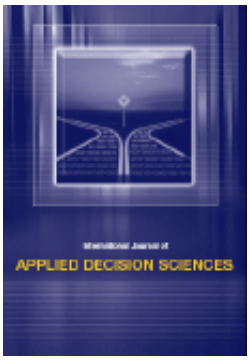


International Journal of Applied Decision Sciences

ISSN online: 1755-8085 - ISSN print: 1755-8077
https://www.inderscience.com/ijads

The strategic impact of information systems in organisations: an empirical study

Renato Lopes da Costa, Ana Cunha, Rui Gonçalves, Leandro Pereira, Álvaro Dias, Rui Vinhas da Silva

DOI: 10.1504/IJADS.2022.10044279

Article History:

Received:	04 October 2021
Accepted:	15 October 2021
Published online:	22 December 2022

The strategic impact of information systems in organisations: an empirical study

Renato Lopes da Costa*

Business Research Unit – BRU-IUL,
ISCTE – Instituto Universitário de Lisboa,
Lisbon, Portugal
Email: renatojlc@gmail.com
*Corresponding author

Ana Cunha

ISCTE – Instituto Universitário de Lisboa,
Av.ª das Forças Armadas,
1649-026, Lisbon, Portugal
Email: cunha.sofia.ana@gmail.com

Rui Gonçalves

PIAGET Almada,
Avenida Jorge Peixinho, no. 30,
Quinta da Arreinela, 2805-059, Almada, Portugal
Almada, Portugal
Email: ruiahgoncalves@gmail.com

Leandro Pereira

BRU-Business Research Unit,
ISCTE – Instituto Universitário de Lisboa,
WINNING LAB,
Lisbon, Portugal
Email: leandro.pereira@iscte-iul.pt

Álvaro Dias

Universidade Lusófona de Humanidades e Tecnologias,
ISCTE – Instituto Universitário de Lisboa,
Lisbon, Portugal
Email: alvaro.dias1@gmail.com

Rui Vinhas da Silva

Business Research Unit – BRU-IUL,
ISCTE – Instituto Universitário de Lisboa,
Lisbon, Portugal
Email: Rui.Vinhas.Silva@iscte-iul.pt

Abstract: In a volatile, uncertain, complex, and ambiguous world, having up-to-date information of a high quality is one of the main assets that organisations can have, enabling them to choose the best strategies that will grant competitive advantage, resilience and consequently drive success. The present research aims to understand the contribution of information systems (IS) for strategy, what benefits organisations can achieve through the effective implementation of IS and in which resources organisations should invest, as a way to maximise those benefits and to mitigate the risks associated with IS implementation. The methodology uses data gathered through a questionnaire and analysis is done using structure equation modelling. The results obtained show that the IS have a positive impact in organisations' strategy and that the investments made by organisations in IS implementation are influenced by the benefits and risks perceived by using IS.

Keywords: information systems; organisational strategy; benefits of IS; risks of IS; investments in IS.

Reference to this paper should be made as follows: Lopes da Costa, R., Cunha, A., Gonçalves, R., Pereira, L., Dias, Á. and Vinhas da Silva, R. (2023) 'The strategic impact of information systems in organisations: an empirical study', *Int. J. Applied Decision Sciences*, Vol. 16, No. 1, pp.87–113.

Biographical notes: Renato Lopes da Costa has a PhD in General Management, Strategy and Business Development by ISCTE (Portugal). He has articles published in several specialised journals in the East, the USA, Canada, Africa, South America and Portugal. He is currently a researcher and member of BRU-UNIDE and a Professor at INDEG where he holds the post of Director of the MSc BA (Master in Business Administration) and guides students in the development of Masters and PhD theses. He teaches business strategy modules in executive and Post-Graduate Masters degrees. Since 2013, he has also accumulated teaching duties as an invited Professor at the Military Academy where he teaches the Knowledge Management.

Ana Cunha has a degree in Tourism from the Lusíada University of Lisbon and a Master in Business Management from ISCTE Business School. In 2018, she did her Erasmus in Barcelona, which was one of the most enriching experiences she had on a personal and academic level. She currently works in the Compliance Department of BNP Paribas.

Rui Gonçalves received his PhD in Management from Instituto Superior de Economia e Gestão, with research in IS for operational risk management, a Master in Statistics and Information Management from NOVA Information Management School (NOVA IMS), with research in the area of intelligent agents, and a degree in Business Management from the International University. He is currently a Guest Assistant Professor at NOVA IMS and works as a Manager in the Business Expertise division at SAS Portugal. In recent years, he has coordinated the areas of operational risk, compliance, fraud, audit and money laundering.

Leandro Pereira is a Professor of Strategy and Management at ISCTE Business School. He received his PhD in Project Management. He is also the CEO and Founder of WINNING Scientific Management. He is also the former President of Business Case Institute, PMI Portugal Chapter and Training Specialist of the Court of Auditors. As CEO, he receives from Best Teams Leaders the award of Best Team Leader and CEO of Portugal in 2017 in Portugal. He is also a PMP from PMI and ROI certified. As researcher, he published more than 80 scientific publications and ten books. As student, he received the best student award from University of Minho. He is an International Expert in Strategic Management, Project Management, Benefits Realisation Management, and Problem Solving.

Álvaro Dias is a Professor of Strategy at Instituto Superior de Gestão and ISCTE-IUL, both in Lisbon, Portugal. He received his PhD in Management from Universidad de Extremadura, Spain, after an MBA in International Business. He has over 24 years of teaching experience. He has had several visiting positions in different countries and institutions including Brazil, Angola, Spain, Poland and Finland. He regularly teaches in English, Portuguese, and Spanish at undergraduate, Master and Doctorate levels, as well as in executive programs. He has produced extensive research in the field of tourism and management, including books, book chapters, papers in scientific journals and conference proceedings, case studies, and working papers.

Rui Vinhas da Silva is a Full Professor ISCTE-IUL and a Member of the Executive Board INDEG-ISCTE Exec Ed. He was also the President of COMPETE 2020 (2014–2016) and Associate Professor at the University of Manchester, Manchester Business School, UK (since April 2008) and subsequently at ISCTE since April 2010, with Aggregation since September 2011–Present. He was also an Assistant Professor from September 1999 to April 2008 and Research Fellow (Post Doc.) from 1998 to 1999 at the University of Manchester and Director of the Master in Corporate Communications and Reputation Management (2004–2006). From 1998 to 2010, he taught the Full-Time and Executive MBA and PhD programs at Manchester Business School.

1 Introduction

The evolution of the technological era and the increase on the market's competition forced companies had to adapt to that new reality and evolutions. One of the measures taken by firms were the implementation of IS over all its departments to have access to a more complex and updated information. Enabling companies to achieve competitive advantage and consequently being well succeed. That is the reason for the importance of this research. IS are affecting most management functions and have become essential to firm's competitive advantage and survival in the new global digital economy and are considered as one of the type of informatic management systems, must relevant and important for organisations and for decisions support [Alberghini et al., (2014), p.164].' IS make it possible for firms to manage all their information, make better decisions, and improve the execution of their business processes. These activities are supported by flows of material, information, and knowledge among the participants in business processes' (Laudon and Laudon, 2009). During the development of this research many were the studies found regarding the impact that IS can have in companies, nevertheless, none of

them investigated the specific impact of IS in strategy, making relevant to improve the research in the area by providing a deep analysis about the impact that IS can have in the companies' strategy.

Bearing in mind the previous contextualisation, one can assess to the objectives of this research, being them:

a Identify the advantages of investing in IS in firms, namely in organisational strategy.

b Analyse the impact of the investments performed related with IS (e.g., technology, human resource, risk management systems) by companies in its performance.

c Recognise and analyse the impact of risks associated with the use of IS on the investments performed by companies in IS.

d Analyse and identify the contribute of IS for an organisational strategy.

As so, the main objective of the present study is to understand the real impact of IS in companies, to understand if is, in fact, a critical factor of firms' success and survival or if, in other hand, its risks avoid companies to adopt those systems.

The present research is divided into five sections, the first one is the current introductory section. The following section is composed by the literature review with the main concepts of the principal topics under analysis. As IS; organisational strategy; benefits of IS; risks of IS and investments in IS, risk mitigation. The third section covers the research methodology used for the present research as well as the analysis of the data. It also describes the sample as well as the results generated by the developed questionnaire. Lastly, the fourth and fifth sections covers the discussion of the obtained results upon the data collected, with the objective of answering the presented research questions and the final section present the main conclusions of the present investigation, in which the principal challenges and limitations of the present study are discussed, followed by the recommendations for future research.

2 Literature review

2.1 Advantages of information systems

Nowadays IS are assuming a strategic tool for most organisations, to integrate organisational business procedures, and to share information across functional areas of a company (Ehie and Madsen, 2005). IS are affecting most management functions and have become essential to firm's competitive advantage and survival in the 'new global digital economy' [Granger et al., (2007), p.89]. IS is 'an integrated man/machine system for providing; information to support the operations, management and decision-making functions in an organisation. The system uses computer hardware, software, system manual procedures, management and decision models and a database' Davis (1974).

According to World Congress on Engineering and Computer Science et al. (2011), firms have the possibility of obtaining benefits in IS adoption, if the company has the support of the top management departments, a plan adapted to the vision of the business, if invest in the reconfiguration of the business processes and if the firm develop efforts to have effective projects management policy. Besides, the risk associated that is always present in IS adoption. An information system, such as ERP, allows the integration of

other organisational processes, enabling the improvement of efficiency and keeping the competitive position of the company in the market (Addo-Tenkorang and Helo, 2011; Costa et al., 2020). IS make it possible for firms to manage all their information, make better decisions, and improve the execution of their business processes. These activities are supported by flows of material, information, and knowledge among the participants in business processes (Laudon and Laudon, 2009; Pereira et al., 2021a). For Zare Mehrjerdi (2010), an information system is capable to control an organisation, monitoring materials, orders, inventories, and stocks. In this way, IS allows companies to have access to updated, real and complete information, enabling the companies' management improvement. As per Murphy and Simon (2002), the advantages of IS should be classified by categories, namely, the operational, which includes the cost reduction, reduction of operating cycle time, improvement of productivity, quality improvement and improvement of services provided to the customer. The Managerial that has as advantages the improvement in resources management, improvement is decision-making, planning, and improvement of performance. The strategic, with the support for business growth, creation of business innovations, promotion of low operational cost strategy (cost leadership), generation of service differentiation and creation of external relationships, e.g., with customers or suppliers (Pinheiro et al., 2020, 2021). Information technology (IT) infrastructure, in this category for the author the advantages are the creation of business flexibility to support current and future changes, reduction of IT costs and incensement of capacity in the IT infrastructure. The last category pointed by the author is the organisational, that supports organisational changes, facilitates the business learning and creation of common perspective and views.

Most organisation must take strategic decisions in a dynamic business environment. IS have been used in areas like budgeting, financial and management reporting will a high level of success. The same cannot be said for corporate-level decision-making Richards et al. (2019). This has been a fact even if studies, as the one made by Puklavec et al. (2018), showed that IS, like business intelligence systems, enables organisations' strategic planning, improvements of performance, and building of competitive advantage by providing valuable decision-making information for stakeholders at different organisational levels. This is reinforced by Lim and Teoh (2020) that stated that the use of business intelligence systems can have a strategic impact on enhancing the economic performance, adding that organisations can improve cost efficiency and increase their revenue.

2.2 Information systems investments

According to Laudon and Laudon (1998), the companies should invest in technology namely in IS since in today's global market no industry or business can survive without having latest technology. Technology is the tool through which a business is going to grow Investment is required to buy the technology. Thus, is possible to conclude that there is a direct relationship between technology, investment, and business (Dias and Lages, 2021). Fardal and Sornes (2008), consider that Investments in IS develop a foundation for continuing progression; however, their returns are not accomplished smoothly and promptly.

Investments in IS can assist different aims. According to many studies, the IS and IT investments have a great impact in companies' performance. According to Lee et al. (2016), there is a relationship between IT investment and tangible returns such as

productivity, IT investment positively affects business performance. Similarly, Lee (2005) agrees that IT investment growth causes economic performance growth in longer periods. A study done by Kwon (2007) reveals a positive relationship between IT investment and several firms performance variables, such as firm growth, market competitiveness, customer relationships, partnerships with suppliers and operational efficiency. A study conducted by Liao et al. (2015), showed that better IT investments indeed contributes to increasing a firm's service quality and consequently customer satisfaction, market competitive advantage, and profitability. Several previous studies were focused on the relationship between IT investments and a firm performance, the following table represents some of findings of authors that shows that, in fact, IT investments and a firm performance has a positive relationship in many aspects.

Li et al. (2006), defends that if firms want to use IT investment to improve their performance, their IT skills must be improved first and, if the firm wants to improve its IT skills, it should enhance its human IT capability with a background in resource-based view (RBV) theory. Until a firm's IT capability is ready, IT investment will not impact the firm's performance. Hence, is very important for companies to invest in human resources (HR). For Becker (1975), HR investment has a positive influence on profitability mediated by labour productivity. According to Adeleke Oyewunmi et al. (2017), human resource investment (HRI) involves an early cost such as in education and training, that allows firms to be compensated in the future, for instance, increasing the firm's productivity. To Liao et al. (2019), human capital investment aims to get a higher return (profit). Although, for Edmans (2011) and Kwon (2011), HRI cannot give a return in the short-term period, but instead in a long-term period.

The need that the senior management must answer to market dynamics and be more resilient, implies a process of decision making more effective, efficient, timely, speedy and of high quality. Managers are required to analyse information in a timely manner for effective decision-making. Top management require new, reliable, and quality information at speed to support quality decision-making within organisations Tripathi et al. (2020). This makes highly mandatory to invest in IS that can provide managers with the knowledge they need.

2.3 Risks of information systems implementation

Due to the complexity of IS many are the authors that associate the IS risk with the complexity related with the IS development. Thus, many are the possible risks associated with IS, namely, failure to obtain some or all anticipated benefits due to implementation difficulties; implementation time much longer and/or costs much higher than expected; technical systems performance significantly below the estimate; incompatibility of system with selected hardware and software (Laudon and Laudon, 2009), as well as lack of top management commitment, failure to gain user commitment, misunderstanding requirements, lack of user involvement, failure to manage end user expectations, changing scope and lack of required knowledge are some of the risk factors (Keil et al., 1998 and Barki et al., 2001). Those risks can have an impact across all company, namely in a strategic level, leading firms to an ineffective work system performance (Sherer and Alter, 2004; Duque et al., 2020). Hence, to mitigate those risks, according to many authors, companies need to implement risk mitigation actions, being them the creation of control techniques such as, management control, operational controls, and technical control (Granger et al., 2007).

2.4 Information technology and information systems strategy

Business strategy is an important factor in the success of an implementation of an effective IS. Its implementation within an organisation requires a strategic development and the ability to overcome change Sari (2018).

Usually is very difficult to predict how the market and industries will change, and so it is rarely possible to know if a firms' strategy is or not the right strategy to take. The term strategy has been studied and defined by many authors over the years. According to Chandler (1998, p.11), 'strategy is the definition of the principal long-term objective of a company, as well as the adoption of action lines and allocation of resources in order to achieve the established goals'. Mintzberg (1987, pp.16–21), approach defined strategy considering five different perspectives, being them,

1 planning

2 patronisation

3 positioning

4 perspective

5 trick.

While Andrews (1980), gave a more general definition, saying that strategy is the decision pattern of a company that define and reveals its objectives, purposes, and goals. It produces the principal policies and plans to achieve the respective objectives and define the business scale in which the company should be involved, and the type of economic and non-economic organisation that the firm want to its shareholders, employees and for the community in general. Another definition was given by Barney and Hesterly (2005), the author defined strategy as the theory about how to gain competitive advantages. For the authors a good strategy is the one that generates such advantages. More recently, Merriam-Webster (2021), defined strategy as being 'the art of devising or employing plans or stratagems toward a goal'. In top of the more traditional focus of organisational strategy, there are being a growing focus on sustainability and in tools that help to integrate it as a central dimension of the whole strategy. The development of tools that can also incorporate sustainability as a core dimension will impact in a more robust decision-making process (Pereira, et al., 2021b).

The present investigation aggregates two main topics, 'IS' and 'organisational strategy'. Several authors gave multiple concepts to 'IS', although there is not an established singular definition for the term, is possible to define it as being a system that supports operations, management and decision-making using computer-based devices, that treats relevant information across all the organisational levels [Davis, 1974; Buckingham et al., (1987), p.18; Turban et al., 2004]. The same happened to the definition of strategy that have being adapted according to the society's evolution. Being defined as the principal long run objective of a firm, and the adoption of actions resources allocation, to achieve the established goals [Chander, (1998), p.11], also, strategy is the theory about how to gain competitive advantages (Barney and Hesterly, 2005), and "the art of devising or employing plans or stratagems toward a goal" (Merriam-Webster, 2021).

For many authors both concepts 'IS' and 'strategy' has a close relationship in an organisational approach, several were the investigations that revealed that many

important objectives of an organisational strategy depends strongly on the organisation's IS capabilities, those are the ability to leverage and sustain its competitive positioning, to create strategic value, to develop closer relationships between the firm and its customers and to integrate the firm's resources (Doherty and Terry, 2009; Duhan, 2007; Fink, 2011; Kim et al., 2010).

According to many studies the use of IT brings many benefits to companies, for Mata et al. (1995), 'Only IT management skills are likely to be a source of sustainable competitive advantage (SCA).' Also, 'Some firms have gained advantage by using IT to leverage intangibles, complementary human and business resources, such as flexible culture, strategic planning-IT integration, and supplier relationships' (Powell and Dent-Micallef, 1997).

According to Lu et al. (2006), only IT management skills are likely to be a source of sustained competitive advantage since they are gained over long periods through the accumulation of experience in the firm, enabling to deal with complex relations between the IT function and business functions, customers, and suppliers. Sabherwal and Chan (2001) suggested a distinction between IT strategy and IS strategy: IS strategy focuses on business systems or applications, and its main objective is the alignment with the business needs and its use for strategic benefits, whereas IT strategies focus on technology policies, including such aspects as architecture, technical standards, safety standards, and technological risk attitudes. IT strategy has a significant effect on the value creation, the term – IS strategic planning (ISSP) was defined by Boynton et al. (1994, p.59), as being the 'activities directed toward:

1 recognising organisational opportunities for using information technology

2 determining the resource requirements to exploit these opportunities

3 and developing strategies and action plans for realising these opportunities and for meeting the resource needs'.

IS strategy has the objective of define what are the applications and functionalities needed to support an operational business of an organisation. This strategic plan should be aligned with the strategic objectives of a firm, being susceptible to changes according to the natural changes of the business and the market (Gouveia and Ranito, 2004). A firm's strategy has considerable effect on organisational performance. That the better strategy of the company, the company's performance also improves with the support of IT strategy. Also, there it can be found that the use of IS provides faster and easier access to information, improves business processes, while identification opportunities and threats that may occur in the market (Lim and Teoh 2020). The research of Yoshikuni, Albertin (2018) stated that IS can deliver business value through the promotion of environmental adaptation by pioneering new products or responding to emergent opportunities. The same author added that IS allow organisations to communicate objectives more effectively, scan the environment, promote organisational flexibility, and innovate in a volatile environment. At the same time, when having the business strategy supported by IS, organisation can be more flexibility, remaining competitive by enabling improvisation capabilities that allow builing new operational capabilities and to face emerging risks.

3 Methodology

3.1 Research model

In this section will be descripted the methodology used in the present investigation to answer to the research questions of the present research previous mentioned, throughout the collection data method. For a better understanding the definition of some relevant terms will be done afterwards in regards with some terminologies, namely, the concept of methodology, the existent types of data collection and a description of the data analysis technique that will be used in this investigation.

Firstly, is relevant to state that the research methodology used for any investigation is highly influenced by the aims and objectives of the study. In regards with research methodologies, it can be exploratory or confirmatory in nature (Derek and Warren, 2020). According to Baptista Lucio and Hernández Sampieri (2014), scientific research can be defined as being the set of systematic and empirical processes that are applied to a specific study. In this study confirmatory research will be done through the collection of data using a quantitative method – questionnaires – and the analysation of that data through statistical analysis.

Following the Williams (2007), approach, considering the three possible methods of data collection that are, quantitative, qualitative, and mixed method. To reach reliable conclusions for the present investigation, through the usage of accurate data and considering the research questions of the present paper a quantitative method was applied, as previous mentioned, by the means of an online questionnaire. According to Derek and Warren (2020), a quantitative methodology is typically used when the research aims are confirmatory in nature. For instance, a quantitative methodology might be used to measure the relationship between variables or to test a set of hypotheses, as will be done in the current paper.

To answer to the research questions mentioned in Section 2, as stated in the previous paragraph a quantitative methodology was used, namely through the modelling of structural equations (structural equations modelling or SEM). SEM is a general statistical modelling technique commonly used in the behavioural sciences, the modelling is based in path analysis, which was created by Sewall Wright, a geneticist, at 1921 (Wright, 1921). SEM is represented by latent variables with structural coefficients estimated based on the correlation of observable variables. In the statistical approach, this model refers to a set of equations with assumptions, in which the factors are determined based on the statistical observation. Thus, structural equations are related to equations using the factors in the analysis of the observable or latent variables (Joreskog and Sorbom, 1993).

According to Tarka (2018), SEM helps researchers to explain, predict and to identify development trends and describe the details related to their existential sphere with the behaviour of individuals, groups, or organisations by recognising a series of conditions and define and discover the critical factors and relationships which set trends in a given society. Nevertheless, considering that the main goal of the social sciences is in addition to conduct an elementary statistical description and to recognise individual factors and behaviours, also to reveal the cause-and-effect links between the scientific areas and the social reality, complex methods of analysis for statistical purposes are needed, namely SEM (Tarka, 2018).

For many years, several schoolers developed many analytical procedures, thus in the early beginnings of SEM development an indirect reconstruction was needed trough Spearman's works (1904). The author laid the foundations for SEM by constructing the first factor model which later became an important measurement part of the more general SEM analytical strategy. There are two main reasons that explains the frequent use of this methodology, namely due to the ability to provide researchers with a complete approach to quantifying and testing theories and the fact that models of equations structural factors to explicitly consider the measurement error, which is ubiquitous in most situations (Raykov and Marcoulides, 2000). SEM is presented as a tool of excellence when measuring the total effect (direct and indirect) of the explanatory variable on the dependent (Haque et al., 2019).

SEM was used to test the conceptual model, through the partial least squares technique (PLS), which is a variance-based structural equation modelling technique. For that matter, the SmartPLS software was used (Henseler et al., 2015). The analysis and explanation of the obtained results followed a two-step approach, first, the reliability and validity of the measurement model were appraised and after the structural model was assessed.

The target population of the present investigation were individuals that work or had worked using IS. For data collection, an online questionnaire was developed in Google Forms, available through a link. The questionnaire was distributed via social networks, namely, LinkedIn, Facebook, Email, WhatsApp and Instagram. From which resulted a total of 99 valid questionnaires answers.

In the following figures (Figure 1 and Figure 2), shows all the variables and items that integrated the conceptual model of the present investigation. The respective model was developed to answer the research questions based on the following hypotheses formulated accordingly.

H1 The benefits of IS on organisational strategy have impact on the investments performed by companies on those systems.

H2 The benefits associated with the use of IS have a positive effect on IS impact in organisational strategy.

H3 The investments performed by companies increase the IS outcomes and companies' performance.

H4 The risks associated to IS implementation have impact on the investments performed by companies and affect the impact of IS in strategy.

H5 The risks associated with the use of IS influence the impact of those systems in organisational strategy.

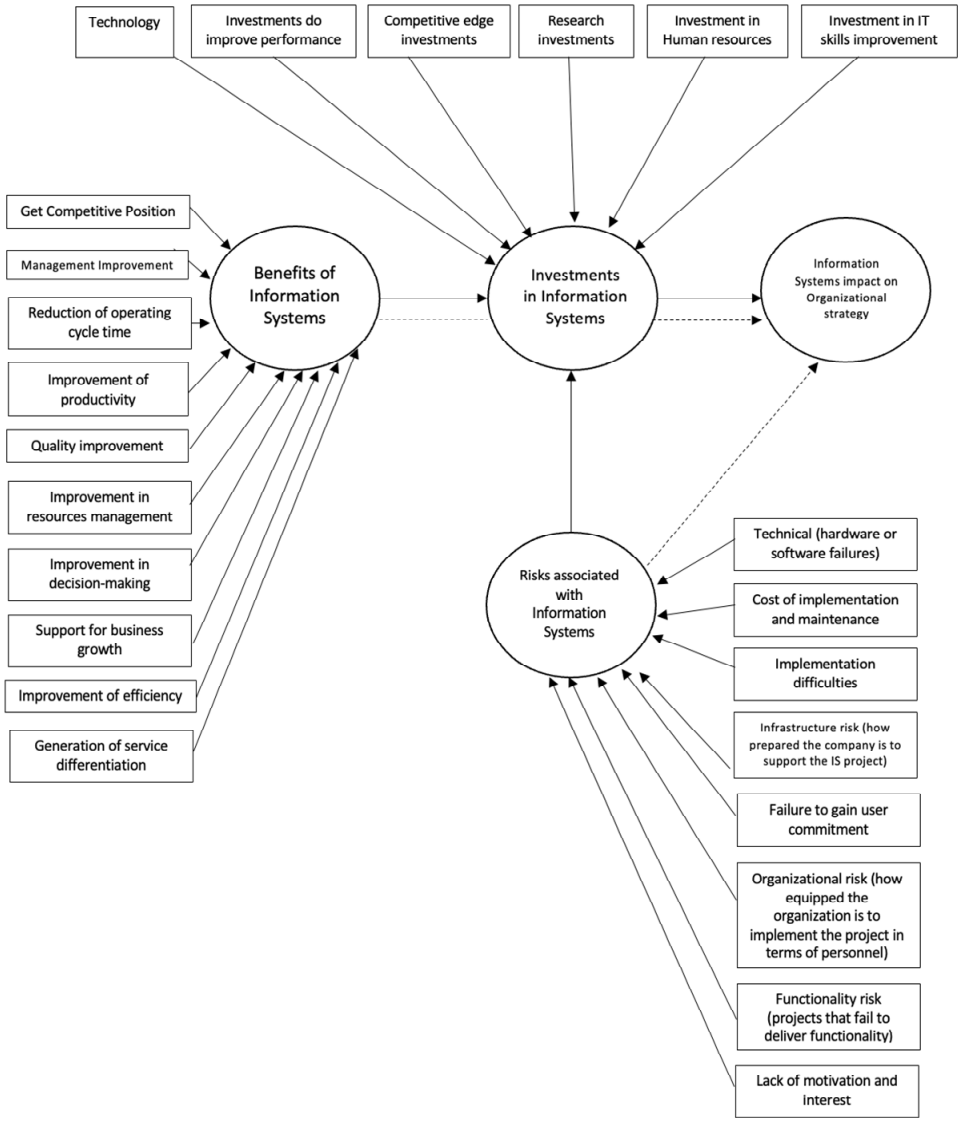
Table 1 shows the relationship between the references and the proposed objectives of the present investigation, as well as the research questions, previously stated in this section, and the respective Hypotheses.

Table 1 Relationship between literature review, objectives, research questions and hypotheses

Objectives		*Research questions*		*Hypotheses*		*Literature review*
OBJ1	Identify the advantages of information systems implementation in firms, namely in organisational strategy.	Q1	What are the benefits associated with the use of information systems namely in strategy?	H2	The benefits associated with the use of information systems have a positive effect on information systems impact in organisational strategy.	Murphy and Simon (2002), quoted by Queiroga (2009, p.8), Zare Mehrjerdi (2010, p.308), World Congress on Engineering and Computer Science et al. (2011), Laudon and Laudon (2009), Li et al. (2006), and Gouveia et al. (2004)
OBJ2	Analyse the impact of the investments performed related with information systems (e.g., technology, human resource, risk management systems) by companies in its performance.	Q2	In which aspects should a company invest to increase the information systems implementation outcomes and companies' performance?	H1	The benefits of information systems on organisational strategy have impact on the investments performed by companies on those systems.	Laudon and Laudon (1998), Lee (2005), Fardal (2007) and Lee et al. (2016)
				H3	The investments performed by companies increase the information systems outcomes and companies' performance.	
OBJ3	Recognise and analyse the impact of risks as respective strategies used by companies to mitigate those risks associated with information systems implementation.	Q3	How can firms mitigate information systems implementation risks, and do they affect the impact of IS in strategy?	H4	The risks associated to information systems implementation have impact on the investments performed by companies and affect the impact of IS in strategy.	Keil et al. (1998), Barki et al. (2001), Loudon and Loudon (1991), Sherer and Alter (2004), Patterson (2015) and Barney and Hesterly (2005)
OBJ4	Analyse and identify the contribute of information systems for an organisational strategy.	Q4	What is the contribute of information systems for an organisational strategy?	H1	The benefits of information systems on organisational strategy have impact on the investments performed by companies on those systems.	Davis (1974), Buckingham et al. (1987 pp.18), Turban et al. (2004), Chandler (1998, p.11), Webster (2021), Doherty and Terry (2009), Duhan (2007), Fink (2011), Kim et al. (2010), Murphy and Simon (2002), quoted by Queiroga (2009, p.8), Zare Mehrjerdi (2010, p.308), World Congress on Engineering and Computer Science et al. (2011), Laudon and Laudon (2009), Li et al. (2006), Lin et al. (2014), Gouveia et al. (2004), Lee (2005), Fardal (2007), Mar et al.(2012), Lee et al. (2016), Barki et al. (2001), Loudon and Loudon (1991), Sherer and Alter (2004), Watson (2007) and Barney and Hesterly (2005)
				H2	The benefits associated with the use of information systems have a positive effect on information systems impact in organisational strategy	
				H3	The investments performed by companies increase the information systems outcomes and companies' performance.	
				H4	The risks associated to information systems implementation have impact on the investments performed by companies and affect the impact of IS in strategy.	
				H5	The risks associated with the use of Information systems influence the impact of those systems in organisational strategy.	

The Figure 1 shows the conceptual model of the present investigation that will be tested through the SmartPLS 3 software. In the same figure are shown the Hypothesis, previous mentioned, as well as their relationship with the dependent variable, namely if are direct and indirect. The boxes of the figure reveal the items that will be individually tested and the respective bibliographic support. The figure clearly shows the model variables and respective items and as mentioned previously, the items were selected considering many authors that were stated in the literature review section.

Figure 1 Conceptual model to be tested in SmartPLS 3



Source: Author elaboration

Table 2 Sample details

Category	*Class description*	*Total number*	*Percentage*
Nationality	Portuguese	92	92.9%
	British	2	2.02
	Australian	1	1.01
	Italian	1	1.01
	Mozambican	1	1.01
	Romanian	1	1.01
	Spanish	1	1.01

Source: Author elaboration

3.2 Sample description

To have an accurate sample characterisation, the first part of the questionnaire was made by questions regarding socio demographic data. The present sample has a total of 99 respondents. An analysis was carried out on all variables that could statistically characterise the sample, especially regarding its demographics, job position and activity sector, to understand the existing sample with respect to its nature and the dimension of experience and professional knowledge.

Concerning the demographic data, the present sample was mainly composed by female gender, with a total percentage of 65.7% of the total answers. Being the remaining answers responded by male gender 34.3%. Moreover, regarding the age of the respondents of the questionnaire, the most part of the respondents had between 19 and 24 years with the total percentage of 48.5%, followed by 40.4% of the group age between 5 and 34 years. Being the groups less represented in the present sample the ones with the group ages of 35 to 44 years, 45 to 54 years, and 55 to 64 years, with percentages of 5.1%, 4% and 2%, respectively. Regarding the remaining questions of the sample characterisation, the respondents were inquired about its nationality, job position and respective sector of activity. Those questions, mainly the last two, were especially relevant for the present investigation to understand if IS are particularly more used in a determined position / sector.

The results obtained about the nationality respondents are shown on the Table 2, thus, one could conclude that the main part of the respondents has Portuguese nationality with 92.9% of the total answers.

4 Presentation and discussion analysis

4.1 Data analysis

The examination and interpretation of the results obtained through the questionnaire was made based on two different methods. The first on related with the evaluation of the reliability and validity of the measurement model and the second approach regarding the evaluation of the structural model. To evaluate the quality of the measurement structural model is required the concentration in specific indicators that predict the model

capabilities, being the most important indicators the reliability, convergent validity, and discriminant validity (Sarstedt et al., 2017).

Considering that all the items had the standardised factorial loads above 0.5 and are all significant when $p < 0.001$, reveals the reliability of the individual indicator (Sarstedt et al., 2017). Concerning the reliability of the internal consistency, it was confirmed based on the values obtained in Cronbach's alpha and composite reliability (CR) indicators that are all above 0.7 which, as per Sarstedt et al. (2017), is the minimum value. All the previous mentioned results are shown in Table 3.

Based on the values of the Table 3, is possible to conclude that the convergent validity was confirmed namely due to three main aspects. First, all items were positive and significant in their respective constructs as mentioned in the previous paragraph. Second, all constructs had CR values above 0.70. Lastly, all the constructs had the average variance extracted (AVE) values greater than the minimum value of 0.50 (Bagozzi and Yi, 1988).

Regarding the discriminant validity were used to approaches to assess discriminant validity, the criterion of Fornell and Larcker (1981), that were satisfied in all constructs since the square root of AVE construct (the diagonal values in bold in the Table 3) are bigger than its greatest correlation with any construct. The second approach used was the heterotrait-monotrait ratio (HTMT) criterion (Sarstedt et al., 2017; Henseler et al., 2015). All HTMT values are below the threshold of 0.85 (Kline, 2011; Sarstedt et al., 2017; Henseler et al., 2015), providing further confirmation of discriminant validity.

The appraisal of the structural model was made through the significance of the structural path coefficients; the magnitude of the coefficient of determination R^2 of each variable as way to assess the expected accuracy of the model; and Stone-Geisser's Q^2 values as way to assess the predictive relevance of the model (Sarstedt et al.2017). Nevertheless, according to Sarstedt et al. (2017), before the evaluation of the structural model there was still collinearity to evaluate. The VIF (variance inflation factor) values varied between 1,000 and 3,602, all being below the critical threshold of 5 (Sarstedt et al., 2017). Which gives the indication that there is no collinearity. The coefficient of determination R^2 for the two endogenous variables that are the IS impact on strategy and investments in IS were 15.3% and 47.6%, respectively, surpassing the limit value of 10% imposed by Falk and Miller in 1992. The Q^2 values for the endogenous variables (0.122 and 0.218 respectively) were greater than zero, which shows the predictive relevance of the model (Sarstedt et al., 2017).

The values of the Table 4 shows that the benefits of using IS have a significantly positive impact on the investments in IS ($ß = 0.453$, $p < 0.00$). Additionally, since ($ß = 0.391$, $p < 0.018$) the investments in IS have a significantly positive influence on the effect on the Impact of IS on Strategy, and these results confirm the hypotheses H1 and H3, respectively. Finally, it is possible to observe that the Risks associated with IS implementation have also a significantly positive relationship with the investments in IS ($ß = 0.396$, $p < 0.000$, respectively), showing that the greater the Risks associated with IS implementation more are the investments done by companies in IS , to mitigate those risks, supporting hypotheses H4.

To test the mediation hypotheses (H2 and H5), as per recommendation of Sarstedt et al. (2017, p.232), a bootstrapping method was used to test the significance of the specific indirect effects through the mediator (Preacher and Hayes, 2008). Table 5 shows those indirect effects results.

Table 3 CR, AVE, correlations, and discriminant validity checks

	Cronbach's alpha	*rho_A*	*Composite reliability (CR)*	*Average variance extracted (AVE)*	*1*	*2*	*3*	*4*
1) Benefits of information systems	0.933	0.943	0.943	0.624	0.790	0.211	0.636	0.329
2) Information systems impact on strategy	1	1	1	1	0.210	1	0.455	0.193
3) Investments in information systems	0.817	0.83	0.871	0.536	0.578	0.391	0.732	0.61
4) Risks associated with information systems	0.858	0.864	0.889	0.501	0.316	0.182	0.539	0.708

Notes: Cronbach alpha; CR – composite reliability; AVE – average variance extracted.
Bolded numbers are the square roots of AVE. Below the diagonal elements are the correlations between the constructs (Fornel ratios). Above the diagonal elements are the HTMT ratios.

Source: Author elaboration

Table 4 Direct relationships between constructs

	Path coefficients	*Standard deviation*	*T statistics*	*P values*
Benefits of IS -> investments in IS	0.453	0.075	6.076	0.000
Investments in IS -> information systems impact on strategy	0.391	0.165	2,376	0.018
Risks associated with IS -> investments in IS	0.396	0.061	6,496	0.000

Source: Author elaboration

Table 5 Specific indirect relationships between constructs

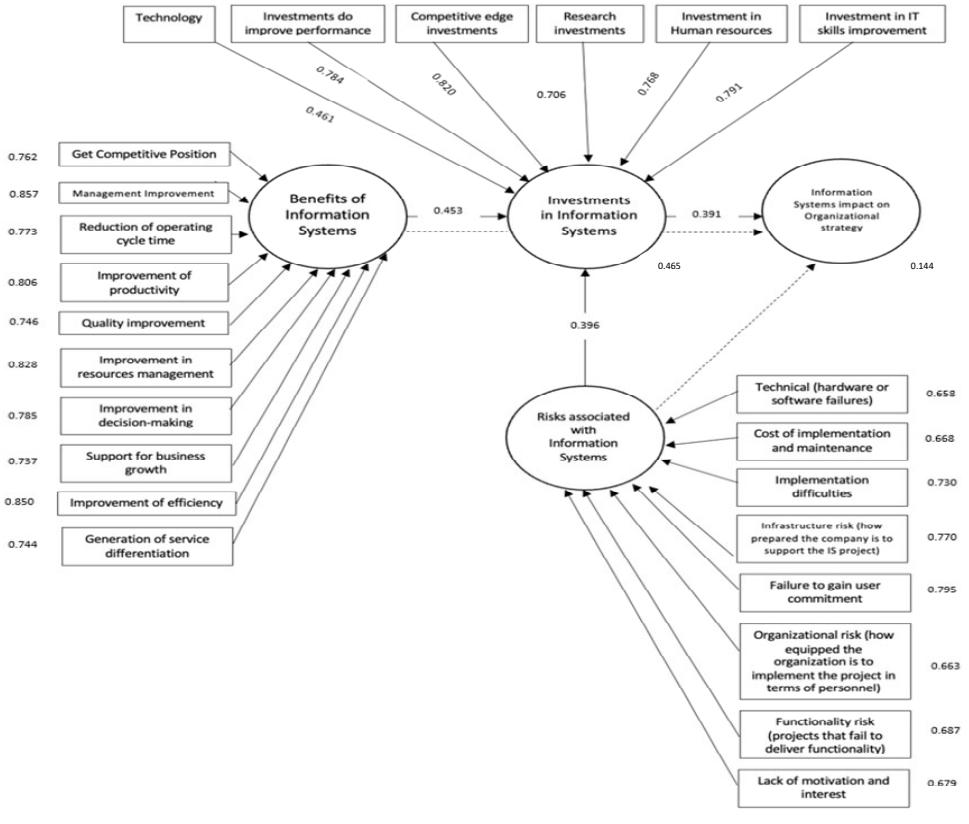
	Path coefficients	*Standard deviation*	*T statistics*	*P values*
Benefits of IS -> investments in IS -> IS impact on strategy	0.177	0.072	2.451	0.015
Risks associated with IS -> investments in IS -> IS impact on strategy	0.155	0.069	2.254	0.025

Source: Author elaboration

The indirect effects of the benefits of IS in the IS impact on strategy through the mediator investments in IS are significant with (ß = 0.177; p <0.015), corroborating the H2 mediation hypothesis. In the same approach, the indirect effects of the Risks associated with IS in the IS Impact on Strategy through the mediator Investments in IS are significant with (ß = 0.155; p < 0.025), corroborating the mediation hypothesis H5. Figure 4 shows the testing of the conceptual model with the values obtained. All the previous mentioned values are shown the Table 5.

The following Figure 2 reveals the results obtained in the tests of the conceptual model. The individual values of each item are the result of the individually testing done for each indicator. The results show that all the items are statistically relevant to the study, since are all above 0.4, since p < 0.000, therefore revealing its reliability (Sarstedt et al., 2017). In regards with the value of 0.453; 0.391 and 0.396 are the path coefficients that reveals that all the direct relationships of the model are statistically significant, confirming the hypotheses H1, H3 and H4 respectively. Lastly, regarding the coefficient of determination R^2 adjusted for the two endogenous variables that are the IS Impact on Strategy and Investments in IS, as shown on the Figure 4, were 14.4% and 46.5%, respectively, surpassing the limit value of 10% imposed by Falk and Miller in (1992). The Q^2 that measure the predictive relevance of the model (Sarstedt et al., 2017), shows that the values for the endogenous variables (0.122 and 0.218 respectively) were greater than zero, which shows the predictive relevance of the model (Hair et al., 2017).

Figure 2 Conceptual model tested with SmartPLS 3 with associated values



Source: Author elaboration

4.2 Hypothesis testing

Considering all the results analysed above obtained through the conceptual model, it is possible to affirm in the hypothesis of the present investigation were or not confirmed, considering the value of β and its statistical significance. Hence, as per the values obtain in the present study it was possible to confirm the first hypotheses which revealed that the benefits of using IS have a significantly positive impact on the investments in IS (ß = 0.453, $p < 0.00$), the same for H3, that was confirmed since (ß = 0.391, $p < 0.018$) showing that the investments in IS have a significantly positive influence on the effect on the Impact of IS on Strategy. The hypotheses H4 was also confirmed showing the significantly positive relationship with the investments in IS and the Risks associated with the use of IS (ß = 0.396, $p < 0.000$). Regarding the remaining two hypotheses, H2 and H5, that are the mediation hypotheses, were also confirmed since (ß = 0.177; $p < 0.015$) and (ß = 0.155; $p < 0.025$) respectively, revealing that indirectly the benefits of IS have a positive effect in the IS impact on strategy through the mediator Investments in IS and that the risks associated with IS have also a positive effect in the IS impact on strategy through the mediator Investments in IS. The Table 6 shows, in a succinct way, the hypotheses confirmed with the respective values mentioned in this paragraph.

Table 6 Hypotheses testing

Hypotheses	β	P value	Accepted/rejected
H1: The benefits of IS on organisational strategy have impact on the investments performed by companies on those systems.	0.453	0.000	Accepted
H2: The benefits associated with the use of IS have a positive effect on IS impact in organisational strategy.	0.177	0.015	Accepted
H3: The investments performed by companies increase the IS outcomes and companies' performance.	0.391	0.018	Accepted
H4: The risks associated to IS implementation have impact on the investments performed by companies and affect the impact of IS in strategy.	0.396	0.000	Accepted
H5: The risks associated with the use of IS influence the impact of those systems in organisational strategy.	0.155	0.025	Accepted

Source: Author elaboration

4.3 Discussion of the results

In the present section, the results obtained through the data collection will be compared with the literature review. In order to understand if those results answers to the research questions of the current investigation –

Q1 What are the benefits associated with the use of IS namely in strategy?

Q2 In which aspects should a company invest to increase the IS implementation outcomes and companies' performance?

Q3 How can firms mitigate IS implementation risks, and do they affect the impact of IS in strategy?

Q4 What is the contribute of IS for an organisational strategy? – having been subjected to several tests using SmartPLS 3 (Henseler et al., 2015).

Three main factors were identified, namely:

1 the benefits of IS (Murphy and Simon, 2002, quoted by Queiroga, [(2009), p.8; Zare Mehrjerdi, (2010), p.308; World Congress on Engineering and Computer Science et al., 2011[.

2 the investments in IS (Laudon and Laudon, 1998; Lee et al., 2016; Fardal, 2007)

3 the risks associated with IS (Sherer and Alter, 2004; Kaplan and Mikes, 2012; Goldsack, 2017).

To achieve results at these 3 main variables, the items associated with each variable were tested individually, through the applied questionnaire, and all of them confirmed to be statistically relevant to the study, when obtaining scores above 0.4, all of which are significant since $p < 0.000$, therefore revealing its reliability (Sarstedt et al., 2017).

Below, the findings obtained from each one of the research questions will be analysed into detail.

Q1 What are the benefits associated with the use of IS namely in strategy?

The present study reveals that, in fact, and as supported by many authors in the literature review section the benefits that companies have using IS are several. IS bring benefits across all or many areas of an organisation, consequently impacting positively companies' strategy.

The usage of IS allows companies to improve in many crucial areas of activity of firms, being all of them intrinsically related with strategy, namely at a management level, significantly improving the management itself, the decision making and management of the companies' resources. As revealed in the results of the individual tests of the conceptual model with values above 0.7 in which $p > 0.000$ as supported by the Literature review. Namely, the Zare Mehrjerdi (2010, p.308) study, that defends that IS allows companies to have access to updated, real and complete information, enabling the companies' management improvement, make better decisions (Laudon and Laudon, 2009) and improve resources management (Gouveia et al., 2004). The results of the conceptual model also revealed that the operational area is also positive impacted by IS, namely, reducing the operation cycle time and consequently improving the quality of the services / products delivered to customers.

Lastly, and answering to this research question, all the benefits directly related with firms' strategy were all statistically significant, all above 0.7 in which $p > 0.000$, revealing that the use of IS have a significant positive relation with strategy. As per the results obtained in the questionnaires, IS enable companies to get competitive advantage, support business growth, improve efficiency and productivity and generate a differentiated offer in the services / products delivered to clients, which is corroborated by the Literature review. Addo-Tenkorang and Helo, World Congress on Engineering and Computer Science, Ao, and International Association of Engineers (2011, p.1111), defended that the IS implementation enable the improvement of efficiency and keeping the competitive position of the company in the market. As well as Li et al. (2006), and Gouveia et al. (2004), that mentioned that IS generates competitive advantages over competitors in cost or in differentiation and support in the organisational long-term plan.

Q2 In which aspects should a company invest to increase the IS implementation outcomes and companies' performance?

Considering the obtained results in the questionnaire's answers, the benefits of IS are directly related with the Investments performed by companies. As discussed above, most of the Benefits related with the implementation of IS, increase the performance of firms. Therefore, the greater the investment of companies in technology – also supported by the literature review reinforced by many authors, that argued that considering today's global market no industry or business can survive without having latest technology, thus is crucial for companies survival to invest in technology / IT (Laudon and Laudon, 1998; Liao et al., 2015; Lee et al., 2016) – in competitive edge, research, and HR, namely the ones with specific IS/IT capabilities, the greater the IS outcomes and the better the companies' performance.

Bearing in mind the increasing importance of IS in companies nowadays, more than perform IT investments, firms should be aware of the importance of human IT capability, especially with a background of RBV (Dias and Lages, 2021). That was proven through

the result obtained in this item HR in the conceptual model under analysis, in which, the value obtained was higher than 0.7 considering $p > 0.000$. The human resource investment positively influences productivity and consequently companies' performance.

Q3 How can firms mitigate IS implementation risks, and do they affect the impact of IS in strategy?

The current investigation unveiled that the Risks associated with IS implementation have a positive relationship with the company investments, which means that more risks of IS implies more investment in IS. That in turn, influence indirectly the impact of IS in strategy as shown on the conceptual model. The principal risks associated with the implementation of IS in the current investigation were technical (hardware or software failures), cost of implementation and maintenance, implementation difficulties, infrastructure risk, organisational risk, functionality risk, failure to gain user commitment and lack of motivation and interest.

Associating those risks with the categories of investments mentioned in the previous research question, led to a very interesting comparison that demonstrate the significance of the relationship between these two variables. Namely, considering that as more as the company have technical risks, more important is to invest in proper and suitable technology, to mitigate that threat. Similarly, with the failure to gain user commitment and Lack of motivation and interest risks, if companies have detected that the user commitment is negatively influencing the outcomes of IS as well as the lack of motivation and interest by its users. Based on the literature review and on data collection results, companies will invest more, namely in HR, to face those risks.

One can affirm, based on the findings of the current paper, that the principal reason that explains this positive relationship is the necessity of companies to face the risks with risk mitigation plans and actions. As defended by Granger et al. (2007), for risk mitigation, companies should have management control, operational controls, and technical controls, namely, technical capabilities incorporated into the IT infrastructure specifically to support increased confidentiality, integrity, and availability of information services, which explains the importance of IS investments when approaching IS risks.

Reinforcing, IT control systems are critical for companies' data protection and is one of the best options to mitigate and control de risks associated with IS, such as the vulnerability to potential information attackers (Mar et al., 2012). For some scholars the investments performed by companies should not just be related with IS and technology but also in a specific Information system of Risks management, namely, the Enterprise risk management (ERM) (Patterson, 2015). Investment in risk assessment techniques is particularly important for companies, since enable the identification of existing and potential risks, that consequently, decrease companies' vulnerabilities and provides a secure environment for information assets (Eroğlu and Çakmak, 2016).

Q4 What is the contribute of IS for an organisational strategy?

First, the present research question can be answered through the association of all the above. In the beginning of this discussion topic, in regards with the first research question, it was possible to verify that the use of IS brings a wide range of benefits for companies, namely, for strategy. As already stated, some of those benefits are to get competitive advantage in the market over competitors in cost or in differentiation, support in the organisational long-term plan, support business growth, improve efficiency and productivity and generate a differentiated offer in the services / products delivered to

clients and improve efficiency. Thus, considering that strategy is the definition of the principal long run objective of a firm, and the adoption of actions resources allocation, to achieve the established goals [Chander, (1998), p.11], also, bearing in mind, that strategy is directly related with competitive advantage issues (Barney and Hesterly, 2005). One can confirm that the adoption of IS and consequently its benefits impact positively the companies' strategies.

For that matter, 'IS' and 'Strategy' has a close relationship in an organisational approach, several were the investigations that revealed that many important objectives of an organisational strategy depends strongly on the organisation's IS capabilities, those are the ability to leverage and sustain its competitive positioning, to create strategic value, to develop closer relationships between the firm and its customers and to integrate the firm's resources (Doherty and Terry, 2009; Fink, 2011; Kim et al., 2010).

On other hand, by analysing the contribute of IS for an organisational strategy in a risk perspective, is possible to confirm that both variables are significantly related. As stated, is the discussion of the third research question, and considering the obtained results. Companies are aware of the risks related with the adoption of IS and the importance of their mitigation. Therefore, due to that necessity of risk mitigation firms are investing in suitable systems / strategies, namely in enterprise risk management, human IT capability, especially with a background of RBV, that indirectly impacts positively companies' strategies, enabling companies to be less vulnerable and with less chance to fail. Also, the identification of IS risks as well as the investment on their mitigation, can lead to better decisions according to the company mission, finally, that can increase the likelihood that a firm will adopt the right strategy. Which has as an ultimate objective the generation of competitive advantage.

5 Conclusions

The main purpose of this study was to understand the real impact of IS in companies and especially the role they play and the contribute they have at a strategic level. As such, a quantitative method was used to collect data, through questionnaires and analysed afterwards that data using statistical methods, namely through the modelling of structural equations SEM. This section seeks to present and discuss the study's main findings, highlighting its final conclusions.

During the process of understanding the uses of IS for strategy, other variables intrinsically associated with the use of IS were considered. Among those variables that will contribute to this investigation in regards with the impact of IS in strategy, are benefits, investments, and risks.

Overall, with the present research it was possible to prove that, considering that strategy can be defined as the main long run objective of an organisation is directly related with competitive advantage issues (Barney and Hesterly, 2005). As per the results obtained in the investigation the main benefits that the adoption of IS brings to companies are to get competitive advantage, support in business growth, efficiency, and productivity improvement [Addo-Tenkorang and Helo, World Congress on Engineering and Computer Science, Ao, and International Association of Engineers, (2011), p.1111]. And in terms of cost, differentiation, and support in its long-term plan (Gouveia et al. 2004). Thus, one could confirm that the adoption of IS and consequently its benefits impact

positively the companies' strategies. Revealing the importance and contribute of those systems for firms.

On other hand, in the present investigation was analysed the impact of the Risks associated with the use of IS on the Investments performed by companies. The major risks that were identified were a technical risk namely, hardware or software failures, (Granger et al., 2007), cost of implementation and maintenance, difficulties implementing IS, infrastructure and organisational risk, functionality risk, and lack of user commitment (Belmiro and Pina, 2001, quoted by Queiroga, 2009). Although as per the results obtained in this paper, the investment in proper and suitable technology, can avoid and mitigate technical risks. Similarly, to the lack of user commitment and lack of motivation risks, if companies detect that the level of user commitment is negatively affecting the outcomes of IS, they will invest more, namely in HR, to deal with those risks. Additionally, one of the solutions used by companies nowadays to face and avoid the risks of IS are the investment in a specific IS of risk mitigation, namely, Enterprise risk management (ERM), as well as in risk mitigation plans and risk controls. Regarding the risk control Granger et al. (2007), found a comprehensive framework that divides mitigation risks control in an organisation in three categories.

1 Management control – that intended to ensure that the requirements for system confidentiality are satisfied.

2 Operational controls – include day-to-day processes more directly associated with actual delivery of the information services.

3 Technical control – technical capabilities incorporated into the IT infrastructure specifically to support increased confidentiality, integrity, and availability of information services.

As so, the main objective of the present study was achieved, that was to understand the real impact of IS in companies, to understand if is, in fact, a critical factor of firms' success and survival or if, in other hand, its risks avoid companies to adopt those systems. In regards with the companies that already adopted IS the aim of this investigation is to understand it contribute at a strategic level. The results obtained revealed that IS are affecting most management functions and have become essential to firm's competitive advantage and survival [Granger et al., (2007), p.89] and were also considered as one of the types of informatics management systems, must relevant and important for organisations and for decisions support [Alberghini et al., (2014), p.164; Laudon and Laudon, 2009]. In regards with the risks, with the present investigation one could verify that, although the implementation of IS have many risks associated was not a reason that led companies to avoid in the investment in those systems. Contrariwise, the risks led companies to invest more, to mitigate those risks.

In sum, this research allowed to determine that the use of IS benefit companies in most of the departments of companies, but at a strategic level. In turn, these systems will increase the competitive position of companies, support in business growth, efficiency, and productivity improvement.

Hence, the present investigation has allowed to deepen the studies in the field of the impact of IS in strategy and understand the relationship of that with the investments in IS, benefits of using those systems and the risks associated with it. Hence, it is relevant to analyse both limitations and implications of the present study.

Concerning the limitations to the present study, considering the field of IS and the is in constant technological development nowadays, this approach can ultimately limit the ability to form casual relationships between the variables. In addition. Additionally, another limitation of the present study is related to the fact that a convenience sample was used which limits the ability to generalise results, since the sample was not representative of a population neither randomly obtained (Baptista Lucio and Hernández Sampieri, 2002). Regarding the second research question, a limit sample was obtained which ultimately compromise the ability to make significant statistical inferences. Thus, regarding external validity, it is not possible to generalise the results as they are not representative. Even though this investigation was able to reinforce some of the scholars existing theory concerning the impact of SI in firms, particularly in strategy, the present research should be perceived as an exploratory study, which cannot be generalised, or representative.

Finally, it is important to bear in mind that the technological evolution, namely at enterprises level are still in current development. Thus, is expected that in the next few years the use of technology and consequently, the use of IS in organisations become more widely used, which will ultimately influence the companies' strategies as revealed in this study. Hence, regarding the impact of the use of IS in organisation strategy, would be interesting for a future investigation to understand if the sector of activity has influenced the IS impact in strategy. Moreover, another study that could be done in the future in regard of the use of IS at a corporate level is to understand what the impact of those systems in the remaining departments of companies is, beyond the strategic department.

To conclude, the impact of IS on organisational strategy allows further empirical research regarding IS. Due to the significant increase in the use of technology and the use of IS by companies. Lastly, it is wished that this research could motivate further studies in this field, which is likely to become increasingly important, particularly at an organisational level.

References

Adeleke Oyewunmi, O., Adewale Osibanjo, O., Oluwabusayo Falola, H. and Joshua Olujobi, O. (2017) 'International review of management and marketing optimization by integration: a corporate governance and human resource management dimension', *International Review of Management and Marketing*, Vol. 7, No. 1, pp.265–272 [online] http:www.econjournals.com.

Alberghini, E., Cricelli, L. and Grimaldi, M. (2014) 'A methodology to manage and monitor social media inside a company: a case study', *Journal of Knowledge Management*, Vol. 18, No. 2, pp.255–277, https://doi.org/10.1108/JKM-10-2013-0392.

Andrews, K.R. (1980) *The Concept of Corporate Strategy*, 3rd ed., Pennsylvania, R.D. Irwin.

Bagozzi, R. and Yi, Y. (1988) 'On the evaluation of structure equation models', *Journal of the Academy of Marketing Science*, Vol. 16, pp.74–94, DOI: 10.1007/BF02723327.

Baptista Lucio, P. and Hernández Sampieri, R. (2002) Metodología de la Investigación pdf.

Barki, H., Rivard, S. and Talbot, J. (2001) 'An integrative contingency model of software project risk management', *J. of Management Information Systems*, Vol. 17, No. 4, pp.37–70.

Barney, J.B. and Hesterly, W.S. (2005) *Strategic Management and Competitive Advantage Concepts and Cases Global Edition* [online] www.pearsonglobaleditions.com (accessed June 2021).

Becker, G. (1975) *Human Capital: A Theoretical and Empirical Analysis*, with Special Reference to Education, 2nd ed., National Bureau of Economic Research, Inc.

Boynton, A.C., Zmud, R.W. and Jacobs, G.C. (1994) 'The influence of IT management practice on IT use in large organizations', *MIS Quarterly*, Vol. 18, No. 3, pp.299–318, https://doi.org/10.2307/249620.

Buckingham, R.A., Hirschheim, R.A., Land, F.F. and Tully, C.J. (1987) in Buckingham et al. (Eds.): *Information Systems Curriculum: A Basis for Course Design* [online] https://dl.acm.org/doi/10.5555/19600.29370 (accessed November 2020).

Chandler Jr., A.D. (1998) *Strategy and Structure: Chapters in the History of the American Industrial Enterprise*, MIT Press, Cambridge.

Costa, R., Resende, T., Dias, A., Pereira, L. and Santos, J. (2020) 'Public sector shared services and the lean methodology: implications on military organizations', *Journal of Open Innovation: Technology, Market, and Complexity*, Vol. 6, No. 3, p.78, https://doi.org/10.3390/joitmc6030078.

Davis, G.B. (1974) 'Sensor based management information systems', *Paper Presented At Unknown Conference*, New York City, NY, USA.

Derek, J. and Warren, K. (2020) *What (Exactly) Is Research Methodology?* [online] https://gradcoach.com/what-is-research-methodology/ (accessed November 2020).

Dias, Á., Pereira, L. and Lopes da Costa, R. (2021) 'Organizational capabilities as antecedents of entrepreneurship: a basis for business practice and policy making', *Journal of African Business*, pp.1–18, https://doi.org/10.1080/15228916.2021.1907156.

Dias, A.L. and Lages, L.F. (2021) 'Measuring market-sensing capabilities for new product development success', *Journal of Small Business and Enterprise Development*, No. Ahead of Print., Vol. Ahead of Print, pp.1–21.

Doherty, N.F. and Terry, M. (2009). The role of IS capabilities in delivering sustainable improvements to competitive positioning. The journal of strategic information systems : incorporating International Information Systems. - Amsterdam [u.a.] : Elsevier, ISSN 0963-8687, ZDB-ID 1099465-8. - Vol. 18.2009, 2, p. 100-116

Duque, L., Costa, R., Dias, Á., Pereira, L., Santos, J. and António, N. (2020) 'New ways of working and the physical environment to improve employee engagement', *Sustainability*, Vol. 12, No. 17, p.6759, https://doi.org/10.3390/su12176759.

Edmans, A. (2011) 'Does the stock market fully value intangibles? Employee satisfaction and equity prices', *Journal of Financial Economics*, Vol. 101, No. 3, pp.621–640, https://doi.org/10.1016/j.jfineco.2011.03.021.

Ehie, I. and Madsen, M. (2005) 'Identifying critical issues in enterprise resource planning (ERP) implementation', *Computers in Industry*, Vol. 56, pp.545–557, DOI: 10.1016/j.compind.2005.02.006.

Eroğlu, Ş., & Çakmak, T. (2016). Enterprise Information Systems within the Context of Information Security: A Risk Assessment for a Health Organization in Turkey. Procedia Computer Science, 100, 979–986. https://doi.org/10.1016/j.procs.2016.09.262.

Falk, R. and Miller, N. (1992) *A Primer for Soft Modeling*, The University of Akron Press, Akron, OH.

Fardal, H. and Sornes, J-O. (2008) 'IS strategic decision-making: a garbage can view', *Issues in Informing Science and Information Technology*, Vol. 5, pp.553–569, DOI: 10.28945/1028.

Fink, L. (2011) 'How do IT capabilities create strategic value? Toward greater integration of insights from reductionistic and holistic approaches', *Eur. J. Inf. Syst.*, Vol. 20, pp.16–33, Doi: https://doi.org/10.1057/ejis.2010.53.

Fornell, C. and Larcker, D.F. (1981) 'Evaluating structural equation models with unobservable variables and measurement error', *Journal of Marketing Research*, Vol. 18, No. 1, pp.39–50, https://doi.org/10.2307/3151312.

Goldsack, R. (2017) 'Why risk management should be a vital part of your information security policies', *Why Risk Management Should be a Vital Part of your Information Security Policies IT Security Central*, (teramind.co).

Gouveia, B.L. and Ranito, J. (2004) *Sistemas de Informação em Gestão*, Sociedade portuguesa de inovação.

Granger, M., Dick, G., Luftman, J., Van Slyke, C. and Watson, R. (2007) 'Information systems enrollments: can they be increased?', *Communications of the Association for Information Systems*, Vol. 20, https://doi.org/10.17705/1CAIS.02041.

Haque, A., Fernando, M. and Caputi, P. (2019) 'The relationship between responsible leadership and organisational commitment and the mediating effect of employee turnover intentions: an empirical study with Australian employees', *Journal of Business Ethics*, Vol. 156, DOI: 10.1007/s10551-017-3575-6.

Henseler, J., Ringle, C.M. and Sarstedt, M. (2015) 'A new criterion for assessing discriminant validity in variance-based structural equation modeling', *Journal of the Academy of Marketing Science*, Vol. 43, No. 1, pp.115–135, https://doi.org/10.1007/s11747-014-0403-8.

Jöreskog, K.G. and Sörbom, D. (1993) 'LISREL 8: structural equation modeling with the SIMPLIS command language', *Scientific Software International*.

Kaplan, R. and Mikes, A. (2012) 'Managing risks: a new framework', *Harvard Business Review*.

Keil, M., Cule, P.E., Lyytinen, K. and Schmidt, R.C. (1998) 'A framework for identifying software project risks', *Communications of the ACM*, Vol. 41, No. 11, pp.76–83, https://doi.org/10.1145/287831.287843.

Kim, H. S., Kim, Y.G. and Park, C.W. (2010) 'Integration of firm's resource and capability to implement enterprise CRM: a case study of a retail bank in Korea', *Decision Support Systems*, Vol. 48, No. 2, pp.313–322.

Kline, R.B. (2011) *Principles and Practice of Structural Equation Modeling*, Guilford Press, New York.

Kwon, G.J. (2011) 'The Innovation of human resource investment and value relevance in equity valuation', *Asian Social Science*, Vol. 7, No. 12, pp.22–35.

Kwon, S-O. (2007) *Impact of IT Investment on Firm Performance: Focusing on Four Moderators*, Master's thesis, Korea Advanced Institute of Science and Technology.

Laudon, K.C. and Laudon, J.P. (1998) *Management Information Systems*, p.422, Prentice-Hall of India Private Limited.

Laudon, K.C. and Laudon, J.P. (2009) *Essentials of Management Information Systems*, 8th ed., Pear son Education, Upper Saddle River, NJ.

Lee, H., Choi, H., Lee, J., Min, J. and Lee, H. (2016) 'Impact of IT investment on firm performance based on technology IT architecture', *Procedia Computer Science*, Vol. 91, pp.652–661, https://doi.org/10.1016/j.procs.2016.07.164.

Li, E., Chen, J-S., Huang, Y-H. and Huang, J-S. (2006) 'A framework for investigating the impact of IT capability and organisational capability on firm performance in the late industrialising context', *Int. J. Technology Management*, Vol. 36, pp.886–892, Doi: 10.1504/IJTM.2006. 009969.

Liao, C.H., Mo, S. and Grant, J. (2019) 'Market implication of human capital investment in training', *Academy of Accounting and Financial Studies Journal*, Suppl. Special Issue, Vol. 15, No. 1, pp.59–87, Doi: http://dx.doi.org/10.20961/jab.v20i1.501.

Liao, Y.W., Wang, Y.M., Wang, Y.S. and Tu, Y.M. (2015) 'Understanding the dynamics between organizational IT investment strategy and market performance: a system dynamics approach', *Comput. Ind.*, Vol. 71, pp.46–57, doi: 10.1016/j.compind.2015.02.006.

Lim, Y.Y. and Teoh, A.P. (2020) 'Realizing the strategic impact of business intelligence utilization', *Strategic Direction*, Vol. 36, No. 4, pp.7–9, https://doi.org/10.1108/SD-09-2019-0184.

Lu, X-H., Huang, L-H. and Heng, M.S.H. (2006) 'Critical success factors of interorganizational information systems – a case study of Cisco and Xiao Tong in China', *Information & Management*, Vol. 43, No. 3, pp.395–408, Doi: https://doi.org/10.1016/j.im.2005.06.007.

Mar, S., Johannessen, R., Coates, S., Wegrzynowicz, K. and Andreesen, T. (2012) 'Information technology risk and controls', *Global Technology Audit Guide*, 2nd ed., p.36 [online] http://www.theiia.org/bookstore/downloads/freetomembers/0_1006.dl_gtag12nded.pdf.

Mata, F.J., Fuerst, W.L. and Barney, J.B. (1995) 'Information technology and sustained competitive advantage: a resource based analysis', *MIS Quarterly*, December, pp.487–505.

Merriam-Webster (2021) *Strategy*, Merriam-Webster.com Dictionary [online] https://www.merriam-webster.com/dictionary/strategy (accessed 9 December 2021).

Mintzberg, H. (1987) 'The strategy concept I: five Ps for strategy', *California Management Review*, Vol. 30, No. 1, pp.11–24, doi: 10.2307/41165263.

Murphy, K.E. and Simon, S.J. (2002) 'Intangible benefits valuation in ERP projects', *Information Systems Journal*, Vol. 12, No. 4, pp.301–320, https://doi.org/10.1046/j.1365-2575.2002.00131.x.

Patterson (2015) - Patterson, T. (2015). The Use of Information Technology in Risk Management. The Use of Information Technology in Risk Management, (September). Retrieved from https://www.aicpa.org/InterestAreas/FRC/AssuranceAdvisoryServices/DownloadableDocuments/ASEC_Whitepapers/Risk_Technology.pdf.

Pereira, L., Pinto, M., da Costa, R., Dias, Á. and Gonçalves, R. (2021a) 'The new SWOT for a sustainable world', *Journal of Open Innovation: Technology, Market and Complexity*, Vol. 7, No. 18, https://doi.org/10.3390/joitmc7010018.

Pereira, L., Santos, J., Dias, Á. and Costa, R. (2021b) 'Knowledge management in projects', *International Journal of Knowledge Management (IJKM)*, Vol. 17, No. 1, pp.1–14.

Pinheiro, J., Lages, L.F., Silva, G.M., Dias, A.L. and Preto, M.T. (2021) 'Effects of absorptive capacity and innovation spillover on manufacturing flexibility', *International Journal of Productivity and Performance Management*, (published ahead of print), pp.1–22, https://doi.org/10.1108/IJPPM-04-2020-0156.

Pinheiro, J., Silva, G.M., Dias, Á.L., Lages, L.F. and Preto, M.T. (2020) 'Fostering knowledge creation to improve performance: the mediation role of manufacturing flexibility', *Business Process Management Journal*, (published ahead of print), pp.1–22, https://doi.org/10.1108/BPMJ-10-2019-0413.

Powell, T.C. and Dent-Micallef, A. (1997) 'Information technology as competitive advantage: the role of human, business, and technology resources', *Strategic Management Journal*, Vol. 18, pp.375–405, http://dx.doi.org/10.1002/(SICI)1097-0266(199705)18:5<375::AID-SMJ876>3.0.CO;2-7.

Preacher, K.J. and Hayes, A.F. (2008) 'Contemporary approaches to assessing mediation in communication research', in Hayes, A.F., Slater, M.D. and Snyder, L.B. (Eds.): *The Sage Sourcebook of Advanced Data Analysis Methods for Communication Research*, pp.13–54, Sage Publications, Inc., https://doi.org/10.4135/9781452272054.n2.

Puklavec, B., Oliveira, T. and Popovič, A. (2018) 'Understanding the determinants of business intelligence system adoption stages an empirical study of SMEs', *Industrial Management and Data Systems*, Vol. 118, No. 1, pp.236–261, https://doi.org/10.1108/IMDS-05-2017-0170.

Queiroga, A.I.de.C.M. (2009) *Avaliação do potencial sucesso de implementação de um ERP* [online] http://repositorium.sdum.uminho.pt/handle/1822/26422 (accessed November 2020).

Raykov, T. and Marcoulides, G.A. (2000) *A First Course in Structural Equation Modeling*, Lawrence Erlbaum Associates Publishers, USA.

Richards, G., Yeoh, W., Chong, A.Y.L. and Popovič, A. (2019) 'Business intelligence effectiveness and corporate performance management: an empirical analysis', *Journal of Computer Information Systems*, Vol. 59, No. 2, pp.188–196.

Sabherwal, R. and Chan, Y.E. (2001) 'Alignment between business and is strategies: a study of prospectors, analyzers, and defenders', *Information Systems Research*, Vol. 12, No. 1, pp.11–33, https://doi.org/10.1287/isre.12.1.11.9714.

Sari, N.Z.M. (2018) 'The business strategy and development life cycle with quality accounting information systems', *International Journal of Scientific and Technology Research*, Vol. 7, No. 12, pp.295–300.

Sarstedt, M., Ringle, C. and Hair, J. (2017) *Partial Least Squares Structural Equation Modeling*, DOI: 10.1007/978-3-319-05542-8_15-1.

Sarstedt, M., Ringle, C. and Hair, J. (2017) *Partial Least Squares Structural Equation Modeling*, DOI: 10.1007/978-3-319-05542-8_15-1.

Sherer, S. and Alter, S. (2004) 'Information systems risks and risk factors: are they mostly about information systems?', *Communications of the Association for Information Systems*, Vol. 14, https://doi.org/10.17705/1CAIS.01402.

Spearman, C. (1904) *The American Journal of Psychology*, Vol. 15, No. 1, [online] http://www.jstor.org/stable/1412159 (accessed November 2020).

Tarka, P. (2018) 'An overview of structural equation modeling: its beginnings, historical development, usefulness and controversies in the social sciences', *Quality and Quantity: International Journal of Methodology*, Vol. 52, No. 1, pp.313–354, https://doi.org/10.1007/s11135-017-0469-8.

Tripathi, A., Bagga, T. and Aggarwal, R.K. (2020) 'Strategic impact of business intelligence: a review of literature', *Prabandhan: Indian Journal of Management*, Vol. 13, No. 3, pp.35–48.

Turban, E., McLean, E. and Wetherbe, J. (2004) *Tecnologia da Informação para gestão*, 3rd ed., Bookman, Porto Alegre.

Williams, C. (2007) 'Research methods', *Journal of Business & Economics Research (JBER)*, Vol. 5, No. 3, https://doi.org/10.19030/jber.v5i3.2532.

World Congress on Engineering and Computer Science, Ao, S.I. and International Association of Engineers (2011) World Congress on Engineering and Computer Science: WCECS 2011 : 19–21 October, 2011, Newswood Ltd., International Association of Engineers, San Francisco, USA. Hong Kong.

Wright, S. (1921) 'Systems of mating, Iv. the effects of selection', *Genetics*, Vol. 6, No. 2, pp.162–166, https://doi.org/10.1093/genetics/6.2.16.

Yoshikuni, A.C. and Albertin, A.L. (2018) 'Effects of strategic information systems on competitive strategy and performance', *International Journal of Productivity and Performance Management*, Vol. 67, No. 9, pp.2018–2045, https://doi.org/10.1108/IJPPM-07-2017-0166.

Zare Mehrjerdi, Y. (2010) 'Enterprise resource planning: risk and benefit analysis', *Business Strategy Series*, Vol. 11, No. 5, pp.308–324, https://doi.org/10.1108/17515631011080722.