

Natural and Design Science Perspective on the Business Value of IT

Full Paper

Anna Neumeier

FIM Research Center

anna.neumeier@fim-rc.de

Gilbert Fridgen

FIM Research Center

gilbert.fridgen@fim-rc.de

Hanna-Vera Müller

FIM Research Center

hmueller@amf-fn.de

Thomas Wolf

FIM Research Center

thomas.wolf@fim-rc.de

Carina Reith

FIM Research Center

CarinaReith@web.de

Abstract

This paper provides a structured overview of selected articles concerning the research on the Business Value of IT. It aims to identify key themes within this field, as well as research gaps. As our guiding framework, we divided the literature to two categories reflecting the main approaches within IS business value research: First, papers that can be assigned to the Natural Sciences Paradigm dealing with the question of how and why IS/IT create value. Second, papers that are based on the Design Science Paradigm dealing with the actual realization and evaluation of the BVIT, which are the key subjects from a management point of view. In a third step, we identify research that combines both paradigms, since the combination of the two research paradigms would be valuable for both research streams.

Keywords

Business Value of IT, IT Value Creation, Benefits Management, Benefits Evaluation, Literature Review.

Introduction

Like in case of almost every kind of investment, investments in information systems and information technology (IS/IT) are undertaken in order to receive some kind of value. Each investment requires a specific price, although there is no guarantee that value can be created. Especially in the context of IS/IT investments, the risk whether an investment will be rewarded by return is quite high. While the money spent for IT investments increased up to a global IT spending of about \$ 3.8 trillion (Reisinger 2013), there is still a huge number of IT projects that fail (Flyvberg and Budzier 2011). Almost fifteen years ago, Nicolas Carr published an article, which fueled the discussion of whether or not IS/IT is able to create value at all (Carr 2003). In this article, Carr argues that IT cannot be a source of competitive advantage. Although Carr's article received a lot of attention, he did not initiate but rather revive the discussion about the Business Value of IT (BVIT). Since more than 30 years, researchers based their investigations on different paradigms like the *Natural Science paradigm* (NSP) or the *Design Science paradigm* (DSP) (Buhl et al. 2012a, Buhl et al. 2012b, March and Smith 1995). In the sense of the former one, many papers have been published that either propose or justify theories to explain the BVIT. In contrast, the latter one evoked numerous publications that developed models to assess the BVIT. Although research within these paradigms focuses on the same topic, there is almost no mutual interchange or cooperation. Yet, the numerous examples of IT project failure in practice indicate that neither research in the context of *Natural Science* nor *Design Science* are on their own able to empower practice to appropriately manage their BVIT. However, according to Flyvberg and Budzier (2011) the continuous measurement and controlling of expected benefits seems to be related to IT project success positively. Hence, research should incorporate *Natural Science* elements to understand the coherences in BVIT creation, *Design Science* elements to develop tools to improve the management of BVIT and connected elements to validate the tools.

Due to an ever-increasing number of articles within this topic, the importance of literature reviews is growing (Fettke 2006). In order to synthesis theoretical foundation and practical assessment of the BVIT,

this paper reports on the findings of a literature review on the BVIT. Therefore, we develop a framework that covers the key research themes. We especially strive to bridge the gap between *Natural Science* and *Design Science* research in order to achieve synergies and mutually solve current BVIT issues of practice. By identifying the strengths and weaknesses of the research directions, we can highlight the potential of their integration and its contribution to a successful completion of IT projects. There are numerous previous literature reviews in the context of the BVIT, but to the best of our knowledge, none has contrasted and integrated these two research perspectives in a similar way. The remainder of this paper is structured as follows: In the next section, key terms and concepts related to the BVIT are defined. We provide some background on the applied research method. Following the classification of March and Smith (1995) and Buhl et al. (2012b), we develop a framework that distinguishes the *NSP* and the *DSP* to describe all aspects of research concerning the BVIT. The framework guides an analysis and interpretation of the research directions. We highlight the most important issues and draw conclusions. We finally summarize our key findings, outline possible limitations, and derive implications for future research.

Key Terms and Concepts

The two central terms in this area of research are ‘information technology’ and ‘value’. We consider information technology (IT) and information systems (IS) both together referred to as IS/IT, comprising hardware, software, infrastructures, applications, networks, the internet and other communication technologies. “Many papers [...] assume there is a common understanding” (Bannister and Remenyi 2000, p. 232) of value. Research commonly agrees that value is a complex construct. Especially when value is regarded from a measurement perspective, narrow definitions are used. Sometimes rather broad definitions are used. Renkema and Berghout (1997), e.g. define value as the sum of financial and non-financial consequences caused by the investment in IS/IT.

Combining value and IS/IT leads us to the concept of the BVIT. It is also often referred to as IS business value, IT value, value from IS/IT, and other related terms. Melville et al. (2004) define the BVIT as “the organizational performance impacts of information technology at both the intermediate process level and the organization-wide level, and comprising both efficiency impacts and competitive impacts” (Melville et al. 2004, p. 287). This definition implies that value can be realized and measured at different levels within the organization. We stick to this definition in the following. Researchers also recognized that IS/IT does not create value per se. IS/IT can only enable positive effects by initiating organizational change. These effects are called benefits (Ward et al. 1996). “Benefits arise when IT enables people to do things differently” (Peppard et al. 2000, p. 5). Consequently, “benefits” is frequently used to describe positive impacts in the context of IS/IT. Many investments in IS/IT fail to deliver the expected benefits due to the lack of a holistic approach for value assurance, though (Ward et al. 1996). As benefits describe the effect of change and the interdependency between benefits realization and change management, Ward et al. (1996) derive the term Benefits Management (BM). Benefits management is defined as “the process of organizing and managing such that the potential benefits arising from the use of IS/IT are actually realized” (Ward et al. 1996, p. 214). Methods to realize the potential benefits of investments in IS/IT may also be referred to as benefits realization, value assurance, IT value management, or as a part of IT project management.

Research Approach

This paper sticks to the well-established method by Cooper et al. (2009). Accordingly, we illustrate the scope, before outlining the procedure of searching, defining the relevant information for the research objective and selecting the relevant studies. We integrate the results in a framework. Subsequently, we analyze the articles, summarize the results, draw conclusions and present the findings to public.

This literature review copes with research articles addressing the BVIT. To consider an adequate sample of articles, we limit the period of publishing from 1998 to 2014. We limited the studies to 1998 since by then more and more evidence of a positive relationship between IT and business value has been found (e.g., Brynjolfsson and Hitt 1998). Studies published before 1998 have only been included if they appear to be of exceptional relevance, like basic papers of new research directions. Several other literature reviews cope with topics in this research area. Nevertheless, none of them gives a comprehensive overview of the topic. Melville et al. (2004) develop a framework based on the resource-based view. Piccoli and Ives (2005) focus on strategic investments in IT. While Schryen (2013) focuses on topics why IS/IT creates

value, Braun et al. (2009) and Hesselmann and Kunal (2014) limit their research to the Benefits Management process. Furthermore, many reviews focus on giving an overview on the evaluation of IT investments (e.g. Bannister and Remenyi 2000, Walter and Spitta 2004). Other reviews deal with the confirmation of specific statements (e.g. Brynjolfsson and Hitt 2000, Dedrick et al 2003).

To give a broad and comprehensive overview, we analyze studies that investigate the business value creation from IS/IT. We examine studies based on the *NSP* about *whether* IS/IT generates business value in general and also various studies explaining *how and why* IS/IT creates value (Buhl et al. 2012b, March and Smith 1995). We furthermore include studies investigating how the value of IS/IT can be *determined and realized in business practice* according to the *DSP* (Buhl et al. 2012b, March and Smith 1995). We do not analyze how results of previous studies differ from one another, as this requires a detailed examination of each individual study that exceeds the focus of this paper. We rather focus on how existing research can contribute to the realization of BVIT in practice by deriving generalizable insights regarding circumstances and premises of the operation of IS/IT. Although, this literature research is embedded in the context of other literature reviews, we exclude these for the analysis of the review at hand, since they do not contribute to the intention of this paper.

To identify relevant literature, we conducted a keyword-based search of different databases. We searched in title, keywords and abstract in the databases. Table 1 outlines the databases and keywords.

Databases	AIS Electronic Library , EBSCOhost, EmeraldInsight, IEEEExplore, ACM Digital Library, Web of Science
Keywords	'Benefits Management', 'Benefits realization', 'Business Value of IT', 'Investment evaluation', 'IS/IT evaluation', 'IS/IT investments', 'IT Business Value', 'IT effectiveness', 'IT payoff', 'IT performance', 'IT project failure', 'IT project success', 'IT projects', 'IT value', 'IT value proposition', 'Performance measurement', 'Project evaluation', 'Return of IT', 'Value assurance'

Table 1 List of databases and keywords

In order to answer the question regarding how and why IT creates value, one focus of the research at hand are theories regarding the genesis of BVIT. We focus on information about the origin of BVIT as well as on why and how IT is supposed to create value for business. We also include information from studies that are supporting or justifying existing theories of other authors. The second focus of this research are concepts and methods that aim to assess and realize BVIT. In order to answer the question how the value of IT can be realized and determined in business practice, we also account for studies that evaluate exiting ones. Here, we similarly include information about the assessment and determination of BVIT itself.

As the resulting set of more than 1,200 articles was too big to process it directly, we examined the articles' titles and abstracts to decide whether an article contributes to the research objective. Thus, we identified the relevant set of articles. To complete the literature review, we conducted a forward and backward search as recommended by Webster and Watson (2002) and included relevant articles in the final set. Finally, we considered a set of 388 articles relevant for this literature synthesis.

Analysis of Relevant Literature

In the following, we develop a framework that provides a structure for the topics central ideas, which we used to analyze the identified articles (Webster and Watson 2002). March and Smith (1995) claim that an appropriate framework for IS/IT should incorporate *Natural* and *Design Sciences* as well as interactions between the disciplines. Researchers that stick to *Natural Sciences Paradigm* investigate "the transformational power of IT and its impacts on individuals, teams, or organizations" (Buhl et al. 2012b, pp. 237) and "disclose general insights and document them as justified theories" (Buhl et al. 2012b, pp. 237f). They use theories for explanation and prediction (Gregor 2006). In contrast, researchers that follow the *DSP* "fully engage with industry [and] directly participate in solving business problems in line with [...] the sciences of the artificial paradigm" (Buhl et al. 2012b, pp. 237f). Nevertheless, "it is important to appreciate their interaction" (March and Smith 1995, p. 254), as both paradigms should be complementary to each other. Following the classification of March and Smith (1995) and Buhl et al. (2012b) the framework distinguishes the *NSP* and the *DSP*. To give an overall view of the topic, Figure 1 also displays the integration of both paradigms.

Within the *NSP* the goal of research is to uncover truth (Winter 2008), to understand and explain reality (March and Smith 1995), and to explain how and why things are and work (Simon 2001). Research in this

discipline usually is descriptive and aims to produce general knowledge about the abovementioned issue. Hence, it is a knowledge-producing activity, as researcher propose and test theories. The two main research activities are *theory discovery* and *theory justification* (March and Smith 1995). Following the *NSP*, the first category of the framework deals with the question: *How and why does IT create value?*

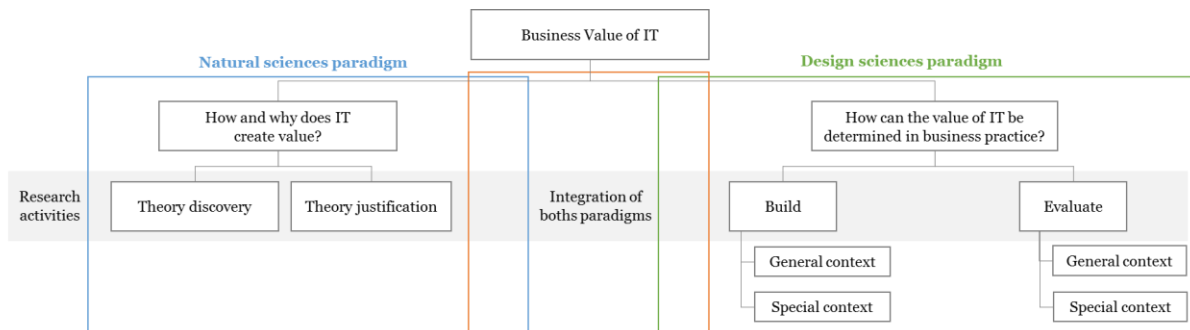


Fig. 1 Framework for the classification of identified work

In contrary, the focus of *Design Science* lies on the question “how things ought to be in order to attain goals and to function” (Simon 2001, pp. 4-5). Knowledge is used and applied to real-world problems. The aim is to create value or utility by designing IS/IT that solve problems of business practice (March and Smith 1995). To solve problems derived from industry, researchers in *Design Science* usually first develop a method, model or framework for a special purpose and evaluate the artifact in order to determine how well it serves this purpose. Derived from the *DSP*, the second category of the framework deals with the question: *How can the value of IT be realized and determined in business practice?* The two main research activities in the area are *build* and *evaluate*. As research activities are usually linked to a specific purpose, this framework further distinguishes whether a certain activity is performed for one or only a few special purposes (*special context*) or whether the artifact is built to be applicable in a *general context*.

In the third part, the frameworks looks at the integration of *NSP* and *DSP*. By connecting the two paradigms, the strength of both can be utilized. Artifacts that are created by researchers using *DSP* are oftentimes not based on a strong theoretical basis and the underlying natural laws are not well understood. By connecting the artifact with knowledge from *NSP*, artifacts would be based on a more solid theoretical foundation (Buhl et al. 2012b) and their “design can be aided by explicit understanding of natural laws” (March and Smith 1995, p. 254). Furthermore, *Design Science* approaches can be used to justify *Natural Science* claims. *Natural Science* theories are supposed to uncover truth (Winter 2008), but it is oftentimes hard to validate the correctness. By applying the claims to practice with the help of *Design Science* approaches, the validation problems might be overcome (March and Smith 1995).

NSP: How and Why Does IT Create Value?

One could also ask whether IS/IT create value at all. Studies in the late 1980s and in the early 1990s failed to find evidence for a positive relationship between IT investments and productivity growth in the economy of the USA. This phenomenon is known as the productivity paradox (Brynjolfsson 1993). Researcher proposed numerous possible explanations for this phenomenon, such as measurement problems, limitations in the data set used, time lag effects, choice of the dependent variable (Brynjolfsson 1993; Brynjolfsson and Hitt 1998), and application of different theoretical concepts (Oh and Pinsonneault 2007). Finally, more and more evidence of a positive relationship has been found (e.g., Brynjolfsson and Hitt 1998). However, all efforts to explain the paradox failed to yield a uniform answer. Consequently, the awareness grew that a large number of factors affects value creation. This led researchers and scientific scholars to recognize the BVIT as a complex and multidimensional construct (DeLone and McLean 2003; Peppard et al. 2000) and moved the focus from the question of whether IS/IT create value, to the how and why of value creation. As theoretical concepts used as a basis for the development of models or frameworks are essential for understanding the results and research contributions, we introduce some of them. Due to the broad variety of concepts applied, we focus on the ones most frequently used in the set of relevant literature. In total 183 studies have been allocated to this category and have been classified as either “theory discovery” (33 papers) or “theory justification” (74 papers) or both (76 papers).

Theory of Production: As mentioned above, researchers have long tried to explain the relationship between IT and productivity. The first ones used economic theories in particular, the Theory of Production, as theoretical foundation. Economic theories assume the firm as a singular decision maker and deal with the prediction of the firm's behavior in external markets (Grant 1996). In neoclassical economics, the firm is assumed as rational, profit-maximizing decision maker that operates in an environment of perfect competition. Production factors are perfectly mobile. They are always used in a way that creates the highest value, the partial output of each input factor is easy to determine and everyone has perfect and complete information. The Theory of Production is applied when analyzing the relationship between inputs and outputs. IS/IT are regarded as input factors that create some output, which was originally measured in terms of productivity. Most papers based on Theory of Production agree that besides the direct impacts of IT on productivity, there are also indirect impacts that need to be considered. IT is an enabler for other input factors whereas the other factors should be at a certain level to ensure value creation. *Examples:* Brynjolfsson and Hitt (1996), Dewan and Kraemer (2000)

Capital Market Theory: In an efficient capital market, according to the Efficient Market Hypothesis (EMH) (Fama 1965), all available information is fully reflected in securities prices (Lo 2007). The announcement about an IT investment constitutes new information. Investors interpret the information and reflect it in the firm's stock price. If IT investment is valuable to the firm, positive abnormal stock returns should be observable. Most studies using Capital Market Theory agree that IT investments need complementary investments to create value. *Examples:* Bharadwaj et al. (1999); Bardhan et al. (2013)

Theory of Production and Capital Market Theory: Dewan et al. (2007) combine both theories. They explicitly analyze the risk-return relationship of investments in IS/IT. They apply the Theory of Production and find that IT investments are substantially riskier than other forms of investments and that firms in high-IT risk industries obtain higher returns from their IT investments. They also analyze the risk-return relationship from a capital market perspective. As there is evidence for a positive and significant impact of IT risk on the market value of the firm, high valuations of IT investments can partly be attributed to a risk premium associated with them.

Organizational Theory: In Organizational Theory the firm is regarded as a complex organization which needs to coordinate multiple individuals (Grant 1996). The Process-Oriented approach builds on the assumption that IT creates value by affecting the way companies operate (Porter and Millar 1985), i.e. by influencing organizational processes. Mooney et al. (1996) argue that first-order impacts of the interaction between the organization and IT occur at the process level and that managers should stronger focus on business process change as an intermediary variable. Porter's value chain (Porter 1985) is often used in this context to analyze the impact of IT on the different value activities and the linkages among these activities. *Examples:* Mooney et al. (1996); Tallon et al. (2000)

Process Theory: Process theory is primarily concerned with the type of relationship between the constructs used in a model, but it does not assume any specification regarding the content of the constructs. Therefore, process theory can be combined with any of the abovementioned theories. Process-relationships account for the possibility that the outcome does not always occur, but it explains how it occurs in case it does (Soh and Markus 1995). Process theory is supposed to be well suited in situations where the outcome is uncertain. Most papers that are based on process theory coincide that the value of IS/IT cannot be assessed without looking at the context. Furthermore, IS/IT value is usually a combination of different factors. *Examples:* DeLone and McLean (1992); DeLone and McLean (2003)

Resource-Based View (RBV): The RBV of the firm is the most dominant theoretical concept. The focus of the RBV is the firm's resources, and their potential to serve as a source of competitive advantage (Barney 1991). Based on two assumptions, the heterogeneity of firm resources within an industry and the immobility of resources, the RBV aims to explain how a firm can use its resources to implement strategies in order to improve performance. A resource is a source of competitive advantage, if it is (1) valuable to the firm, (2) rare among industry competitors, (3) imperfectly imitable, and (4) without any strategically equivalent substitutes. The RBV provides a way to analyze how IS/IT as a firm resource can be employed to create strategic value and which other firm resources might play an important role in the value creation process (Wade and Hulland 2004). According to the RBV investments in IS/IT alone cannot be a source of competitive advantage, as the investment itself can be imitated quite easily. It is more the combination of different resources, their relationship and the environment that can transfer IS/IT into a competitive advantage. *Examples:* Bharadwaj (2000); Melville et al. (2004); Chae et al. (2014)

Conclusions: Considering that the research on “the how and why of IT value creation” started more than 40 years ago, one might consider this a fairly mature topic. However, there are still new aspects being studied and new theoretical concepts being applied in order to gain insights on value creation from IS/IT. There is increasing confidence about the value creation potential of IS/IT, but it is not possible to draw one general conclusion, because this issue is approached in many different ways. However, inherent in all approaches is the recognition that there is not just one step from the IT investment to value, but that value creation is actually a complex process which is also influenced by contextual factors. Most articles agree that IS/IT per se do not create value, but need to be effectively implemented into organizational structures. Therefore, researchers have to consider the impact on processes and the interaction with other organizational resources, including human resources. Further, many authors noticed that IS/IT not only affect performance directly, but also indirectly, which highlights their role as enablers. Another aspect is the importance of business process change and complementary investments and that the implementation of change and organizational learning needs time. Furthermore, an interesting finding relates to the consideration of risk factors within BVIT research. Based on our analysis, risk factors have hardly been considered as a part of the BVIT creation process. However, bearing in mind the fast evolution of IS/IT and the dynamics of the environment, the analysis of the risk-return relationship might be worth stronger consideration in the future (Dewan et al. 2007). Furthermore, authors recognized that intangible output factors play an important role (Bharadwaj et al. 1999), but they were mostly neglected or were not specifically analyzed. Hence, future research should consider intangible value components. In light of today’s fast-changing environment and organizational change and development, the context of the research subject is not static either. Thus, it is only logical that research should aim to discover additional factors that affect value creation and the mechanisms underlying this impact. Although the topic has been subject of research for quite long, it is far from being exhaustively studied, and perhaps it will never be.

DSP: How can the Value of IT be Realized and Determined in Business Practice?

There are two key themes within this category. The first theme involves the concepts and processes that aim to deliver value and utility to a firm from specific IS/IT, which will be referred to as *Benefits Management* (BM). The second theme deals with issues associated with the actual assessment of the value of investments in IS/IT and is thus called *Benefits Assessment*. Although the latter is an essential part of the BM process, we decided to consider it separately because it receives special attention within the field of research on the BVIT. By analyzing studies assigned to the DSP, we found that all studies can be categorized by two dimensions. The first dimension considers whether a new artifact is built and/or an existing one is evaluated. The second takes into account whether the artifact is built to be applicable to only one or a set of problem situations or whether it is evaluated in a general or specific context. The latter could be a method that is built for a special type of IS/IT investment or that especially considers one type of benefits. In total 201 studies have been allocated to the DSP and have been classified as either concerning Benefits Management (88 papers) or more specifically the Benefits Assessment (113 papers).

Benefits Management: The most cited model in the context of BM is the Cranfield BM Process Model (Ward et al. 1996). The model comprises five steps that are supposed to be performed subsequently, but with special request for feedback loops emphasizing the lifecycle character of the model. Although the Cranfield BM Process Model was developed about 20 years ago and the importance of BM has been increasingly recognized in literature in the subsequent years, this model remained the only holistic BM approach in our literature sample that received considerable attention. Nevertheless, there is still a large gap from BM research to the adoption of BM in practice. More than 20 years ago, Ward et al. (1996) found that consistent methodologies to BM were rarely applied and that the focus during IS/IT implementation was on time and budget rather than on benefits delivery. More than 10 years later, Ashurst et al. (2008) still reported an inadequate benefits focus in IT projects. In the meantime, other studies also reported a failure to consider benefits sufficiently throughout project implementation and beyond, and observed a strong focus on time, budget, and technical delivery as well as only limited attention to organizational change (Love et al. 2005; Peppard et al. 2000). However, the application of BM procedures actually increases the likelihood of benefits realization, especially when combined with a good understanding of the IS/IT and business processes as well as the ability to communicate between business and IT experts (Braun et al. 2010a). Furthermore, it is required to consider a project’s benefits, costs, risks and interdependencies appropriately. However, since circumstances change and new risk factors occur during the runtime of a project, a continuous projects success measuring and steering is inevitable to manage an

IT project successfully (Fridgen et al. 2015). Nevertheless, the status quo in literature shows that the situation has not changed significantly in the past 20 years and that despite recent ambitions there remain many unresolved questions, which should be addressed by future research in this area. *Examples:* Ward et al. (1996); Ashurst et al. (2008); Love et al. (2005); Braun et al. (2010a); Fridgen et al. (2015)

Benefits Assessment: Benefits Assessment includes the evaluation of benefits as well as of costs and risks linked to their realization. In contrast to the holistic *Benefits Management*, there is no predominately-used evaluation approach. There are some methods, adopted from classical investment evaluation, which are quite commonly applied (e.g., Net Present Value, Return on Investment). However, due to the special characteristics of investments in IS/IT, such as the intangibility of its outcomes or the risks associated with its implementation, the evaluation of IS/IT is quite different from other types of investment. Recognizing the inadequacy of traditional approaches, many studies develop new evaluation instruments. However, only a few specifically address the incorporation of intangible and non-financial benefits (Dutta 2004), indirect or hidden costs (Love et al. 2004) and risk factors (Beer et al. 2013), since those aspects usually cannot easily be measured. The fact that some value components are hard to identify and to evaluate does not mean they are not important. Based on environmental and organizational dynamics, all costs, risks, and benefits should receive consideration in an integrated way. *Examples:* Bannister and Remenyi (2000); Kumar (2004); Dutta (2004); Beer et al. (2013)

Conclusion: Overall, we can constitute that many papers concentrate on only one research activity (either build or evaluate). Most articles concentrate on evaluating existing artifacts in a specific application context. Considering the 'build' activity, more papers in our literature sample develop generally applicable tools, whereas papers that perform the evaluation activity put a strong focus on the application and evaluation of tools in a specific context. This distribution reflects the trade-off that researchers face. They aim to develop and publish tools that may be valuable to a broad audience; however, because of the need to adapt those tools to specific circumstances, they provide an illustration of a possible application.

Studies that Combine Elements from both Paradigms

We also found some papers that combine elements from both paradigms. DeLone and McLean (1992) propose an IS Success Model to explain the mechanisms leading to IS success that can be considered as a *Natural Science* approach. However, a few years later, DeLone and McLean (2003) built a bridge between *Natural* and *Design Science* by refining and adopting their model to evaluate current e-commerce systems. Braun et al. (2010b) rather take the opposite path, analyzing the 'how' and 'why' of BM success and its contribution to organizational performance. They apply the RBV and examine the path from resources that are necessary for BM to the development of BM competencies, while also considering contextual factors. Yogev et al. (2012) draw back on the RBV as a basis for the development of a research model assessing and explaining how business intelligence can create business value. Pavlou et al. (2005) explicitly point out the theoretical foundation of their evaluation method. They propose an analytical method based on the knowledge-based view to measure the return on IT. Tallon and Kraemer (2007) evaluate a measure by linking it to the value creation process. Applying sense-making theory, they build a model linking process-level IT impacts to IT impacts at the firm level and to organizational performance. Although there are some articles that combine elements from both categories, these are the exception rather than the norm. However, these articles do indicate the advantages of the interconnection between the two categories. Based on a sound analysis and understanding of 'how' and 'why' IS/IT creates business value, methods to assess and measure the business value can be developed more accurately. Therefore, as the two paradigms complement each other and might undoubtedly benefit from interaction (Buhl et al. 2012a and 2012b), it is somehow incomprehensible why these two research paradigms are recognized as contradistinctive rather than mutually supplemental.

Results, Limitations and Possible Directions of Future Research

Analyzing the two main perspectives on the BVIT, we conclude that a lot of research has been done in both fields. One of the major findings within the papers that are based on the *NSP* is that most articles agree that IS/IT per se do not create value, but need to be effectively implemented into organizational structures. The objective of the *DSP* in contrast is the development and publication of generalizable tools and methods that may support a broad audience in practice in assessing BVIT. As these methods have to be evaluated, most researchers in the context of *DSP* closely cooperate with business partners for testing

and improvement reasons. In this field, we see the connection of *Natural* and *Design Science*. *Natural Science* would undoubtedly benefit from an increasing interconnection with practitioners whereas *Design Science* could definitely profit from an in depth knowledge about “how” and “why” IS/IT creates business value. This becomes even more obvious, as even more than 10 years after the implementation of consistent methodologies to BM and BVIT; managers do not sufficiently apply BM in practice. This is easy to explain if one brings to mind that the development of accurate problem solving methodologies requires profound background knowledge about the topic behind the problem case. Consequently, it is difficult to build models and evaluation methods for the BVIT without understanding the underlying value creation theories of IS/IT. Therefore, as the two paradigms of *NSP* and *DSP* rather complement than contradict each other, they definitely would benefit from interaction. Therefore, further research should especially feel encouraged to investigate in and bridge over the actual gap between *Natural* and *Design Science*. Besides, researchers should analyze the reasons for the still limited adoption of BM in practice. Furthermore, it might be valuable to devote increased efforts to the operationalization of value dimensions, as it is important to make them measurable (Braun et al. 2010a). In light of the large number of failing IT projects and reports on cost overruns, it might also be valuable to analyze the reasons why organizations do not devote additional resources to data collection and evaluation.

There are some points that may limit our findings. The papers were allocated to the different categories and subcategories based on their titles, their abstracts, and in some cases their introductory sections. Albeit we tried to keep the mechanism we applied in order to detect and evaluate the papers objective, it still remains subjective to some extent. Furthermore, we cannot guarantee that our literature sample exhaustively covers the topic, although the search process was thoroughly conducted. Finally, we have not accounted for a possible publication bias in our literature sample. Bearing these limitations in mind, we are convinced that the literature review is valuable to research and practice in many respects. We provide a structured overview of the research area for scientific scholars just starting to get familiar with the problem domain. Our literature review will help them to identify which themes have received most attention and which have not been thoroughly covered. Scholars of IS business value research may identify and embed their work against a broad background, get an overview of the work of others, and identify future research opportunities. Although research on the BVIT has a long history, interest in the topic is unbroken. This research has delivered valuable insights about the current state of “how” and “why” IS/IT create value and “how” it can be determined in practice. Furthermore, it pointed out that these two research question, which currently are investigated by two concurrently aligned research streams, are closely interwoven and would undoubtedly benefit from interaction. Future investigations of research in this context might also supplement the applicability of BM and value assurance in practice, since a proper understanding of theories behind the value creation process might enable research to yield methods that more accurately approach current problems and future challenges related to the BVIT.

REFERENCES

- Ashurst, C., Doherty, N.F., and Peppard, J. 2008. “Improving the impacts of IT development projects: the benefits realization capability model”, *European Journal of Information Systems* (17), pp 352–370.
- Bannister, F., and Remenyi, D. 2000. “Acts of faith: instinct, value and IT investment decisions,” *Journal of Information Technology* 15, pp. 231–241.
- Bardhan, I., Krishnan, V., and Lin, S. 2014. “Business Value of Information Technology: Testing the Interaction Effect of IT and R&D on Tobin's Q,” *Information Systems Research* 24(4), pp. 1147-1161.
- Barney, J.B. 1991. “Firm Resources and Sustained Competitive Advantage,” *Journal of Management Information Systems* 17(1), pp. 99–120.
- Beer, M., Fridgen, G., Mueller, H.V., and Wolf, T. 2013. “Benefits Quantification in IT Projects,” in *Proceedings of the International Conference on Wirtschaftsinformatik*, Leipzig, Paper 45.
- Bharadwaj, A.S. 2000. “A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation,” *MIS Quarterly* 24(1), pp. 169.
- Bharadwaj, A.S., Bharadwaj, S. G, and Konsynski, B.R. 1999. “Information technology effects on firm performance as measured by Tobin's q,” *Management Science* 45(7), pp. 1008–1024.
- Braun, J., Ahlemann, F., and Riempp, G. 2009. “Benefits Management – A Literature Review and Elements of a Research Agenda,” in *Proceedings of the International Conference on Wirtschaftsinformatik*, H.R. Hansen, D. Karagiannis, H.-G. Fill (eds), Vienna, Austria, Paper 54.

- Braun, J., Mohan, K., and Ahlemann, F. 2010a. "How Benefits from IS/IT Investments are Successfully Realized," *Proceedings of the 31st International Conference on Information Systems*, R. Sabherwal, and M. Sumner (eds.), St. Louis, Missouri, Paper 120.
- Braun, J., Ahlemann, F., and Mohan, K. 2010b. "Understanding Benefits Management Success: Results of a Field Study," in *Proceedings of the 18th European Conference on Information Systems*, M. A. Alexander, M. Turpin, and J. P. van Deventer (eds.), Pretoria, South Africa, Paper 65.
- Brynjolfsson, E. 1993, "The productivity paradox of information technology," *Communications of the ACM* 36(12), pp. 66–77.
- Brynjolfsson, E., and Hitt, L.M. 1996. "Paradox Lost? Firm Level Evidence on the Returns to Information Systems Spending," *Management Science* 42(4), pp. 541–588.
- Brynjolfsson, E., and Hitt, L.M. 1998. "Beyond the productivity paradox," *Communications of the ACM* 41(8), pp. 49–55.
- Brynjolfsson, E., and Hitt, L.M. 2000. "Beyond Computation: Information Technology, Organizational Transformation and Business Performance," *The Journal of Economic Perspectives* 14(4), pp. 23–48.
- Buhl, H.U., Fridgen, G., Müller, G., and Röglinger, M. 2012a. "On Dinosaurs, Measurement Ideologists, Separatists, and Happy Souls," *Business & Information Systems Engineering* 4(6), pp. 307–315.
- Buhl, H.U., Müller, G., Fridgen, G., and Röglinger, M. 2012b. "Business and Information Systems Engineering: A Complementary Approach to Information Systems - What We Can Learn from the Past and May Conclude from Present Reflection on the Future," *Journal of the Association for Information Systems* 13(4), pp. 236–253.
- Chae, H., Koh, C.E., and Prybutok, V.R. 2014. "Information Technology Capability and Firm Performance: Contradictory Findings and their Possible Causes," *MIS Quarterly* 38(1), pp. 305–326.
- Carr, N.G. (2003). "IT doesn't matter". *Harvard Business Review* 38, pp. 24–38.
- Cooper, H., Hedges, L.V., and Valentine, J.C. 2009. *The handbook of research synthesis and meta-analysis*, 2nd edition, Russell Sage.
- Dedrick, J., Gurbaxani, V., and Kraemer, K.L. 2003. "Information Technology and Economic Performance: A Critical Review of the Empirical Evidence," *ACM Computing Surveys* 35(1), pp. 1–28.
- DeLone, W.H., and McLean, E.R. 1992. "Information Systems Success: The Quest for the Dependent Variable," *Information Systems Research* 3(1), pp. 60–95.
- DeLone, W.H., and McLean, E.R. 2003. "The DeLone and McLean Model of Information Systems Success: A Ten-Year Update," *Journal of Management Information Systems* 19(4), pp. 9–30.
- Dewan, S., and Kraemer, K.L. 2000. "Information Technology and Productivity: Evidence from Country-Level Data," *Management Science* 46(4), pp. 548–562.
- Dewan, S., Shi, C., and Gurbaxani, V. 2007. "Investigating the Risk Return Relationship of Information Technology Investment: Firm-Level Empirical Analysis," *Management Science* 53(12), pp. 1829–1842.
- Dutta, A. 2004. "Putting Numbers on Intangible Benefits," in *Proceedings of the 25th International Conference on Information Systems*, Washington, DC, Paper 31.
- Fama, E.F. 1965. "The Behavior of Stock-Market Prices," *The Journal of Business* 38(1), pp. 34–105.
- Fettke, P. 2006. "State-of-the-Art des State-of-the-Art: Eine Untersuchung der Forschungsmethode „Review“ innerhalb der Wirtschaftsinformatik," *Wirtschaftsinformatik* 48(4), pp. 257–266.
- Flyvbjerg, B., and Budzier, A. 2011. "Why your IT Project may be riskier than you think," *Harvard Business Review* 89(9), pp. 23–25.
- Fridgen, G., Klier, J., Beer, M., and Wolf, T. 2015. "Improving Business Value Assurance in Large-Scale IT Projects," *ACM Transactions on Management Information Systems* 5(3), pp. 12
- Grant, R.M. 1996. "Toward a Knowledge-Based Theory of the Firm," *Strategic Management Journal* 17, pp. 109–122.
- Gregor, S. 2006. "The nature of theory in information systems," *MIS Quarterly* 30(3), pp. 611–642.
- Hesselmann, F., and Kunal, M. 2014. "Where we headed with benefits management research? Current shortcomings and avenues for future research". *Proceedings of the 22nd European Conference on Information Systems*, M. Avital, J. M. Leimeister, and U. Schultz (eds.), Tel Aviv, Israel, Paper 16.
- Irani, Z. 2002. "Information systems evaluation: navigating through the problem domain," *Information & Management* 40(1), pp. 11–24.
- Kumar, R.L. 2004. "A Framework for Assessing the Business Value of Information Technology Infrastructures." *Journal of Management Information Systems* 21(2), pp. 11–32.
- Lo, A.W. 2007. "Efficient Market Hypothesis," in *The New Palgrave: A Dictionary of Economics*, L. Blume and S. Durlauf (eds), Palgrave MacMillan, New York.

- Love, P.E., Ghoneim, A., and Irani, Z. 2004. "Information technology evaluation: classifying indirect costs using the structured case method," *Journal of Enterprise Information Management* 17(4), pp. 312–325.
- Love, P.E.D., Irani, Z., Standing, C., Lin, C., and Burn, J.M. 2005. "The enigma of evaluation: benefits, costs and risks of IT in Australian small-medium-sized enterprises," *Information & Management* (42), pp. 947–964.
- March, S.T., and Smith, G.F. 1995. "Design and natural science research on information systems," *Decision Support Systems* 15, pp. 251–266.
- Melville, N., Kraemer, K.L., and Gurbaxani V. 2004. "Review: Information Technology and Organizational Performance: An Integrative Model of IT Business Value," *MIS Quarterly* 28(2), pp. 283–322.
- Mooney, J.G., Gurbaxani, V., and Kraemer, K.L. 1996. "A Process Oriented Framework for Assessing the Business Value of Information Technology," *The DATA BASE for Advances in Information Systems* 27(2), pp. 68–81.
- Oh, W., and Pinsonneault, A. 2007. "On the Assessment of the Strategic Value of Information Technologies: Conceptual and Analytical Approaches," *MIS Quarterly* 31(2), pp. 240–265.
- Pavlou, P.A., Housel, T.J., Rodgers, W., and Jansen, E. 2005. "Measuring the Return on Information Technology: A Knowledge-Based Approach for Revenue Allocation at the Process and Firm Level," *Journal of the Association for Information Systems* 6(7), pp. 199–226.
- Peppard, J., Lambert, R., and Edwards, C. 2000. "Whose job is it anyway? Organizational information competencies for value creation," *Information Systems Journal* 10(4), pp. 291–322.
- Piccoli, G., and Ives, B. 2005. "Review: IT-Dependant strategic initiatives and sustained competitive advantage: a review and synthesis of the literature," *MIS Quarterly* 29(4), pp. 747–776.
- Porter, M.E. 1985. *Competitive advantage: Creating and sustaining superior performance*, New York Free Press.
- Porter, M.E., and Millar, V.E. 1985. "How information gives you competitive advantage," *Harvard Business Review*, pp. 149–174.
- Reisinger, D. 2013. "Gartner: Worldwide IT spending to hit \$3.8 trillion in 2013," [http://news.cnet.com/8301-1001_3-57576820-92/gartner-worldwide-it-spending-to-hit-\\$3.8-trillion-in-2013/](http://news.cnet.com/8301-1001_3-57576820-92/gartner-worldwide-it-spending-to-hit-$3.8-trillion-in-2013/). Accessed 2017-02-27
- Renkema, T.J., and Berghout, E.W. 1997. "Methodologies for information systems investment evaluation at the proposal stage: a comparative review," *Information and Software Technology* 39(1), pp. 1–13.
- Schryen, G. 2013. "Revisiting IS business value research: what we already know, what we still need to know, and how we can get there," *European Journal of Information Systems* 22, pp. 139–169.
- Simon, H.A. 2001. *The sciences of the artificial*, Cambridge, Mass, MIT Press.
- Soh, C., and Markus, M.L. 1995. "How IT Creates Business Value: A Process Theory Synthesis," *Proceedings of the 16th International Conference on Information Systems* 1995, Amsterdam, Netherlands, pp. 29–41.
- Tallon, P., and Kraemer, K. 2007. "Fact or Fiction? A Sensemaking Perspective on the Reality Behind Executives' Perceptions of IT Business Value," *Journal of Management Information Systems* 24(1), pp. 13–54.
- Tallon, P.P., Kraemer, K.L., and Gurbaxani, V. 2000. "Executives' Perceptions of the Business Value of Information Technology: A Process-Oriented Approach," *Journal of Management Information Systems* 16(4), pp. 145–173.
- Wade, M.R., and Hulland, J. 2004. "Review: The Resource-Based View and Information Systems Research: Review, Extension, and Suggestions for Future Research," *MIS Quarterly* 28(1), pp. 107–142.
- Walter, S.G., and Spitta, T. 2004. "Approaches to the Ex-ante Evaluation of Investments into Information Systems," *Business and Information Systems Engineering* 46(3), pp. 171–180.
- Ward, J., Taylor, P., and Bond, P. 1996. "Evaluation and realisation of IS/IT benefits: an empirical study of current practice," *European Journal of Information Systems* (4), pp. 214–225.
- Webster, J., and Watson, R.T. 2002. "Analyzing the Past to Prepare the Future: Writing a Literature Review," *MIS Quarterly* 26(2), pp. 8–13.
- Winter, R. 2008. "Design science research in Europe". *European Journal of Information Systems* 17(5), pp. 470–475.
- Yogev, N., Fink, L., and Even, A. 2012. "How Business Intelligence Creates Value". *Proceedings of the 20th European Conference on Information Systems 2012*, Barcelona, Spain, Paper 84.