaches allow users to lower information overload (Scheepers, 2006), provide them with needed knowledge (Teo and Men, 2008), and help with decisions (Chang and Wang, 2011). This interconnects customisation and personalisation function to other functions such as information management, knowledge management, or content management.

Three special features that support customisation and personalisation were identified in the literature. First, subscriptions allow users to specify which information they want to receive (Teo, 2005). They can list topics or areas which they are interested in or which relate to their tasks and they get automatic alerts that notify them that something new was published or added to the content (Tsui and Fong, 2012). These alerts or notifications can be collected in a specific tool called Rich Site Summary (RSS) (Bessis et al., 2011). More details are illustrated in Table 5.10.

5.2.8 Business Process Management

Portal is not a typical system that would be ideal for supporting Business Process Management (BPM). However, for some companies it could be easier and cheaper to support only some (mainly administrative) processes and thus they can avoid an investment into BPM Suites systems. Since EIP's ability to support processes is limited because EIPs do not support process modelling and execution through a process engine, the support is limited mainly to workflow (Bargas-Avila et al., 2009; Fenz, 2012; Tojib et al., 2008). Workflows mainly support various self-service applications (Benbya et al., 2004) such as human resources applications (Ruta, 2005) or some tasks integrated from transaction processing systems (ERP, SCM, CRM) as was suggested in subsection 5.2.6.

More general view based on the results of the content analysis of the relevant literature shows that BPM function helps with task management (Raol et al., 2002) through

Table 5.10: Details of customisation and personalisation function

Name	Document	Quotation Content
tailoring	Benbya et al (2004)	modify their own interfaces and specify their preferences, but also the ability of the system to use such information to dynamically deliver speci?c content to users in order to propose to them the most relevant information to perform their job
profiling - information filtering	Benbya et al (2004)	A critical ingredient that provides information filtered for an individual's working style, delivered in a highly personalized manner. In other words the profiling allows the distribution of "the right information to the right person"
role and location	Daniel and White (2005)	information provided to be tailored to the role or location of each individual staff member
recommend	Elsner and Krämer (2013)	generate personalized recommendations and identify all relevant services
decisions	Chang and Wang (2011)	personalized information that is necessary for making informed business decisions
example	Jain and Joseph (2013)	provide information that is personalised for each visitor according to his/her personal roles and responsibilities. For example, registered, alumni and prospective all users need different types of information (UWEBD, 2012). Individual users should be able to create their personal library of selected knowledge.
definition	Jain and Joseph (2013)	Customisation means, when users have a control over portal contents, its appearance, and control over what and how the information is displayed. For example, access of information in the full text or a quick summary, access of the information on the ?rst page or the secondary page of the portal.
definition	Musgrave (2004)	Personalisation as a portal feature (that is, tailoring the information presented to an individual based on their personal, social or geographical characteristics)
roles	Ruta (2005)	different services to employees than to management
supply-side function	Scheepers (2006)	supply-side function, that is, facilities that enable providers to tailor content for specific portal users or communities in line with their unique needs
demand-side	Scheepers (2006)	demand-side activities, that is, facilities that enable individual users to set specific preferences in terms of their own portal access (such as content interests, layout, and personal links)
simplification	Scheepers (2006)	to get rid of the stuff [users] never wanted to see and just put in the stuff that they used frequently
knowledge	Teo and Men (2008)	presenting knowledge in a personalized manner
push	White (2000)	information "pushed" to the desktop for alerting purposes, and information that is pulled from databases and servers, and from other members of staff
subscribe	Zhang and El-Diraby (2012)	Subscribe to interested KIs: System users should be able to formulate subscription request according to their particular interests. These subscriptions are to be semantic rich (i.e., driven from the ontology).

routing and streamlining processes (Al-Busaidi, 2012; Benbya et al., 2004; Tojib et al., 2008). BPM function also helps with process automation (Michaelides and Papazian, 2007; Chang and Wang, 2011), task tracking (Prescott et al., 2010), and optimization (Elsner and Krämer, 2013). Details showing the content of quotations can be found in Table 5.11.

Table 5.11: Characteristics of BPM function

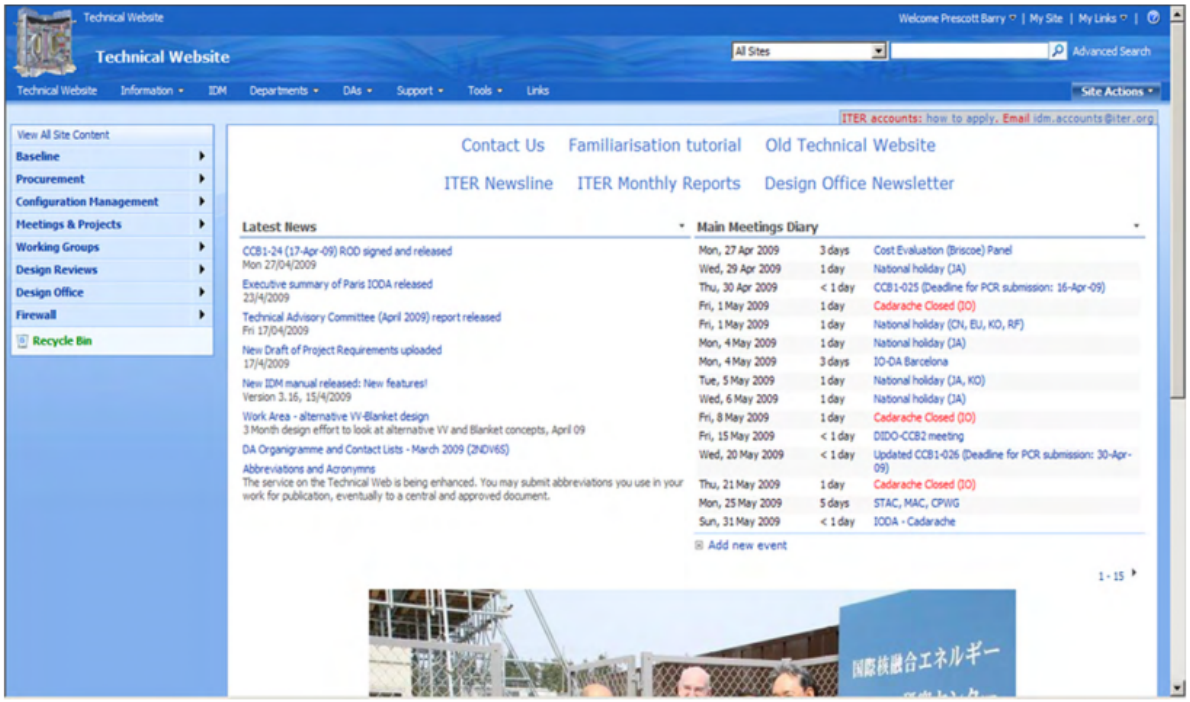
Name	Document	Quotation Content
self-service	Benbya et al (2004)	Self-services applications (including pay stubs, update address and contact information and review bene?ts statements online)
automation	Benbya et al (2004)	Business process automation capabilities suchas routing and work?ow
across departments	Feng et al. (2010)	integrate business events across existing information systems and departmental boundaries
process integration	Feng et al. (2010)	integration of business processes in a network
access to processes	Fink and Neumann (2009)	superior access to organizational information, applications, and processes
supports user	Jain and Joseph (2013)	actively support the user in his or her business processes
assigning tasks	Lee et al. (2009)	managing shared resources, segmenting and assigning tasks, and managing information ?ows
scheduling	Lee et al. (2009)	scheduling
monitoring	Lee et al. (2009)	progress monitoring of activities
information ?ow	Remus (2007)	managing the information ?ow within and between business processes in a very ?exible way
self-service	Tojib et al. (2008)	online self-service applications
process integration	Tripathi et al. (2012)	For inter-organizational integration the necessity for process integration increases. Different processes are developed for every level of government organizations
entire process	Urbach et al. (2010)	entire business process can be completed by means of the portal

5.2.9 Distribution

This function synthesize several features and tasks that permeate other functions (data, information, document, knowledge management - see below in subsequent sections). It means that this function does not stand on its own but merely provides part of the structure (subcategories) to the other mentioned functions. However, it is important and distinct to features and functions of EIPs, therefore it has its own section. An example, how distribution function can be demonstrated can be seen in an example (Prescott et al., 2010, p. 572) depicted in Figure 5.7. It shows a start page of EIP where

news and calendar features are used for distribution of a content.

Figure 5.7: Content tools used on the welcome page (Prescott et al., 2010)



The main goal of this function is to distribute content and it is sometimes labelled as content management function (Prescott et al., 2010; Scheepers, 2006; Bargas-Avila et al., 2009). Distribution function usually presents the content in the form of documents, search results, web pages etc. (Hotho et al., 2001; Dias, 2001) in various formats including PDF, HTML, XML (Benbya et al., 2004). Distribution can be divided into data, information, knowledge, and document distribution (details for density and number of quotations for each category is displayed in Figure 5.8. Each specific sub-category is described in the following text. Table 5.12 shows the most important quotations that are associated with distribution in general.

Distribution Tools

Distribution tools are heterogeneous set of various tools that support operations with (very generally outlined) content. As shown in the overview picture, it is possible to find e.g. news, blogs, FAQs, repositories, or videos in this set. The goal of news is to inform employees by various newsletters about internal news (Benbya et al., 2004; Chan and Liu, 2007) or project news (Prescott et al., 2010). This feature can also provide employees with messages from management (Bargas-Avila et al., 2009), or bulletin boards

Figure 5.8: Distribution function overview.

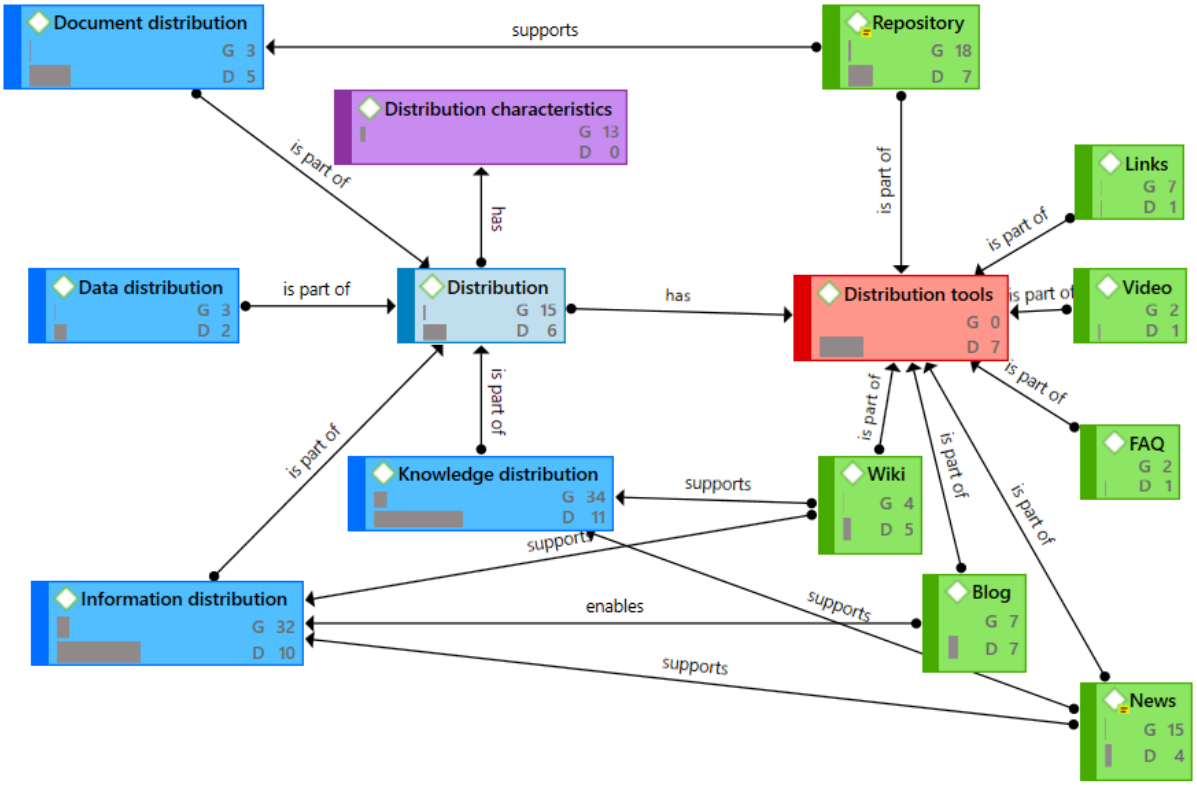


Table 5.12: Characteristics of distribution function

delivers relevant content	Bargas-Avila et al. (2009)	delivers relevant content for my work
distribution channels	Benbya et al (2004)	Push/pull technology Delivery via web distribution, web content management, pushdelivery, e-mail notification, etc.
Publishing (char)	Benbya et al (2004)	Publishing Includes the ability to render or publish documents in alternate formats including HTML, PDF, XML, etc
summarising search results	Dias (2001)	presents a summary of reports, documents or other information objects requested by the user.
presentation (desc)	Hotho et al. (2001)	Presentation: At the front end we use a simple web application that is based on the idea of conceptual hypermedia. The interface is automatically generated by exploiting facts from the knowledge warehouse
distribute resources to stakeholders	Jain and Joseph (2013)	market a university's academic faculties and research resources to all the stakeholders world-wide
Content management (char)	Prescott et al. (2010)	Most large organisations need to publish information on an intranet for internal purposes
relevant content for functional domains	Scheepers (2006)	'one-stop shops' for relevant content about specific functional domains (Human resources, Marketing, etc.)

can contain information and news on the latest development in company or industry (Chan and Liu, 2007; Teo, 2005). In the case of blogs, users of EIP can share their

thoughts about work related issues or problems and share their experience (Teo, 2005). A special part of the distribution features is FAQs (frequently asked questions) which is functionality where a user can quickly find answers related to typical issues (Benbya et al., 2004).

Although wiki pages support mainly collaboration and knowledge function, they can be regarded also as a distribution tool because they can be used for distribution information and knowledge which are embedded in the content of pages. Hyperlinks that are typically used together with blogs or wiki pages can quicken navigation between wiki pages, blog posts or websites (Jain and Joseph, 2013; Teo, 2005; Detlor, 2000). Blogs and wiki pages can also contain videos.

The most complex and abstract feature is repository. It provides structure and directories to the organisational content which is distributed by this function. Repositories are closely connected with knowledge function and knowledge tools because they often provide knowledge maps which represent the structure of organisation knowledge (Jain and Joseph, 2013; Lee et al., 2009). Repositories can also provide document repositories which store documents and assist with their retrieval (Van Baalen et al., 2005) and classification (Chou and Chou, 2002).

Data Distribution

Distribution of data in EIPs mainly consists from delivering customised data to users (Jain and Joseph, 2013) so they can focus only on the data they need and are interested in. Distributing data through an integrative technology such as EIP can speed the whole process of date delivery to users (Chan and Liu, 2007) because data are presented to users in an easy to use interface in web browsers (Daniel and Ward, 2006). As data are mainly considered as a needed condition to information and knowledge distribution, more focus was dedicated in analysed articles to information and knowledge distribution.

Information Distribution

The main goal of information distribution is to make any needed information available to the users in the time they need the information (Feng et al., 2010). This can be done mainly through information processes such as information sharing, exchange,

presentation, publishing, and distribution (Dias, 2001; Hotho et al., 2001; Zhang and El-Diraby, 2012; Feng et al., 2010, e.g.). These processes are partial synonyms (their purpose is to get the information to users), however, they slightly concentrate on different things and users play different roles during performing these processes. Exchange is very close to communication, sharing information can be another name for publishing information, publishing is close to presenting. Therefore, this category was named as distribution because it is probably the most general term that was found during the analysis.

Document Distribution

Document distribution is somewhere in the middle between information and knowledge. It can be characterised as "publishing of documents in alternate formats including HRTML, PDF, XML" (Jain and Joseph, 2013, p. 407). Documents contain both information and knowledge, whereas explicit knowledge is most of the time captured and stored in documents such as manuals, case studies, or lessons learned. From this reason, not many articles directly mention or discuss document management. However, during analysis enough concepts related to document management emerged and category for document management, and also for document distribution, was created.

Documents that are distributed via EIPs are usually documents templates or forms, project plans, and reports (Tsui and Fong, 2012). These documents are distributed to selected users (Dias, 2001) which can be selected according to customisation and personalisation functionality. As suggested, through documents information and knowledge can be published (Zhang and El-Diraby, 2012).

Knowledge Distribution

Similar to previous distribution categories, knowledge distribution focuses on presenting, sharing, and exchanging knowledge. Knowledge can be distributed via various channels such as web distribution, subscription and notification, or e-mails (Benbya et al., 2004). It is important to note that knowledge is transferred mainly through communication, therefore, communication function plays an important role (not only) for knowledge distribution.

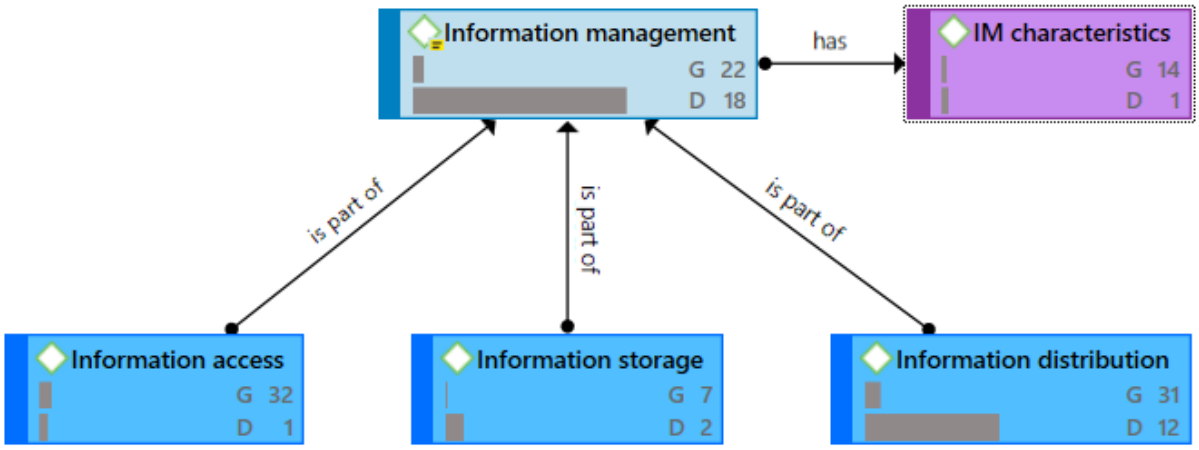
5.2.10 Data Management

Besides data distribution (which is more information distribution), data management function is responsible for access to data, data integration, and several other features. Access to data and data integration are two closely connected features. Users can access data through portal from different organisational databases (Chang and Wang, 2011; Yang and Huh, 2008) and external data sources (Detlor, 2000; Tsui and Fong, 2012). Data integration does not mean an actual physical integration (i.e. merging databases) but integration of data on presentation layer which appears to the user as one database (Tripathi et al., 2012). Data integration also works on application layer as it integrates data and applications together (Fink and Neumann, 2009). However, most of the functionality of data management is connected with information management which is the content of the next section.

5.2.11 Information Management

Information management (IM) is a complex concept and together with knowledge management function this is the function with most of the quotations. This resonates with identified portal characteristics and number of analysed documents that mentioned information and knowledge characteristics (see section 4.1 and Figure 4.2). Description of this function is divided into description of identified main sub-categories which are information management characteristics, information access, and information storage (see Figure 5.9. Information distribution was described in subsection 5.2.9 focused on distribution function.

Figure 5.9: IM processes in EIP



Information Management Characteristics

The main goal of IM function of EIP is to "*consolidate, manage, analyse, and distribute information across and outside of an enterprise*" (Yang et al., 2005, p. 350). EIPs are part of an information infrastructure (Detlor, 2000) and able to manage information life cycle (Dias, 2001), Yang et al. (2005) even considered EIPs as a concept of IM. This function covers various types of structured and unstructured information such as HR information, company documents and records, company history, sales, product information, and information in sophisticated applications such as enterprise resource planning and customer resource management applications (Davies, 2007). Thanks to this, users can unlock valuable and strategically important information (Dias, 2001; Fink and Neumann, 2009). More insight into IM characteristics can be found in Table 5.13.

Information Access

The mission of EIPs is to provide a dynamic personalised single access point to all relevant information within an organisation (Oppong et al., 2005; Dias, 2001; Daniel and Ward, 2006). This ensures that the access is quick (Jain and Joseph, 2013), easy (Dias, 2001), and centralised (Tsui and Fong, 2012).

Information Storage

Information storage mainly covers archiving (Benbya et al., 2004) and various forms of information indexing which is connected to the search function. Stored information, even if not frequently used, can become a base for knowledge retrieval and acquisition processes (Jain and Joseph, 2013). Informations are usually stored in repositories as a content of documents (Dias, 2001). Document function is therefore discussed in the next section.

5.2.12 Document Management

Document management function can be understood as a bounding concept between information and knowledge management functions. Most of the explicit knowledge is stored in documents which are based on information. As it was difficult to differentiate between document management, information management, and knowledge management, this function lacks structure and categorisation. However, from a conceptual view, the quotations that are part of this function could not be placed neither in

Table 5.13: Characteristics of IM function

Name	Document	Quotation Content
IM+KM processes	Al-Busaidi (2012)	provides tools that support several information and KM activities including information and knowledge capture, integration, search, access, retrieval and dissemination
information types	Davies (2007)	information provided may include structured and unstructured information such as human resource information, company documents and records, company history, financial, sales, product and shipping information as found in databases, e-mails, files, archives and sophisticated applications such as enterprise resource planning and customer resource management applications
information infrastructure	Detlor (2000)	information infrastructure
manage information life cycle	Dias (2001)	manage the information life cycle, establishing storage hierarchical levels and discarding unnecessary information or documents
satisfy information needs	Dias (2001)	satisfy the information needs of all types of corporate users
unlock	Dias (2001)	unlock valuable and strategic information,
coordination	Jain and Joseph (2013)	coordination across organisations and facilitates smoother work?ows
reuse	Jain and Joseph (2013)	better reuse of information and knowledge
routing of information	Lee et al. (2009)	routing of information
query and analyze information	Raol et al. (2002)	query and analyze information
synthesize	Teo and Men (2008)	The ability to synthesize knowledge and information from different sources, such as textual analysis features and metadata analysis features.
IM (char)	Yang et al. (2005)	consolidate, manage, analyze and distribute information across and outside of an enterprise
concept of IM	Yang et al. (2005)	EIP is a new concept of information management

knowledge management or information management alone and it would be overcomplicated to have them in both categories (i.e. IM and KM). Therefore, separate category covering document management function was created. Important quotations related to document management function can be found in Table 5.14.

Document management is about "*content creation, authorisation, inclusion and publishing of documents in alternate formats including HRTML, PDF, XML etc.*" (Jain and Joseph, 2013). Function's main purpose is to store, share, browse, navigate, and manipulate with documents (Urbach et al., 2010; Bessis et al., 2011; Tsui and Fong, 2012). Portals can be used as a main gateway that allows users to collaboratively edit documents,

Table 5.14: Characteristics of document management

Name	Document	Quotation Content
browsing and navigation	Bessis et al (2011)	browsing and navigation between documents
document clustering	Hotho et al. (2001)	document clustering
Content Analysis	Chau et al. (2006)	Content Analysis component should be responsible for analyzing the documents retrieved from the different data sources
Document management (char)	Jain and Joseph (2013)	Publishing - content creation, authorisation, inclusion and publishing of documents in alternate formats including HRTML, PDF, XML etc.
community and document collaboration	Raol et al. (2002)	community and document collaboration
Work?ow	Sharma et al. (2006)	Workflow and routing of documents
document review	Tsui and Fong (2012)	reduce the time lag in waiting (sequentially) for document review
different versions	Tsui and Fong (2012)	reduce the efforts in reconciling different versions of the same document
Store and share	Urbach et al. (2010)	Store and share documents

keep different versions of them, or review them (Raol et al., 2002; Prescott et al., 2010; Tsui and Fong, 2012).

However, document function can provide more sophisticated features such as automatic content analysis of documents (Chau et al., 2006) which can automatically reveal more information or knowledge to users. Documents can be also clustered in groups (Hotho et al., 2001) or used together with process management and workflows (Sharma et al., 2006). Nevertheless, the most important use for documents is knowledge management which is discussed in the next section.

5.2.13 Knowledge Management

EIPs support KM processes in several ways. One perspective was provided by Ryu et al. (2005) and is depicted in Figure 5.10. Processes that are supported can be divided into the following categories of knowledge distribution (discussed previously), knowledge application, knowledge generation, and organisational learning. Besides these processes, knowledge management characteristics and knowledge tools were identified during the content analysis. Figure 5.11 shows an overview of knowledge management function and its sub-categories with number of quotations and relations.

Figure 5.10: KM processes in EIP

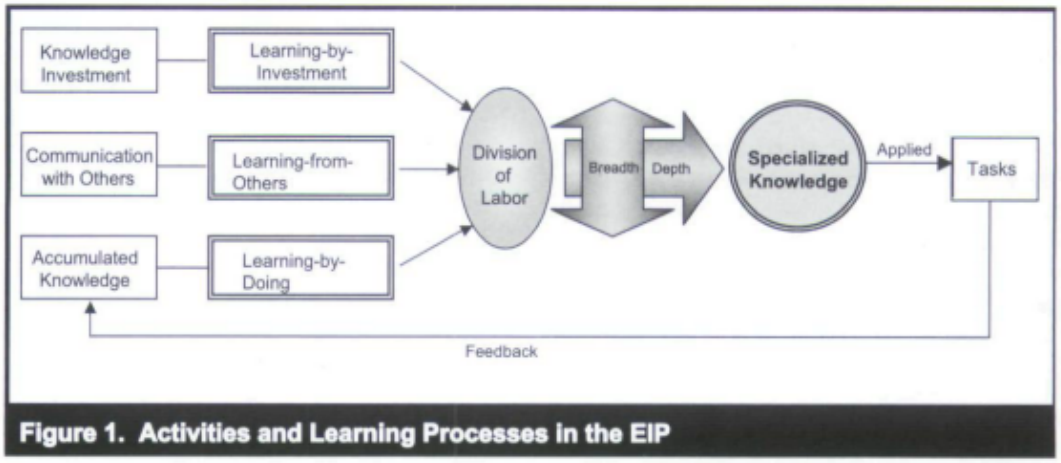
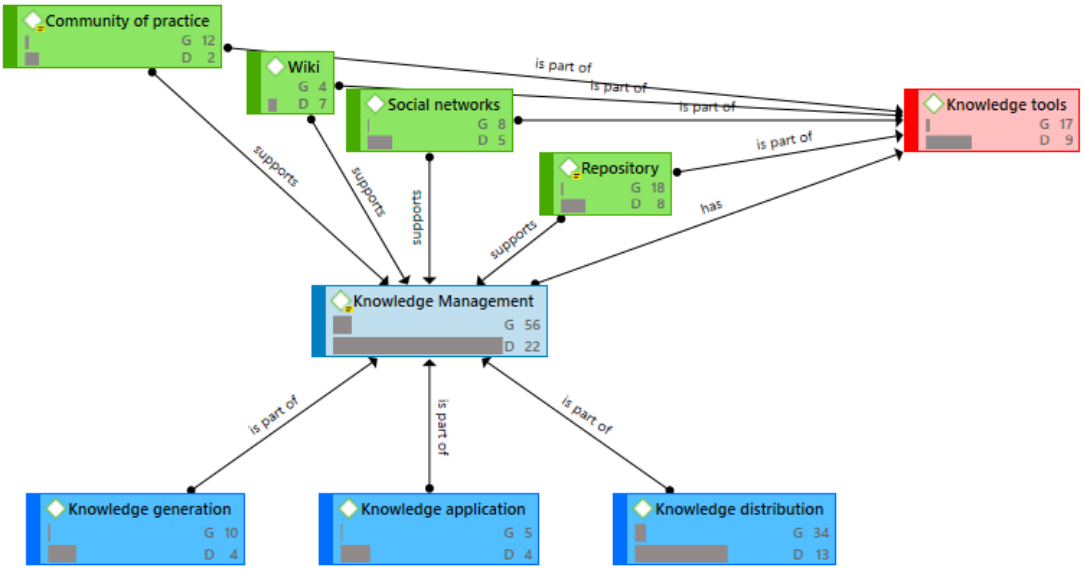


Figure 5.11: Overview of knowledge management function



Knowledge Characteristics

Portals can be considered as gateway to knowledge (Jain and Joseph, 2013) as they help with organisation of the whole knowledge process (Lee et al., 2009). Various authors list KM processes that EIPs supports such as discovery, creation, production, acquisition, organisation, exchange, storage, codification, caption, retrieval, integration, sharing, dissemination, application, and reusing knowledge (Detlor, 2000; Jain and Joseph, 2013; Teo, 2005; Al-Busaidi, 2012). Many of these processes are synonyms (or can be used as synonyms) and thus they were synthesized into categories that were introduced in Figure 5.11.

Portals play an important role in locating experts (Dias, 2001) or retrieving competence

profiles (Urbach et al., 2010) which supports user to retrieve or find needed knowledge. When the location of experts is elaborated it can lead to creation of knowledge networks (Lee et al., 2009). As the knowledge function is the most mentioned and discussed in the analysed research it resonates with claims made by some authors which consider EIPs as (primary) Knowledge Management Systems (Ryu et al., 2005; Benbya et al., 2004; Khalifa et al., 2008; Tsui and Fong, 2012) that are specifically intended to support knowledge management in organisations.

Knowledge Tools

The important role of communication and collaboration tools (e.g. wiki pages, discussion forums) and features for supporting knowledge management was discussed in respective sections above. The following tools are specific for knowledge management and therefore they are discussed here in higher detail. These tools and features are communities of practice, and repositories.

Communities of practice (CoP) are groups of people (employees) which have similar interests or deal with a similar issues and challenges (Zhang and El-Diraby, 2012). CoPs can function as helping groups where colleagues can share experience or generate new knowledge (Jain and Joseph, 2013) by harnessing of good practices, and ideas generation (Tsui and Fong, 2012). These communities are particularly helpful when teams are virtual or remote which can be further supported by e.g. social networks (Lee et al., 2009; Jain and Joseph, 2013) or communications and collaboration features in general.

Repositories can be used for storing e.g. documents or discussion history that can contain knowledge (e.g. solutions for solving problems). This part is serviced by document management function and features as was discussed in previous section. Moreover, repositories can store meta-data about the documents (Dias, 2001), can index them and subsequently features of the search function can be used to retrieve documents according these meta-data. Knowledge (documents) can be clustered by using methods such as ontology-based clustering (Hotho et al., 2001) that allows group unstructured documents according to similarities or their content.

These tools have direct impact on knowledge generation. While EIPs cannot generate knowledge per se, they can provide environment for knowledge creation (Wang et al.,

2009). This can be achieved either by using some of the tools mention in the previous paragraphs. Knowledge can be applied with the use of EIPs for example during working on process tasks (Benbya et al., 2004) which is connected also to business process management function.

Organisational learning

Portals can be also used as virtual learning centers (Sharma et al., 2006). They provide e-learning capabilities (Tsui and Fong, 2012), and applications (Benbya et al., 2004). It can be used for training and providing orientation to new employees (Daniel and Ward, 2006), contain briefing materials on new standards or procedures (Teo, 2005), or videos of colleagues explaining some solutions.

5.3 Benefits of EIP

Identification of effects that the above described and discussed functions have on organizational performance was not easy, however, from different reasons from identification of the functions. One of the goals of this research was to lay grounds of a general taxonomy of information system benefits (see Chapter 6 because information system research did not provide any general and usable taxonomy to this day. Creating categories of functions of EIPs was able to be done inductively as a limited set of sources that could be used was identified. However, as was shown in Chapter 3, research in IS benefits are limited. As shown in section 5.1, some previous attempts to list potential benefits of IS have been done but they have not received high scientific impact.

During the content analysis, two main categories were distinguished. First, category of benefits that represents and label any direct, positive, and usable impact that EIPs have in an organisation and the impact is generated by EIPs. Second, category of business value represents any impact EIPs have on organisational performance. The difference between these two categories is mainly in the level of abstraction and generalisation. In this section, benefits of EIP are described and discussed, the next section contains business value categories.

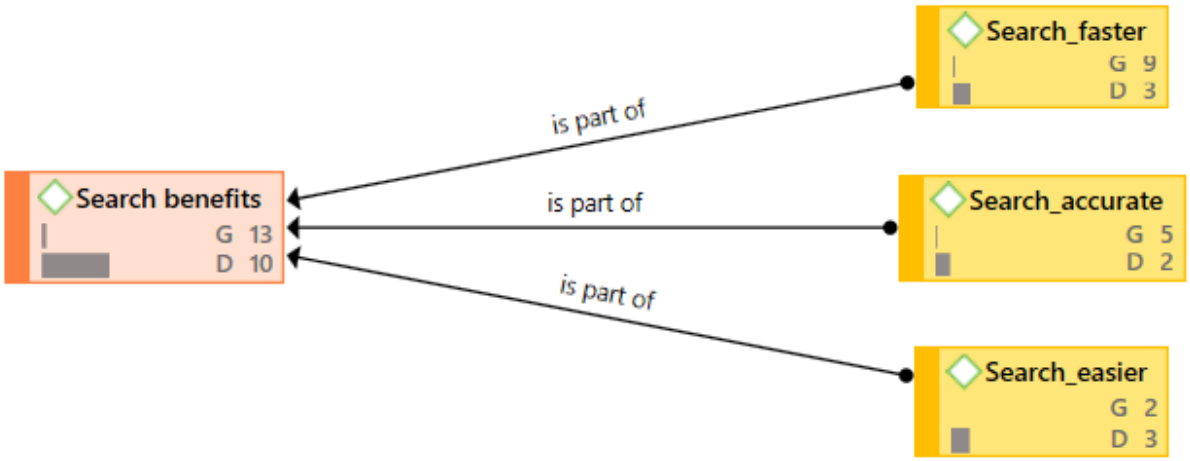
The following text is structured similarly as the content of the previous section. Every benefit or business value is described and discussed according to content of coded

quotations which are displayed in quotation tables and every category is interpreted with the help of code-to-code relations in a network.

5.3.1 Benefits from Search

Effects of search function can be categorised into the three main areas as search was identified in the analysed literature either as fast, easy, or accurate. Fast search is connected with search efficiency which means that the search is performed optimally. Efficient search reduces time spent on retrieving results (mainly information) of a search query (Dias, 2001; Chan and Liu, 2007; Tsui and Fong, 2012). Although finding information fast is important, when a wrong, inaccurate, or no information is found the speed does not help. Therefore, accuracy of the search (Chang and Wang, 2011) makes the search effort effective (Chau et al., 2006) providing users desired (Bargas-Avila et al., 2009) and high-quality information (Feng et al., 2010). Both benefits thus make the search and information retrieval easier (Detlor, 2000; Chau et al., 2006). Logically, benefits from search directly improves productivity. Overview of search benefits can be found in Figure 5.12.

Figure 5.12: Overview of search benefits

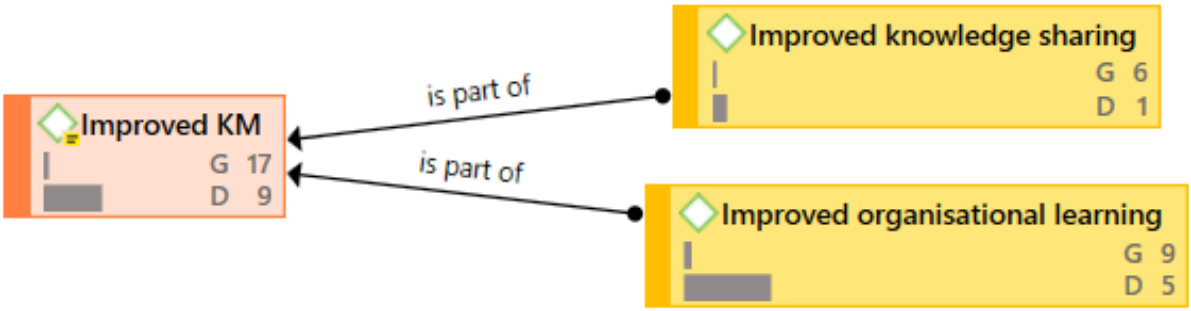


5.3.2 Benefits from Knowledge Management

Besides improving knowledge management in general, EIPs can improve organisational learning and knowledge sharing. Portals can do it by integrating (previously mentioned) tools and functionalities (Al-Busaidi, 2012). Often, knowledge from past projects can be lost, however, when using EIPs for supporting project work (especially work on project documents), some knowledge can be retained in portals through these

documents (Teo, 2005). Through established communities of practice through EIP, organisations can reach better understanding of the individual and group expertise (Tsui and Fong, 2012). Overview of categories of knowledge management benefits can be seen in Figure 5.13.

Figure 5.13: Overview of KM benefits



Improved Organisational Learning

Portals can improve organisational learning by several ways. In general, employees can learn more by using dedicated portal functions (Chau et al., 2006). It is especially useful for training new employees as EIP can reduce time and need for direct training (Dias, 2001; Michaelides and Papazian, 2007) because (not only new) employees, when learning online, can learn at their own pace when they need to (Teo, 2005). Consequently, organisation can experience higher returns on employees' learning (Al-Busaidi, 2012).

Improved Knowledge Sharing

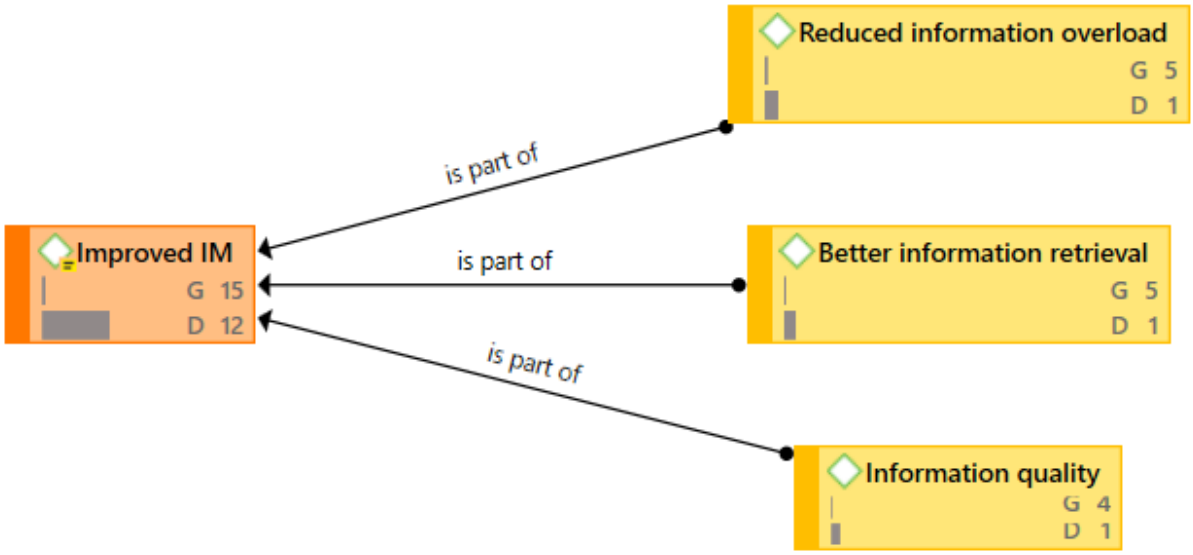
Using EIPs makes sharing more comfortable (Wu and Wang, 2012) as employees can find and publish everything at one place. This makes the transfer of knowledge easier and less costly (Van Baalen et al., 2005). Sharing between various departments (Jain and Joseph, 2013) can increase reciprocity in knowledge sharing among employees and thus increase the pace of knowledge diffusion across the organisation (Van Baalen et al., 2005).

5.3.3 Benefits from Information Management

In general, EIPs improve access to information (Daniel and White, 2005) by making it more effective and efficient (Al-Busaidi, 2012) because EIPs can integrate distributed

and scattered information sources (Dias, 2001). Information management function helps user with organisation of information (Chou and Chou, 2002) and all the processes that are part of information management such as retrieval, distribution, storage, reuse (Jain and Joseph, 2013; Detlor, 2000; Chan and Liu, 2007). During the analysis three distinct categories of benefits of information management were identified. Their overview can be found in Figure 5.14.

Figure 5.14: Overview of IM benefits



Reduced Information Overload

Portals can reduce information overload (Urbach et al., 2010) because they can reduce massive quantities of information by features from customisation and personalisation function (Feng et al., 2010) and by filtering irrelevant information according to users profile and needs (Michaelides and Papazian, 2007). They can further eliminates redundancy in publishing and creation of new information (Jain and Joseph, 2013) because of their integration function.

Increased Information Quality

By using EIP, users can retrieve more useful and more relevant information because it is tailored to their needs and preferences (Feng et al., 2010). Information management tools and features and integration of data and information make it easier for users to increase access and exposure to the information that is suitable for them (Jain and Joseph, 2013) and thus not to spend significant amount of time to chaotically search for the needed information.

Better Information Retrieval

Together with search functionality, EIPs can reduce the amount of time spent on locating information (Chou and Chou, 2002). Easier collection of information is possible by correct structure of the information in repositories (Urbach et al., 2010; Chan and Liu, 2007).

5.3.4 Other Benefits

In this section, other benefits that emerged during analysis but were not as much frequent as the previous ones, are discussed together in this section because their content was not so rich to create whole section for them individually.

Benefits from Collaboration

Organisations can benefit from EIPs through the collaboration function in several ways. Most of them are connected to cooperation between employees which means that they can collaborate more effectively and efficiently because they have appropriate support from IS/ICT. For example using collaboration tools can result in fewer meetings as employees can solve problems online with the support of EIP (Chan and Liu, 2007). Specifically, employees can collaborate through EIP functionality on documents (Tsui and Fong, 2012). The ability to use collaboration functions incentive users to work together closer and more efficiently (Benbya et al., 2004; Chang and Wang, 2011). Enhanced collaboration can be targeted not only on employees but also on business partners (Daniel and Ward, 2006) resulting in increased performance of collaborative commerce (Chang and Wang, 2011).

Benefits from Communication

Benefits resulting from enhanced communication through EIPs are very closely connected with collaboration benefits as users need to communicate in order to collaborate (Chang and Wang, 2011; Chau et al., 2006). Similarly to collaboration, communication benefits can be harvested not only internally but also when communicating with trading partners (Daniel and White, 2005).

Increased Satisfaction of Employees

Communication, collaboration, and other functions do not necessarily improve only productivity or reduce costs but they can also increase satisfaction of employees (Benbya et al., 2004). Especially mobile employees who have fewer face-to-face interactions with colleagues can sense closer attachment to their organisation (Tojib et al., 2008). Various self-service application (usually connected to HR department) (Ruta, 2005) and other applications (Feng et al., 2010) can increase morale and loyalty (Tojib et al., 2008). Although this benefit is not the first target of EIPs it can prove as very helpful for organisations.

Improved Processes

Business process management function automates business processes (Michaelides and Papazian, 2007) which can have several impacts beyond just logical increase of productivity that can be increased for example by integration both internal and external processes through EIP (Chang and Wang, 2011). Especially if it involves customer processes that can be performed more efficiently (Al-Busaidi, 2012), it can increase response times customer requests (Michaelides and Papazian, 2007).

5.4 Business Value

In the following paragraphs, concepts that were identified as business value that is enabled by EIPs are presented and discussed. Business value is the most important category as it shapes the whole conceptual model and taxonomy because it stands "*on the top*" of the hierarchy. Business value is the reason why organisations invest in EIPs (any software) and implement them. As an overview (see Table 5.15), all the concepts that were identified are related by the count of quotations to the respective articles. The abbreviations in columns stand for the respective business value concepts, i.e. CA = competitive advantage, PR = productivity, SI = sales increase, CR = cost reduction, EF = efficiency, IN = innovation, and BV = business value. The last column represents all occurrences of business value codes in the articles, however, it does not match the sum of all the others concepts. The reason is that some concepts are not discussed in this thesis as they were found e.g. only in one article or no relation that would relate them to other concepts such as benefits or functions was found.

Table 5.15: Document-code table for business value codes

	CA	PR	SI	CR	EF	IN	BV
D 1: Al-Busaidi (2012)	2	5	2	5	2	1	19
D 2: Bargas-Avila et al. (2009)	0	1	0	0	0	0	1
D 3: Benbya et al (2004)	0	2	0	3	1	0	7
D 5: Daniel and Ward (2006)	0	0	0	0	0	0	1
D 6: Daniel and White (2005)	0	0	0	0	1	0	1
D 8: Detlor (2000)	0	0	0	1	0	0	1
D 9: Dias (2001)	2	2	1	0	2	0	12
D 10: Elsner and Krämer (2013)	0	1	0	0	1	0	3
D 11: Feng et al. (2010)	1	1	0	0	0	0	2
D 13: Fink and Neumann (2009)	2	0	0	0	0	0	2
D 15: Chan and Liu (2007)	0	5	0	1	0	0	6
D 16: Chang and Wang (2011)	0	2	0	0	0	0	3
D 18: Chou and Chou (2002)	0	3	0	1	2	0	6
D 19: Jain and Joseph (2013)	0	0	1	0	1	2	4
D 20: Khalifa et al. (2008)	0	0	0	0	0	1	2
D 23: Michaelides and Papazian (2007)	0	1	1	5	3	0	11
D 25: Oppong et al. (2005)	0	0	0	0	0	0	1
D 26: Prescott et al. (2010)	0	1	0	0	0	0	1
D 27: Raol et al. (2002)	0	2	1	0	0	0	3
D 29: Ruta (2005)	0	0	0	0	1	0	1
D 36: Tian et al. (2012)	0	0	0	0	0	0	2
D 37: Tojib et al. (2008)	1	2	0	1	3	0	5
D 39: Tsui and Fong (2012)	0	5	0	0	0	0	7
D 40: Urbach et al. (2010)	2	8	0	2	1	0	13
D 42: Wang et al. (2009)	0	0	0	0	0	0	1
D 43: White (2000)	1	0	1	1	0	0	4
D 45: Yang et al. (2005)	0	0	0	0	1	0	1
D 46: Yang and Huh (2008)	0	1	0	1	1	0	3

5.4.1 Competitive Advantage

Portals were reported in some empirical studies (Fink and Neumann, 2009; Urbach et al., 2010) to be able to increase a competitive advantage of companies that use EIPs. Urbach et al. (2010) investigated in what extent EIPs contribute to organisational performance. Fink and Neumann (2009) focused on IT infrastructure capabilities which are supported by EIPs and which have positive outcome on competitive advantage. Neither of those studies focused on functions or features of EIPs that can improve competitive advantage and focused only on overall organisational level. In Table 5.16 all articles that discussed or mentioned EIPs in relation to competitive advantage are

displayed together with quotation that covers the competitive advantage concept.

Table 5.16: Competitive advantage generated by EIPs

Document	Quotation Content
Al-Busaidi (2012)	corporate competitiveness
Al-Busaidi (2012)	stay competitive
Dias (2001)	competitive advantage
Dias (2001)	competitive
Feng et al. (2010)	businesses more competitive
Fink and Neumann (2009)	IT-based competitive advantage
Fink and Neumann (2009)	positive competitive outcomes
Tojib et al. (2008)	increased competitive advantage
Urbach et al. (2010)	distinguish my organization from similar organizations
Urbach et al. (2010)	my organization make itself an overall success
White (2000)	provide companies with a competitive advantage, as they can become more proactive and agile

5.4.2 Productivity

Value generated by productivity category consists mainly from increasing productivity in general (not specified in the articles), reducing time needed for employees' tasks, and more efficient and effective work. Although it could be argued that efficient work is faster work, due to the inaccuracy of differentiation of these two terms by authors of the articles, efficiency and effectiveness were kept in one category. Detailed summary of articles and quotations that were directly investigating (i.e. quotations are located in results sections or were part of a survey) EIPs and productivity can be seen in Table 5.17.

Besides the main categories, EIPs can increase productivity by several different (indirect) ways. According to Al-Busaidi (2012), EIPs can increase employee adaptability, which allows them to be productive faster. In a study from Urbach et al. (2010), users were asked e.g. if EIPs could make their tasks easier to accomplish. In the next chapter, more ways of how EIPs can achieve higher productivity are shown.

5.4.3 Sales Increase

Although Al-Busaidi (2012) reported that some companies increased sales due to EIP implementation, portals are not directly intended to increase sales and directly support customer processes. However, they can help indirectly and some portals have oc-

Table 5.17: Quotations showing how EIPs increase productivy

Document	Quotation Content
Al-Busaidi (2012)	employee adaptability
Bargas-Avila et al. (2009)	work more efficiently
Benbya et al (2004)	Increased productivity
Benbya et al (2004)	Improve worker satisfaction and productivity
Chan and Liu (2007)	fewer meetings through internet communication and collaboration
Chan and Liu (2007)	reduce errors and wastage
Prescott et al. (2010)	Much time is saved
Teo (2005)	The resource materials found in the knowledge repositories reduce the time needed to source from multiple sources when the need arises
Teo (2005)	enhance productivity
Tsui and Fong (2012)	save considerable time in conducting (multiple) searches
Tsui and Fong (2012)	BI portal/dashboard is expected to deliver signi?cant productivity gains and improvements
Tsui and Fong (2012)	save users time by not needing to constantly check for the availability of updated/new information
Tsui and Fong (2012)	save time by reusing existing assets
Urbach et al. (2010)	accomplish tasks more quickly
Urbach et al. (2010)	improves my job performance
Urbach et al. (2010)	increases my productivity
Urbach et al. (2010)	enhances my job effectiveness
Urbach et al. (2010)	makes it easier to accomplish tasks
Urbach et al. (2010)	is useful for my job
Urbach et al. (2010)	improve the quality of working results

casionally an e-commerce and e-business functionality (White, 2000). If EIPs support tasks that are performed by sales force, it can increase their performance (Raol et al., 2002) and consequently boost customer loyalty by eliminating problems caused by delays and inefficiencies (Al-Busaidi, 2012). Improved customer service level (Michaelides and Papazian, 2007) is not the only way how EIPs can increase sales. Jain and Joseph (2013) used an example of university portal that was able to attract students because university staff had public profiles.

5.4.4 Cost Reduction

EIPs can reduce costs in various areas which can be caused by several different benefits. Probably the least expected cost reduction is reduction of printing costs and paperwork related costs (Benbya et al., 2004; Detlor, 2000; Michaelides and Papazian, 2007). How-

ever, especially in the case of HR or self-service portals, this can be the sole reason why they are implemented. Another areas where EIPs reduce costs are at operational level (Al-Busaidi, 2012; Michaelides and Papazian, 2007), sales processes (Al-Busaidi, 2012), training (Benbya et al., 2004), and administration (Yang and Huh, 2008). List of the articles together with different reasons for cost reduction can be found in Table 5.18.

Table 5.18: Cost reduction overview

Document	Quotation Content
Al-Busaidi (2012)	operational costs
Al-Busaidi (2012)	savings
Al-Busaidi (2012)	support and selling costs
Al-Busaidi (2012)	operational costs
Al-Busaidi (2012)	redundancy and cost
Benbya et al (2004)	Elimination of paperbased statements
Benbya et al (2004)	Employee self-service model reduces costs
Benbya et al (2004)	training costs
Detlor (2000)	reduce internal information publishing costs
Chan and Liu (2007)	savings in document filing/copying
Chou and Chou (2002)	cost of healthcare information access
Michaelides and Papazian (2007)	operating costs
Michaelides and Papazian (2007)	transaction costs
Michaelides and Papazian (2007)	less paperwork, with improved audit trail
Michaelides and Papazian (2007)	efficient response to queries
Michaelides and Papazian (2007)	efficient access to order information and better distribution of documentation
Tojib et al. (2008)	reduced cost
Urbach et al. (2010)	lowering organizational costs
Urbach et al. (2010)	reduction in human resources and organizational costs
White (2000)	cost savings
Yang and Huh (2008)	administrative costs

5.4.5 Efficiency

Although efficiency can be considered as making things better or faster and thus merged with productivity, during the analysis, several concepts that were not a direct increase in productivity emerged. Also, authors did not carefully distinguished difference between efficiency and effectiveness, therefore this category encompasses both terms. EIPs can foster effectiveness by increasing the quality of outcomes (Chou and Chou, 2002) by empowering employees during work on some of their tasks (Tojib et al., 2008). For example, in a case study produced by Ruta (2005), Hewllet-Packard was able to in-

crease effectiveness of their human resources operations through employing HR portal.

Efficiency caused by EIP usage is mainly targeted internally as EIPs improve efficiency of internal operations (Urbach et al., 2010) or productive efficiency (Elsner and Krämer, 2013). For example, business-to-employees portals enhance efficiency by streamlining work processes (Tojib et al., 2008). Therefore, according to Dias (2001), EIPs make an organisation more agile.

5.4.6 Innovation

Benefits connected with innovations originates mainly in knowledge and collaboration function. For generation new ideas, EIPs are an ideal tool (Khalifa et al., 2008) as they provide communication, collaboration, and knowledge sharing tools. Especially social networks and communities of practice can be helpful with creativity (Jain and Joseph, 2013).

5.4.7 Decision Making

Although no analysed article and no articles used for theoretical foundations of this categorisation mentioned it directly, decision making directly influence closely strategic management and forecasting. The closest was Dias (2001) who stated that corporate portals can improve strategic cohesion. Mainly because EIPs help executives, managers, and analysts with decisions (Dias, 2001). EIPs help users through knowledge sharing (Benbya et al., 2004) with more conscious and independent decisions (Dias, 2001). Moreover, portals can help them solve problems based on information stored in portal and knowledge shared through the portal (Tsui and Fong, 2012; Teo, 2005).

Chapter 6

Taxonomy of Information Systems Benefits

Although the results of the content analysis are usable by themselves as an output of a basic research because they deepen the knowledge about functions and benefits of EIP, they can be applied during several phases of EIP implementation. The most suitable phase is pre-implementation phase when justification, pre-sales consultations, and user requirements gathering and analysis happen. However, the usability of outputs is relevant even in subsequent phases (more in subsection 7.1.2).

The results were summarized in Chapter 5 into categories of functions and benefits that are enabled and supported by EIPs. They can be combined into hypotheses (subsection 6.1.1) which can be synthesized into the Taxonomy of Information Systems Benefits (TISB) for EIPs (TISB4EIP). Taxonomy is typically a hierarchical representation of categories. The conceptual model represents the taxonomy and is based on hypotheses, which constitute the model and are presented and discussed in this chapter. The conceptual model is too large to be printed in the thesis and is therefore appended as a separate file in the directory where dissertation is submitted.

6.1 Conceptual model of EIP business value

The conceptual model is an amalgamation of relationships between concepts that emerged during qualitative content analysis of EIP research articles. The grounds for creating the conceptual model originated in relationships emerged from the content analysis. Some relationships were complex enough to formulate hypotheses (see subsection 6.1.1) explaining how certain EIP features can enable certain business values through supporting functions and improving their capabilities.

6.1.1 Hypotheses

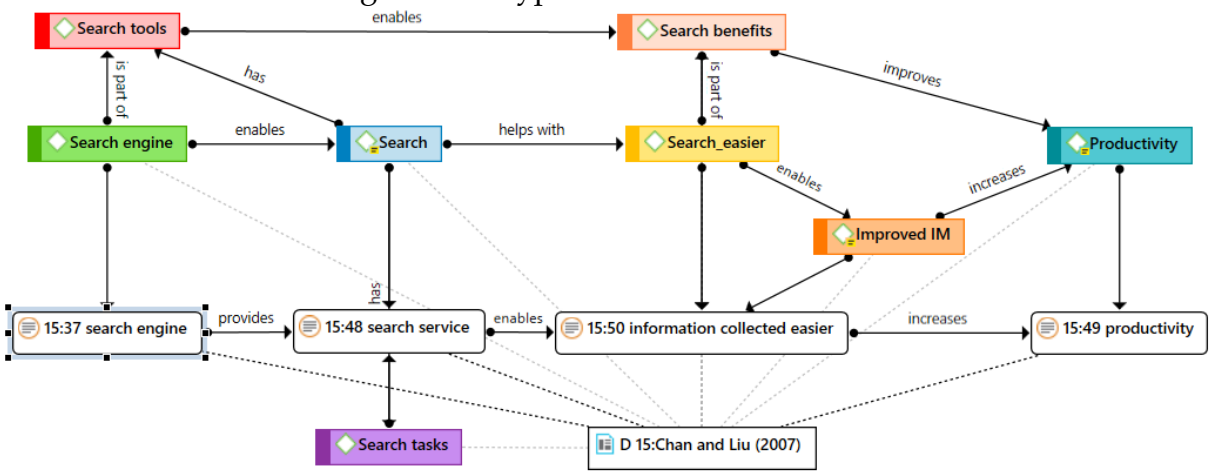
The hypotheses identified during the content analysis form grounds of the basic conceptual model. In the following text the content and meaning of hypotheses is discussed and they are visualised by Atlas.ti networks.

H01: Search increases productivity

Relation between search (function) and productivity seems to be straightforward and instinctive. Nevertheless, to add more details to support this argument, the instinctive understanding of how the search function of EIPs is not enough. Chan and Liu (2007) designed a corporate portal for construction industry. And according to their design, search engine that provides search services (as part of the search function of the portal) to the users enables easier collection of information. This subsequently means that easier collection of information can increases productivity and it happens directly (by saving time for information search) and indirectly through improved information management. Therefore two versions of H01 can be formulated.

> H01a: *Search engines, which are part of the search function, enables easier collection of information which increases employees productivity by saving their time.*
> H01b: *Search engines enables easier collection of information which improves information management which consequently increases employees productivity.*

Figure 6.1: Hypotheses H01a and H01b

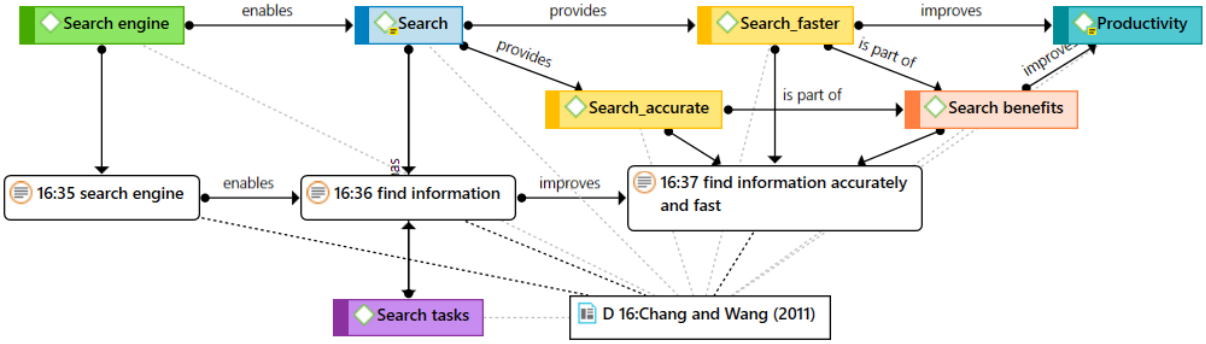


Besides being easier, another reasons why search can improve productivity is that the search is a fast (efficient) and accurate (effective). Chang and Wang (2011) surveyed

automotive companies about how the search in EIPs can help them. He did not mention productivity directly, however, with faster search of information it is logical that the ultimate effect is increased productivity.

H01c: *Search engine, which support search function of EIP, supports efficient (faster) and effective (accurate) search which increases productivity of employees.*

Figure 6.2: Hypothesis H01c



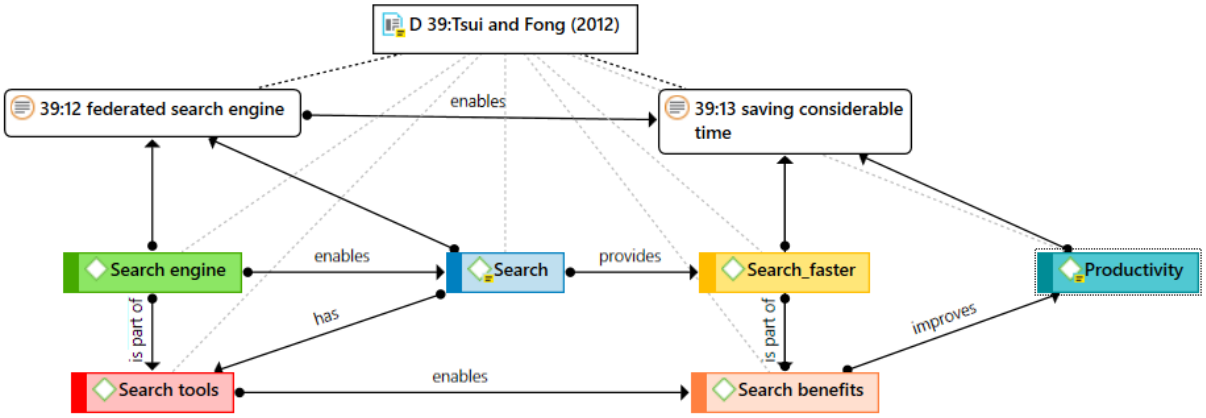
Hypothesis H01a can be further specified because in another study by Tsui and Fong (2012), federated search engines were shown to be able to save a considerable amount of time when users use this feature to perform search queries. And straightforwardly, faster search can also increase productivity. Federated search was identified also in article from Davies (2007), however, the study did not tackle any relation between the feature and other benefits. The hypothesis can be formulated as:

H01d: *Federated search engine, which support search function of EIP, supports faster search which increases productivity of employees.*

H02: Communication improves knowledge management

Communication function and associated features and tools can support knowledge management in many ways. According to Urbach et al. (2010), discussion forums and instant messaging support corporate knowledge management which subsequently improves knowledge acquisition and management. Communication is needed antecedent for any sharing of knowledge and EIPs can support make the communication for employees easier and more efficient.

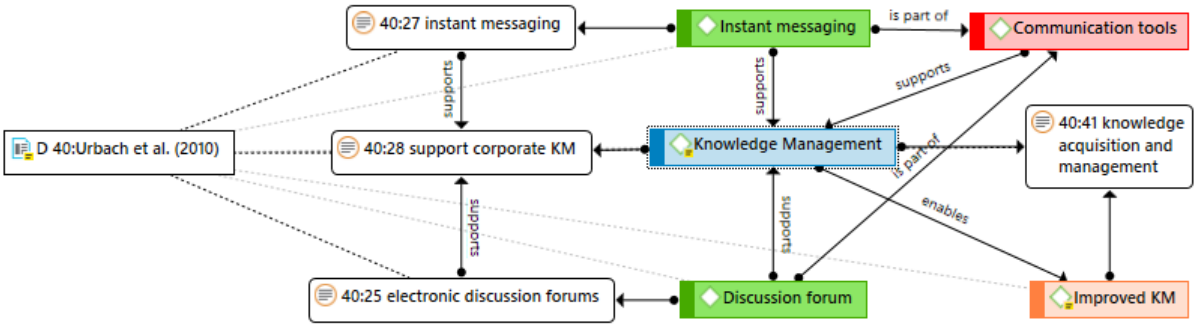
Figure 6.3: Hypothesis H01d



H02a: *Discussion forum improves knowledge acquisition and management process through support of corporate knowledge management processes.*

H02b: *Instant messaging improves knowledge acquisition and management process through support of corporate knowledge management processes.*

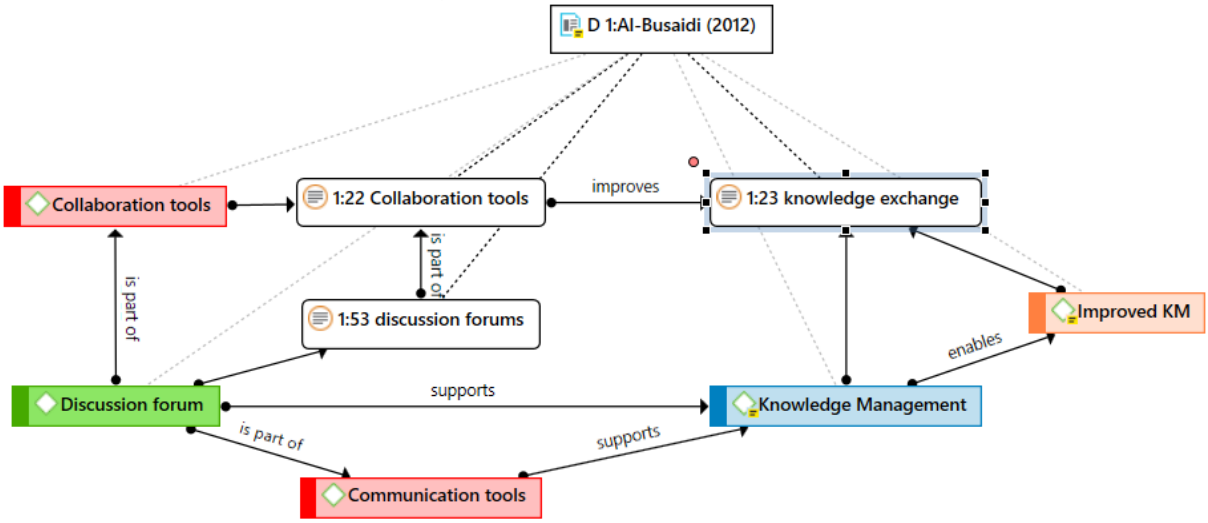
Figure 6.4: Hypotheses H02a and H02b



Al-Busaidi (2012) offers slightly more specific insight into the relation between discussion forums and knowledge management. However, in his study, he treats forums as a collaboration tool (in this paper, forums are understood as communication tools). Nevertheless, discussion forums can improve knowledge exchange as the users of EIP can engage into communication with each others.

H02c: *Discussion forum improves knowledge exchange through supporting collaborative environment.*

Figure 6.5: Hypothesis H02c



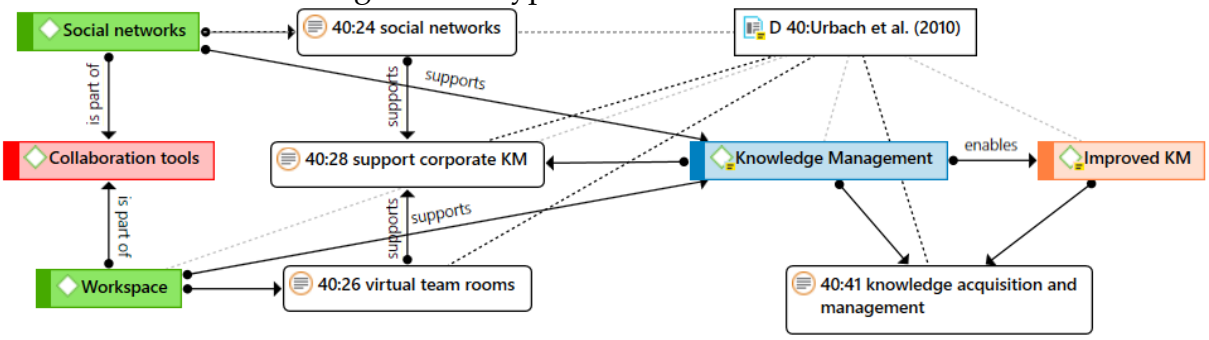
H03: Collaboration improves knowledge management

Similar to communication function, collaboration features and tools can support knowledge management. Urbach et al. (2010) showed that social networks and workspace (e.g. virtual team room or site) improve knowledge acquisition and management. Without collaboration and virtual contacts, sharing of knowledge would be difficult. Therefore, when EIPs support these features they make it more convenient for employees to share and acquire needed knowledge.

H03a: *Workspace improves knowledge acquisition and management process through support of corporate knowledge management processes.*

H03b: *Social network feature improves knowledge acquisition and management process through support of corporate knowledge management processes.*

Figure 6.6: Hypotheses H03a and H03b

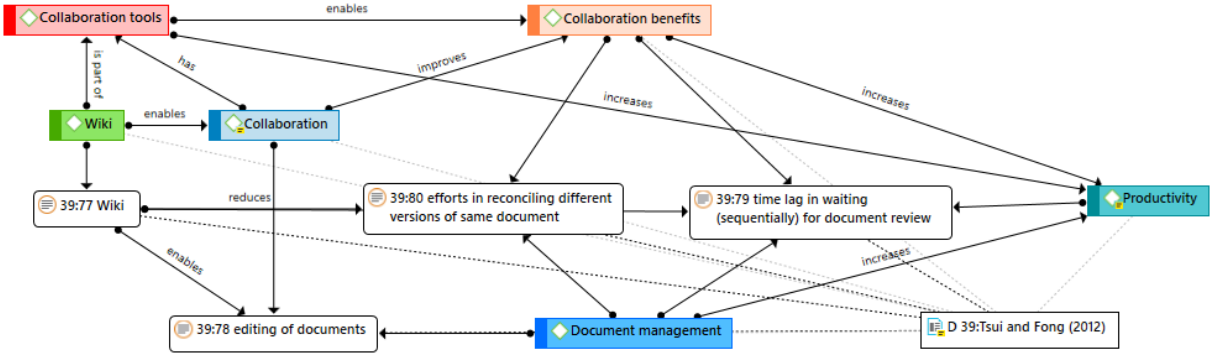


H04: Wiki pages increase productivity

Wiki pages as a collaboration and publishing tool enables collaborative editing and versioning of documents that are published online (Tsui and Fong, 2012). Wiki pages can thus reduce efforts when merging various version of the same document and consequently reduce time needed for document management which increases productivity. Although wiki pages can also play a role of knowledge tools this hypothesis does not cover this type of functionality.

> H04: *Wiki pages increase productivity by reducing time needed for document management through enabling collaboration.*

Figure 6.7: Hypothesis H04



H05: Workspace increases productivity

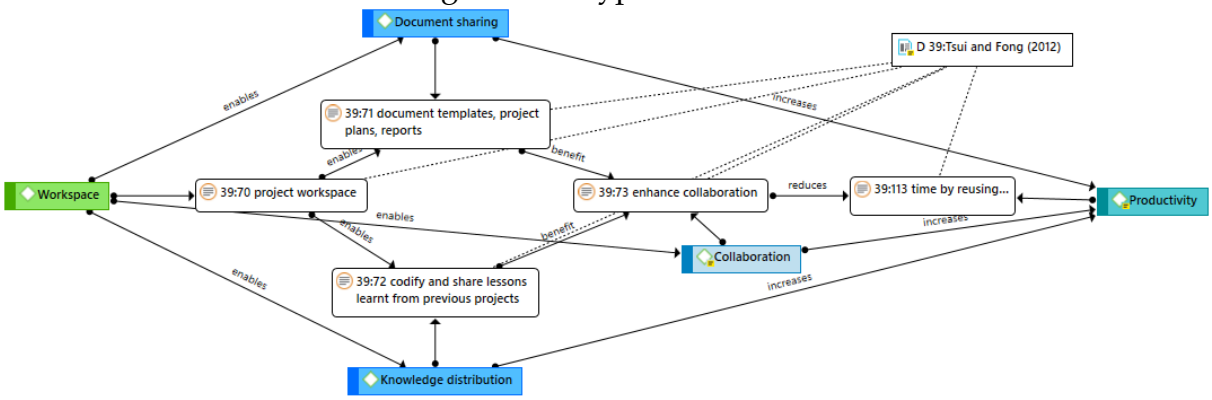
Because workspace feature is a very broad concept which encompasses almost everything that can be associated with collaboration function, it can be regarded as an integrative term for collaboration tools. It is therefore used for supporting project management (Tsui and Fong, 2012). It enables document sharing, collaboration and knowledge distribution which ultimately reduces time by reusing existing assests (i.e. knowledge, documents) and thus increasing productivity.

> H05: *Workspace increases productivity by reducing time while reusing assets needed for project management tasks through document sharing, knowledge distribution and collaboration.*

H06: Electronic Data Interchange increases productivity

Data distribution in the form of Electronic Data Interchange (EDI) can enable faster transfer of data from projects (Chan and Liu, 2007). When the transfer of data is fast,

Figure 6.8: Hypothesis H05

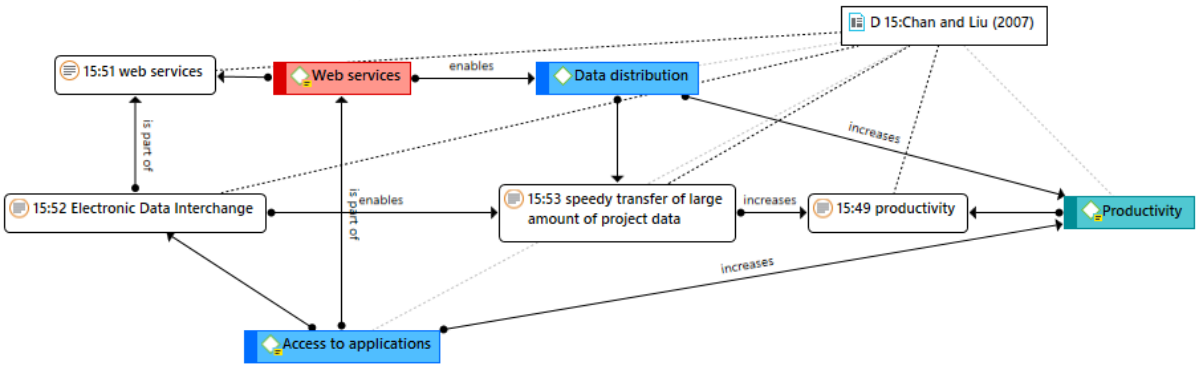


it can logically increases productivity. EDI is not native functionality of EIPs but is integrated into portal's functionality. Therefore, not only data distribution can increase productivity but also functionality of access to applications can increase productivity.

H06a: *Data distribution which is enabled by EDI increases productivity through fast transfer of large amount of data.*

H06b: *Access to application such as EDI increases productivity through fast transfer of large amount of data.*

Figure 6.9: Hypotheses H06a and H06b

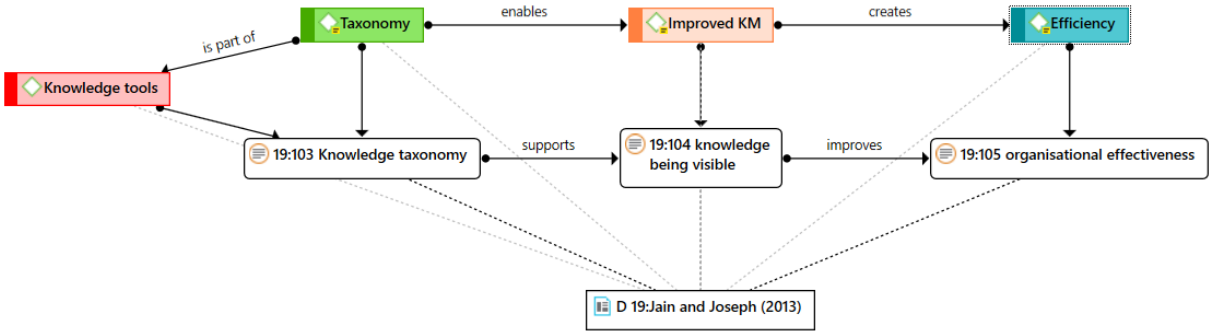


H07: Taxonomy improves efficiency and productivity

Creating taxonomies can help with knowledge management because taxonomies categorise and organise knowledge. According to Jain and Joseph (2013) taxonomies that are part of EIPs supports process that makes knowledge more visible (identifiable). Employees can consequently find or use more knowledge which allows them to be more effective in their work.

H07a: *Taxonomies support knowledge management by making knowledge visible and this improves organisational effectiveness.*

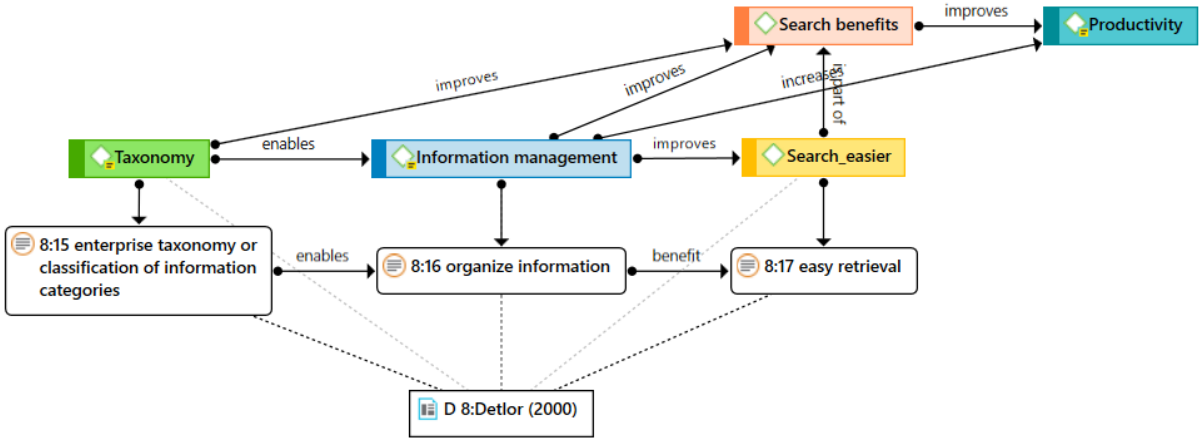
Figure 6.10: Hypothesis H07a



Because taxonomies can improve knowledge management they can also improve information management. Indeed, Detlor (2000) suggested that taxonomies can be used for classification of information into categories. This helps to have information better organised and consequently it makes searching for it easier. As easier search is part of search benefits and they were shown to increase productivity, this hypothesis can be therefore extend.

H07b: *Taxonomies enables information organisation which makes it easier to search for information which improves productivity.*

Figure 6.11: Hypothesis H07b



H08: Blog improves communication, information and knowledge management

Blogging feature embedded in EIPs is a widely usable feature that supports several functions and enables several benefits. When users post their experience on a corporate

blog they involve themselves into a knowledge sharing process as their colleagues can read e.g. solution of a problem and use this solution to solve same or similar problem they are dealing with. Improved knowledge acquisition can subsequently improve the whole knowledge management in an organisation (Urbach et al., 2010).

By sharing personal or work related information, blogs can also function as a communication feature that enhance corporate communication (Tsui and Fong, 2012). As was discussed earlier, communication and collaboration are antecedents of functional knowledge management in an organisation. Therefore, although not mentioned directly, improved knowledge management by using blogs can be also explained partially by improved communication.

As knowledge management is closely related with information management (information becomes a knowledge during knowledge generation process) and subject of communication is information, blogs also improve information management by increasing quality of information that is communicated (Jain and Joseph, 2013). Blogs contain quality information because it originates directly from users by their own initiative.

> H08a: *Blogs improve corporate knowledge management by support knowledge acquisition and management.*
> H08b: *Blogs improve corporate communication by frequent sharing personal and job related information.*
> H08c: *Blogs improve information quality by increased access and exposure to quality information.*

H09: Wiki improves quality of information

This hypothesis comes from the same research as H08c. Similar to blogs, wiki pages publish information that are collaboratively created and edited by active users on (usually) voluntary basis. Therefore, other users of wiki pages are exposed to potentially higher quality information (Jain and Joseph, 2013).

> H09: *Wiki pages improve information quality by increased access and exposure to quality information.*

Figure 6.12: Hypotheses H08a, H08b, H08c

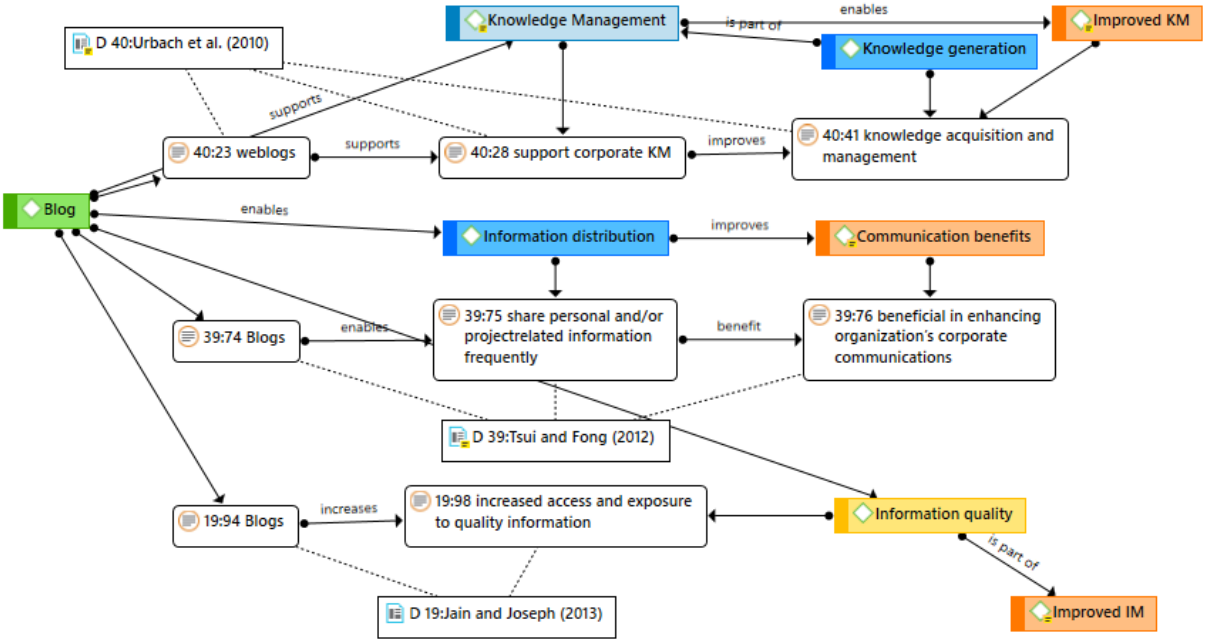
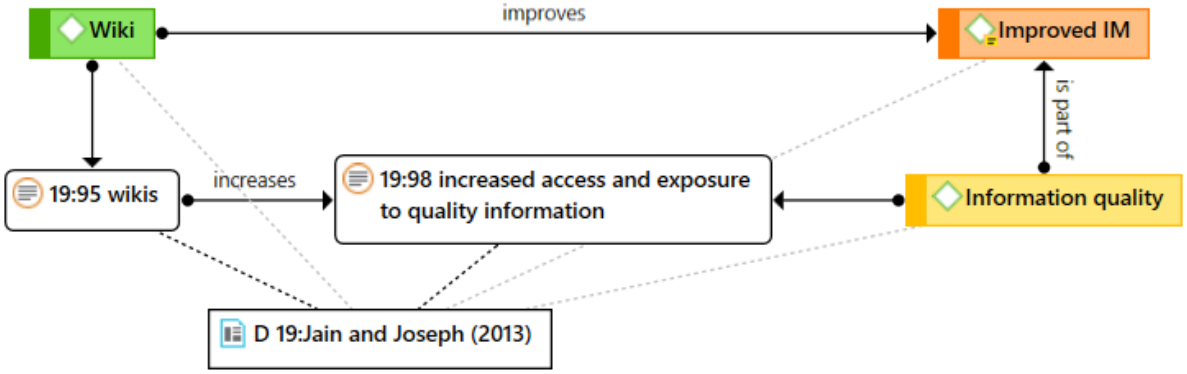


Figure 6.13: Hypothesis H09

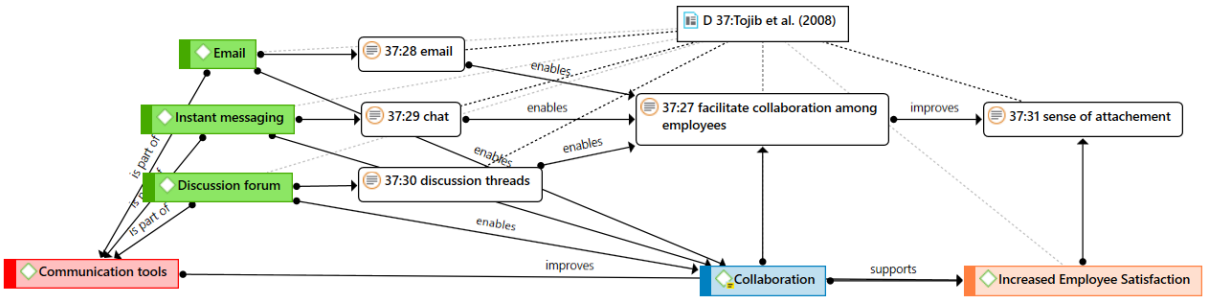


6.1.1.1 H10: Communication improves satisfaction and effectiveness

Communication tools, specifically emails, discussion forums and instant messaging can facilitate collaboration between employees (Tojib et al., 2008). The fact that employees that are mobile and work in the field could lose attachment to the firm can be remedied by EIPs that integrate these functions. And the increased sense of attachment can increase satisfaction of these employees because they feel as an integral part of the group.

H10a: *Communication tools increase employee satisfaction because they facilitate collaboration between mobile employees.*

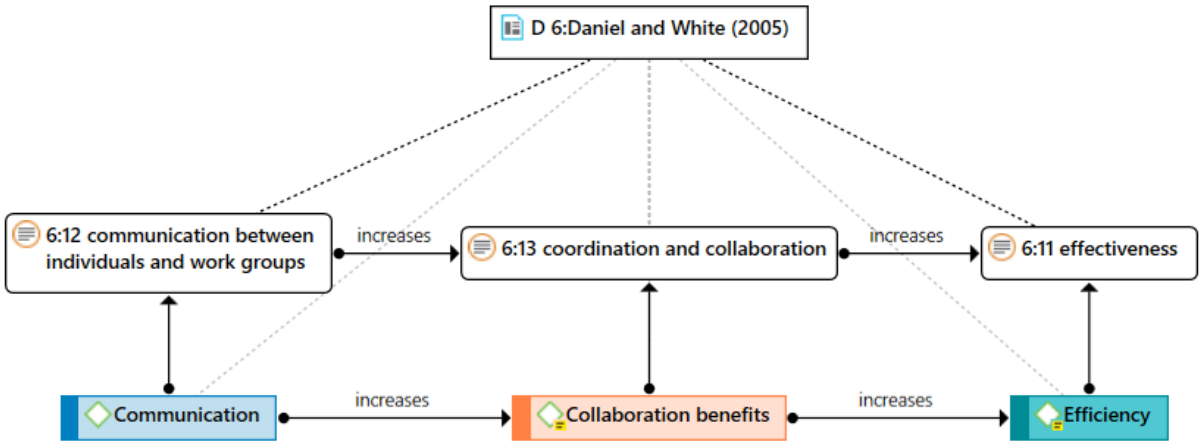
Figure 6.14: Hypothesis H10a



The fact that communication function increases effectiveness of collaboration function was discussed several times. Daniel and White (2005) mentioned that communication between individuals and work groups can foster better coordination and collaboration and thus EIPs can enhance effectiveness.

H10b: *Communication increases coordination and collaboration which subsequently increases effectiveness.*

Figure 6.15: Hypothesis H10b



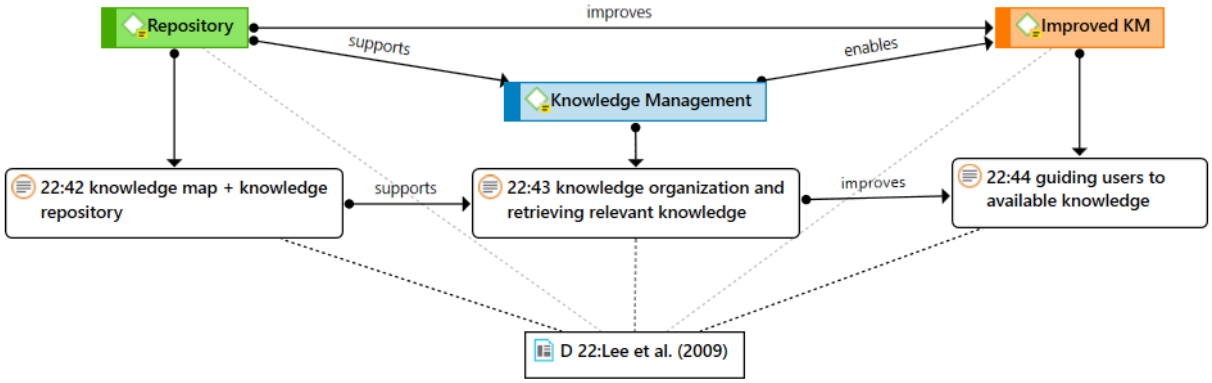
6.1.1.2 H11: Knowledge repositories improves knowledge management

Explicit knowledge needs to be stored somewhere and knowledge repositories which usually contain knowledge rich documents are the ideal solution that can be integrated into EIPs. Together with knowledge maps (overview and directory of the knowledge in repository), knowledge repositories can support organisation and retrieval of relevant knowledge for users guiding them to available knowledge (Lee et al., 2009). Users have higher chance to get to the right knowledge in the right time they need it.

H11: *Knowledge repository can improve knowledge management efficiency by sup-*

porting retrieving and organisation of relevant knowledge.

Figure 6.16: Hypothesis H11



6.1.1.3 H12: Social networks and COP improve knowledge distribution and innovation capability

Social networks support creating communities and relations that are important for establishing of communities of practice (Jain and Joseph, 2013). Social networking alone can improve knowledge sharing. However, social networking can also supports creation of communities of practice which subsequently support creation of innovations. Therefore, the rate of innovation can be increased by knowledge distribution which is supported by social networks and communities of pracitce.

H12a: *Social networks increases innovation capability through improving knowledge distribution.*

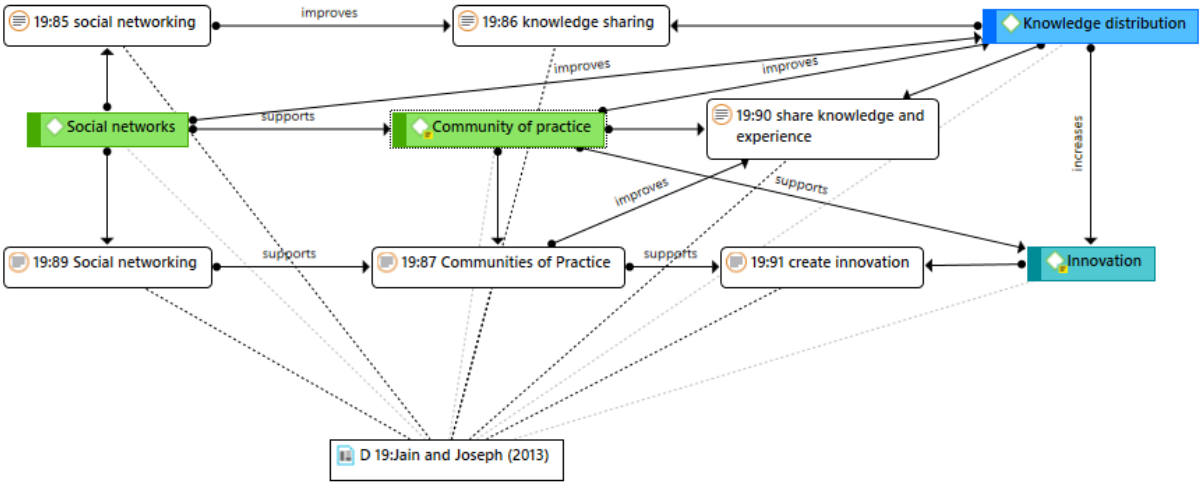
H12b: *Communities of practice supported by social networks improve creation of innovations through improving knowledge distribution.*

H13: Forums improve decision making

Discussion forums can provide expert help (either by finding old threads or receive a response for a questions) (Teo, 2005). In threaded discussions, employees can share their opinions or experience. They can even "*brainstorm*" to resolve the problem that is a subject of the discussion. This solution is especially usable for getting help from experts in other geographical locations.

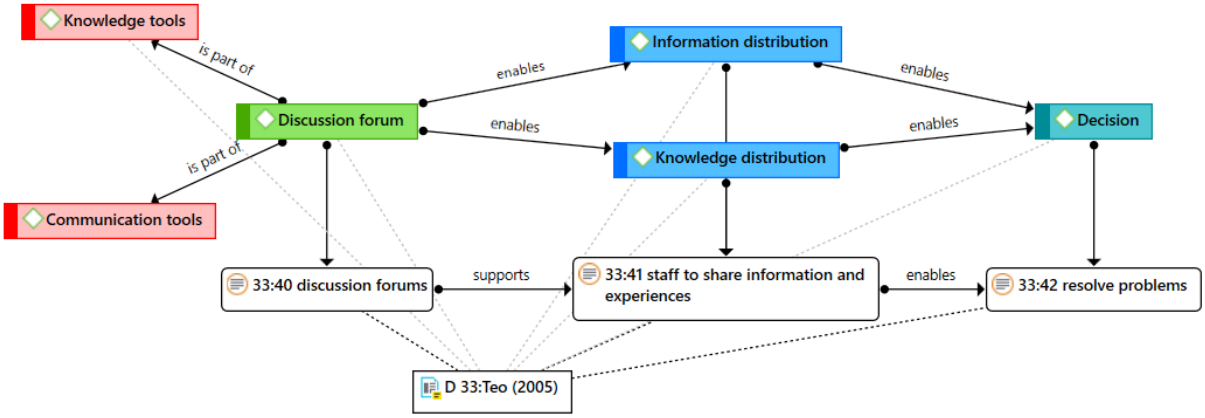
H13a: *Discussion forum supports employees to share information which helps them to solve problems.*

Figure 6.17: Hypotheses H12a and H12b



H13b: *Discussion forum supports employees to share knowledge which helps them to solve problems.*

Figure 6.18: Forum supports information and knowledge sharing which helps with decision making



6.2 Using TISB

The results of the content analysis allow creating sub-models of the general conceptual model which are usable for answering specific questions such as:

- What are typical benefits for a specific type of EIP (according to its used name in the studies)?
- What a specific feature can bring when implemented?
- What is needed to implement and support in order achieve a specific benefit?

All the presented hypotheses can be used for creating questionnaire structures that can be used for conducting interviews with users during analytical phase before implementing EIPs. Consultants can use these questions to find what users would like to have as a functionality of EIPs and then they can connect these functionalities with benefits or business value. This can be used also from other directions, i.e. the interview could be focused on benefits and consultants can then use the relations in the conceptual model for identifying the functions and features that are needed to enable these benefits.

Besides creating sub-models and specific questions, TISB can be used for creation of a standardized questionnaire. The questionnaire can be found online by using a link that is appended in the folder where this dissertation is submitted.

Chapter 7

Discussion

Uniqueness of this thesis roots in the fact that this is the first wide systematic and comprehensive review of EIP research. No attempt to systematically review scientific papers investigating EIPs was made. Previously, Dias (2001) conducted narrative review of EIP but only as a new concept very early after EIPs were introduced. Then, Raol et al. (2002) conducted review of features of EIP, however, this analysis was based mainly on non-scientific literature. When starting any research, the first natural step is to search for stand-alone literature reviews and using them as a guidance for the research design. In my case, I had to firstly create such a review.

Although this thesis is based mainly on secondary data which consist from research articles, SLR is considered as a self-standing research (Okoli and Pawlowski, 2004; Tate et al., 2015; vom Brocke et al., 2015). Moreover, as stated by Webster and Watson (2002, p. xiii) "*literature review [...] facilitates theory development, closes areas where a plethora of research exists, and uncovers areas where research is needed. [...] The literature review represents the foundation for research in IS. As such, review articles are critical to strengthening IS as a field of study*".

However, it is time consuming endeavour (especially when done individually and not in a research team), as confirmed by Allen and Olkin (1999), who calculated that completing a systematic quantitative meta-analysis review takes an average of 1,139 hours. In the case of a systematic qualitative analysis review, the time needed for the analysis increases significantly, as a qualitative analysis consumes logically more time than a quantitative one. In the case of this thesis, the average time estimations for the SLR , content analysis, and writing the results is almost 1600 hours, more details are presented in (Table 7.1).

Despite the fact that this thesis is not pioneering the method of SLR in information

Table 7.1: Estimated workload of content analysis

	Time (min)	Articles	Hours
Article retrieved	20	803	268
Abstract analysis	15	803	201
Full text analysis	25	89	37
Open coding	120	99	198
Axial coding	140	55	128
Selective coding			240
Total (coding)			1072
Conceptual model creation			400
Writing the results			120
Total (content analysis)			1592

systems discipline, the notion that SLR should become a literature review standard is quite new (see Peffers and Santos, 2013; Willcocks et al., 2015). Nevertheless, some SLR papers have been already published in respected IS journals which increases the credibility of this methodological concept. To my current knowledge, this thesis is the first attempt to produce SLR in the IS or business management field in the Czech Republic and possibly the first or one of the first doctoral thesis that conducted SLR in the Czech Republic across social sciences.

The rest of the arguments that supports the uniqueness of this thesis are discussed in the next section that contains impacts of this research separated into two areas: theoretical and practical. Then, limitations of this thesis are discussed. This chapter concludes with suggestions for further research.

7.1 Research implications

In general, impacts of the research which are interlinked with originality can be divided in theoretical and practical. Theoretical implications are connected with basic theoretical research and they push the borders of scientific progress. Practical implications are connected to applied research and use of the outputs in pedagogy.

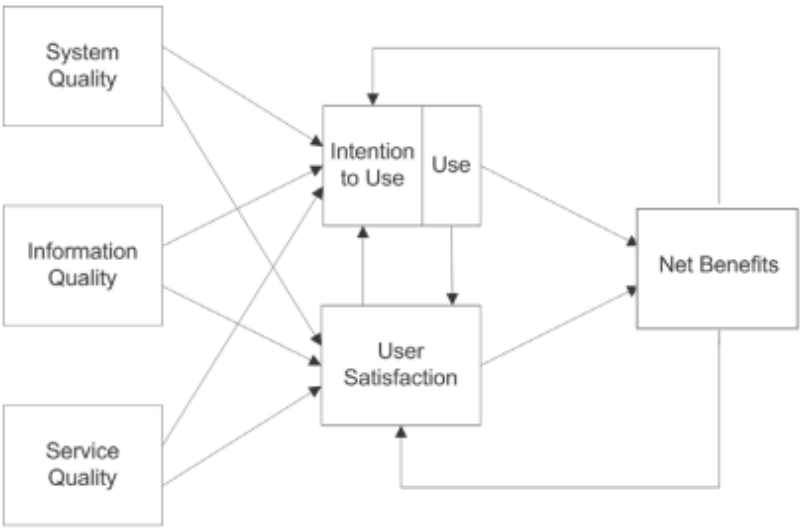
7.1.1 Theoretical impact

The results of this study synthesize and aggregate the knowledge about EIPs into one unified view. As was shown and discussed in section 4.1, many definitions and views on EIPs exist. By unifying the dispersed knowledge and creating EIP taxonomy, all future EIP investigations can have clear reference and categorization which can be used for achieving higher validity and reliability of any research that will focus on EIPs. The main purpose of effective scientific progress is not to reinvent the wheel and to build on the previously investigated theories. By unifying the research in EIP field, repeating or not using already existing research could be less frequent.

Resource based view (introduced in section 1.6) is frequently used as a theoretical framework in IS research. However, it lacks the necessary detail that can be used for application at an individual project level. It explains how resources can affect organizational performance or competitive advantage, however, particular types of IS are treated as a black box. It does not provide suggestions and context for investigating the impact of an implementation of one IS. This can be demonstrated on two examples of typical investigations of IS impact on organisational performance. The first research is the notorious DeLone and McLean IS Success Model (DeLone and McLean, 2003) that shows (in Figure 7.1) how quality of system, information, and service can affect intention to use the system and user satisfaction which together affect benefits generated by this system. However, the model does not provide much information about the independent variables. The variables are measured by self reporting of the respondents on the Likert scale and the items are very general, i.e. for information quality variable, the questions cover completeness, easy of understanding, personalisation, relevance, and security. But the model cannot show what is behind these measures, in another words, what features and tools enables the completeness of the information. Therefore, any effort to use this research will result in the knowledge, that completeness of the information is important but it will not show how to achieve it.

Another example can be the study by Fink and Neumann (2009). Although they measured organisational impacts of EIPs, they treated EIPs as a "black box". They did not differ any functions or features of the portals and it is therefore not possible to use this research in a practical situations where the functionality of EIPs could be configured according to the results. The model can be found in Figure 7.2.

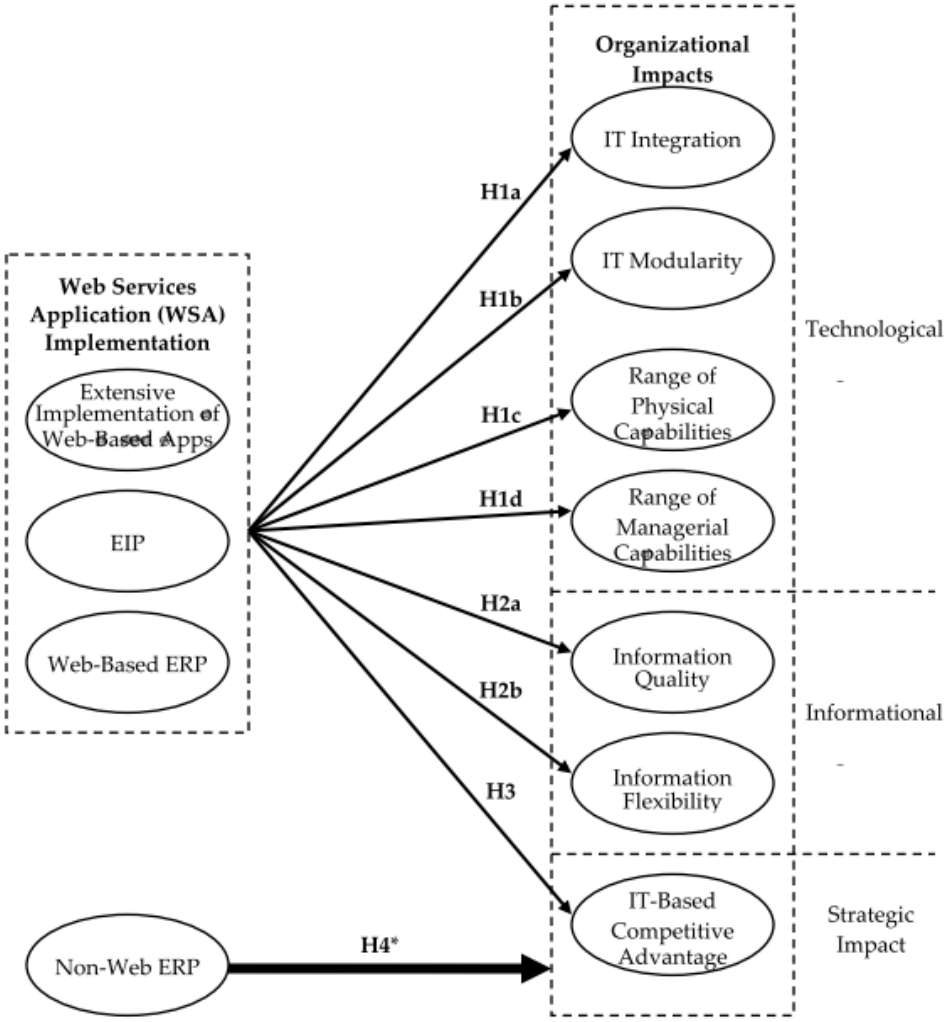
Figure 7.1: DeLone and McLean IS Success Model (DeLone and McLean, 2003)



Therefore, this study showed, how a particular IS type can be conceptualized to show how it impacts the organizational performance and competitive advantage. Representation of this finer granularity of IS resources is the conceptual model described and discussed in Chapter 6. Example of a concrete application which this study provides can be hypotheses formulated in subsection 6.1.1 which shows how specifically individual features of portals creates business value. Typical ISBV research would focus on formulations on a general level such as "information system increases efficiency of information search". However, this study provides insight into how the efficiency search is achieved. For example H01c explains that *search engine, which support search function of EIP, supports efficient (faster) and effective (accurate) search which increases productivity of employees*.

In accordance with the main purpose of a qualitative and an inductive research which is to build or extend scientific theory this research provides some answers regarding the theory of IS/IT business value and extends Resource Based View (RBV) Theory that was raised by several authors. This study partially answers the call from Schryen (2010b, pp. 153-154), how different types of investments can impact the company performance. This study not only shows how EIPs impact the company performance (i.e. which tools, features, and functions are connected with EIP have impact on which benefits and business values) but also how to scientifically develop a measuring tool for different types of application software.

Figure 7.2: Research model by Fink and Neumann (2009)



Furthermore, this research established grounds for developing a general taxonomy of IS benefits. Although some research focusing on categorization of IS capabilities exists, not many successful attempts to categorize IS benefits could be found. Therefore, a general taxonomy of IS benefits needs to be designed inductively for every major technology and then synthesized to be generally usable. This research created the taxonomy of EIP benefits, which is the first major attempt to create any complex IS benefits taxonomy that would connect tools, features, function, benefits, and business value together. Previous studies focused only on one part (category) of the taxonomy.

From methodological point of view, this research shows how to use content analysis and SLR for designing and developing a theoretical artefact. Although SLR is becoming a standard for reviewing research studies and is considered as a separate research discipline (Okoli and Pawlowski, 2004; Tate et al., 2015; vom Brocke et al., 2015), this thesis is likely the first doctoral thesis in Czech Republic that uses systematic literature

review and is based on qualitative analysis. This attempt can help to increase the using of systematic literature review not only for the purpose of reviewing the literature, but more importantly, for using secondary sources and already existing research. It shows how to effectively *"stand on the shoulders of giants"* (vom Brocke et al., 2015) and not *"polluting"* the research terrain by yet another empirical investigation conducted only for the sake of conducting which will lead to a dead end.

7.1.2 Practical impact

Practitioners in the companies which are considering implementation of EIP can use the results of this research to gather more information for the decision making process. Consultants in the companies that are explaining customers why their EIP solution would be beneficial for them can use it to increase the visibility of EIP benefits and how specifically EIP can help the customer to increase business value.

Companies that are doing consultancy or development of other types of software can use this thesis to create their own conceptual model of benefits of their information system as this thesis pioneered the methodology of creating taxonomy of information system benefits. Companies can also customize questionnaire that is appended to this thesis or use hypotheses and conceptual model to create script for user requirements interviews.

Besides the usability of this research in corporate practice, the results of this research could be useful for teaching. Some of the results of this study were already incorporated into the curriculum of Information Systems study programme. Specifically, into the courses MPH_PINF and MPH_EKIS. In the first course, the results of EIP literature review are used and in the second course, the results of IS business value and justification literature review are used. In the future, the extension of RBV will be incorporated into the content of a course that is being designed (Information Systems Theory). The methodological approach that was used in this study and my experience obtained during the research could be used for designing a methodological course (e.g. for doctoral studies) that will show how to conduct systematic literature review, qualitative content analysis and how to create a theory with inductive qualitative research approach.

The last practical use that is being discussed at the time of finishing this thesis is to use the outcomes of this thesis on collaborative research with private sector partner. Such

research project is negotiated with one international SW company that is stationed in Brno. This indirectly shows that outcomes of this thesis are potentially usable and wanted in the practice.

7.2 Limitations

This study has some limitations that are caused by the natural need of limiting the research in order to make it feasible. First, from a methodological point of view, this research is based mainly on secondary data. Second, the justification review did not provide any usable taxonomy.

Although the theoretical relations between features, functions, tools, benefits, and business values are grounded in the body of knowledge cover by the past EIP research, the concrete values and explanation strength of each relationship need to be established quantitatively. This study is not able to say that e.g. search benefits enable more business value than collaborative benefits. For this purpose a questionnaire was developed based on the hypotheses and relations that build the conceptual model.

Even if SLR research can be used as a stand-alone research, it would be better to extend this research with empirical investigation. Interviews or survey could be conducted in order to provide more insights into the conceptual model that could be confirmed or extended. However, the way how this research was conducted was very time consuming and extending the study by another part that could be considered as another stand-alone research would be too much for the first long-term research project. This situation therefore shows how the research could be further extended.

During conducting this study, no comprehensible integrated research that would present taxonomy or categorization of IS benefits or business value(s) was found. This hinders the explanatory value of the proposed conceptual model and limits its generalization. Systematic literature review of IS/ICT benefits and business value(s) would help with coding process and conceptual model design. However, by conducting "at least" narrative literature review of IS business value with focus on justification, I was able to increase my theoretical sensitivity and to ground the results of this study in theory. However, doing the second SLR would also prolong the whole research project.

Suggesting an approach based on RBV that will be generally usable for any EIP (or technology) could be seen potentially questionable. Competitive advantage is derived from idiosyncratic and difficult-to-imitate resources (Teece et al., 1997, p. 513) and a general use of the approach suggested in this study should be based on the possibility that EIPs are (conceptually) same in every organization. However, the nature of the suggested approach is based mainly on the notion that the various combination of the IS resources and their creative use is what establishes the competitive advantage. Therefore, the presented model tries to capture the combinations in its structure by linking every single identified function or feature with supported processes which impacts the organization and mediate thus the benefits which form the business value of EIPs.

7.3 Further research

This study can be used or extended in further research in several ways. First, the taxonomy can be customised for different technologies. Portals can be considered as part of the Social Information Systems which are similar in some functionality to EIPS. Second, by customising the taxonomy to different technologies it could be generalised into a general TISB and not only TISB4EIP. Third, a benchmarking tool that will use questionnaire that is designed based on this study could be created and offered to companies that can answer the questionnaire and then be able to compare their results with anonymous results of other companies. Fourth, the potential of further interpretations and analyses of the codes and quotations that are enclosed to this thesis as Atlas.ti project file was not fully reached. However, by coding the context of quotations (e.g. section in which the quotation is), further analyses of subsets of quotations and codes could be made. Another way how the coded data can be used is more thorough analysis of quotations divided by different portal types. Fifth, another stream of future research can follow the typical cycle of qualitative research that creates theory and subsequent quantitative research that tests the theory to provide inputs for consequent qualitative research that can improve or extend the theory.

Another direction of the further research could be a longitudinal study of one or more cases of EIP implementation. It could be interesting to investigate all the phases during

the technology life-cycle, i.e. justification phase and evaluation connected to it, then implementation phase and then post-implementation phase where purpose and wayas how the benefits are evaluated can change. Further, impacts of various benefits and functions can also change during the time.

Conclusion

This research was aimed on showing how IS justification process for a particular type of IS/ICT can be structured and provided by information of better quality. In this thesis, Enterprise Information Portal were used for demonstration, how content analysis could be used for Resource Based View (Theory) extension and how it can be used for showing, how particular features of EIPs creates benefits and value through support of processes. Research in the ISBV field should focus more on individual technologies at a project level because as was shown in this thesis too much attention is focused on quantitative studies that deals only with surface and general understanding how types of technology can help organisations.

This thesis was divided into seven chapters. Theoretical background was introduced in Chapter 1. Chapter 2 discussed research designed that was used in this study. Narrative review of the literature from IS justification and IS business value field was conducted in Chapter 3. Chapter 4 systematically reviewed the literature focusing on EIP research. In this chapter EIPs were defined and various characteristics of this technology were discussed.

Chapter 5 presented descriptive and analytical results from the content analysis of relevant EIP research articles. Theories and concepts that were partially used for creating categories were described and portal functions (section 5.2) and benefits (section 5.3) that were identified, conceptualised, and categorised during the analysis were presented. The final output of this research was introduced in Chapter 6 where hypotheses that constitute a new artefact were described. The main result of this research is called Taxonomy of Information Systems Benefits for Enterprise Information Portals (TISB4EIP).

The main outputs of this study is appended Atlas.ti project file, TISB4EIP, and questionnaire. The project file contains more than 1700 quotations from analysed articles, 175 codes, 253 links, and 142 analytical networks. As this output is publicly available anybody can use it for further and deeper analyses. TISB4EIP features taxonomy of

EIP benefits and their relations to functions that EIPs support in organisations. The questionnaire can be used by consultants and analysts for user requirement gathering or by other researchers to investigate benefits of EIPs and their antecedents.

Appendix A

Appended files

Below is the list of files appended to this thesis with short explanation of their content.

Definition_quotations.doc contains all quotations that are connected with EIP definitions.

EIP_review contains Atlas.ti project file.

Zotero contains all found articles for the SLR of EIPs research.

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