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## **CAN WE AFFORD IT?**

**A SYSTEMATIC LITERATURE REVIEW OF THE DETERMINANTS AFFECTING ON THE ADAPTION OF THE INVESTMENT PROPOSALS**



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## ABSTRACT

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Information security field lacks of understanding of how to succeed with investments proposals. This theoretical study approaches the underinvestment challenge through existing information technology and information system studies. Three main categories were recognized to affect on investment proposals adaption in a company context. However, the main contribution for these study is the discussion of the leveragability of the research method for examing the phenomenon from this specific perspective. Among the findings related to key determinants affecting on investment proposals, the impact of the research method for the findings are considered. Several suggestions for further research of investment studies and the development of the research method are discussed.

Key words: information security, information technology, information system, investment proposals, adoption, theoretical research, systematic literature review

## TIIVISTELMÄ

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Systemaattinen kirjallisuuskatsaus investointialoitteiden hyväksymiseen vaikuttavista tekijöistä

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Tietoturvallisuuden tutkimuksessa ei ole kyetty tunnistamaan tekijöitä, jotka vaikuttavat tietoturvallisuusaloitteiden onnistumiseen. Teoreettinen tutkimus lähestyy haastetta tarkestelemalla olemassaolevia tietotekniikan ja tietojärjestelmien tutkimusta yritysympäristössä. Aloitteiden hyväksymiseen vaikuttavat tekijät määritettiin kolmeksi kategoriaksi. Tietoturvallisuusaloitteisiin vaikuttavien tekijöiden tunnistamisen ohella tutkimusmenetelmän vaikutus tuloksiin on käsitelty. Useita suosituksia ilmiön jatkotutkimukselle sekä tutkimusmenetelmän kehittämiseksi on esitetty.

Avainsanat: tietoturvallisuus, tietotekniikka, tietojärjestelmät, investointialoite, hyväksyminen, teoreettinen tutkimus, systemaattinen kirjallisuuskatsaus

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## 1 INTRODUCTION

*Imagine if a typical Monday morning at the office would start like this: your e-bank gives you a kind notice that you are out of your limit as you are about to confirm the monthly payment of your new car. Obviously salary is late for some reason. When you are about to give bitter feedback to nice payroll administration ladies, your colleague saves your time and tells about the denial of service (DoS) attack that the payment service met this morning. That is not the whole story, as you hear the attackers have managed to prostrate also other electronic services like customer systems, company web sites and obstructed a customer service call center. As you login into your tabletop, you notice that the account has been hacked and some important customer information has vanished. Your phone rings, and you hear that the failure of the control system of your factory has caused a serious delay for the production. It is suspected that an outsider has penetrated into the system. Meanwhile you inform the chief information officer (CIO) about the problems, you get e-mail that tells your subcontractor having met problems with his logistic system - the delivery of the raw material is inhibited. You take a long breath meanwhile a clock is ticking expensive minutes and the needless cargo ships are waiting in a port. You dial CIO again and start to yell at her. She listens until you are done and says: "Well, Bob. It was you, Chief Executive Officer (CEO), who said a few years ago: " No, we can not afford it."".*

Although this was a hypothesized example of practical impacts of what could happen if information security practices of the firm would fail, the truth is not that far from a story. According to Kaspersky Lab's report (2016) to recover from the security breach it costed more than half a million US dollars, an average, for a small and medium-sized (SMS) company in 2015. The same report estimated that the average expected direct loss caused by a security breach, without taking into account eg. the costs for professional services to cover lost contracts and downtime, staff hiring and training costs or infrastructure upgrades cost, is 38 000 US Dollars. 75% of security breaches reported also led to unexpected further expenses. (Kaspersky Lab, 2016.)

Information security threats have become more common and serious, and the critical business information and assets are in danger, as the adaption of fast mounting IT solutions will increase problems in the future. Launching new solutions without paying attention to security aspects is risky, not least because the serious impacts of non-secured information solutions and functions (eg. health care, critical infrastructure, services). These are about to mount in the future, when the use of devices and technology arises in the different functions in every level of our daily lives. At the end of 2015, ISACA and RSA Conference conducted a global survey of 461 cyber security managers and practitioners, in which



almost 75 percent of respondents expected to fall prey to a cyber attack in 2016 (2016).

The importance of the information security — the protection of valuable intellectual property and business information in digital form against information security threats — is an increasingly significant management issue. The operating environment and the societies are not the same than they were only a few decades ago. The incredible pace of develop on a wide range of technological solutions and innovations have enabled the digitalization of the society - and caused its almost complete dependence on networks, energy and technology producing solutions levels of modern and - even less modern societies. Key actions of the company are increasingly dependent on information technology and computer networks.

The concept of the information security has been seen complex and its value has been found difficult to evaluate concretely. Because the aim of the information security is to prevent and mitigate certain problems, like impacts of the security breaches to happen - and typically investments are supposed to produce profit, the informations security is seen more as a cost than an investment. According to Tsiakis and Pekos (2008), to become more likely that the decision-makers of the company would find the information security as really valuable asset for their business, should the information security be integrated in company business activities and the information security should be presented in financial terms.

Company decision-makers' reluctance for information security concern might be reasoned by that the information security development demands typically extra resources eg. time, costs and efficiency capacity - and delays getting the solution for markets. This may decrease the decision-makers' willingness to pay attention to information security issues. Many factors have impacts on the adoption of those investment proposals and, in general, information security, unfortunately, is underinvested.

The research problem is an underinvestment issue: how to get decision-makers invest in information security? As discussed above, the underinvestment phenomenon is a recognized and serious issue. A lack of information security could cause effects like business profit loss or reputation loss - or at worse it may even jeopardize personnel's safety (Saint-German, 2005). The aim of this work is to produce a view of the factors that affects on either denial or approval of investment proposal. The research question is:

- What determinants affect on the adaption of the investment proposal?

It is important to notice, that the 'adoption' of the investment proposal means in this study:

- a phase, in which it is decided, whether the proposal will or will not be taken into consideration (processing input) and serious discussion, and
- a phase, in which the investment proposal is either accepted or rejected for the implementation (decision-making process).

Typically underinvestment issue is examined from *efficiency and optimal amount approaches, which do not work in practice*. This study approaches the problem by examining the experiences in information technology (IT) and information systems (IS) fields. Even though IT and IS are not the same, both have a long history and certain similarities regarding information security.

The research is carried out as a systematic literature review (SLR), a research method that is rarely used in information security, IT or IS fields. IT and IS fields include more empirically tested research material of the factors affecting on investment proposals in varying environments than the information security field.

Systematic literature review method proved to be unsuitable for examining this specific phenomenon. More details of its unsuitability and impact on findings are discussed later in this study.

The paper examines empirical research concerns of the investment proposals success especially in a company context. The company concept in this study means any entity that engages in business; an organization that makes, buys, or sells goods or provides services in exchange for money and which may be structured differently and owned by one or more people (Merriam-Webster, 2016; Business Dictionary, 2016). Companies are examined primarily in a private sector. The research process is presented in Figure 1.

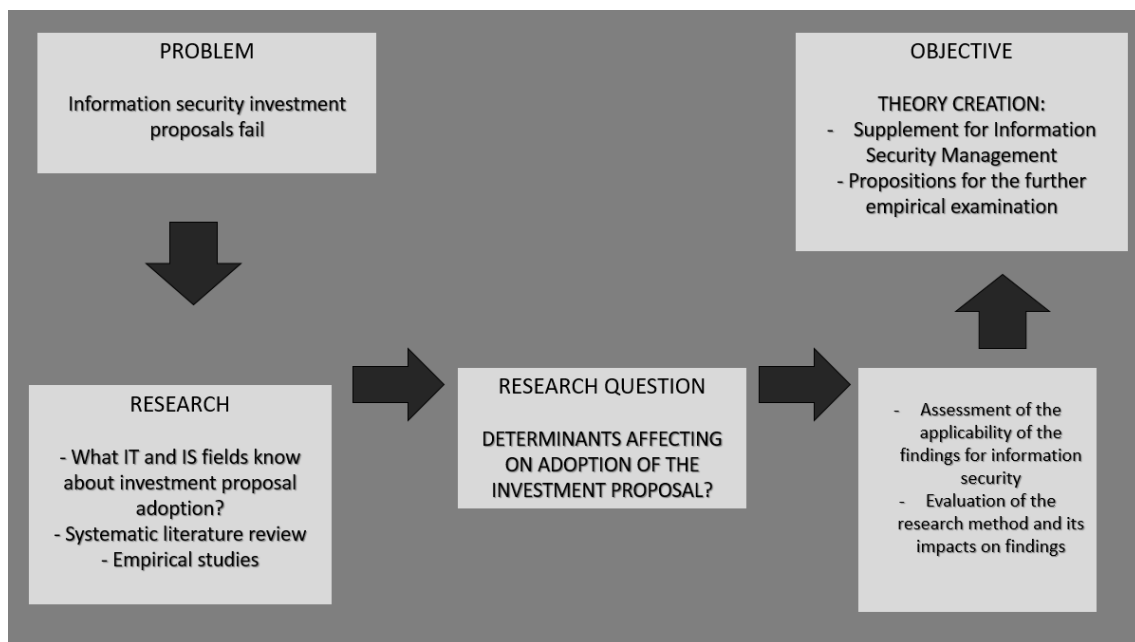


FIGURE 1 Research framework

The research is important because information security violations cause remarkable both tangible and intangible losses for the companies. Information security can also represent an important business opportunity, when companies create end-to-end customer experiences that are both convenient and secure. The valuable solutions to encourage the companies invest in information security are needed.

The increasing use of information technology, digital solutions and the growing amount of information are more common in everyday business. This also justifies the importance of the research.

The research has the following structure: the next chapter introduces the background, early work, and the change of the operating environment. The third chapter presents the reasoning of the research methodology. The realization of the research process is presented in detail in chapter four. The findings of the analysis are presented in chapter five. Discussion of the findings and the impacts of the research method for the results are placed in chapter six. Conclusions, including research contributions, the proposals for further study and the limitations are presented in chapter seven.

## 2 BACKGROUND OF THE RESEARCH

The aim of this chapter is to support the understanding of the phenomenon and the research problem by presenting the characteristics of an operating environment, information security, and investment approaches. The chapter includes definitions of the key concepts and gives also a short insight in early information security investment studies to justify the importance of a new research.

### 2.1 Information security

The definition of the information security varies depending on the approach. The study relies on Zaini's and Masrek's (2013, p. 270) conceptual information security framework, which includes dimensions of organizational security, technical security, and physical and environmental security, building altogether the organizational agility. This study highlights also the integration of the information security with business strategy and objectives, its meaning when protecting critical business asset and functions, risk-based approach to information security policy creation, policy compliance, continuance management, resilience ability and the commitment and support of the top management of the company related to information security.

Information security is seen here as an important part of overall security of the undisputed part of the organization's processes and functionality, since it supports the maximization of benefits and secures business continuity. It is also seen as a business opportunity when enabling a trustworthy business or when launching new business innovations.

Information security is needed for protecting the critical asset, like necessary information, and critical business functions and processes. It also has major impacts on organization's reputation, downtime and outages, intellectual property, complying with laws and regulations, maintaining data integrity, to assure the business continuity in a disaster situation, enabling business opportunities, governmental information security initiatives, preventing a serious security breach, protecting other asset (e.g. cash) from theft and misuse and improving efficiency/cost reduction and protecting personnel safety. Information security management is a challenging task without even considering the operating environment. Information itself might not typically be perceived as an asset which would have a value that should be protected somehow. Zafar and Clark (2009) proposed the areas of information security as follows:

- understanding and assessment of the potential risk of the organization;
- information security awareness training and education;
- information security practices;

- creation of information security modes of operation for protecting information asset;
- creation of information security policy and compliance for mitigating the influences after security breach occurrence;
- implementation of technological and monitoring for preventing and mitigating the security breaches;
- continuous assessment of the technology, politics, practices and personnel to manage information security issues and;
- information security governance as a part of company's governance.

Information security is guided by different laws, regulations and settings. It affects on personnel, political, economical, technical and processes levels in the organization.

The security expert, John Palfreyman (2010), discussed of the balance between the technology and human factor; in which technology is about better firewalls, advanced virus detection and more effective encryption - whereas human factor is about organizational leadership, learning, culture and processes. Onwubiko and Lenenghan (2009) claimed that global outsourcing, consumer-centricity, security compliance and legislation as emerging global business drivers have imposed security requirements that complicate traditional perspective in security management and insist combining the information security objectives to business strategy and objectives.

Information security manager, the person that is in charge of information security, has a challenging task to respond to multidimensional security in the organization. For example Tracy (2007) discussed that the aim of information security management is to turn an organization's security policies into security requirements that can be codified, taken into the organization, enforced, and measured and can be concreated by establishing a security mentality as the default way of doing business.

Information security management refers to this study the target-oriented and interactive social activities, the purpose of which is to achieve information security objectives through information, people, technology and processes; which works better and more efficiently when they are managed than without management. In this study, the information security manager generally refers to a person who is responsible for all areas of information security for the company, regardless of the title (eg. director of information security, information security manager, information security officer or chief of information security etc.) or a specific position in organization.

Personal responsibilities, job description or job objectives, title and ranking of the information security manager at the organization or disposable resources can vary by company. For example, the larger companies may have a separate information security department. On the other hand, in the smaller companies the information security management might be determined to a person as part of other duties. Briney and Prince (2002) explained that the majority of the small and medium-sized enterprises bases their information security decisions

on the security policy accepted by the top management of the organization. Baskerville and Siponen (2002), in turn, presented in their study that the security in large companies the information security is institutionalized generally through the security practices into a corporate culture. It is seen that the capability of information management may have a great influence in customer, financial, human resources, and organizational effectiveness measures of company's performance (Mithas, Ramasubbu and Sambamurthy, 2011).

As an essential part of information security and a tool of security management, information security policy can be seen as an official announcement of the desired state of the organisational information security, including direct guidance of security objectives and practices and limitations to influence and direct the actions and behaviours of organization members to achieve the aim of the information security (Höne & Eloff, 2002).

Caralli and Wilson (2004) presented the organization-centric approaches to security management consider the impact of risks and their effect on the organization to determine which security activities and practices are best for them allowing the organization to focus on their true security needs. They (Caralli & Wilson, 2004) feared, that security bases only on technical infrastructure and emphasized a process centric view on security management; when applying a risk perspective to security is a logical progression and risk management is a basic business function and must be performed at an organizational level to be purposeful. Vroom and von Solms (2004) also emphasized that the policies, procedures and controls need to be audited to make sure that they are in line with the objectives, goals and vision of the organisation.

## **2.2 Change of the operating environment and information security**

Information technology began to play a part in business only in the late 1950s, and the Internet had an impact on the business during 1990s. As a background for this research, it can be seen, that the combination of advances in enterprise technology and more effective malicious actors causes a challenging task for protecting business processes and critical information and at the same time information security field battles with underinvestment issue.

According to Siponen, Karjalainen, Kohli and Shao (2014) the main reason for the challenge is cause by the fact that information security investments are not keeping the pace with information technology investments. The increased use of IT and IS have resulted increase of potential threats to information security (Menon & Siponen, 2015). Information security threats are here seen under the threat of the information security for business purposes, as a result of which the realization of the company's key business assets (eg. The critical information, services, activities, products, processes, personnel, premises), availability, confidentiality, integrity, repudiation, identity and verifiability may face a risk of being jeopardized, weakened or disappeared, for example.

The threats can be categorized for varying reasons, example by basing them on user mistakes or misuses, source of threats (force of nature, human error, tech-nics), external (spam, phishing, denial of service) and internal (mistakes) threats of the organization, motivation of the attackers, or categorizing the targets of the threats. Whitman (2003) presents the following categories for the information se-curity threats:

1. act of human error or failure,
2. compromises to intellectual property,
3. deliberate acts of espionage or trespass,
4. deliberate acts of information extortion,
5. deliberate acts of sabotage or vandalism,
6. deliberate acts of theft,
7. deliberate software attacks,
8. forces of nature,
9. quality of service deviations from service providers,
10. technical hardware failures or errors,
11. technical software failures or errors and,
12. technological obsolescence (Whitman, 2003.).

The Threat Mind Map published by European Union Agency for Network and Information Security (ENISA, 2016), shows that the threats can occur for many entities, which causes that the threat and risk assessment are becoming increasingly challenging. According to ENISA (2016) at least malwares, web ba-sed attacks, web application attacks, botnets and denial of services are deter-mined as top threats in 2015. Alongside of them physical damage/theft/loss, in-sider threat (malicious and accidental), ransomware and identity theft are expec-ted to arise in the near future.

ENISA has divided threats into nine categories: 1) Physical attacks, 2) Di-sasters, 3) Outages, 4) Failures/Malfunions, 5) Unintentional damages, 6) Ne-farious activity/Abuse, 7) Damage/Loss (IT assets), 8) Eavesdropping/Intercep-tion/Hijacking and 9) Legal problems. (ENISA, 2016.) What is important here, is that the threats have become more common and dangerous, also affecting for the company side.

More and more sensitive or critical business information is processed, sha-red and stored in networks and cloud services. The trojans steal the passwords and confidential information, capture the netbank session and are enable to leve-rage the computer for criminal actions. Common for these malicious software is the ability to hide from the user. The traces of the criminal actions are easily dis-missible. (Suoranta, 2008.)

The environment where we are living has changed a lot in a few decades. Technology development, new innovation and solutions have major impact on the change. This development walks alongside of the information security threats. How remarkable the information security threats are globally? They are severe. Technological threats are determined to be at top 20 list of global threats (The World Economic Forum, 2016) and are about to rise because of rising amount of

the information shifting in internet. Her Majesty's Government's (2015) technical report presented that 90% of large organisations and 74% of small businesses had a security breach in 2015. The arisal of the year 2014 was 81% (large) and 60% (small) for companies. Staff-related breaches featured notably: three-quarters of large organisations and nearly one-third of small organisations suffered a staff-related breach (HM Government, 2015).

Information security threats generate significant losses for the companies. Kaspersky Lab (2015) revealed that 90% of businesses admitted a security incident, and 46% of businesses lost sensitive data due to an internal or external security threat. According to the World Economic Forum (2015) Global Risks 2015 Report most cybercrime incidents go unreported. IBM Cost of Data Breach 2015 found that total cost of a data breach was 3,8 million US dollars representing a 23% increase since 2013 (Verizon, 2015). With the increasing volume and cost of data breaches, decision makers have begun considering IT security a larger business risk, which has increased interest in cyber insurance (Verizon, 2015).

Network crime has become more professional, aiming to achieve economic benefits. It is typical that criminals typically work by themselves, but rather co-work in chains with different roles. The complex and widespread chains hampers the investigation of crimes. The traces may lead to countries where the local authorities have a lack of resources and jurisdiction. A small probability to get caught increases the criminal actions. (Kääriäinen, 2010.) Operating environment is dependent on softwares, hardwares, networked actions and that makes the ICT systems and functions targets for criminals. The complexity of ICT systems does not able the total identification, tracing and protection of security attacks. Networking increases the efficiency and performance by increasing the vulnerabilities.

The value of the information security as a method to secure and enable the critical business functions and protect the most important asset is fairly seen in its whole nature in the company side. Usually through the costs caused by security breaches, who have started to notice that the digitalisation and its side-effects, like Internet of Things (IoT) development, would be best leveraged when taking the information security aspects also into account. This demands, most of all, investing in information security.

Information security requires more from computation processor of the computer, such as encryption, decryption or verification files. It takes time from provider to execute them and therefore the technical security solutions often undermine the functionality and user comfort. Risk and safety measures required by it will have to be proportioned to the cost of, for example, the functionality. To speak from the perspective of usability and security, the new and existing technology is not trouble-free.

By watching daily news anyone can make a note that security of the new digital solutions, like IoT, is generally very weak. What it comes to the development of any information system, the security requirements of those are competing with the functionality and ease of use (often speed). Also the challenge of the security of the interoperability of the Internet of Things to be developed has not



been solved. The failure of the information security may cause ramifications, like civil and criminal penalties, including fines or imprisonment and may further cause losses for the company's business or reputation (Saint-Germain, 2005). Directly or indirectly, result from the effects of the information security management may also lead to the most severe threats for instance of the company's existence and profitability or the safety of the personnel.

Security breaches may also violate to operating and financial valuation losses, including operational disruption, lost revenues from customer attrition or loss of financial market confidence and legal fees (Menon & Siponen, 2015). Kajava et al. (2006) pointed that the failure of the organization's information security measures can greatly increase the side effects of the business and social networking activities with external stakeholders of the organization (eg. customers, freight operators, partners or other stakeholders).

If a company produces critical infrastructure services or products, may the threats also cause effects broadly in society. Kajava et al. (2006) concerned that the prevailing view of the information security as an expense (non-profit) result in the unrealized security measures - and the price will rise even higher for companies.

The HM Government (2015) reported that 39% of organisations had not changed their investment policy (attitude) despite having suffered a security breach. Estimation of the invested cyber security insurance was globally 2 billion US dollars in 2014. Ponemon Institute (2015) evaluated that the criminals have started to recognize that insurers possess large amounts of personal information about customers (credit card and payment data) attracting to identity thieves and fraudsters.

## 2.3 Investment

In finance, an investment means a monetary asset purchased with the idea that the asset will provide income in the future or appreciate and be sold at a higher price (Investopedia, 2016). Technology is the remarkable force behind many of today's new innovation and especially cost-cutting functions.

The digitization of products or services might require different forms of monetization, adjustments to firms' business scope, or structural changes to provide an adequate basis for the new operations, if other markets or new customer segments are addressed. Structural changes refer to variations in a firm's organizational setup, especially concerning the placement of the new digital activities within the corporate structures. (Matt, Hess & Benlian, 2015.).

Bacon noticed already in 1994 that in a competitive environment the right IS or IT investments are selected in order to sustain company's viability and prosperity. According to National Institute of Standards and Technology (NIST) report (Bowen, Chew and Hash, 2007) organizational assets and operations have become increasingly dependent on information and technology to accomplish

mission and performance goals. Recognizing this dependency, information becomes a strategic enabler for mission accomplishment and protecting that information becomes a high priority of an organization (Bowen et al., 2007).

Investment in digital technology takes typically its place through the spending on ICT and telecom hardware, software, networks, databases and user platforms across the economy (van Ark, 2014). Executives are forced to decide the wide range of various IT projects, like wide Enterprise Resource Planning (ERP) systems and IT solutions championed by specific groups.

Project championing has long been recognized as an important element in successful project implementation. Schon (1963), Chakrabarti (1974) and Maidique (1980) first identified the importance of the sponsorship role as a means for improving the prospects for innovative organizational behavior. Champions can be members of top management or they can be corporate intrapreneurs and they typically play a variety of supportive roles, either as an internal member of the project or external to the project team (Pinto & Patanakul, 2015).

The US-based Project Management Institute (PMI) (2013, p. 32) described the sponsor as "the person or group who provides resources and support for the project and is accountable for enabling success" In addition, the PMI (2013) noticed, that the project sponsor can be external or internal, meaning that he can be within the organisation of the project manager or not. The PMI (2013) also described the sponsor as a spokesperson for the project within the organization, which leads the project from initiation through to project closure and transfer of deliverables into the business.

The ISO 21500 standard, Guidance on Project Management, identifies project sponsors as one of its target reader groups "in order to provide them with a better understanding of the principles and practice of project management and to help them give appropriate support and guidance to their project managers, project management teams and project teams;" (ISO, 2012).

It is seen, that though IT investment has grown rapidly, the development of processes for managing such investments has not kept pace. Senior executives are concerned, whether they are making the right IT decisions and if the planned savings are about to succeed, and are balancing between the escalating costs and uncertain benefits of IT (Keen, 1991). Companies need an integrative process for IT investment justification and management to realize value and overcome the challenges associated with driving major IT initiatives through complex organizations, but managers rarely note the importance of the strategic alignment (Henderson and Venkatraman, 1999).

Depending on environment, the chief information officer (CIO) is typically responsible for providing input to the prioritization of IT projects and ensuring that the projects deliver certain value to the company. Managing IT investments is challenging because of the broad impact of investments, which, often have effect on activities across the entire value chain of the company and because measuring their impact effectively is difficult (Chowdhury, Sherer & Ray, 2001). It is noticed, that IT alone does not create benefits, but the management process that

uses IT to create benefits has a great impact on it (Brynjolfsson & Hitt, 1998; Keen, 1991).

CIOs are often disconnected from others in their organizations that make decisions about new technological innovations. The disconnection between IT and other parts of the organization has been a persistent and critical issue over the last three decades (Caffrey & McDonagh, 2008). While CIOs are often held accountable for results, they may not be responsible for the complementary operating unit organizational changes required to achieve full benefits from IT projects (Chowdhury et al., 2001). Studies indicate that over 50 percent of IT projects cost more than twice their original estimates (Schniederjans & Cao, 2002) significantly diminishing their payoff.

Chowdhury et al. (2001) argued, that the ability to influence others in the organization is becoming more important for CIO success. However, executives in general often do a poor job of influencing other executives (Williams and Miller, 2002). Morton (1983) noted that project champions contributed to project success through engaging. Although many variables contribute to this problem, a lack of foresight in the IT acquisition or investment decision process has been cited as a major factor in general.

It was noticed already two decades ago (Holden & Wilhelmij, 1995; Irani, Ezingard & Grieve, 1997; Semich, 1994; Simms, 1997) that the traditional, exclusive focus on financial or technical aspects of the initial investment decision is incomplete and leading to false assumptions about the true expenses and yields of IT. Also Hitt and Brynjolfsson (1996) identified hidden nontechnical costs and benefits that are typically not included in IT value analysis. Pinto and Slevin (1988, p. 17) suggested, that the champion is best utilized by focusing on “non-traditional” leadership behaviors on behalf of the project and categorized the behaviors as follows in Table 1:

Behavior	Description
Cheerleader	Provides the needed motivation (spiritual driving force) for the project team.
Visionary	Maintains a clear sense of purpose and a firm idea of what is involved in creating the project
Politician	Plays the necessary “political games” and maintain important contacts to ensure broad-based support for the project
Risk-taker	Is willing to take calculated personal and professional risks on behalf of the project
Ambassador	Maintains good contacts with all critical project stakeholders (top management, intended users, and the rest of the organization) and representing the interests of the project

TABLE 1 Non-traditional roles of leadership. (Pinto & Slevin, 1998, p.17)

## 2.4 Information security investment

There are gaps in our understanding about how the investment proposals should be carried through so that they would actually success. Earlier information secu-

rity studies have mainly examined the investment challenge through either *appropriate amount* of investment perspective or *efficiency* of the investment perspective (Karjalainen et al., 2014 and 2015; Menon & Siponen, 2015; Toivanen, 2015).

The importance of the underinvestment phenomenon is definitely recognized and generally understood that the success of the information security investment is a major challenge for the management. Impacts on the rejection of the investment proposals are escalating in a fast phase. The early work has approached the challenge theoretically, and the efficient practical research is incomplete and fragmented. Specific characteristics of certain operating environment often miss from the studies. There does not exist findings that are rigorously generalizable.

There exists quite small amount of studies, that are not basing on mathematical or financial calculations or estimates. *The optimal information security investment perspectives* have defined the optimal amount to invest in information security with different methods just as the *efficient information security* investment perspective studies have different measurements, mostly basing on ROI-approach, to determine the effectiveness of information security to justify the investment proposals. These two kinds of approaches have not been able to solve the investment challenge by today.

The problem with both perspectives is that there has not been found the solutions, that would benefit in practice – or would even be beneficial in theory. Most of the methods do not include empirical testing, which means the results may base only on theoretical formulas. That causes a considerable problem because exact data and knowledge is not available in real world cases for decision making. The authentic nature of information security, that it cannot be assured in traditional means turns these propositions empty. In fact, these propositions try to offer a solution for symptoms, not for a disease. The varying factors and specific circumstances are neither taken into account. Table 2 presents some examples of previous information security investment studies.

TABLE 2 Information security investment approaches and issues (continues to next page)

Researcher	Definition/Issue
<b>Optimal Information Security Investment perspective</b>	
Fiengenbaum and Thomas (1988), Jegers (1991)	Risk-averse decision makers tend to have less capital constraints in decision making.
Kort et al. (1999)	Two models to evaluate optimal investment: maximization of the net cash flow stream and protection by investing in security equipment.
Gordon and Loeb, (2002)	Risk-neutral company will maximize its expected profit from security investments and investment should never exceeds 37% of potential loss.
Matsuura (2003)	Extension to Gordon and Loeb's (2002) model: integration of the investment optimization with the insurance decision making
Cavusoglu et al. (2004)	IT managers should consider estimation of breach costs, risk management, cost-effective configuration of IT and value from deployment of multiple security technologies.
Bodin et al. (2005)	An analytic hierarchy process, ratings method variant of the AHP to determine the optimal allocation of a budget.
Tanaka et al. (2005)	Extension to Gordon and Loeb's (2002) model: Reducing vulnerability may counteract the free-riding problem in interdependent security.
Hausken (2006)	Four classes of security investment breach functions and four types of marginal returns to information security investment.
Magnusson et al. (2007)	The theoretical conditions for information security to become a part of value creation: economical models has limited value in calculating value creation or effectiveness.

Huang et al. (2008)	The expected utility theory with several propositions like: until the potential loss from a security breach obtain certain level, the company is not worthwhile to invest more in protection. Risk-averse decision makers are more willing to invest to reduce company risks, but not all risks are worthwhile to be protected.
Cavusoglu et al. (2008)	Decision theory and game theory perspectives.
Wang (2009)	Extension to Gordon and Loeb's (2002) model: probability-based theory for calculating the probability of insecurity of protected resource and the optimal investment level with API- and OSI -algorithms.
Tatsumi and Goto (2009)	Extension to Gordon and Loeb's (2002) model: positive drift of threat causes larger and later expenditure. Efficiency of vulnerability reduction technology encourages companies to invest earlier, which induces cost reduction.
Fenz et al. (2011)	Calculating the information security standard-compliant IT security solution portfolios and communicating the portfolios' risk versus cost trade-off figures to decision makers.
Bandyopadhyay et al. (2012)	Information security planning should incorporate the actions of those firms that hackers considers as potential alternative targets.
Beebe et al. (2014)	Rational choice and economic models for information security investments need to be supplemented with risk perception measurement and account for individual level decision biases.
<b>Efficient Information Security Investment Perspective</b>	
Purser (2004), Davis (2005), Mizzi (2004), Sonnenreich et al. (2006)	Extended ROI models
Ramachandran and White (2005)	A methodology for assessing the impact of IT investment in security tools and products.
Gordon and Loeb (2006)	Return of Investment (ROI): three cased model.
<b>Other Information Security Investment Perspectives</b>	
Gal-Or and Ghose (2005)	Game theoretical framework: information sharing is more valuable when product substitutability is higher, sharing alliances yield greater benefits in more competitive industries and the benefits increase with the size of the firm.
Backhouse et al. (2006)	How market mechanisms may be more efficient than regulatory interventions in resolving the information asymmetria problem.
Liu et al. (2011)	The relationship between decisions made to knowledge sharing and investment.
Chai et al. (2011)	Information security investment leads to positive abnormal returns for firms.
Ioannidis et al. (2011)	A utility theoretic approach of optimal timing of interventions in information security management.
Karjalainen et al. (2014)	ITSI decisions depend on the support of key stakeholder constituencies (end users, information security specialists and organizational decision-makers). They support ITSI only when their values are satisfied.
Toivanen (2015)	Categorized findings affecting to failed investment decision.
Cavusoglu et al. (2015)	Institutional pressures and internal security needs assessment (ISNA) explain the variation in organizational investment in information security control resources.
Karjalainen et al. (2015)	A need to recognize the focal actors and their different value expectations and roles that need to be balanced during ITSI process.
Menon and Siponen (2015?)	Assumption, that decision makers are unbiased may lead to the rejection of information security investments. Rational leaders commit to an IT security proposal, which is reasoned due to the congruence of the proposal with their leadership style.

TABLE 2 Information security investment approaches and issues (continues from previous page)

Information security investment research needs the new kinds of holistic approaches to fix the investment challenge. Dhillon and Backhouse (2001) worried that because the focus of most research in information systems security studies is made from technical system approaches, the use of a socio-organizational perspective for understanding information systems security is only at a theory-building stage. The latest studies of other investment perspectives (Karjalainen et al., 2014 and 2015; Menon & Siponen, 2015; Toivanen, 2015) examined the investment issue from non-mathematical or ROI points of views and suggested solutions related widely to human, or the socio-organizational, factors.

Karjalainen et al. (2014, 2015) argued that the success of the information security investments is dependent on identifying the key factors and their value and motivations relating to IT service (ITSI) processes. Menon and Siponen (2015)

discussed in their heuristic-systematic model that the amount of security investment is often inadequate basing on mathematical models that view information security decision makers as unbiased and homogeneous. They (Menon & Siponen, 2015) were the first to bring out the vision of the investment challenge as a reasoning issue (multi-level structural equation modeling and prospect theory). They also discussed that the commitment to IS security differs by degree of leadership rationality and inspirational leadership of the decision maker - and suggested, more than to rely on calculations to consider the leadership style of a manager before negotiating.

Also Dutta's and McCrohan's (2002) early vision that organizational computer security starts with senior management support and not with firewalls support this approach. Toivanen (2015) made a comprehensive list of the factors causing the fail of the investment proposals. All these studies were tested empirically to justify the models presented in practice and they proposed a solution, that reminded to take into account the certain variables in circumstances affecting to investment decision.

Even though the results of these latest studies seem promising, after all, there still exists a limited number of studies focusing to examine the investment challenge from a human factor perspective. This study will meet the investment challenge due early IT and IS researchs' practical experiences aiming to develop a theory of factors, other than mathematical models, affecting to success of investment initiatives. The methodological starting points and the implementation of the research are discussed more detailed in next chapter.

Cybersecurity Ventures (2016) publishes quarterly a combination report of global security actions reported from different actors. The Q2/2016 report stated that the worldwide security market will increase from 75 billion (2015) to 170 billion US Dollars by 2020. The Q2 report included also the interesting following findings:

- PricewaterhouseCoopers' (PwC) Global State of Information Security Survey 2015 found that U.S. information security budgets have grown at almost double the rate of IT budgets over last two years.
- International Data Corporation (IDC) reported 2015 that The especial areas of growth are security analytics/SIEM (10%), threat intelligence (10%), mobile security (18 %) and cloud security 50 %.
- Market research 2015 of Gartner indicated that the global spending on IT security is to increase to 101 billion US Dollars on information security in 2018.
- PwC Global (2016) forecasted that the global cyber insurance market will reach 7.5 billion US Dollars in annual sales by 2020.
- Atlantic Council and the Zurich Insurance group estimated 2015 that security attacks could cost up to 90 trillion US Dollars by 2030, if security fails to advance at high speed. (Cybersecurity Ventures, 2016.)

These findings indicate that the general interest of information security investment has arisen, but more actions, including investment initiatives, are needed to establish rigorous and effective information security to protect the critical information and other assets when information threats keep on moving in a fast pace.

Information assets are claimed to be underinsured against theft or destruction based on the value since there is a significant difference between the insurance coverage of traditional assets and information assets. Ponemon Institute (2015) reported that on average, approximately 51 % of property, plant and equipment (PP&E) assets are covered by insurance and approximately 28 % of PP&E assets are self-insured, but only an average of 12 % of information assets are covered by insurance, because companies value PP&E higher (648 million US Dollars) than information assets (617 million US Dollars). (Ponemon Institute, 2015.) HM Government (2015) reported that with 31% growth up from 2014, 44% of large and small businesses increased information security spend in the last year. 32% of large and 27% of small companies have insurance that covers them in the event of a breach. Same percent, 32% of respondents have not carried out of any form of security assessment in 2014. (HM Government, 2015.)

The traditional method for calculating standard return of investment (RoI) is that it equals the sum of the gain minus the cost, divided by the cost. The higher the resulting value, the greater the RoI. According to information security professional Bruce Schneier (2008) in a security context RoI is inaccurate because security is not an investment that provides a return. "Depending on how you answer those two questions...and any answer is really just a guess, you can justify spending anywhere from 10 to 100,000 US dollars annually to mitigate that risk." Schneier (2008) also argued that there does not exist appropriate crime rates for information security, so the methods like annualized loss expectancy (ALE), generally used method for assessing costs versus benefits to support decision making, are not useful.

Schneier noticed the lack of data is one reason that ALE can not be comprehensively leveraged. With the data he meant the data about how individual security countermeasures or specific configurations of countermeasures mitigate those risks, - and the data on incident costs. According to Schneier, too fast moving threats and the characteristics of the attacks supposed to be prevented change so quickly that the accumulation of data fast enough is impossible. By the time that some data has gotten, there already exists a new threat model for which lacks of enough data. (Schneier, 2008.)

In this study, the research problem examines the information security investment challenge taking into account the experiences of IT and IS fields. According to Magnusson et al. (2007) an inadequate investment in information security means that an organization has limited resources and security investments often compete with other investments that have high revenue potential. The issue of underinvestment in information security is a high-priority problem in the research and practice of information security management (Ernst & Young, 2013;

Menon & Siponen, 2015) and investment proposals based on purely rational calculations may lead to rejections by inspirational-style leaders (Menon & Siponen, 2015). This research examines considerations from non-mathematical nor financial points of views.



### 3 METHODOLOGY AND THE RESEARCH PROCESS

This chapter includes introducing and reasoning the selected research method and the description of the research process. The systematic literature review (SLR) is used as a research method to achieve the full-featured image and analysis of the success factors relating to investment initiatives.

The research was reasoned to implement theoretically, because detailed information was needed to achieve a response for a question "how", so that the real nature of the phenomenon could be understood. Taylor, Bodgan ja DeVault (2015) determined that the aim of the qualitative research is to make sure that the theory fits the data and not vice versa.

When it comes to systematic literature review, the theory will be built afterwards basing on research results. Metsämuuronen (2010) emphasized that the aim of the qualitative research is to get people act in accordance with the results of the research. It is common for the qualitative research that the determinations will be done depending on individual's capacity and the personal perspectives of the researcher. To achieve the reliability of the scientific research the personal views and conclusions are discussed in certain chapters and paragraphs, differing from the empirical material. The nature of the review is descriptive.

#### 3.1 Systematic literature review as a research method

Systematic literature review (SLR) is a theoretical research method, which examines the existing literature (second grade research), and then is, according to Fink (2005), a systematic, exact and repeatable research method to identify, assess and also synthesize the relevant studies. Baumeister and Leary (1997, p. 312) noted, that the aim of literature review is to:

- 1) develop existing theory and build also a new one;
- 2) assess the theory;
- 3) get an overall image of the entirety;
- 4) recognize problems and;
- 5) enable to describe the historical development of a certain theory.

Systematic literature review is seen valuable, because at its best, it can increase the importance of a research relating to decision making process (Aveyard, 2007, pp. 6-8). Aim of this literature review is to produce a comprehensive picture of existing knowledge relating to investment proposal adoption or rejection - and to evaluate the suitability of the systematic literature review as a research method to examine this specific phenomenon. According to Boell and Cecez-Kecmanovic, neither IS nor neither IT literature has effectively adopted SLR, in spite of increased general adoption of SLR as a replicable, transparent, objective,

unbiased and rigorous research method (2016). Method is also unfamiliar for information security studies. The suitability of the method is discussed in Discussion. The decision to leverage a systematic literature review as a research method culminated on three reasons:

1. Research method (SLR) enables gaining the necessary overall image of what it is known about factors enabling the successful investment initiatives and its possible challenges basing on early research in IT and IS fields, which are closest fields to information security field.
2. Personal resources: systematic literature review, as an independent research method from external factors, enables carrying out the research in certain timeframe including clear and strict guidance for each work phase.
3. Systematic literature review offers a solid and comprehensive scientific base for possible further examinations, in which proposed theory can be tested empirically in practice.

If we look in history of systematic literature review, although meta analysis was conducted in areas of public policy and social interventions, initially, systematic research synthesis was applied to research medicine and health. A Scottish doctor, Archibald Cochrane (1972), advocated for the use of randomized control trials to make medicine more effective and efficient in his book 'Effectiveness and Efficiency: Random Reflections on Health Services'. He encouraged health practitioners to practice evidence based medicine and the Cochrane Library database of systematic reviews.

Professor David Sackett followed Cochrane's way and emphasized a systematic review as the conscientious, explicit, judicious use of current best evidence in making decisions about the care of individual patients (Sackett, Rosenberg, Gray, Haynes, Richardson, 1996). After that, a group of health service researchers in Oxford began a programme of systematic reviews on the effectiveness of health care interventions as a ground for evidence-based medicine.

The critical appraisal and synthesis of research findings in a systematic manner emerged in 1975, when Gene Glass, an American statistician and a researcher of educational psychology and the social sciences, was the first who launched the technique as 'meta analysis', when produced the conducted syntheses of psychotherapy (Smith, Glass and Miller 1980). He illustrated its first use in his presidential address to the American Educational Research Association in San Francisco in 1976. Smith, Glass and Miller (1980) produced the most extensive illustration of the technique relating to literature on psychotherapy outcome studies.

Compared to traditional procedures, SLR uses a more systematic approach to data collection, has more transparent and explicit procedures; thus has less potential for hidden assumptions or biases to drive results, and it focuses mainly on the magnitude of effects rather than statistical significance. There does not exist a specific guided method for searching and analysing literature material, so

the narrative literature review as a research method lacks of repeatability (Aveyard 2007, p. 15). It is said that SLR also highlights the results in conclusions that are less bound by context than conclusions that arise from individual studies.

When compared to SLR, meta-analysis, which is very close to SLR, leverages statistics (numbers and raw data) to combine the findings of different studies examining same phenomenon by quantitative methods. Almost always meta-analysis processes the studies included in some systematic review and the size (bigger is better) is an important issue in the meta-analysis, which is known from its strong evidential value (Salminen, 2010). Valentine and Konstantopoulos (2016) summarized the benefits of SLR compared to narrative reviews:

- more objective and more replicable,
- large amounts of information can be examined efficiently,
- systematically examine variations in different processes,
- examine differences due to study methods, types of informants, industry etc. and,
- studies can be used to rule out each others' alternative explanations, when similar results from studies with different approach lead to strengthening in conclusions.

When examining the main rules of SLR, the research material should contain all researches, that are relevant to the topic and research question (Aveyard, 2007). Kekäle, Weerd-Nederhof, Cervai ja Borelli (2009) noticed that it is not allowed just summarize the original research, instead of that the review should foster the examination of the subject by synthesizing the material and by providing the scientific critic to it. It is also essential to leverage systematic literature review to assess the consistency and potential shortcomings of the early work (Salminen, 2011).

To be repeatable, the literature review requires exact process planning and process description. The method includes an exact research question, which has an important meaning when generating the context and theory for the study. The careful documentation of each phase of review ensures the transparency and clearance of the method. The answers for the research questions are supposed to find by following the accurate guidance of the systematic literature review. It is important to recognize the methodological quality and combine the research results to benefit from the research results. (Metsämuuronen 2005, pp. 38–39; Pettigrew & Roberts 2006, p. 4.)

It is an advantage for this research that both quantitative and qualitative research material could be included to study, because studies implemented with both approaches are needed to achieve the comprehensive view of the phenomenon. Systematic literature review is seen profitable when describing the efficiency or implementation of certain processes or functions. The review can be descriptive or critical. Due literature review are the best evidences of the topic tried to be found relating to certain problem, taking into account the specific context of the subject. (Macdonald 2003, 3-6; Pettigrew & Roberts 2006, p. 189.)

When discussing about the limits related to systematic literature review, Petticrew and Robert (2006) pointed that the method is unpleasant for the early stage research topic, or if there exists limited amount of research material, because of the few existing articles might not unveil the best practices or knowledge of the topic. Information security studies set limitation for leveraging the method because of these reasons. Instead of that, IT and IS fields are older research areas, including also greater amount of empirical studies.

As a challenge for SLR, Valentine and Konstantopoulos saw that it relies on statistical significance to gauge what a study says because unimportant effects can be statistically significant, and important effects might not be statistically significant (2016). SLR can also be used as a vote count of research results to get a view and conclusions about the literature as a whole. Third challenge is that there is missing a clear guidance of a stage, when the research material collection can be ended. The strict entry and exclusion criterias for research material are essential, because IT and IS fields produce new studies in a fast pace, so it is impossible to include all studies in this research.

When critical analysis is not used in selection phase, alongside of that the quality of the research material might also vary. Metsämuuronen (2005, 38) found that several research with a wide scope lacks of database or journal information. It is also known that researcher may create biased and distorted results if synthesis of the research results are developed subjective (Pettigrew & Roberts 2006, 4). These limitations and notes will be taken into account by reviewing the process and its phases by an anonymous assistant.

### **3.2 Research process**

Systematic literature review follows the model of Okoli and Schabram (2010, p. 9), which is developed taking into account especially information security approach. The systematic literature review processes paraphrased Okoli's and Schabram's (2010) eight-phased model is presented in figure 2.

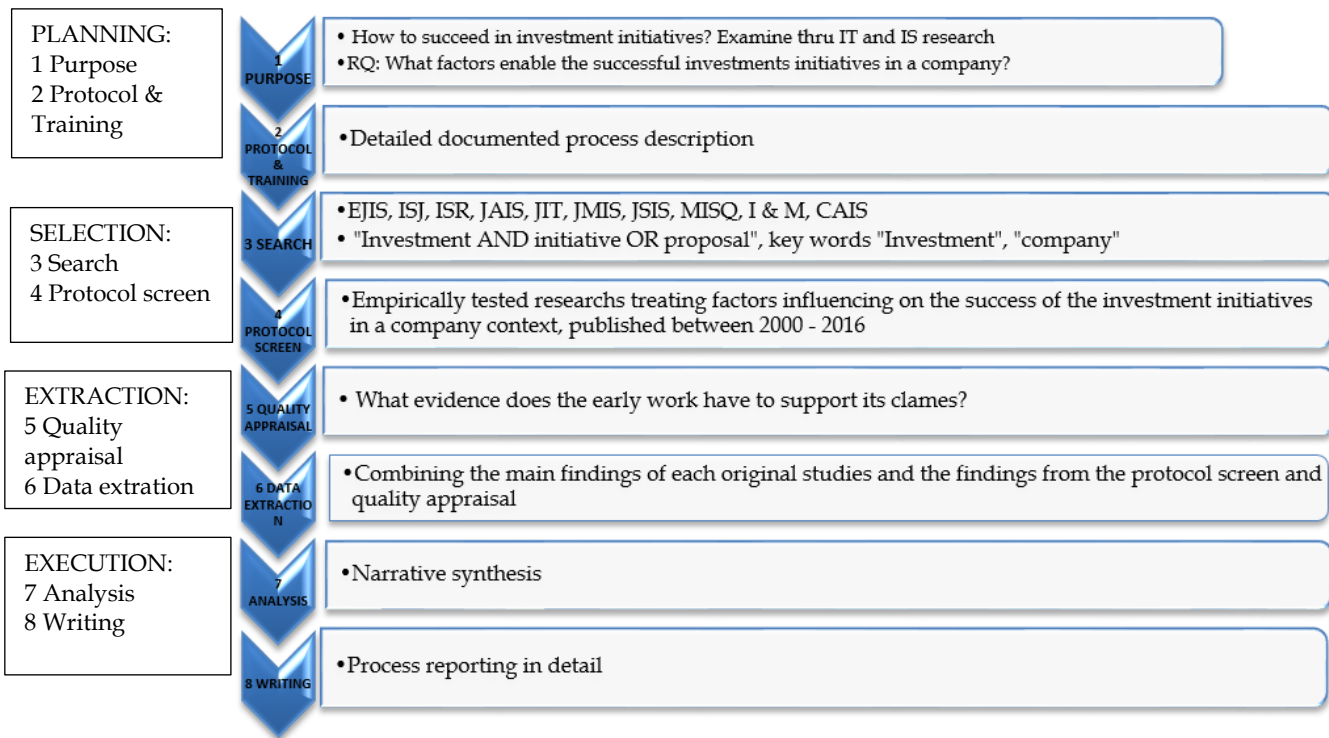


FIGURE 2 Systematic Literature Review process paraphrased Okoli and Schabram (2010)

The main principles of the model are described here.

1. **Purpose:** Clearly defined purpose and aim of the review. Protocol means creating a research plan including entry and exclusion criterias of the original research. Protocol is used to ensure the systemacy and transparency of the research process (Aveyard, 2010; Rutter et al., 2010, p. 21).
2. **Protocol and training:** A written and detailed protocol document to ensure the consistency of the implementation (Training would be included if more than one reviewer used).
3. **Searching for the literature:** Detailed describtion of the comprehensive-ness of the search, including search phrase, key words, databases and journals used in the study.
4. **Practical screening:** Defining criterias for accepting or rejecting material to be reviewed for the next round to control the amount of the studies and enable the manageability of the research.
5. **Quality appraisal:** The quality evaluation of the original research articles that will be included in the study, since the quality of the final study depends on the quality of the original studies.
6. **Data extraction:** Systematic extract of the applicable information from each study documented detailed in tables.
7. **Analysis of findings:** Combining the facts extracted from the original studies using narrative synthesis (quantitative and qualitative techniques).

- 8. Writing the systematic literature review:** Process reporting in detail for that the results of the review can be independently reproduced

## **4 REALIZATION OF THE RESEARCH**

This chapter presents comprehensively the eight phases implemented in research process. The process started from planning (purpose and protocol). Next phase included search and protocol screen. On the third phase, extraction, the critical assessment of the quality and data extraction were made carefully. The fourth and final phase, execution, included analysis and writing.

### **4.1 Planning**

The planning of this specific research subject started in April, 2016, when the need for the study arised from a conversation with another of the supervisors. The purpose and the aim were seriously discussed with the supervisor - and then chosen to be a theoretical examination of IS and IT fields understanding of the success factors relating to investment proposal adaption. Detailed protocol (research plan) was presented and approved in the beginning of May. Peer student of the university volunteered to be as a reviewer of the study.

### **4.2 Selection**

The selection phase included material search and protocol screen. The research question and the systematic approach were taken into account during literature search. The examination determined to accomplish by reviewing studies from trusted journals. The protocol screen accomplished according to specific criteria. The protocol screen can be seen as a first step of setting the specific criterias and evaluating the original research material against them. These phases are discussed here in detail.

#### **4.2.1 Entry and exclusion criterias and data collection**

Okoli and Schabram (2010) guide, that the entry and exclusion criterias should be defined after data collection phase. However, because the specific criterias and the goal for the study were clear and defined already in a research plan, it was reasoned the take these criterias into account already during literature search. Entry and exclusion criteria definition for approval or rejection of the research material is important part for the research, because they give the boards for the examination.

The selection of the entry and exclusion criterias depends on the research question and the practical reasons, such as requirements of the master thesis as an academic work, time and finance. The careful selection of both criterias

supported to search, evaluate and screen and then the choose of the most qualified and essential options of all material.

According to Aveyard (2010, pp. 70-72) the criterias enable to build the clear image of the research subject to be able to answer exactly for research question. As noticed from material search phase, it is important to define the context of the study precisely, for that the amount of the results would not climb too high.

Information security field has not managed to find suitable solutions for the underinvestment issue, so the solutions from other discipline, so the IT and IS, the closest fields from Information security, were examined. If used precisely, SLR ought to offer a comprehensive view of the practice found in IT and IS research. The qualitative research emphasizes the validity of the research, especially when the research literature consists of empirically tested material, so it was decided that all approved research material should contain empirical part.

There existed a great amount of IT and IS investment studies so to avoid the too large amount of studies and ensure manageability of the research it was reasonable to limit the publishing year starting from a year 2000 and focusing on well-known academic journals. Also for the same reason the conference articles, books, blogs and other sources, than scientific research articles, were rejected. The specific entry and exclusion criterias of the original research are presented in a table 3.

Entry criterias:	Exclusion criterias:
Articles published in selected ten journals	Articles outside of chosen 10 journals
Peer-reviewed articles	Non-peer reviewed articles
Articles published between years 2000 – 2016	Articles published earlier than in a year 2000
Scientific research articles	Literature reviews, conference articles and books
Articled examining the factors inclucing on the success of investment initiatives	Articles that did not threatd factors influencing to investment initiatives
Different experiences of different actors related to research subject	Matemathical calculations of appropriate amount of investment or ROI estimations
Preparing and processing investment initiatives	News, blogs, columns, companies´ web sites, advertisements
English articles	Non-english material
Articles that operated in a company context	Articles that did not treated the issue in a company context
Empirically tested studies	Non-empirical studies
IT or/and IS field articles	Articles from other (inc. information and cyber security) fields than IS or IT
Articles that were free of charge for the researcher	Articles that were not free of charge for the researcher

TABLE 3 Entry and exclusion criterias of the original research

Based on a research question, the scientific research articles examining the factors relating to success of investment initiatives (/ proposal), different points of views of different actors, just like investment proposals relating to various projects (eg. enterprise resource planning (ERP)) were accepted for the study.



Articles, that did not study the research subject or research field were not accepted. The empirically tested studies in a company context were also accepted to be reviewed to ensure the reliability, credibility and appropriate circumstances relating to operating environment. Non-empirical studies, those that did not discuss the investments in a company context – or the studies published before year 2000, were eliminated without further examination.

Because inadequate investment issue (Menon & Siponen, 2015) has not been solved by defining the appropriate amount of investment (mathematical calculations) or efficient investment (financial analysis) approaches, were also that kind of IT and IS studies rejected. As discussed later in detail, approximately more than a half of the search material, that would have been suitable otherwise, offered these kinds of non-acceptable approaches. English was chosen as a language of the original work, so that it would be easier to compare the original materials.

#### 4.2.2 Material search

Ten specific journals were chosen in study to ensure the coverage of the original material. The Finnish Publication Forum (Julkaisufoorumi, 2016) has rated the journals for level 3 (PF 3). The search phrase was built as follows: “investment” AND initiative OR proposal AND company

The use of the Boolean operators AND and OR enabled to focus on the right target (initiative) and the operating environment (company) in studies. A word “proposal” was found to correspond a word “initiative” so the AND operator used to include both options. The Boolean operator NOT was not needed. Peer reviewed – function was used (optional in some journals) to ensure the better quality of the material. The publication year was limited to years 2000 – 2016. The last search was made 01.06.2016. Only english and free of charge (for researcher) material was accepted. Search phrase worked well in all journals, with the exception of JMIS. JMIS consists of certain folders lacking of any search functions for the articles. The folders used in JMIS are presented in Attachment 1. The following valued academic journals were used in search:

- European Journal of Information Systems (EJIS)
- Information Systems Journal (ISJ)
- Information Systems Research (ISR)
- Journal of AIS (JAIS)
- Journal of Information Technology (JIT)
- Journal of MIS (JMIS)
- Journal of Strategic Information Systems (JSIS)
- MIS Quarterly (MISQ)
- Information & Management (I & M)
- Communications of the Association for Information Systems (CAIS)

The material search had to be implemented three-phased. Because of a great amount of articles, I was forced to do more screening turns than the original guidance of SLR advices to get appropriate amount of articles for protocol screening. The three turns were named as: 1. Original search; 2. Pre-screen 1 and; 3. Pre-screen 2. The content of the phases are discussed next and the results of each turn are presented in Table 3.

1. **Original search:** totally 2897 articles were found.
2. **Pre-Screen 2:** checking the material again. Especially time limit (2000-2016) headings and search words. The articles containing an appropriate headline - or keywords "investment" and "company" were sifted this phase. There did not existed the possibility to limit the years of the articles in all databases. According to headline, a year studies or key words, some of the results, that were from non-company environment and not treated investment, or were older that from year 2000 were rejected. There were 1135 articles left after this phase.
3. **Pre-Screen 3:** did the previous phase again, detailing and tightening search criterias, which was possible, in some cases. There were 903 articles left after this phase for practical screening.

JOURNAL	ORIGINAL SEARCH RESULTS	PRE-SCREEN 1	PRE-SCREEN 2
EJIS	89	89	89
ISJ	202	136	136
ISR	387	371	371
JAIS	195	105	105
JIT	133	46	46
JMIS	75	75	75
JSIS	108	108	108
MISQ	578	127	127
I&M	457	169	169
CAIS	673	383	150
<b>TOTAL</b>	<b>2897</b>	<b>1136</b>	<b>903</b>

TABLE 4 Included material per journal in different phases of literature search

The material search was ended for the date 31.05.2016. Totally 2897 articles, including duplications, were found and further examined using criterias reasoned in the previous chapter. Even though at the beginning of the material search it seemed, that these criterias established were clear - and could offer a solid base for the search, it was then noticed, that the criterias had to still be strengthened, as discussed on next chapter.

### 4.2.3 Protocol screening

At the beginning of this phase, there existed totally 903 articles, so it was reasoned that the entry and exclusion criterias had to be strengthened. Because of a great amount of studies it would have been impossible to read the whole context of each article. At this phase the abstracts and the key words of the articles were examined. The protocol, or practical, screening were done in three turns, once again, because of the great amount of studies. The turns are described here.

**Practical screen 1:** In this turn, all articles were screened basing on their abstracts. At the beginning of this phase, the entry and exclusion criterias were reviewed and the folders for the material search were established, and all articles in following phases were documented. The table was created containing relise notes, brief description of the content for all 903 articles.

The distribution of articles conducted by using 'traffic light' technique. The rejected articles were marked as red, and accepted marked as green. The articles, that were unclear were marked as yellow. After read the yellows again, they turned either red or green. An anonymous reviewer also examined the 'reds' to ensure that no critical information was rejected. This traffic light technique turned to be helpful to deal with a large amount of data.

Most of the excluded studies were, according to abstract, not empirically tested mathematical formulas. Even if using the search phrase mentioned earlier, the results included articles that did not deal with the research phenomenon (investment decision). Several of the those articles dealt with the monetary value of IT, competitiveness of the company, the calculation of the efficiency of the company or project practical implementation. Public investment studies were rejected, just like conference papers and information security studies. At the end of this phase, all the 'traffic light' results were documented in their own files, so that it would be easy to get these, if needed. There were 396 articles at the end of this turn.

The articles, that did not stand for the entry criterias, but included useful information otherwise (eg. conference papers), were marked as blue. These articles were used in conclusions when make comparing. Twenty and two (22) articles were rejected, because they were duplications: ISR (15) JAIS (1), JMIS (5) and MISQ (1).

**Practical screen 2:** because there still existed 396 articles, the next turn of protocol screening based both on abstract and conclusions. The excluded articles did not deal with the subject or the research method was found to be non-suitable. There were **183** articles left for further examinations. Once again, an anonymous reviewer examined the 'reds'.

**Practical screen 3:** there does not exist any specific definition for the appropriate amount of original works inclusion for SLR. When examining the earlier SLRs conducted in University of Jyväskylä as a master thesis, the amount of included articles varied from 12 to 40. So the criterias had to be strengthened, once again.

To get the right focus for the the work, the adoption of the investment was seen as a process, where the decision-making were seen as a middle point of the process. The phase before that was named 'pre' and phase after that as 'post', against which the articles were examined. The definitions and examples of the 'pre' and 'post' descriptions based on the themes arised from the articles are presented in Table 5. The pre - post categorizing technique proved to be effective for screening.

POST / REJECTED	PRE/ ACCEPTED
Mathematical functions, formulas, calculations or other evaluations of the impacts after implementation.	IT & Business alignment, IT & business strategy
Value of investment (post calculations)	Business models & investment
Impacts of investment after implementation	Implementation plan, if seemed to accept the investment decision
Effects of implementation of investment or the project (after the acquire)	Adoption and use, if relate investment planning (taking business strategy and investment into account)
Implementation process of the project in practice	Role, competence, skills, performance, relationships (CIO, CEO, board etc.)
Adoption, if used referring to start of using or approval for use	IT/IS role and value and responsibilities in organization and its impact on decision-making
How investment impacts on markets calculations	How market impacts on investment decision

TABLE 5 Pre - post definitions

Articles, that dealt with 'pre' were included. If the suitability of an article was still unclear after this, was the content of the article then examined in detail. The articles that were about to reject were also screened by an anonymous reviewer to confirm that not any relevant studies were left out. At the end, there existed 22 articles for quality appraisal. The articles per journals and years are presented in the Table 6.

Journal	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	Total
European Journal of Information Systems (EJIS)																		0
Information Systems Journal (ISJ)																1		1
Information Systems Research (ISR)				1														1
Journal of AIS (JAIS)					1													1
Journal of Information Technology (JIT)																1		1
Journal of MIS (JMIS)		1	1					1										3
Journal of Strategic Information Systems (JSIS)	1	1														1		3
MIS Quarterly (MISQ)						1				1								2
Information & Management (I & M)							1			1					2			4
Communications of the Association for Information Systems (CAIS)		1	1						1	1			1	1				6
<b>Total</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>22</b>

TABLE 6 Bibliographical sources of the articles reviewed

### 4.3 Extraction phase

The extraction phase consists of a quality appraisal and data extraction phases. Quality appraisal is discussed to be the second phase of an evaluation of the early work. The detailed phases of selection, critical analysis and extraction are discussed here.

#### 4.3.1 Quality appraisal

The size, quality and the reliability of the research can be influenced by evaluating the evidence grade of the early work (Pope et al., 2007, pp. 32–40). The aim of the quality appraisal was to evaluate the evidences that were introduced to reason the claims the of the original researches. According to Fink (2005), there has to be scoring of the methodological quality, since the quality of the final SLR depends of the quality of the original study. Okoli's and Schabram's (2010) guide does not contain a clear guidance for assessing the quality. Instead of that, they offer only some examples and recommendations for the assessment.

At the beginning of this phase, totally 22 articles met the inclusion criterias of protocol screening for this critical quality assessment. In this phase, the articles were read through for the first time during the examination process. During reading, totally six articles more were excluded, when noticed that they did not meet

the original entry criterias. These notions could not have been noticed earlier during practical screening. The exclusion were reasoned as follows:

- 1 article of Byrd, Lewis & Bryan, 2006 was excluded when observing the content and noticed that the hypotheses of the article posed the clear "post"-thema.
- 3 articles were excluded, when turned out that they were applied case study approach. On the bases of general guidance for SLR, a case study approach does not offer suitable and especially generalized information for systematic literature review (SLR) because of its nature. These were articles of Chowdhury, Sherer and Ray (2001), Pavlou, Housel, Rodgers and Jansen (2004), Hedman and Henningsson. (2016).
- 1 article was excluded, because it concluded complex mathematical financial formulas of evaluating risks of offshoring (article of Hahn, Doh and Bunyaratavej, 2009).
- 1 article of Frisk, Bannister and Lindgren (2015) could not be leveraged for the quality appraisal after noticing that its full content was not free of charge for the researcher.

The Attachment 2 contained the evaluation questions of the evidence and quality grades, against which original material was assessed. All the studies met the same questions. Each question included several quality indicators, which described the nature of the monitored subject in detail. The table of questions was developed based on several sources (Pope et al., 2007; Jousimaa, Liira, Liira & Komulainen, 2010; Kontio & Johansson, 2007, pp. 103-107). To be suitable for the synthesis, the article had to have 14 points of 20 at minimum to reflect a high quality. The findings of the critical quality assessment with the scores are reported in Attachment 3.

At the end of quality appraisal, one more article was rejected. First rejection based on the findings in critical quality assessment. The article of Benaroch, Kauffman and Shah (2007) lacked of sufficient documentation of required information of interview data, which caused the lack of clarity of the reliability of the study (missing information of data target group. The justification of the data collection implementation was insufficient and several other important quality evidences were missing. Also the scope and quality and nature of the interview group was poorly - if at all presented, and lots of information were missing. 15 of the articles were accepted for later examination.

Against recommendations relating to nature of original research material of SLR, an exception was made relating to one case study article. The evolutionary study of Shollo, Constantiou and Kreiner (2015) examined the interplay between evidences and judgement in the IT project prioritization process. The research phenomenon was interesting, important - and underexamined, and study offered rare view of the determinants of decision making and investment

process. The research was logic, comprehensively implemented and reported, including validity elements, so it was only reasoned that to accept for the research. At the end, 16 articles were critically analyzed basing on their quality. Fifteen of them were accepted for a synthesis and the point distribution of those is presented in Table 7.

Scores of quality appraisal (max. 20 p.)	Amount of primary studies (N= 15)
20	0
19	3
18	5
17	2
16	1
15	2
14	2
<b>AVERAGE</b>	<b>17</b>

TABLE 7 Point distribution of quality appraisal of 15 primary studies

The detailed and tabulated evaluation of the quality will also support to understand the specific operating environment, prevailing conditions and other factors in which the results of the study may be applied in an original research.

#### 4.3.2 Data extraction

The aim of the data extraction is to take information basing on research question systematically from each research to be as a raw material for the synthesis phase (Okoli & Schabraham, 2010, p. 29). The extraction was done before synthesis. The information extracted in this phase were combined with carefully tabulated earlier findings (information collected from the practical screen and from the quality appraisal) to be used in the data synthesis phase. The data extraction phase included findings scoring and documentation of the main findings. Findings were scored based on evidence trait. relevanttia. Aveyardi (2010, pp. 90-91) suggested the following questions to critically evaluate whether the quality of the information of the research is suitable:

- Is the material relevant for the literature review?
- Does the material response to research question?
- Is the material quality of the material good enough so that it can be included research?

These questions are applied here to define a certain state of evidences for each article. When concerning the last question, it was decided that the quality is good enough, if the article reached at least 17 points from the quality appraisal to ensure that the quality is critically assessed. The states and their definitions and the number of studies are presented in Table 8. The table relating to data extraction including main findings and the quality scores (content, methodology and information) is presented in Attachment 4.

State of evidences	Definition	Number of studies
Poor (P)	Answer is "Yes" for 1 or 0 questions	0
Medium (M)	Answer is "Yes" for 2/3 questions	8
Excellent (E)	Answer is "Yes" for all three questions	7

TABLE 8 Content evidences



## 5 ANALYSIS OF FINDINGS

“Execution” of the SLR, according to Okoli and Schabrami (2010), includes analysis (narrative synthesis) and writing (reporting in detail). The narrative synthesis (Pettigrew & Roberts, 2006), where the active use of tabulation is recommended, is used to analyze both quantitative and qualitative techniques, so at the end, both quantitative and qualitative studies will be analyzed qualitatively. In the first phase of a narrative synthesis the results of the original researches will be set in detailed data collection forms (tabulation). The selected research articles were put together in the table (Table 9). The next phase included search for the prominent codes (for example differences between research results or similarities) from material and in the third phase the certain themes were given for the findings (one theme describes the group of certain codes). The synthesis started by reviewing the research question, then reading and coding the chosen articles. The material orientation was kept in mind during coding. After the coding, the certain themes were defined. According to Tuomi and Sarajärvi (2009, p. 93) theming the material enables comparison of the existence of the certain themes.

### 5.1 Methodological and definitional issues in the articles review

Description of the research articles is a dominant part of SLR. The Table 9 is leveraged to help the describing. Tabulation also supports to quantify the processing and enables present remarkable findings numerically, and provides an opportunity to diverse interpretation (Eskola & Suoranta 2000, pp. 164–165).

The headings in Table 9 express the categories applied in the typology of articles. This section will examine the categories and sub-categories in detail. The articles were written by 39 authors. The authors with the largest number of publications were Enns, Chen, Ryan and Harrison, of whom each wrote two research articles. Ryan and Harrison wrote the articles together.

#### 5.1.1 Type of research

Regarding the type of research, the articles were organized within three groups: explorative, descriptive and confirmatory. The confirmatory group consisted of nine articles. The explorative and confirmatory groups both included three articles. It seems that IT and IS research are dominated by studies with the theory driven hypotheses.

### 5.1.2 Country of research and data collection

The data for analyzing determinants affecting on investment proposals were collected between 2000 and 2015 from eight different countries, four situated in Europe. Data were collected more than once in United States (7 databases) and in Taiwan (2 databases). The country of the data collection were not reported in three articles. One article did not specify, in which European country the data was collected.

The geographical coverage was fairly medium, and the number of studies in different countries was low. Majority (12) of the researches used purely survey as data collection method. Two researches used interviews, and one used both interviews and survey. A case study approach had been applied in one research of Shollo, Constantiou and Kreiner (2015). As reasoned earlier, a case study approaches did not mainly included to study, because they did not reach the quality standards of the study. This one study was justified to be included because of its exceptional relevance and liable nature. According to Eisenhardt (1989), the use of larger amount of case study would probably make an in-depth analysis and explanation of replication logic, in such a way that researchers could identify the similarities and differences across of data collection.

### 5.1.3 Time frame, sample size and response rate

Majority of the articles used cross-sectional data. There was only one study that used longitudinal database. The dominance of cross-sectional databases could have meant that, researchers provided somewhat superficial information. Longitudinal studies are needed in the future, because those present the process as it occurs over time. The survey sample size ranged between 23 and 2000. In the case study research, the sample size was 43, and another of the interview sample size was 23. The studies were conducted in years 2000 – 2015.

The average response rate of the articles varied from 7 % to 100% and the average rate was 39,5 %, which is quite good. Generally, the response rates varied from very low to very high. These low response rate studies used survey (7%, 9%, 18,5 %, 16,1%, 16%, 16, 7 %) as a data collection method. Few studies reported of actions of trying to activate the respondents. Personally administrated surveys might increase the response rate. Two studies also argued, that the low response rate is typical for executive questionnaires. It seems that in these low cases, the questionnaire arrangement were negligently arranged and the authors trusted naively, that respondents would be active.

#### 5.1.4 Industry type and firm size

Three studies examined only one industry. Manufacturing companies were studied in six articles. Services were studied in five articles. Studies examined manufacture included typically also service industry in their study. The rest examined finance (3), and insurance (3). There were seven studies, that included more than two industries in their studies. Further studies concentrating on specific industries are needed, because there may be differences between high tech and low tech companies. On the other half, studies with various industries with similar amount of informants of each industry may offer more generalizable information. The sizes of the companies varied from small to large. Typically studies examined either companies with large size (6) or all size companies (4). It seems that small and especially medium sized companies need for further examination.

#### 5.1.5 Informants

In 11 studies, the interviewees were identified as executives or managers. 14 articles used more than one informant group. The range of key informants were extended from CIOs to executives, top management, general managers, business partners, owners and controllers. For the validity, this indicates that in most of the articles the adequate informants were recognized. By using two or more informants from each firm researchers should be able to offset biases based on individual opinions. The work experience were reported in four articles, and it varied from 10 to 15 years. Only two of the studies reported the sex of the informants.

### 5.2 Theoretical frameworks utilized in the articles

None of the articles were mainly based purely on investment theories. Investment phenomenon was examined basing on the theory closest of the research orientation. Alignment theory, socio-technical system theory and IT adoption theory were all applied in two researches. All other theories varied. Majority of the studies discussed and reasoned specific theories quite well. Most of the articles gave a brief introduction to investment approach, even if they did not utilize investment theories. Only few studies discussed the relationship between the theory and findings. It appeared that there exists a limited amount of IS and IT investment theories. The combinations of several theories, or rather, precise perspectives, other than investment theories, dominated the studies of investment proposal adaption research.

The absence of investment theories makes the study of investment adoption fragmented and the comparison of findings more difficult. The complexity of the process of investment proposal adoption is important to examine in later studies.

TABLE 9 Methodological and definitional issues in the articles reviewed (continues to next page)

Author(s):	Type of Article:	Country of research:	Data Collection: Case Study Survey	Sample size:	Response rate:	Industry type:	Firm size:	Informants type:	Analytical approach: / Analyzing approach	Time Frame Cross-sectional Longitudinal	Average size of IT Budget/ year:	Amount of IT Professionals
Kearns & Lederer (2000)	Confirmatory	US	S	1200	107 responses	Various	All sizes Average annual budget \$250 M	50 % IS executives / 50 % other senior executives on the same firm	Porter's (1980) competitive forces model); IS-based resources for competitive advantage/ Grounded theory Structural equation modeling	Cross-sectional	N/A	> 19 IS professionals: 50%
Ryan & Harrison (2000)	Descriptive	US	S	108	46 % (50)	Aerospace Agriculture Construction Government Health care Real estate Others	All sizes	Presidents/owners: 12 % VP or CIO: 38 % Directors: 24 % Managers: 22 % Controllers: 4 %	Socio-technical systems theory (STS)/ Generic Use of Cost-Benefit Analysis, Tricore model	Cross-sectional	\$10000 -\$1000000	N/A
Enns, Huff & Golden (2001)	Confirmatory	North America	1) In-depth interview 2) Matched pair-survey	1) 7+7 2) 177+ 177	1) 100% 2) 15%	1) Various 2) Service & manufacture	1) N/A 2) Fortune 1000 firms	1) CIOs and their individually picked key business partners from same company 2) Top IS executives and their peers	Individual commitment theory/ Influence behavior theory Content analysis	Cross-sectional	N/A	N/A
Kambil & Lucas (2002)	Explorative	N/A	S	500	7%	N/A	L	50% CEOs 50% board directors	Upper Echelons / Correlation and factor analysis	1998 - 1999: Cross-sectional	2,18 % of Annual revenue	66% have CIO
Ryan, Harrison & Schkade (2002)	Confirmatory	37 states in US	S	1515	16 (200)	Service: 125 Manufacture: 68 Other: 7	S, L	President: 3 VP: 49 Dir IS/IT: 49 CIO 19 CFO 2 Controller 5 IS/IT manager 48 Other 25	Socio technical systems (STS) theory/ ANOVA repeated measures analysis of variance	Cross-sectional	£1,7 M of Annual Revenue	17 IT personels on average
Bassellier, Benbasat & Horner Reich (2003)	Confirmatory	North America	S	404	49%	Insurance: 1) car and home insurance, 2) insurance against loss of employment	L: 1) 5144 emp. 2) 2500 emp.	Business managers: hierarchical distance from the CEO: 1-2 levels:16% 3-4 levels:55% > 4 levels:2%	Theory of reasoned action/ Structural Equation Modeling with LISREL	Cross-sectional	1) \$3.22 CAD billion in revenues 2) \$1.6 billion CAD in revenues	Centralized IT department
Chang, Hung, Yen & Chen (2008)	Decribtive	Taiwan	S	500	16,7%	Logistics industry	74,1% L >\$80 M	Logistics executives: 29,6% General manager/ deputy general managers: 27,2% Others: 16%	Perspectives from several authors/ Discriminant analysis, open coding and axial coding and decribtion analysis	Cross-sectional	> NT\$1.51 million: 51,9%	> 5 persons in IS department: 49.4 %

Author(s):	Type of Article:	Country of research:	Data Collection: Case Study Survey	Sample size:	Response rate:	Industry type:	Firm size:	Informants type:	Theoretical approach: / Analyzing approach	Time Frame Cross-sectional Longitudinal	Average size of IT Budget/ year:	Amount of IT Professionals
Andriole (2009)	Confirmatory	*North America 56.9% *Europe 27.5% *Middle East 15.7%	S	>50	N/A	Manufact.: 21,6% Financial Services: 27,5% Insurance: 2% Chemicals: 5,9% Retail: 13,7% Technology: 11,8% Pharmac.: 7,8% Other: 9,8%	N/A ERB** 72, 7% or PMO***: 62,7%, OAB**** 5,9% / centralized IT 62% / N/A	CEO: 5,9% CFO: 3,9% Corp. CIO: 54,9% Div. CIO: 19,6% Corp. CTO: 2% Div. CTO: 3,9% Other: 9,8%	Alignment theory, Business technology Alignment Maturity Model	Cross-sectional	<\$5M: 11,8% \$5M - < \$10M: 9,8% >\$10 - \$25M: 2,6% >\$25M-\$100M: 17,6% >\$100M to \$500M: 19,6% >\$500M: 19,6%	1 - 9: 3,9% 10 - 19: 3,9% 20 - 49: 5,9% 50 - 99: 23,5% 100 - 499: 31,4% 500 - 999: 9,8% / /
Sobol & Klein (2009)	Confirmatory	US	S	1000	9,2 % (92)	N/A	N/A	IT managers: 52, general managers: 40	Upper Echelon/ N/A	Cross-sectional	N/A	N/A
Enns & McDonagh (2012)	Explorative	Ireland	Semi-structured interviews	23	100 %	Finance 8 Telecom 3 Manufact. 2 Public sector 10	L	9 CIOs as a part of top management, 14 CIOs a level below of top management	Alignment Theory / Iterative analysis	Cross-sectional	Average ICT investment €31 million	N/A
Wang, Chen, Nevo, Jin, Tang & Chow (2013)	Confirmatory	China	S	82	1) 79,3% 2) 91,5%	Manufact.: 54,5% Service: 45,5%	All sizes <100: 50% 101-999: 36,5% >1000: 13,5 %	N/A	Perspective of market orientation / PLS	Cross-sectional	N/A	N/A
Lin, Ku & Huang (2014)	Explorative	Taiwan	S	900	16,11% (130)	10 industries (43,8% manufact., 25,4 % services)	N/A	Top managers (VP: 60%, Assistant presiden 13,8 %, Senior manager :60%)	TOE Framework / Partial Least Squares (PLS)	Cross sectional	N/A	N/A
Oliveira, Thomas & Espadana (2014)	Descriptive	Portugal	S	2000	18,5% (369)	Manufact., service	N/A	CIO, CTO, VP of IS or E-business	IT adaption theory (TOE) / PLS, Holistic evaluation	Cross-sectional	N/A	N/A
Shollo, Constantiou & Kreiner (2015)	Confirmatory	N/A, *Scandinavia	CASE STUDY	43	100 %	Finance	L	Members of 21 prioritizing groups (PGs) included members of IT units, senior manager and members from various business units, IT committee	Evidence-based management theory / Evolutionary, iterative approach,	Longitudinal > 18 months	N/A	N/A
Singh, Aggarwal & Cojubarrenco (2015)	Confirmatory	N/A	S	200	23,5% (47)	Venture Capital	N/A	Random sample of 200 VCs who invest in early-stage IT ventures from the VentureXpert database	Framework of the illusion of knowledge / Comparative analysis / Regression analysis	Cross-sectional	N/A	N/A

TABLE 9. Methodological and definitional issues in the articles reviewed (continues from previous pages)

The analyzed units were: type of article, country of research, data collection, sample size, response rate, industry type, firm size, time frame (cross-sectional/longitudinal), definition of informants, theoretical and analyzing approach, theories utilized, IT budget and IT personnel on average. S= small, M = medium, L = Large

\* = Location of Corporate Headquarters

\*\* = executive review boards

\*\*\* = project management offices

\*\*\*\* = outside advisory board

### 5.3 The findings reported in the articles

The approaches to investment varied by article. The approaches are presented down below.

- Strategic alignment
- Human-related costs and benefits, evaluation
- CIO influencing, peer commitment
- Board competency and attitude, role of CIO
- IT competency
- RFID adaption evaluation adaption evaluation
- Governance competence, positioning
- CIO competence and influencing
- CIO influencing
- IT & market orientation alignment
- Top management characteristics, influence
- Cloud computing adoption evaluation
- Evidences for decision-making in prioritization process
- Competence of the champion

Based on these approaches and the content of the studies, three themes presented in Table 10 were identified. Attachment 4 presents the categories with themes and the main findings of the studies. The importance and the meanings of the findings and the limitations and shortages of the original work will be presented in Discussion in detail.

Themes	Approaches
Personal competence and behavior	CIO influencing, peer commitment Board competency and attitude, role of CIO Governance competence, positioning CIO competence and influencing CIO influencing Top management characteristics, influence Competence of the champion IT competency
Evidence evaluation	Human-related costs and benefits Cloud computing adoption Evidences for decision-making in prioritization RFID adaption
Company performance	Strategic alignment IT & market orientation alignment

TABLE 10 Themes of research articles

### 5.3.1 Personal competence and behavior

Totally eight articles included this category. The studies were implemented from different perspectives: CIO, Board, CEO, venture capitalist, peers of CIO and business manager bringing an insight of different roles. A competence is here seen to include personal traits, skills, abilities, motivation, education, experience and attitude.

What it comes to board members, age was discussed in two studies. They argued that the younger boards are associated with larger IT investment and existing older boards lacks of technology interest and knowledge causing relatively little board existence on investment decision making. Understanding of the board importance as another resource for managing IT and creating positive IT outcomes. CIO's good communication skills and relationship building skills were connected to effective and positive influencing behavior to others in organization. Unsuccessful influencing on executives was seen increasing the disconnection between CIOs and executives. Information intensity of an industry and internal environment were seen to be connected to CIO's ability to bring forward strategic proposals. A need for business education in strategic management for IT executives was noticed important in two studies for accepting CIOs in top management councils and for enabling to convince the peers to commit.

The relationship between the characteristics of the board of directors, IT rank, IT investments, and the presence and role of a CIO was noticed, just as rather technical, than general market oriented CIOs were noticed to have a higher infrastructure investment, no regard of size or market leader. The top manager's level of involvement was seen to have a positive influence on IT championing behavior, and that the most amenable for investment were the managers with high degree of openness to experience. Also CEO's attitudes and opinions were seen to relate to the firm's IT rank and budget, and his concern over the threats from technology, which is important especially when concerning the investment proposal acceptance. It was seen in two studies that IT knowledge and IT experience has a connection to intention to champion (business managers and venture capitalist).

Altogether, it seems that most of the IT and IS investment studies related to competence and behavior and presented different approaches. However, all the findings need further verification and new approaches, so that the certain taxonomia would be found. It is important to notice, that these findings were valid and produced in certain kinds of specific context and situation. Limitations and shortages, as mentioned earlier will be discussed later.

### 5.3.2 Evidence evaluation

The existed five articles in this category and the main finding are presented here. Two articles examined human-related costs and benefits, all the others different processes (RFID, cloud and prioritization).

The main factors which influences RFID (Radio Frequency Identification) adoption in the logistics industry are: pressure of competition in the market for the dimension of industry environment; pressure of transaction partners suppliers' industry environment, cost estimation, and integration of supply chain strategy, complexity and mutual standard.

Five factors were seen to influence the adoption of cloud computing: relative advantage, complexity, technological readiness, top management support and firm size. Facilitators and inhibitors of cloud-computing adoption were noticed to be different in the manufacturing and services sectors. When studying investment prioritization process, three aspects were noticed to affect on investment decision: 1) investment proposal's alignment with the company's roadmap; 2) the project's comparative value relative to competing projects within the group; 3) project's impact as part of a program or its interdependencies with other IT projects in the organization. The main investment decisions were noticed to be made during the this phase. Investment prioritization was noticed to involve a number of judgement devices (networks, sponsors, labels, domain expertise, and forums) to support decision makers to make a decision for prioritization IT projects in large scandinavian financial company.

Two studies argued that human-related (SCB) costs and benefits (eg. productivity, quality of work, change management, better communication, impact of IT on employees' feeling of loss of power or control, employee morale, job dissatisfaction) must be incorporated into IT investment decisions to evaluate IT payoffs more completely. When costs and benefits were included in the decision process, training expense and labor savings were assigned some tangible value. In the case of decisions that greatly disrupt the SCB, decision-makers tended to set more importance on post-implementation benefits, than they did on implementation costs. Altogether, evidence evaluation category included

### **5.3.3 Company performance**

Only two articles considered the investment's relationship with company performance. The aspects were IS - business alignment and IT and market orientation. It was noticed that while for IS executives both the information systems plan with the business plan (ISP-BP) and BP-ISP alignment predicted the use of IS-based resources for competitive advantage., for other senior executives, only ISP-BP alignment predicted it. Study noticed, that to achieve competitive advantage from their information systems investment, both groups shared an understanding of the role of ISP-BP.

Relating to IT and market orientation the examined the article showed that because market orientation were widely embedded into firm norms, values, and culture, it reflected a firm's ability to flexibly leverage resources to enable market-oriented activities and strategic movements based on market requirements. A firm with enhanced IT capabilities needed to consider aligning and combining IT with marketing orientation capabilities.



## 6 DISCUSSION

This chapter includes the main findings compared to other findings, the reliability, validity and the generalizability of the early work, just as of this study. The impact of the SLR method for the findings and for the information security research are highlighted as a main contribution of this study are concerned. The importance of this research, just as its contributions and limitations are discussed in detail.

### 6.1 Discussion of main findings

The findings indicated that there are challenges in investment adaption and these challenges relate to certain areas, the areas that are recognized also in information security field. The studies of IS and IT fields have similarities to information security, but they differ from that mostly because of their large amount, different perspectives, varying methodology, and the ways they were carried out. Investment proposal adoption has generally recognized to be a challenge, not only in information security field, but also in IT and IS fields. The challenge, both in IS and IT fields, just as in information security field, is in most cases tried to solve by mathematical calculations and financial estimations. It was also noticed, that the exclusion criterias, defined in chapter 3, actually excluded the majority of the IS and IT fields investment studies out of this research. This shows that there exists extremely small amount of IT or IS investment proposal studies from this specific perspective containing certain boundaries.

When concerning the original research question and the purpose of this study, the determinants affecting on the investment proposal adoption, it can be seen that the findings were two-folded. At first, the study was carried out carefully applying SLR guidance. Secondly, the various findings of determinants, that have impacts on investment decision-making were recognized, even if all these findings require further verification. Investment decision was considered as a sub-field for research about in half of studies.

The main findings (personal competence and performance) suggest that the factors both enabling and inhibiting investments are mainly organizational: they include a personal competence and behaviour (eg. obsolescent IT or business knowledge, a lack of influencing and relationship skills). This view has gained support even earlier, when Beath (1991) and Morton (1983) saw that influencing and relationship skills are important in project championing; they had crucial importance of the project, resolving conflicts, and unequivocally supporting the project team. Two other finding categories include evidence evaluation and company performance.

In research articles, the investment decision-maker typically were CEO or board or correlating, mainly the role had high status. However, Kelley and Lee (2010) argued that in many cases, champions are not at an organization's senior levels, and their position typically is not well defined within the organization's

chain of command. According to Knight (1987), Dougherty and Hardy (1996), they often struggle with limited access to resources and a lack of support from top management and the broader organization. The main contribution obviously is the concern of the methodology's impact on findings and its applicability when examining phenomenon like investment proposal adoption.

If the research data is viewed as a whole, it can be seen that studies focused on various processes, in companies with varying size, industry, structure, location and environment specific factors, so the comparability of the similarities and differences of the findings is limited.

The themes of different categories were easy to identify. Studies were conducted between 1998 - 2015, which is a quite long period concerning to industry, that develops in a very fast speed. Still the findings did not reflect of any time specific notions relating to this. Based on findings, this might point out that even the technology has developed enormous speed, the decision structure, practices and cultures have not changed that much. Might this affect both on information security, IS and IT investment challenges?

Strategically, investments were perceived as monitoring the process of investment irregularly and given little attention to global development of the domestic decisions relating to investments. Managers studied were likely to seek to maximize revenues from investment. More generally, investments were claimed to have difficulties in building a portfolio of strategic resources, which make them even more difficult to succeed.

It is interesting, that only one study described the whole investment process in detail, from the beginning till the adoption or rejection decision of the investment had been done. There did not exist a generally approved definition of where the process starts and where it ends. IT and IS investment proposal processes itself is underexamined phenomenon and this turned to be the deepest gap in previous study.

Varying theoretical frameworks were used to varying degrees. The both general and specific IT or IS investment decision theories were missing from the articles. Neither decision nor competence theories were applied in any of articles. There were shortcomings in the methodology of the articles, especially in reporting, defining precisely the target group, the general lack of reasoning of the choice made, and in sample size and response rate. The lack of use of longitudinal studies left the uncertainty of long-term effects of the operations. Comparative studies were missing. In general, analysis of the research articles were comprehensive, though there occurred defects for example in process reporting, methodology and analytical approaches.

The view is that there does not exist that much research of the phenomenon from this point of view and the generalizability of the findings is challenging. The need for further examination of this aspect is obvious, because information security investment proposals tend to fail.

## 6.2 Importance and the contribution of the study

The study did not give rigorous findings of determinants of the investment proposal adoption. The study is important because it 1) gave an insight of the current state of IT and IS research related to phenomenon; 2) tested the suitability of the SLR for examining the kind of phenomenon. When looking at investment proposal adoption, this kind of descriptive research is rare. The main contribution includes the discussion of the methodology suitability for the phenomenon and information security field, its limitations and suggestions of possible areas of development. The study arised the gaps of determing the process stage and key words used in investment proposal adoption research.

## 6.3 Validity, reliability, usability and the research methodology impacts

As mentioned, the quality (validity and reliability) of the study depends much on the original work of the systematic literature review. The review was conducted by following carefully the SLR guidance of Okoli and Schabram (2010), defining specific criterias for research material, screening content and quality carefully (more than required), and reporting and documenting all phases in detail. Anonymous reviewer was used to ensure, that relevant material would not have been rejected. Even when everything possible is done to ensure the validity and the reliability of the study, there does exist some limitations.

During the material search, it was noticed, that more strictly the determined the examined investment proposal process stage (pre or post) was, the far more easier it was then to recognize the adequate research articles. In most of cases, the adequance of the article did not managed to determine basing on the abstract of the article. This caused the reasoning for several extra screening stages. Similarly, definitions of the words used to describe key words 'adoption' decision (accept, make a decision, assimilate, leverage, align, adopt, approve, implement etc.) or investment 'proposal' (initiative, investment, proposition, project, prioritization etc.) varied a lot. The accurate determination, of which words are used to describe the phenomenon and the certain stage of process, do really matter. Basing on the findings, that may sign that these processes - or word determination have not unanimously defined in IS and IT fields. The ability to recognize the process specific stage is missing in IS and IT research.

Material search were definitely the most demanding phase of this SLR process, not least because of these causes. One conclusion is that the techniques developed during the process (pre-post definition) supported remarkably protocol screening. It was also noticed, that the data search bases did not have the kind of functions (search options) that the specific material could have been found.

After a strict and critical evaluation phases, 15 research articles were approved for this research. The amount is small, indeed, but more important than that is the fact, that the quality of the SLR depends of the quality of the original studies.

If these inclusion criterias would have been loosened, it is probable, that the study would have not met the aim set for SLR. Because of the limited amount of research material the general taxonomy was almost impossible to find, and even if found, the validity and the generalizability were left in suspicious light.

Even if the quality of the studies was generally relevant, these findings were single observations, that the missing taxonomy could be found. The gap of this study is the missing comparison for other studies. The reasoning for that is that there does not exist similar studies.

The methodology itself, caused certain limitations for the work. If following the guidance of Okoli and Schabram (2010), in this certain phenomenon, it can not be guaranteed that all relevant material were included.

It is possible in theory, that some suitable studies were excluded, because of research resources and it - would have made no sense to examine all articles found in material search. This indicates, that the SLR guidance related to information security, IS and IT studies should be focused. Another possibility to increase the validity of the study would be limit the material timely narrow, including few years.

Another question is, if the personal ability of the researcher is valid for determining the criterias for the quality and evidences required. The guidance of Okoli and Schabram (2010) lacks of comprehensive instructions of how to define and evaluate the sufficient quality of the content and the evidences of the research material. It is essential for SLR, that the research material is qualified and sufficient. The kind of tool is important so that the research articles could be compared and evaluated, which is one of the original aim of the SLR. This is another shortcome of the research method. As reported, the research process was concluded through as strictly as possible. The lack of these kinds of important boundaries might impact on the findings and the usability of the research.

When concerning the research method's impact on findings it is justified to state that the suitability of the research method for this phenomenon and also for the information security is limited and inefficient. Okoli's and Schabram's model does not directly suit for analysing investment proposal adoption research. The suggestions for the writers, researchers and the developers of the data search services are proposed. When it comes to this specific phenomenon, it is important for SLR to define the context and the entry and exclusion criterias exactly, so that the material search would not result into too wide material. Further development is needed relating to guidance of SLR.

## 7 CONCLUSIONS

The aim of this study was to produce a view of the factors that affects on determinants of investment proposals in a company context. The research question was: "What determinants affect on the adaptation of the investment proposal?"

The findings were two-folded. At first, several factors were found and then identified for three categories to affect on the investment proposals adaption. Most of them related to personal competences of both CIOs and decision-makers. Also factors relating to evidence evaluation, that was needed to support the decision-making - and the factors relating to company's performance were found. Secondly - it was found, that SLR, as the way it is guided now - has limitations as a research method for examining the phenomenon.

This theoretical study contributed research by offering an understanding of the state of the IT and IS researchs from this specific approach. The study scanned how widely the phenomenon has been studied, and how it is approached. The study also recognized factors affecting on investment proposals adaption and then offered a base for further confirmatory examinations of findings usability for information security. Study included usability evaluation of research method for the phenomenon being studied, and its limitations and benefits. The method, in the case of information security field, requires critical thinking and judgement in relation to work effort and time. Lots of areas were suggested to be reconsidered relating to further development of the SLR. Two gaps were found in early IS and IT studies; the lack of specific IS and IT investment theories and the lack of the descriptions of the investment processes.

Further study relating to investment could examine investment theories of information security, IS and IT. Further theoretical study could examine the state of the phenomenon earlier than year 2000. Leverageability of the decision theories could be tested empirically. Use of the approaches, other than information security, IT or IS, could be viewed. In this case, there is a need to find an area that deals with the intellectual, intangible asset perspective. Also the investment process in a company context itself, as it differs as a result of various factors, might need further examination. Empirical, longitudinal studies, including follow-up examinations are required, so that for example the time effects for the phenomenon could be understood and the validity of the work could be guaranteed.

When it comes to limitations, it cannot be said, that true taxonomy of the determinants affecting on investment proposals adaption could have been found. Mainly, because of irrelevancy of the research method and a small amount of original work, the validity and the generalizability of the findings have to be questioned. SLR method for IS and IT needs to be developed to get it more optimal, rigorous and effective.

## REFERENCES

- Aveyard, H. (2007). *Doing a Literature Review in Health and Social Care: A Practical Guide*. Open University Press, Berkshire.
- Aveyard, H. (2010). *Doing a Literature Review in Health and Social Care: A Practical Guide* (2nd edition). Open University Press, Berkshire.
- Backhouse, J., Baptista, J. & Hsu, C. (2006). Rating Certificate Authorities: A Market Approach to the Lemons Problem. *Journal of Information System Security*, 2(2), 3-14. Retrieved 02.06.2016 from <http://www.jissec.org/Contents/V2/N2/V2N2-Backhouse.html>
- Bacon, J. (1994). Why companies invest in information technology? *MIS Quarterly*, pp. 335-354.
- Bandyopadhyay, T., Liu, D., Mookerjee, V., & Wilhite, A. (2012). Dynamic competition in IT security: A differential games approach. *Information Systems Frontiers*, 16(4), 643-661.
- Baskerville, R. & Siponen, M. (2002). An information security metapolicy for emergent organizations. *Logistics Information Management*, 15(5/6), 337-346.
- Baumeister, R.F. and Leary, M.R. (1997). Writing narrative Literature Reviews. *Review of General Psychology* 1997, 1(3), 311-320. Retrieved 01.02.2016 from <http://psychology.yale.edu/sites/default/files/baumeister-leary.pdf>
- Beath, C.M. (1991). Supporting the information technology champion. *MIS Quarterly*, 15 (3), 355-372.
- Beebe, Nicole L.; Young, Diana K.; and Chang, Frederick R. (2014). Framing Information Security Budget Requests to Influence Investment Decisions. *Communications of the Association for Information Systems*, 35(7).
- Bodin, L., Gordon, L.A. & Loeb, M.P. (2005). Evaluating information security investments using hierarchy. *Communications of ACM*, 48(2).
- Boell, S. & Cecez-Kecmanovic, D. J. (2015). On being 'systematic' in literature reviews in IS. *Journal of Information Technology*, 30(161). Retrieved 30.07.2016 from doi:10.1057/jit.2014.26 JIT
- Briney, A. & Prince, F. (2002). 2002 ISM survey: Does size matter. *Information Security Magazine*. Retrieved 02.02.2016, from: <http://www.infosecurity-mag.com>
- Brynjolfsson, E. & Hitt, L.M. (1998). Beyond the productivity paradox: Computers are the CAlyst for Bigger Changes. *Communications of the ACM*.
- Caralli, R.A. & Wilson, W.R. (2004). The challenges of security management. Survivable Enterprise Management Team. Networked Systems Survivability Program. Software Engineering Institute. Retrieved 01.05.2016 from <http://www.cert.org/archieve/pdf/ESMchallenges.pdf>
- Caffrey, E. & McDonagh, J. (2008). A longitudinal perspective on critical issues in the management of information systems in large organisations. Proceedings of the 1st International Conference on Business Innovation and Information Technology, Dublin, Ireland, Logos Verlag, 36(64).

- Cavusoglu, H., Cavusoglu, H. & Raghunathan, S. (2004). Economics of IT Security Management: Four Improvements to Current Security Practices. *Communications of the Association for Information Systems*, 14, 65-75.
- Cavusoglu, H., Cavusoglu, H., Son, J-Y. & Benbasat. (2015). Institutional pressures in security management: Direct and indirect influences on organizational investment in information security control resources. *Information & Management*, 52(4), 385-400.
- Cavusoglu, H., Raghunathan, S., & Yue W.T. (2008). Decision-Theoretic and Game-Theoretic Approaches to IT Security Investment. *Journal of Management Information Systems*, 25(2), 281-304.
- Chai, S., Kim, M. & Rao, H.R. (2011). Firm's information security investment decisions: Stock market evidence of investors' behavior. *Decision Support Systems*, 50, 651-661.
- Chakrabarti, A. (1974). The role of champion in product innovation. *California Management Review*, 17(2), 58-62.
- Cochrane, A.L. (1972). *Effectiveness and efficiency: random reflections on health services*. London: Royal Society of Medicine Press.
- Davis, A. (2005). Return on security investment-proving it's worth it. *Network Security*, 8-10.
- Dhillon, G. and Backhouse, J. (2001). Current directions in IS security research: towards socio-organizational perspectives. *Information Systems Journal*, 11, 127-153.
- Dougherty, D. and Hardy, C. (1996). Sustained Product Innovation in Large, Mature Organizations: Overcoming Innovation-to-Organization Problems. *Academy of Management Journal*, 39(5), 1120-1153.
- Dutta, A., & McCrohan, K. (2002). Management's Role in Information Security in a Cyber Economy. *California Management Review*, 45(1), 67-87.
- Eisenhardt, K.M. (1989). Building theories from case study research. *Academy of Management Review*, 14(4), 532-550.
- Eskola, J. & Suoranta, J. (2000). *Johdatus laadulliseen tutkimukseen*. Tampere: Vas tapaino, 164-165.
- Fenz, S., Ekelhart, A. & Neubauer, T. (2011). Information Security Risk Management: In Which Security Solutions Is It Worth Investing? *Communications of the Association for Information Systems*, 28(22).
- Fiegenbaum, A. and Thomas, H. (1988). Attitudes toward Risk and the Risk-Return Paradox: Prospect Theory Explanations. *The Academy of Management Journal*, 31(1), 85-106.
- Fink, A. (2005). *Conducting Research Literature Reviews: From the Internet to Paper* (2. Edit.). Thousand Oaks, California: Sage Publications.
- Gal-Or, E. and A. Ghose. (2005). "The Economic Incentives for Sharing Security Information," *Information Systems Research* (16)2, pp. 186-208
- Backhouse, J., Baptista, J. and Hsu, C. (2006). Rating Certificate Authorities: A Market Approach to the Lemons Problem. *Journal of Information System Security*, 2(2), 3-14.

- Goel, S. and Shawky, H.A. (2009). Estimating the market impact of security breach announcements on firm values. *Information & Management*, 46(7), 404-410 and *Information & Management*, Volume 46(8), 442-447.
- Gordon, L. A., & Loeb, M. P. (2002). The Economics of Information Security Investment. *ACM Transactions on Information and System Security (TISSEC)*, 5 (4), 438-457.
- Gordon, L. A., & Loeb, M. P. (2006). Economic aspects of information security: an emerging field of research. *Information System Frontiers*, 8(5), 335-337.
- Hausken, K. (2006). Returns to information security investment: The effect of alternative information security breach functions on optimal investment and sensitivity to vulnerability. *Information Systems Frontiers*, 8(5).
- Henderson, J.C. & Venkatraman, N. (1999). *Strategic Alignment: Leveraging Information Technology for Transforming Organizations*. IBM Systems Journal.
- Hitt, L.M., & Brynjolfsson, E. (1996). Productivity, business profitability, and consumer surplus: Three different measures of information technology value. *MIS Quarterly*, 20(2), 121-141.
- Holden, T., and Wilhelmij, P. (1995). Improved decision-making through better integration of human resource and business process factors in a hospital situation. *Journal of Management Information Systems*, 12(3), 21-41.
- Huang, C.D., Hu, Q., Behara, R.S. (2008). An economic Analysis of the Optimal Information Security Investment in the Case of a Risk-Averse Firm. *International Journal of Production Economics*, 114(2), 793-804.
- Höne, K., & Eloff, J. H. P. (2002). What Makes an Effective Information Security Policy? *Network Security*, 6, 14-16.
- Ioannidis, C., Pym, D., and Williams, J. (2011). Fixed Costs, Investment Rigidities, and Risk Aversion in Information Security: A Utility-Theoretic Approach. Proceedings of the Tenth Workshop on the Economics of Information Security (WEIS), 171-191.
- Irani, Z.; Ezingard, J.N.; and Grieve, R.J. Integrating the costs of a manufacturing IT/ IS infrastructure into the investment decision-making process. *Technovation*, 11, 12 (1997), 695-706.
- Jegers, M. (1991). Prospect Theory and The Risk-Return Relation: Some Belgian Evidence. *The Academy of Management Journal*, 1(34), 215-225.
- Jousimaa, J., Liira, H., Liira, J. & Komulainen, J. (2010). Hoitosuositusten näytönasteen ja vahvuuden arviointi GRADE - työryhmän tapaan. *Lääketieteellisen Aikakauskirja Duodecim*, 126(16), 1936-1943.
- Karjalainen, M., Siponen, M., Kohli, R. & Shao, X. (2014). What's in it for me? A Stakeholder Theory perspective on Information Technology Security Investment. Completed Research Paper, 1-30. Conference Proceedings. The 2013 Dewald Roode Workshop on Information Systems Security Research, IFIP WG8.11/WG11.13
- Keen, P. (1991). Keynote address: relevance and rigor in information systems research, in H. Nissen, H., Klein and R. Hirschheim (eds) (1991) *Information Systems Research: Contemporary Approaches and Emergent Traditions*, Elsevier Publishers, North Holland, 27-49.



- Kekäle, T., Weerd-Nederhof, P.D., Cervai, S. & Borelli, M. (2009). The "dos and dont's" of writing a journal article. *Journal of Workplace Learning*, 21(1), 71. Retrieved 07.01.2016 from <http://proquest.umi.com/pqdweb?did=1632350541&Fmt=7&clientId=10306&RQT=309 &VName=PQD>
- Kelley, D. & Lee, H. (2010). Managing innovation champions: the impact of project characteristics on the direct manager role. *Journal of Product Innovation Management*, 27(2010), 1007-1019.
- Knight, R.M. (1987). Corporate Innovation and Entrepreneurship: A Canadian Study. *Journal of Product Innovation Management*, 4(4), 284-297.
- Kontio, E. & Johansson, K. (2007). Systemaattinen tarkastelu alkuperäistutkimuksien laatuun. Teoksessa Johansson, K., Axelin, A., Stolt, M. & Ääri, R-L. (toim.) *Systemaattinen kirjallisuuskatsaus ja sen tekeminen*. Turun yliopisto. Hoitotieteen laitoksen julkaisuja. Tutkimuksia ja raportteja. A(51), 101-108
- Kort, P., Haunschmied, J. and Feichtinger, G. (1999). Optimal Firm Investment in Security. *Annals of Operations Research*, 88(0), 81-98.
- Kääriäinen J. (2010). Verkkorikollisuuden vaarat. *Haaste*, 3.
- Liu, D., Ji, Y., and Mookerjee, V. (2011). Knowledge Sharing and Investment Decisions in Information Security. *Decision Support Systems*, 52(1), 95-107.
- Macdonald, G. (2003) Using systematic reviews to improve social care. Reports. Social Care Institute for Excellence, 4, 3-6.
- Magnusson, C., Molvidsson, J., & Zetterqvist, S. (2007). Value Creation and Return On Security Investments (ROSI), in IFIP International Federation for Information Processing 232. In H. Venter, M. Eloff, L. Labuschagne, J. Eloff, and R. von Solms (Eds.), *New Approaches for Security, Privacy and Trust in Complex Environments* (25-35). Boston.
- Maidique, M.A. (1980). Entrepreneurs, champions, and technological innovation. *Sloan Management Review*, 22, 59-76.
- Matt, C., Hess, T. & Benlian, A. (2015). Digital Transformation Strategies. *Springer Fachmedien Wiesbaden*, 57(5), 229-343.
- Matsuura, K. (2003). Information Security and Economics in Computer Networks: An Interdisciplinary Survey and a Proposal of Integrated Optimization of Investment. *Computing in Economics and Finance*, 48, 1-13.
- Metsämuuronen, J. (2005). Näyttöön perustuva päätöksenteko ja systemoitu kirjallisuuskatsaus. *Psykologia*, 40(5-6), 578-581.
- Metsämuuronen, J. (2010). Tutkimuksen tekemisen perusteet ihmistieteissä. *E-kirja Tutkijalaitos*. International Methelp oy. Retrieved 08.01.2016 from <http://www.methelp.com/pdf/TTP4demo.pdf>
- Mithas, S., Ramasubbu, N., and Sambamurthy, V. (2011). How Information Management Capability Influences Firm Performance. *MIS Quarterly*, 35(1), 237-256.
- Mizzi, A. (2010). Return on information security investment – The viability of an anti-spam solution in a wireless environment. *International Journal of Network Security*, 10(1), 18-24.

- Morton, G.H.A., (1983). Become a project champion. *International Journal of Project Management* 1(4), 197-203.
- Myers, P. M. D. (2008). *Qualitative Research in Business & Management* (illustrated edition.). Sage Publications Ltd.
- Okoli, C. & Schabram, K. (2010). A Guide to Conducting a Systematic Literature Review of Information Systems Research. Sprouts. Working Papers on Information Systems. Retrieved 01.03.2016 from <http://www.nti.ufpb.br/~evandro/pe-quisa/RSL/%28Okoli,%20Schabram%202010%20Sprouts%29%20systematic%20literature%20reviews%20in%20IS%20research.pdf>
- Onwubiko, C. & Lenenghan, A.P. (2009). Challenges and complexities of managing information security. *International Journal of Electronic Security and Digital Forensics*, 2(3). Retrieved 01.05.2016 from <http://www.inderscienceonline.com/doi/abs/10.1504/IJESDF.2009.027524>
- Pettigrew, M., Roberts, H. (2006) *Systematic Reviews in the Social Sciences: A Practical Guide*. Blackwell, Malden.
- Pinto, J.K. & Patanakul, P. (2015). When narcissism drives project champions: A review and research agenda. *International Journal of Project Management*, 33(5), 1180-1190.
- Pinto, J.K. & Slevin, D.P. (1998). The project champion: key to implementation success. *Project Management Journal*, 20(4), 15-20.
- Pope, C., Mays, N. & Popay, J. (2007). *Synthesizing Qualitative and Quantitative Health Evidence. A Guide to Methods*. Open University Press, Maidenhead, 32-40.
- Purser, S. (2004). Improving the ROI of the security management process. *Computers & Security*, 23, 542-546.
- Ramachandran, S. and G. W. White. (2005). Methodology to Assess the Impact of Investments in Security Tools and Products. *Journal of Information System Security*, 1(2), 3-25.
- Rutter, D., Francis, J., Coren, E., Fisher, M. (2010). *SCIE Systematic Research Reviews: Guidelines* (2nd edition). Social Care Institute for Excellence, London, 21.
- Sackett, D.L., Rosenberg, W.M.C., Gray, J.A.M., Haynes, R.B. & Richardson, W.S. (1996). Evidence based medicine: what it is and what it isn't. *British Medical Journal*, 312, 71-2.
- Saint-Germain, R. (2005). Information Security Management Best Practices Based on ISO/IEC 17799. Setting Standards. *The Information Management Journal*, 60-66. Retrieved 04.03.2016 from [http://www.arma.org/bookstore/files/Saint\\_Germain.pdf](http://www.arma.org/bookstore/files/Saint_Germain.pdf)
- Schniederjans, M.J. & Cao, Q. (2002). *E-commerce operations management*. World Scientific Publishing Company. Singapore.
- Schon, D.A. (1963). Champions for radical new inventions. *Harvard Business Review*, 41 (2), 77-86.
- Semich, J.W. (1994). Here' s how to quantify it investment benefits. *Datamation*,

- 40(1), 45– 48.
- Simms, I. Evaluating IT, where cost-benefit analysis fails. *Australian Accountant*, 67, 4 (1997), 29–31.
- Smith, M., Glass, G. & Miller, T. (1980). *The benefits of psychotherapy*. Baltimore, MD: Johns Hopkins University Press.
- Sonnenreich, W., Albanese, J., Stout, B. (2006). Return On Security Investment (ROSI) - A Practical Quantitative Modell. *Journal of Research and Practice in Information Technology*, 38(1): 45-56.
- Stellingwerf, R. & Zandhuis, A. (2013). ISO 21500 Guidance on project management - A Pocket Guide. Van Haren Publishing, Zaltbommel.
- Suoranta, L. (2008). Verkkorikokannattaa. *Tietokone*, 14.
- Tanaka, H., Matsuura, K. & Sudoh, O. (2005). Vulnerability and information security investment: An empirical analysis of e-local government in Japan. *Journal of Accounting and Public Policy*, 24, 35-59.
- Tatsumi, K. and Goto, M. (2010). Optimal timing of Information Security Investment: A Real Options Approach, in *Economics of Information Security and Privacy*. In T. Moore, D. Pym & C. Ioannidis (Eds.), 211-228. New York NY: Springer US.
- Taylor, S.J., Bodgan, R. & DeVault, M.L. (2015). *Introduction to Qualitative Research Methods: A Guidebook and Resource*. Retrieved 09.02.2016 from [https://books.google.fi/books?hl=en&lr=&id=pONoCgAAQ-BAJ&oi=fnd&pg=PR11&dq=benefits+of+qualitative+research&ots=Qgxiaw9w4N&sig=b6szLEKVVW6YXwXbHIWswTAuzhs4&redir\\_esc=y#v=onepage&q=benefits%20of%20qualitative%20research&f=false](https://books.google.fi/books?hl=en&lr=&id=pONoCgAAQ-BAJ&oi=fnd&pg=PR11&dq=benefits+of+qualitative+research&ots=Qgxiaw9w4N&sig=b6szLEKVVW6YXwXbHIWswTAuzhs4&redir_esc=y#v=onepage&q=benefits%20of%20qualitative%20research&f=false)
- Tracy, R.P. (2007). IT Security Management and Business Process Automation: Challenges, Approaches, and Rewards. *Information Systems Security*, 16(2), 114-122.
- Tsiakis, T. and Pecos, G. (2008). Analyzing and determining Return on Investment for Information Security. *International Conference on Applied Economics (ICOAE)*, 879-884.
- Tuomi, J. & Sarajärvi, A. (2009). *Laadullinen tutkimus ja sisällönanalyysi*. Tammi, Helsinki.
- van Ark, B. (2014). Productivity and Digitalisation in Europe: Paving the Road to Faster Growth. The Conference Board and the Centre for Innovation Economics.
- Vroom, C. and von Solms, R. (2004.) Towards information security behavioural compliance. *Computers & Security*, 23(3), 191-198.
- Wang, S.L., Chen, J.D., Stirpe, P.A., & Hong, T.P. (2009). Risk-Neutral Evaluation of Information Security Investment on Data Centers. *Journal of Intelligent Information Systems*, 36(3), 329-345.
- Whitman, M.E. (2003). Enemy at the Gate: threats to 2003 information security. *Communications of the ACM*, 46(8), 91-95. Retrieved 20.04.2016 from [http://www.sis.pitt.edu/jjoshi/courses/IS2621/p91\\_whitman.pdf](http://www.sis.pitt.edu/jjoshi/courses/IS2621/p91_whitman.pdf)
- Williams, G.A. & Miller, R.B. (2002). Change the way you persuade. *Harvard bu-*

*business review*, 80(5), 64-73.

- Zafar, H. and Clark, J.G: (2009). Current State of Information Security Research in IS. *Communications of the Association for Information Systems*, 24(34), 557-596.
- Zaini, M.K. & Masrek, M.N. (2013). Conceptualizing the Relationships between Information Security Management Practices and Organizational Agility. *Advanced Computer Science Applications and Technologies (ACSAT), 2013 International Conference*, 269-273. Retrieved 03.03.2016 from <http://ieeexplore.ieee.org/xpl/articleDetails.jsp?arnumber=6836589&queryText=information%20security%20management&newsearch=true>

### **Non-published sources**

- Project Management Institute. (2013). Project Management Talent Gap. Report.
- Kajava, J., Anttila, J., Varonen, R., Savola, R. & Röning, J. (2006). Senior Executives Commitment to Information Security - from Motivation to Responsibility. Retrieved 19.02.2016 from [http://www.ee.oulu.fi/research/bisg/files/pdf/pdf\\_1013.pdf](http://www.ee.oulu.fi/research/bisg/files/pdf/pdf_1013.pdf)
- Karjalainen, M., Siponen, M., Kohli, R. & Shao, X. (2015). Toward a Behavioral Theory of Information Technology Security Investment Decisions: A Multiple Case Study.
- Menon, N. and Siponen, M. (2015). Inadequate Investment in Information Security: A Field Experiment on the Role of Senior Managers' Decision-Making Biases.
- Salminen, A. (2010) Mikä on kirjallisuuskatsaus. *Johdatus kirjallisuuskatsauksen tyyppeihin ja hallintotieteellisiin sovelluksiin*. Vaasan yliopiston julkaisuja. Opetusjulkaisuja 62. Julkisjohtaminen 4. Retrieved 29.02.2016 from [http://www.uva.fi/materiaali/pdf/isbn\\_978-952-476-349-3.pdf](http://www.uva.fi/materiaali/pdf/isbn_978-952-476-349-3.pdf)
- Siponen, M., Karjalainen, M., Kohli, R., & Shao, X. (2014). Examining the Mystery of Underinvestment in Information Security: Explaining Why Information Security Investment Proposals are Accepted or Rejected.
- Toivanen, H. (2015). *Case study of why information security investment decision fail?* Unpublished Master thesis. University of Jyväskylä.

### **Internet sources**

- Bowen, P., Chew, E. & Hash, J. (2007). NIST Information Security Guide for Government executives. NIST. Technology Administration, U.S. Department of Commerce. National Institute of Standards and Technology. Retrieved 03.06.2016 from [http://csrc.nist.gov/publications/nistir/ir7359/CSD\\_ExecGuide-booklet.pdf](http://csrc.nist.gov/publications/nistir/ir7359/CSD_ExecGuide-booklet.pdf)
- Business Dictionary. (2016). Definition of Company by Business Dictionary. Ret-

- rieved 01.06.2016 from [www.businessdictionary.com/definition/company.html](http://www.businessdictionary.com/definition/company.html)
- Cybersecurity Ventures. (2016). The Cybersecurity Market Report (Q2 2016). Retrieved 03.06.2016 from <http://cybersecurityventures.com/cybersecurity-market-report/>
- European Union Agency for Network and Information Security. (2016). ENISA Threat Landscape 2015. Retrieved 14.05.2016 from <https://www.enisa.europa.eu/publications/etl2015>
- Ernst & Young. (2013). Under cyber attack. EY's Global Information Security Survey 2013. Retrieved 02.06.2016 from [http://www.ey.com/Publication/vwLUAssets/EY\\_\\_2013\\_Global\\_Information\\_Security\\_Survey/\\$FILE/EY-GISS-Under-cyber-attack.pdf](http://www.ey.com/Publication/vwLUAssets/EY__2013_Global_Information_Security_Survey/$FILE/EY-GISS-Under-cyber-attack.pdf).
- European Commission. (2016). European Digital Progress Report. Retrieved 23.05.2016 from <https://ec.europa.eu/digital-single-market/en/news/commission-releases-2016-european-digital-progress-report-unequal-progress-towards-digital>
- Her Majesty's Government. (2015). Information Security Braches Survey 2015. Technical report. UK Survey. Retrieved 02.06.2016 from: <https://www.pwc.co.uk/assets/pdf/2015-isbs-technical-report-blue-03.pdf>
- Investopedia. (2016) Definition of Investment by Investopedia. Retrieved 01.06.2016 from <http://www.investopedia.com/terms/i/investment.asp>
- ISACA. (2016). Conference State of Cybersecurity: State of Cybersecurity. Implications for 2016. An ISACA and RSA Conference Survey. (Cybersecurity Nexus, CSX). Retrieved 08.08.2016 from [http://www.isaca.org/cyber/Documents/state-of-cybersecurity\\_res\\_eng\\_0316.pdf](http://www.isaca.org/cyber/Documents/state-of-cybersecurity_res_eng_0316.pdf)
- Julkaisuforum.fi. (2016). Classifications of publication channels. Retrieved 01.-04.2.2016 from [www.julkaisuforum.fi](http://www.julkaisuforum.fi)
- Kaspersky Lab. (2016). Damage Control: The Cost of Security Breaches. IT Security Risks Special Report Series. Retrieved 01.06.2016 from: <http://media.kaspersky.com/pdf/it-risks-survey-report-cost-of-security-breaches.pdf>
- Merriam-Webster. (2016). Definition of Company by Merriam-Webster. Retrieved 01.06.2016 from [www.merriam-webster.com/dictionary/company](http://www.merriam-webster.com/dictionary/company)
- Palfreyman, J. (2012). Smarter Cyber Defence. NATO NEC Conference 2012 Vienna. Retrieved 01.06.2016 from [www.iiss.org/recent-key-addresses/iain-lobban-address/97](http://www.iiss.org/recent-key-addresses/iain-lobban-address/97)
- Ponemon Institute. (2015). 2015 Global Cyber Impact Report. Retrieved 20.05.2016 from <http://www.aon.com/attachments/risk-services/2015-Global-Cyber-Impact-Report-Final.pdf>
- Schneier, B. (2007). Schneier on Security. Retrieved 24.05.2016 from [https://www.schneier.com/blog/archives/2008/09/security\\_roi\\_1.html](https://www.schneier.com/blog/archives/2008/09/security_roi_1.html)
- The World Economic Forum. (2015). The Global Risks 2015 Report. Retrieved 20.05.2016 from [http://www3.weforum.org/docs/WEF\\_Global\\_Risks\\_2015\\_Report15.pdf](http://www3.weforum.org/docs/WEF_Global_Risks_2015_Report15.pdf)

- The World Economic Forum. (2016). The Global Risks Landscape 2016. Retrieved 20.05.2016 from <http://reports.weforum.org/global-risks-2016/global-risks-landscape-2016/#landscape>
- Valentine, J.C. & Konstantopoulos, S. (2016). Design and use of Meta-analysis. Using Systematic Reviews and Meta-Analyses to Inform Public Policy Decisions Committee on the Use of Economic Evidence to Inform Investments in Children, Youth, and Families. Retrieved 26.08.2016 from [http://sites.nationalacademies.org/cs/groups/dbassesite/documents/webpage/dbasse\\_171853.pdf](http://sites.nationalacademies.org/cs/groups/dbassesite/documents/webpage/dbasse_171853.pdf)
- Verizon (2015). Cost of Data Breach Study. Retrieved 03.06.2016 from <http://www-03.ibm.com/security/data-breach/>

### Reserch literature material

- Andriole, S. J. (2009). Boards of Directors and Technology Governance: The Surprising State of the Practice. *Communications of the Association for Information Systems*, 24(22). Retrieved 11.05.2016 from: <http://aisel.aisnet.org/cais/vol24/iss1/22>
- Bassellier, G., Benbasat, I. & Horner Reich, B. (2003). The Influence of Business Managers' IT Competence on Championing IT. *Information Systems Research*, 14(4), 317-336. Retrieved 11.05.2016 from <http://dx.doi.org/10.1287/isre.14.4.317.24899>
- Benaroch, M., Jeffery, M., Kauffman, R.J. & Shah, S. (2007). Option-Based Risk Management: A Field Study of Sequential Information Technology Investment Decisions. *Journal of Management Information Systems*, 24(2), 103-140. Retrieved 11.05.2016 from <http://www.tandfonline.com/doi/pdf/10.2753/MIS0742-1222240205?needAccess=true>
- Byrd, T.A., Lewis, B.R. & Bryan, R.W. (2006). The leveraging influence of strategic alignment on IT investment: An empirical examination. *Information & Management*, 43(3), 308-321. Retrieved 14.05.2016 from <http://www.sciencedirect.com/science/article/pii/S0378720605000674>
- Chang, S-I., Hung, S-Y., Yen, D.C. & Chen, Y-J. (2008). The Determinants of RFID Adoption in the Logistics Industry - A Supply Chain Management Perspective. *Communications of the Association for Information Systems*, 23(12). Retrieved 11.05.2016 from <http://aisel.aisnet.org/cais/vol23/iss1/12>
- Chowdhury, N.M., Sherer, S.A. & Ray, M.R. (2001). Realizing IT Value at Air Products and Chemicals, Inc. *Communications of the Association for Information Systems*, 7(23). Retrieved 11.05.2016 from <http://aisel.aisnet.org/cais/vol7/iss1/23>
- Enns, H.G., Huff, S.L. & Golden, B.R. (2001). How CIOs obtain peer commitment to strategic IS proposals: barriers and facilitators. *The Journal of Strategic Information Systems*, 10(1), 3-14. Retrieved 09.05.2016 from <http://www.sciencedirect.com/science/article/pii/S0963868701000415>

- Enns, H.G. & McDonagh, J.J. (2012). Irish CIOs' Influence on Technology Innovation and IT-Business Alignment. *Communications of the Association for Information Systems*, 30(1). Retrieved 11.05.2016 from <http://aisel.aisnet.org/cais/vol30/iss1/1>
- Frisk, E.J., Bannister, F. & Lindgren, R. (2015). Evaluation of information system investments: A value dial approach to closing the theory-practice gap. *Journal of Information Technology*, 30(3), 276-292. Retrieved 14.05.2016 from <http://dx.doi.org/10.1057/jit.2014.9>
- Hahn, E.D., Doh, J. & Bunyaratavej, K. (2009). The Evolution of Risk in Information Systems Offshoring: The Impact of Home Country Risk, Firm Learning, and Competitive Dynamics. *MIS Quarterly*, 33(3), 597-616. Retrieved 20.05.2016 from <http://web.a.ebscohost.com/ehost/pdfviewer/pdfviewer?sid=c14c61af-e00d-47b3-877e-c4f4aebcfa94%40sessionmgr4006&vid=1&hid=4114>
- Hedman, J. and Henningsson, S. (2016). Developing ecological sustainability: a green IS response model. *Information Systems Journal*, 26(3), 259-287. Retrieved 11.05.2016 from <http://dx.doi.org/10.1111/isj.12095>
- Kambil, A. & Lucas, H.C. (2002). The Board of Directors and the Management of Information Technology. *Communications of the Association for Information Systems*, 8(26). Retrieved 11.05.2016 from <http://aisel.aisnet.org/cais/vol8/iss1/26>
- Kearns, K.S. & Lederer, A.L. (2000). The effect of strategic alignment on the use of IS-based resources for competitive advantage. *The Journal of Strategic Information Systems*, 9(4), 265-293. Retrieved 11.05.2016 from <http://www.sciencedirect.com/science/article/pii/S0963868700000494>
- Lin, T.-C., Ku, Y.-C. & Huang, Y.-S. (2014). Exploring top managers' innovative IT (IIT) championing behavior: Integrating the personal and technical contexts. *Information & Management*, 51(1), 1-12. Retrieved 14.05.2016 from <http://www.sciencedirect.com/science/article/pii/S037872061300092X>
- Oliveira, T., Thomas, M. & Espadana, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. *Information & Management*, 51(5), 497-510. Retrieved 14.05.2016 from [http://ac.els-cdn.com/S0378720614000391/1-s2.0-S0378720614000391-main.pdf?\\_tid=f4422f4c-63f2-11e6-9dea-00000aacb361&adnat=1471380761\\_95f75f622a183d54e9f8527e22a39af0](http://ac.els-cdn.com/S0378720614000391/1-s2.0-S0378720614000391-main.pdf?_tid=f4422f4c-63f2-11e6-9dea-00000aacb361&adnat=1471380761_95f75f622a183d54e9f8527e22a39af0)
- Pavlou, P.A., Housel, T. J., Rodgers, W. & 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). Retrieved 13.05.2016 from <http://aisel.aisnet.org/jais/vol6/iss7/8>
- Ryan, S.D. & Harrison, D.A. (2000). Considering Social Subsystem Costs and Benefits in Information Technology Investment Decisions: A View from the Field on Anticipated Payoffs. *Journal of Management Information Sys*

- tems*, 16(4), 11-40. Retrieved 11.05.2016 from <http://dx.doi.org/10.1080/07421222.2000.11518264>
- Ryan, S.D., Harrison, D.A. & Schkade, L.L. (2002). Information-Technology Investment Decisions: When Do Costs and Benefits in the Social Subsystem Matter? *Journal of Management Information Systems*, 19(2), 85-127. Retrieved 11.05.2016 from <http://dx.doi.org/10.1080/07421222.2002.11045725>
- Shollo, A., Constantiou, I. & Kreiner, K. (2015). The interplay between evidence and judgment in the IT project prioritization process. *The Journal of Strategic Information Systems*, 24(3), 171-188. Retrieved 09.05.2016 from <http://www.sciencedirect.com/science/article/pii/S0963868715000347>
- Singh, H., Aggarwal, R. & Cojuharenco, I. (2015). Strike a happy medium: The effect of IT knowledge on venture capitalists' overconfidence in IT investments. *MIS Quarterly*, 39(4), 887-908. Retrieved 08.05.2016 from <http://web.b.ebscohost.com/ehost/pdfviewer/pdfviewer?vid=1&sid=b4f4881c-be1c-44f8-a956-18bcdde1be76%40sessionmgr1>
- Sobol, M.G. & Klein, G. (2009). Relation of CIO background, IT infrastructure, and economic performance. *Information & Management*, 46(5), 271-278. Retrieved 14.05.2016 from <http://www.sciencedirect.com/science/article/pii/S0378720609000573>
- Wang, Y., Chen, Y., Nevo, S. Jin, J., Tang, G. & Chow, W. (2013). IT Capabilities and Innovation Performance: The Mediating Role of Market Orientation. *Communications of the Association for Information Systems*, 33(9). Retrieved 11.05.2016 from <http://aisel.aisnet.org/cais/vol33/iss1/9>



## ATTACHMENT 1 FOLDERS SELECTED FROM JOURNAL OF MANAGEMENT INFORMATION SYSTEMS

31 folders were selected from Journal of Management Information Systems (JMIS):

- business value
- business-IT alignment
- business value of information technology
- business-IT strategic alignment
- cost-benefit analysis
- economics of IS security
- financial risk management
- financial value
- financial statement planning
- financial services IS and technology
- information economics
- information system economics
- information technology investment
- information technology investment evaluation
- information technology investment decisions
- information technology investment risk
- information technology investment value
- investment
- investment announcement
- investment under uncertainty
- investment valuation
- investment-performance analysis
- IT business value
- IT investment
- IT value
- strategic value of IT
- value creation
- relationship-specific investments
- process modeling
- realized value

## ATTACHMENT 2 QUALITY ANALYSIS QUESTIONS AND DESCRIPTION OF INDICATORS

Quality analysis questions (max. scoring: 20 p)

Article	Y	N	Scores
<b>Purpose and background</b>			
Research phenomenon or subject is clearly reported			
Purpose and objects of the research are defined			
Research responds to its purpose			
The background and history are discussed and the research increases the understanding of the examined subject			
The theory is presented and reasoned – and it is suitable			
<b>Research material and method</b>			
The selection of the research method is reasoned			
Research method is suitable for the research phenomenon			
Research process is reported			
Target group is relevant of its type			
Data collection process is reported in detail			
Analyzing process is reported comprehensively			
Study is compared with previous studies			
Research sample is sufficient and it is estimated (quantitative)			
Research data is comprehensive and it is analyzed (qualitative)			
Research is implemented logically, and research is whole and transparent			
<b>Reliability, validity and ethics</b>			
Validity and reliability of the study are discussed			
Research ethics aspects has taken into account, if possible			
<b>Findings and conclusions</b>			
Research findings are plausible and the importance and usability of the research are evaluated			
Findings are clearly presented and they response to research questions			
Findings are generalizable			
Conclusions are logical and the limitations and the contributions and the propositions for further study are discussed			
<b>Overall rating:</b>			

## Description of quality indicators

Issue	Quality indicators
PURPOSE AND OBJECTS	<ul style="list-style-type: none"> <li>- Phenomenon presentation</li> <li>- Does the research response to its purpose?</li> <li>- The purpose and the objects of the research are described clearly</li> </ul>
BACKGROUND, HISTORY	<ul style="list-style-type: none"> <li>- How detailed is the context of the study described?</li> <li>- Description of the research background and history</li> </ul>
THEORY	<ul style="list-style-type: none"> <li>- Is the theory clearly described?</li> <li>- Is it adequate?</li> </ul>
RESEARCH METHOD	<ul style="list-style-type: none"> <li>- Is the research method suitable?</li> <li>- Why the applied research method is selected</li> <li>- How is the research material selected?</li> <li>- Is the research process described?</li> <li>- Impact of the method selection for findings is discussed</li> </ul>
RESEARCH DATA	<ul style="list-style-type: none"> <li>- How comprehensive is the research data?</li> <li>- Comprehensivity of the research data is discussed: what and why are taken into account?</li> <li>- Target group / sample is relevant of its scope and type</li> </ul>
DATA COLLECTION	<ul style="list-style-type: none"> <li>- Is the data precisely collected?</li> <li>- Description of data collection: who, how</li> <li>- Description of the original data</li> <li>- Impact of the method for data collection</li> </ul>
ANALYSIS	<ul style="list-style-type: none"> <li>- Is the analysis comprehensive?</li> <li>- How the analysis process is described?</li> <li>- Is the analytical approach presented and described?</li> <li>- Applying theory?</li> </ul>
VALIDITY AND RELIABILITY	<ul style="list-style-type: none"> <li>- Validity and reliability of the study are defined and discussed</li> </ul>
ETHICS	<ul style="list-style-type: none"> <li>- Is the research ethics taken into account?</li> <li>- Anonymity of the respondents</li> <li>- Confidentiality of the research material</li> </ul>
FINDINGS	<ul style="list-style-type: none"> <li>- Are the findings plausible?</li> <li>- The findings relates to meaning of the research</li> <li>- Are the findings generalizable?</li> <li>- Description relationship of the relationship of findings and theory?</li> <li>- Findings were logically established</li> <li>- Has the research implemented logically?</li> <li>- Justification of the findings</li> <li>- Each phase of the process is argued and reported in detail</li> </ul>
CONCLUSIONS	<ul style="list-style-type: none"> <li>- Clear description of research context</li> <li>- Logic</li> <li>- Research material supports the findings and conclusions</li> <li>- Contributions, limitations and the propositions for further study are discussed</li> </ul>
REPORTING	<ul style="list-style-type: none"> <li>- How clearly was the study reported?</li> <li>- Construction</li> <li>- Study is whole, transparent and logic</li> <li>- Discussion of contributions and limitations of the research</li> </ul>
WHOLE, IMPACTS, IMPORTANCE	<ul style="list-style-type: none"> <li>- Does the research increase the understanding of the examined subject?</li> <li>- Research includes parts from previous studies</li> <li>- Research offers areas/requirements for further studies</li> <li>- New findings and possible contributions for research and practice</li> </ul>

## ATTACHMENT 3 CRITICAL QUALITY ASSESSMET OF RE-SEARCH MATERIAL

	Re- search article	Quality assessment	SCORES
1	Kearns, K.S. & Lederer, A.L. (2000). The effect of strategic alignment on the use of IS-based resources for competitive advantage. The Journal of Strategic Information Systems, 9(4), 265-293.	<ul style="list-style-type: none"> <li>- Purpose, background and history are presented</li> <li>- Objects and research phenomenon are strictly discussed</li> <li>- Early work and basic concept are discussed</li> <li>- Method is reasoned and suitable</li> <li>- Target selection is reasoned and appropriate, response rate is small</li> <li>- Approach and theory are presented and support the purpose. Modeling, data collection and analysis are presented in details</li> <li>- Contributions and findings are logic</li> <li>- Generalizability is discussed, but the limitations are not taken into account</li> <li>- Future research is discussed</li> <li>- Validity and reliability evidences are presented</li> <li>- Ethics aspects are not presented</li> </ul>	17/20
2	Ryan, S.D. & Harrison, D.A. (2000). Considering Social Subsystem Costs and Benefits in Information Technology Investment Decisions: A View from the Field on Anticipated Payoffs. Journal of Management Information Systems, 16(4), 11-40.	<ul style="list-style-type: none"> <li>- Objects, phenomenon and the purpose of the study are discussed</li> <li>- Work motivation isi presented</li> <li>- Theory and methodology process are presented and evaluated comprehensively</li> <li>- Sample is reasonable and justified</li> <li>- Data collection, coding and data analysis are presented</li> <li>- Analysis of findings, benefit and costs are discussed</li> <li>- Limitations and contributions are presented</li> <li>- Research direction is proposed</li> <li>- Validity and reliability are discussed and taken into account</li> <li>- Research ethics are not discussed</li> </ul>	18/20
3	Enns, H.G., Huff, S.L. & Golden, B.R. (2001). How CIOs obtain peer commitment to strategic IS proposals: barriers and facilitators. The Journal of Strategic Information Systems, 10(1), 3-14.	<ul style="list-style-type: none"> <li>- Research phenomenon, the object and the purpose of the research are clearly described and study fills its purpose</li> <li>- Background and history are widely disscussed</li> <li>- Any specific theory is not reasond</li> <li>- New information is introduced</li> <li>- Methodology, research process, data collection processes and the justifications for target groups are presented detailed</li> <li>- Analysis is carefully done, but analyzing technique is not mentioned</li> <li>- Overall reporting is fluent and the stucture is clear</li> <li>- Reliability and validity are defined and rationalized</li> <li>- Limitations and suggestions for further study are missing</li> <li>- Implementation is proposed</li> <li>- Ethics aspects are not reported</li> <li>- Research is logic, and findings and conclusions are plausible</li> </ul>	15/20

4	Kambil, A. & Lucas, H.C. (2002). The Board of Directors and the Management of Information Technology. Communications of the Association for Information Systems, 8(26).	<ul style="list-style-type: none"> <li>- Research purpose and its meaning are described</li> <li>- History and background are comprehensively presented</li> <li>- Method and data collection processes are explained</li> <li>- Method supports examination of the phenomenon</li> <li>- Selection of the target group is discussed. The response rate is small, the low response rate is reasoned</li> <li>- History and present information are compared and evaluated</li> <li>- Analysis is explained, but the approach is not defined</li> <li>- Findings are tabulated and explained in detail</li> <li>- Findings support conclusions and research object</li> <li>- Relating to implementation there occur some problems. Impacts of those for results are not discussed</li> <li>- Ethics aspects are not discussed</li> </ul>	15/20
5	Ryan, S.D., Harrison, D.A. & Schkade, L.L. (2002). Information-Technology Investment Decisions: When Do Costs and Benefits in the Social Subsystem Matter? Journal of Management Information Systems, 19(2), 85-127.	<ul style="list-style-type: none"> <li>- Background, purpose and phenomenon are presented in detail</li> <li>- Early work is presented and objects are reasoned</li> <li>- Framework and research model is discussed in detail</li> <li>- Relevancy of model and validity are discussed</li> <li>- Data collection is presented and reasond</li> <li>- Hypothesis are analyzed</li> <li>- Analysis of the sample and its type is discussed</li> <li>- Analysis of the data is comprehensively presented (deep analysis)</li> <li>- Aplicability is assessed</li> <li>- Conclusions support findings and research objectives</li> <li>- Proposition for further work are presented</li> <li>- Limitations and contributions are discussed in detail</li> <li>- Ethics is not described</li> </ul>	18/20
6	Bassellier, G., Benbasat, I. & Horner Reich, B. (2003). The Influence of Business Managers' IT Competence on Championing IT. Information Systems Research, 14(4), 317-336.	<ul style="list-style-type: none"> <li>- Study presents parts of previous work</li> <li>- Findings are palausible, logically presented and support conclusions</li> <li>- Finding relates to purpose of the study and purpose and its impacts are discussed</li> <li>- Reliable and validity of the study are seriously and detailed examined and disscussed</li> <li>- Generalizability of the results and relationship of the theory and results are discussed</li> <li>- Explanations of method choise, definition, development and testing are widely discussed</li> <li>- History, early work and key concepts are precisely dealed</li> <li>- Data collection process is presented in details</li> <li>- Measures, validation process, sampling and confirmatory analysis are described in detail</li> <li>- Study and research process are structured and reported comprehensively and transparently</li> <li>- Limitations, contributions and suitable issues for further studies are identified</li> <li>- Theory applied from early work is detailed presented.</li> <li>- Research ethics was discussed</li> </ul>	19/20
7	Benaroch, M., Jeffery, M., Kauffman, R.J. & Shah, S.	<ul style="list-style-type: none"> <li>- Credibility of the findings is limited, because findings base mainly on interview data, which is not clearly established.</li> <li>- Data source is unknown, the scope, response date etc. are not reported</li> </ul>	13/20

	(2007). Option-Based Risk Management: A Field Study of Sequential Information Technology Investment Decisions. <i>Journal of Management Information Systems</i> , 24(2), 103-140.	<ul style="list-style-type: none"> <li>- All the other quality criterias listed no here are also identified and noted mainly comprehensive, but major reason for rejecting this article is because of the lack of proofs and evidences of relevant research data.</li> <li>- Comprehensive discussion of the (nature, amount, response rate and so on) interview respondents is missing (for example scope and response rate). This is very important information when evaluating the validity and usability of the research material. Remarkable part of representing research evidences is missing in this case.</li> <li>- This article is rejected</li> </ul>	
8	Chang, S-I., Hung, S-Y., Yen, D.C. & Chen, Y-J. (2008). The Determinants of RFID Adoption in the Logistics Industry - A Supply Chain Management Perspective. <i>Communications of the Association for Information Systems</i> , 23(12).	<ul style="list-style-type: none"> <li>- Results of the study are comprehensively reported and they are plausible, taking into account the possible variables and limitations</li> <li>- The purpose of the study is clearly presented and results fit the purpose</li> <li>- Examination of the validity and reliability is presented</li> <li>- -The generalizability of the results are narrowly described</li> <li>- Justification for method selection is missing</li> <li>- A definition of reseach material collection exists, but the definitions of the quality criterias of literature sources are missing</li> <li>- Theoretical background, just as limitation and contributions are discussed in detail</li> <li>- Comprehensiveness ja reasoning of data (scope, response rate) are not discussed</li> <li>- Describtion of original data (survey) is detailed presented in detail</li> <li>- Context (history, background) is discussed carefully</li> <li>- Findings are justified</li> <li>- Structure of article is clear and whole</li> <li>- Theory and its feasibility for research are presented</li> </ul>	18 /20
9	Andriole, S. J. (2009). Boards of Directors and Technology Governance: The Surprising State of the Practice. <i>Communications of the Association for Information Systems</i> , 24(22).	<ul style="list-style-type: none"> <li>- Findings are palausible, logically presented and support conclusions</li> <li>- Purpose of the study is clearly presented and the findings related to purpose</li> <li>- Study introduced history and early work shortly</li> <li>- Generalizability is not discussed</li> <li>- Validity and reliability of the study are not discussed</li> <li>- Research method selection decision is not justified</li> <li>- Selection criterias for target group of data collection is not justified, but the group is relevant</li> <li>- Impact of the method selection for findings is not discussed</li> <li>- Data collection process is presented restrictively</li> <li>- Limitations and contributions of the study are not discussed</li> <li>- Comprehensiveness of the research data is not discussed</li> <li>- Theory of the study is adequately presented and its connection between findings discussed</li> <li>- Neither research ethics, like anonymity of the respondents, nor recommendations for further study are discussed</li> </ul>	16/20
10	Sobol, M.G. & Klein, G. (2009). Relation of CIO	<ul style="list-style-type: none"> <li>- Phenomenon, objects and the theory are described</li> <li>- Theory is introduced</li> <li>- Research response to its purpose</li> <li>- Research process is shortly discussed</li> </ul>	14/20

	background, IT infrastructure, and economic performance. Information & Management, 46(5), 271-278.	<ul style="list-style-type: none"> <li>- Methodology is shortly presented</li> <li>- Target group and data collection are reasoned</li> <li>- Study lacks of details relating to target companies</li> <li>- Explanation and evaluation of the low response rate is missing</li> <li>- Analysis and discussion are missing</li> <li>- Estimation of the impact of the research method for the findings is missing</li> <li>- Generalizability evaluation, just like recommendations for future work are missing</li> <li>- The findings are not discussed in detail.</li> <li>- Ethics are not taken under discussion</li> </ul>	
11	Enns, H.G. & McDonagh, J.J. (2012). Irish CIOs' Influence on Technology Innovation and IT-Business Alignment. Communications of the Association for Information Systems, 30(1).	<ul style="list-style-type: none"> <li>- Research subject, object and purpose are clearly presented</li> <li>- Background and history are described strictly</li> <li>- Benefits and advantage of the research are detailed</li> <li>- Article is generally clearly structured</li> <li>- Choice of the method is justified and process is presented</li> <li>- Target group is reasoned</li> <li>- Assessment method is suitable and reasoned</li> <li>- Theory is presented and applied suitable</li> <li>- Impact of the method for the findings is evaluated</li> <li>- Data collection process is reported</li> <li>- Validity and reliability are tested and discussed</li> <li>- Analysis process is logic and leads plausible, generalizable and reasoned findings</li> <li>- Research ethics is taken into account</li> <li>- Limitations, contributions and suggestions for further work are presented</li> <li>- Research fills its purpose and is transparent, detailed and logic</li> </ul>	19/20
12	Wang, Y., Chen, Y., Nevo, S. Jin, J., Tang, G. & Chow, W. (2013). IT Capabilities and Innovation Performance: The Mediating Role of Market Orientation. Communications of the Association for Information Systems, 33(9).	<ul style="list-style-type: none"> <li>- Phenomenon, background and purpose are presented</li> <li>- Theoretical background offers a insight of phenomenon deeply</li> <li>- Hypotheses are presented</li> <li>- Structure of the study is clear</li> <li>- Comparison between existing literature is made comprehensively</li> <li>- Research method is reasoned and presented</li> <li>- Data collection and target group are justified</li> <li>- Method is suitable for the study</li> <li>- Limitations, contributions and suggestions for further study are exposed</li> <li>- Validity of the research is evaluated</li> <li>- Analyses partly missing</li> <li>- Discussion is broad and the conclusions short</li> <li>- Ethics are not discussed</li> </ul>	17/20
13	Lin, T-C., Ku, Y-C. & Huang, Y-S. (2014). Exploring top managers' innovative IT (IIT) championing behavior: Integrating the personal and	<ul style="list-style-type: none"> <li>- Phenomenon and research objectives are presented</li> <li>- History and literature review are presented</li> <li>- Selection of methodology is reasoned and suitable</li> <li>- Model and theory are discussed and adopted suitable</li> <li>- Measurement development and data collection are detailed</li> <li>- Validity and reliability are presented</li> <li>- Reasoning for the sampling and response rate are discussed</li> <li>- Evaluation of measurement data and findings are presented comprehensively</li> <li>- Reporting is logic</li> </ul>	18/20

	technical contexts. Information & Management, 51(1), 1-12.	<ul style="list-style-type: none"> <li>- Conclusions, implications, limitations and suggestions are presented</li> <li>- Findings are logic and support research target</li> </ul>	
14	Oliveira, T., Thomas, M. & Espadana, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. Information & Management, 51(5), 497-510.	<ul style="list-style-type: none"> <li>- Background, purpose and phenomenon are presented in detail</li> <li>- Motivation, objectives and reasoning are presented</li> <li>- Clear structure of article</li> <li>- Research model and hypothesis are explained</li> <li>- Measurement is reasoned</li> <li>- Target group and sample are suitable</li> <li>- Data collection and evaluation are discussed</li> <li>- Assessment of research model and theory are presented and applied</li> <li>- Reliability, validity, correlations, factor loadings are defined and reasoned</li> <li>- Study is implemented logically</li> <li>- Major findings are discussed and their support research purpose</li> <li>- Usability is analyzed</li> <li>- Limitations, further study and conclusions are reasoned</li> <li>- Ethics are not discussed</li> </ul>	18/20
15	Shollo, A., Constantiou, I. & Kreiner, K. (2015). The interplay between evidence and judgment in the IT project prioritization process. The Journal of Strategic Information Systems, 24(3), 171-188.	<ul style="list-style-type: none"> <li>- Phenomenon introduction, purposes and research objectives are discussed</li> <li>- Case study approach is introduced and justified. That this case, the approached is evaluated to be a suitable method for examining the phenomenon. It provides the responses of questions how. Phenomenon is so interesting, important - and underexamined that this article is exceptionally accepted as a case study for research material</li> <li>- Validity of the data collection methods is evaluated</li> <li>- Comparative techniques are used.</li> <li>- Target group is suitable and data is analyzed in detail</li> <li>- Findings are remarkable and their characteristics are discussed comprehensively</li> <li>- Limitations of the study and the suggestions for further research are discussed</li> <li>- Conclusions are logical and findings give a response for research objectives</li> <li>- Research is implemented and reported comprehensively</li> <li>- Study increased significantly the knowledge of the subject with its comprehensive discussion of early work and background</li> <li>- Comparative, iterative nature enabled broad view of the phenomenon</li> </ul>	19/20
16	Singh, H., Aggarwal, R. & Cojuharenco, I. (2015). Strike a happy medium: The effect of IT knowledge on venture capitalists' overconfidence in IT investments. MIS Quarterly, 39(4), 887-908.	<ul style="list-style-type: none"> <li>- Background and phenomenon are presented</li> <li>- Need for research is argued</li> <li>- Research objective and questions are discussed</li> <li>- Early work is presented and the study increases knowledge of the topic</li> <li>- Methodology is poorly presented and not reasoned</li> <li>- Details of sample are missing</li> <li>- Study lacks of evaluation of the data collection process</li> <li>- Validity and the data consistency are discussed</li> <li>- Analysis and findings are missing, future research and limitations of the study are presented</li> <li>- Conclusions are presented narrowly. Because straight findings are missing it is impossible to assess if those support conclusions</li> <li>- Ethics are not discussed</li> </ul>	14/20



## ATTACHMENT 4 THEMES AND MAIN FINDINGS OF THE ARTICLES INCLUDED IN RESEARCH

	Article	Themes of context, Purpose/Objective	Main findings	Information + Quality scores
1	Kearns, K.S. & Lederer, A.L. (2000). The effect of strategic alignment on the use of IS-based resources for competitive advantage. The Journal of Strategic Information Systems, 9(4), 265-293.	<b>COMPANY PERFORMANCE</b> / Provide a model of the relationship of strategic alignment and the use of IS-based resources to produce a competitive advantage	For IS executives both the information systems plan with the business plan (ISP-BP) and BP-ISP alignment predicted the use of IS-based resources for competitive advantage. However, for other senior executives, only ISP-BP alignment predicted it. Study suggest both groups of subjects share an understanding of the role of ISP-BP in creating competitive advantage from their information systems investment.	E + 17/20
2	Ryan, S.D. & Harrison, D.A. (2000). Considering Social Subsystem Costs and Benefits in Information Technology Investment Decisions: A View from the Field on Anticipated Payoffs. Journal of Management Information Systems, 16(4), 11-40.	<b>EVIDENCE EVALUATION</b> / Purpose is to gain an insight into what, when, and how often social subsystem considerations (human-related) costs and benefits, are included in IT investment-decision processes	Even though decision makers attempt seldom quantify many of the social subsystems (SCB) factors (intangible, human-related; eg. productivity, quality of work, change management, better communication, impact of IT on employees' feeling of loss of power or control, employee morale, job dissatisfaction), the SCB costs and benefits must be incorporated into IT investment decisions to evaluate IT payoffs more completely. The more SCB disruption the IT under consideration will induce, the greater consideration IT decision makers should give to costs and benefits in that subsystem. A major problem is that if these SCB factors relating management issues are not formally considered in the acquisition decision, the total anticipated impacts of the project may vary from original projections.	E + 18/20
3	Enns, H.G., Huff, S.L. & Golden, B.R. (2001). How CIOs obtain peer commitment to strategic IS proposals: barriers and facilitators. The Journal of Strategic Information Systems, 10(1), 3-14.	<b>PERSONAL COMPETENCE AND BEHAVIOR</b> / Study examines the barriers and facilitators of peer commitment to the implementation of IS or IT projects: how CIOs gain peer commitment	Peer commitment barriers and facilitators include the firm's external and internal IS/IT environment, appropriateness of the IS/IT initiatives, peer relationships, the ability to use the peer's preferred influence behaviors, and post-commitment implementation realities. If CIO approaches peers in terms of the business case for the proposal and reason for how it fit into the organisations' strategy, they are more likely to be convinced to go along with a project. The nature of the information intensity of an industry and internal environment have a significant impact on the CIO's ability to bring forward strategic proposals. If the firm's vision	M +15/20

			of IT is to automate and IT is seen as a cost, the CIO has less opportunity to introduce strategic proposals. High information intense industries are more conducive to strategic IS /IT project initiation. Use of consultation and ingratiation either brought about a positive or a negative outcome depending on the peer's technical background. Unsuccessful implementation included weak relationship between the CIO and business unit head, wrong employees were placed in charge of the project, and that top management approved the project but the managers at the lower level in the hierarchy did not support it.	
4	Kambil, A. & Lucas, H.C. (2002). The Board of Directors and the Management of Information Technology. Communications of the Association for Information Systems, 8(26).	<b>PERSONAL COMPETENCE AND BEHAVIOR</b> / Association of board characteristics with IT investment decisions and the role of the CIO are examined.	CEOs and boards of companies have limited IT experience. The younger boards, and the boards with more IT experienced external board members are associated with larger IT investments. There is an relationship between the characteristics of the board of directors, IT rank, IT investments, and the presence and role of a CIO. The CEO's attitudes and opinions are also related to the firm's IT rank and budget, especially his concern over the threats from technology. Senior management should view the board of directors as another resource for managing IT and creating positive IT outcomes.	M + 15/20
5	Ryan, S.D., Harrison, D.A. & Schkade, L.L. (2002). Information-Technology Investment Decisions: When Do Costs and Benefits in the Social Subsystem Matter? Journal of Management Information Systems, 19(2), 85-127.	<b>EVIDENCE EVALUATION</b> / Research discussess of which firms and under what conditions IT investments are likely to follow or violate prescriptions by examing firms and situational factors that affect the considerations of social subsystem issues during the IT investment decision processes.	The amount of social subsystem (SCB) disruption associated with the IT, the strategic relevance of the IT to the organization, and the firm's continuous-learning culture each have direct or interactive influences on the decision process. They impact the consideration of social subsystem costs and benefits for IT investments. Organizational size and industry are unrelated to this decision-making. If the SCB is ignored, an IT investment is likely to yield even high risk and low return. In the case of decisions that greatly disrupt the SCB, decision-makers tend to set more importance on post-implementation benefits, than they do on implementation costs. This could cause firms to underestimate expenses affecting the anticipated payoff.	E + 18/20
6	Bassellier, G., Benbasat, I. & Horner Reich, B. (2003). The Influence of Business Managers' IT Competence on Championing IT. Information Systems Research, 14(4), 317-336.	<b>COMPANY PERFORMANCE</b> / The research examined the relationship between IT competence and a business manager's intentions to champion IT.	IT knowledge and IT experience together explain 34% of the variance in business managers' intentions to champion IT: create strong relationships with IT people as well as support and promote IT in their organizations. <i>IT Knowledge</i> consists of technology, application, system development, management, and access to knowledge. <i>IT experience</i> consists of experience in IT projects (the life cycle of IT projects, cost-benefit analysis, projects development, and implementation) and experience in IT management (directing the overall IT function, planning and budgeting and policy setting). It was noticed that junior managers should be seconded to project teams and encouraged to manage the IT budget, plan, and people in their area.	E+ 19/20

7	Chang, S-I., Hung, S-Y., Yen, D.C. & Chen, Y-J. (2008). The Determinants of RFID Adoption in the Logistics Industry - A Supply Chain Management Perspective. Communications of the Association for Information Systems, 23(12).	<b>EVIDENCE EVALUATION,</b> /The objective is to identify the critical success factors that could affect the adoption of RFID in the logistics industry and perspective and to recognize.	The main factors which influences RFID (Radio Frequency Identification) adoption in the logistics industry are: pressure of competition in the market for the dimension of industry environment; pressure of transaction partners, suppliers' industry environment, burden of cost, and integration of supply chain strategy for the organizational dimension; and complexity and mutual standard for the innovation technology dimension. Firms can also gain benefits by improving SCM and the existing decision-making process, and in reducing time and cost related to the introduction of RFID technology.	M + 18/20
8	Andriole, S. J. (2009). Boards of Directors and Technology Governance: The Surprising State of the Practice. Communications of the Association for Information Systems, 24(22).	<b>PERSONAL COMPETENCE AND BEHAVIOR</b> /Study examines the roles and responsibilities of directors, and their participation in major IT technology decisions.	There exists relatively little board involvement in technology planning or oversight and the theory and practice have a disconnection of this state. The majority of companies use executive review boards and project management to govern technology. Existing directors are often old, disinterested in technology, and their status base on personal relationships not their expertise. In spite of increasing technology budgets and the strategic and tactical importance of technology, leadership has become more business- than technology-focused meaning that business knowledge and experience is now more important than technology knowledge, and companies are placing on technology. When moving up the management hierarchy, the awareness and knowledge of technology issues and challenges falls.	M + 16/20
9	Sobol, M.G. & Klein, G. (2009). Relation of CIO background, IT infrastructure, and economic performance. Information & Management, 46(5), 271-278.	<b>PERSONAL COMPETENCE AND BEHAVIOR</b> / Study examines if the CIO background and attitude toward IT investment relates to a strategic orientation of the company's IT or to more tactical IT infrastructure investment and to performance of the firm	Objective financial measures of the firm tend to be higher when the position of the CIO is oriented toward IT rather than general market, no regard of firm size or market power. A CIO with more technical orientation was associated with a more utilitarian view of IT by the firm. CIO, whose positions are characterized as IT orientation, have a higher infrastructure investments. IT vs. general manager relates positively to financial and support measures. Succeeding CIO communicates with individuals, makes the connection between technology and the strategic direction, suggests a need for more business education in strategic management for IT executives and provides argument for accepting CIO in top management councils so they are aware of the strategic points.	M + 14/20
10	Enns, H.G. & McDonagh, J.J. (2012). Irish CIOs' Influence on Technology Innovation and IT-Business Alignment.	<b>PERSONAL COMPETENCE AND BEHAVIOR</b> / Study establish an executive influence framework to demonstrate how Irish CIOs are	The maintenance of strong relationships when CIOs need to partner with others to implement technological innovation is seen very important. When confronted with a situation that requires influence, CIOs have to gather the right information. Good communication skills are an important to ensure that CIOs are influencing others on right way to avoid the misunderstanding. In conflict situations successful CIOs utilize a coalition and solicit outside	E+ 19/20

	Communications of the Association for Information Systems, 30(1).	able to solidify IT contribution to technological innovation via relational means.	expertise to overcome this resistance. These variables led to better IT-business alignment. Successful attempts included following variables: 1) <i>Relate</i> : Maintain Good Executive Relationships and Partner with Executives, Leverage Successful Projects; 2.) <i>Prepare</i> : Gather Information, Use Trial Balloons, Convince Others to Influence; 3.) <i>Communicate</i> : Inform Executives and Interpret External IT Development. Unsuccessful influencing on executives increased the disconnection between the CIO and the executive.	
11	Wang, Y., Chen, Y., Nevo, S. Jin, J., Tang, G. & Chow, W. (2013). IT Capabilities and Innovation Performance: The Mediating Role of Market Orientation. Communications of the Association for Information Systems, 33(9).	<b>COMPANY PERFORMANCE</b> / Article examines which IT capabilities affect innovation performance	IT capabilities positively contribute to market orientation, and indirectly influence firm innovation performance in terms of new product development. Because market orientation is widely embedded into firm norms, values, and culture, it reflects a firm's ability to flexibly leverage resources to enable market-oriented activities and strategic movements based on market requirements. A firm with enhanced IT capabilities needs to consider aligning and combining IT with marketing orientation capabilities to better develop new products.	M + 17/20
12	Lin, T-C., Ku, Y-C. & Huang, Y-S. (2014). Exploring top managers' innovative IT (IIT) championing behavior: Integrating the personal and technical contexts. Information & Management, 51(1), 1-12.	<b>PERSONAL COMPETENCE AND BEHAVIOR</b> /Study investigates the relationships between top managers' individual differences and IIT championing behavior from the personal context and the technical context.	The top manager's level of involvement will positively influence IT championing behavior. Individuals who has a high degree of openness to experience in curious and adventurous will have a high optimum stimulation level positively affecting IIT championing behavior. Top managers have good attitudes towards the championing of new technology it they have positive beliefs about the use of new IT based on their knowledge and experiences. If IIT is seen as a strategic tool for a company, the company needs to fill relevant top management positions with with managers who have a high degree of openness to experience. Because these managers will also have a higher OSL, they will be willing to support IIT.	E + 18/20
13	Oliveira, T., Thomas, M. & Espadana, M. (2014). Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors. Information & Management, 51(5), 497-510.	<b>EVIDENCE EVALUATION</b> /Study assess the determinants that influence the adoption of cloud computing in the manufacturing and services sectors	Five factors influence the adoption of cloud computing: relative advantage, complexity, technological readiness, top management support and firm size. Facilitators and inhibitors of cloud-computing adoption are different in the manufacturing and services sectors.	M+ 18/20
14	Shollo, A., Constantiou, I. & Kreiner, K. (2015). The interplay between evidence and	<b>EVIDENCE EVALUATION</b> /Manager's use of evidences in IT prioritization process	The prioritization process is recognized as an integral component of IS strategic planning. Judgment devices (networks, sponsors, labels, domain expertise, and forums) enable decision makers to reach a proritization decision, but it is rear that decision-maker rely solely	E + 19/20

	judgment in the IT project prioritization process. The Journal of Strategic Information Systems, 24(3), 171-188.		on evidence to make a decision. Judgment involves a number of judgment devices, which mobilize private information, expertise, interpersonal trust to support decision makers in shaping individual judgments and reaching collective decisions for prioritization IT projects. Three important phases are noticed: 1. step deals with the individual project proposal and its characteristics, as well as, their alignment with the company's roadmap; 2. step relates to the project's comparative value relative to competing projects within the group. The main prioritization decisions are made during the this phase, where the members produce and document their proposed prioritization list; 3. step focuses on a project's impact as part of a program or its interdependencies with other IT projects in the organization.	
15	Singh, H., Aggarwal, R. & Cojuharenco, I. (2015). Strike a happy medium: The effect of IT knowledge on venture capitalists' overconfidence in IT investments. MIS Quarterly, 39(4), 887-908	<b>PERSONAL COMPETENCE AND BEHAVIOR</b> /Study examines the effect of IT knowledge on the overconfidence of venture capitalists (VCs) in their IT investments.	VCs with moderate levels of IT knowledge are least overconfident and the VCs with moderate levels of IT knowledge are most resistant to the biasing effects of past successes. Finally, the negative association between stakes and VC overconfidence is stronger with greater levels of IT knowledge. Results create a connection between role of IT knowledge in the domain of IT investments. Findings support the moderation effect of IT knowledge for successes.	M+ 14/20