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The Mediating Role of Absorptive Capacity on the Relationship between Intellectual capital and Firm Performance in high-tech SMEs, UK

Ajeeli, Saher

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# The Mediating Role of Absorptive Capacity on the Relationship between Intellectual capital and Firm Performance in high-tech SMEs, UK

Saher Ajeeli

A thesis submitted to Bangor University in fulfilment of the requirements for the Degree of Doctor of Philosophy



Bangor Business School

**Bangor University** 

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#### Abstract

In a fast changing business environment with accelerated technological development, new knowledge resources and developing dynamic capabilities are becoming vital issues in economic knowledge. Drawing on the Resource-based View in small and medium-sized enterprises (SMEs) and competitive dynamics perspectives, there has been a recent rise in the number of practitioners and academics integrating the knowledge resources of SMEs, which are intellectual capital (IC) and absorptive capacity (ACAP) to achieve superior performance. The main objective of this study is to investigate the mediating role of absorptive capacity on the relationship between intellectual capital and firm performance in high-tech sector SMEs in the UK.

Current research proposed a model for the direct and indirect relationships of ICperformance through ACAP, thereby increasing contributions to knowledge in the field of strategic management. A research conceptual framework was developed with reliance on an existing body of literature in the field of study. It integrates the effects of intellectual capital with absorptive capacity to create and develop dynamic capabilities in pharmaceutical, biotechnology, and the publishing of computer games firms. A quantitative research employing surveys, the selected method of study was justified, because of the number of SMEs and their being geographically widespread around the UK. A five-point Likert-type scale has been used to measure research variables.

A research conceptual framework has been developed and tested by using a structural equational modelling methodology. The results of this study suggested that high-tech SMEs could enhance and improve their financial outcome, if they associate and integrate the firm's intellectual capital with the firm's absorptive capacity to create or develop dynamic capabilities, which has greater significant effects on firm performance. This research concludes by saying that high performance firms respond rapidly to new knowledge and also that there is a strong association between IC and ACAP affecting the performance of SMEs. It is also concluded that CEOs and managers are able to enhance the level of performance in high-tech SMEs by the creation or development of dynamic capabilities through the integration between firm IC and ACAP.

**Keywords**: Intellectual capital, Absorptive capacity, Performance, High-tech, SMEs, UK.

## Dedication

With love and gratitude to

My late mother, Lyla, the great woman I still miss every day

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### **Declaration and Consent**

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# **1. Chapter one: Introduction**

#### 1.1. Introduction

Over last two decades, knowledge has become one of the production factors, also it has received considerable attention from academics and those interested in the field of management. A turbulent business environment and strong competition have pushed organizations to look for new knowledge and exploit it to create innovation and achieve superior performance, which will then put them in a good position against competitors. Therefore, firms are competing to renew their knowledge resources such as intellectual capital (IC), or build dynamic capabilities such as absorptive capacity (ACAP). These important factors are embedded either in employees' heads such as human capital (HC), or in a firm's systems and routines like structural capital (SC) or ACAP. However, two main constructs represent key factors of these concepts, which are absorptive capacity ACAP, and intellectual capital IC. Therefore, this study focuses mainly on intellectual capital and absorptive capacity in high-tech small and medium-sized enterprises SMEs. It provides the empirical results of the integrating effect of these two constructs on firm performance.

This chapter aims to provide an introduction to present research and introduce the research topic. The research topic and the research background have been discussed in the field of strategic management absorptive capacity, intellectual capital, and firm performance. Then, the rationale of the study is briefly discussed in the details. Research objectives have been discussed and research questions have been developed and drawn from the literature. A brief explanation is offered on how current research will bridge the gap in knowledge and prior research. Furthermore, this chapter provides an overview of research contributions, research design and methodology. Finally, the structure of the thesis brings the chapter to an end.

#### 1.2. Research background

#### 1.2.1. Intellectual capital

A large amount of literature has been discussed and has been investigated by intellectuals in different theories, such as human capital theory, organizational learning theory, and resourcebased theory. It is suggested that intellectual capital can create value for a firm, (Bontis, 1998; Youndt and Snell, 2004; Isaac et al, 2010; Hsu and Wang, 2012; Engelman et al, 2017; Kianto et al, 2013; Bendickson and Chandler, 2017). Intellectual capital has been recognized as an important intangible asset that contributes and enhances a firm's success rate and generates the firm's value, acknowledging the significance of intellectual capital (IC) in the firm's strategic profitability and performance (Hsu and Fang, 2009).

Those interested in the field of knowledge, such as (Stuart, 1997), define intellectual capital as "the intellectual material – knowledge, information, intellectual property, experience that can be used to create wealth". In terms of strategic resources, economics defines intellectual capital as a "resource with a non-physical existence with potential to generate future economic benefits" (Abhayawansa and Guthrie, 2014: p 70). Intellectual capital refers to strategic intangible resources for a firm, (Rauch, et al, 2005). Furthermore, the value of intellectual assets of a firm are much greater than its tangible book value, usually three or four times, (Stewart, 1991; Handy, 1989). Intellectual capital represents an important source of innovation and strategic renewal, (Bontis, 1998). However, according to the resource-based view (RBV) (Hsu and Wang, 2012; Bendickson and Chandler, 2017) a firm's intangible resources are more likely to contribute to firm performance. Researchers found that intellectual capital and the interaction among (IC) dimensions have influenced incrementally and radically productivity and innovative capability, (Isaac, et al, 2010; Costa, 2012; Chen Fu et al, 2014; Chen et al, 2014).

Hsu and Wang, (2012) asserted that firms work in a dynamic and turbulent environment, therefore a firm's strategy should be to expand and deploy its resources to survive and compete in such challenging circumstances. In fact, firms which rely on various resources (external and internal) of fund, knowledge, labour and capabilities will be more capable of achieving high levels of performance (Cocca and Alberti, 2010).

Wilson, (2005) urged that firms have to understand and recognize the nature of their resources, whether internal or external and tangible or intangible. Researchers such as (Ghobadian and Gallear, 1997; Ledwith, 2000; Gray and Mabey, 2005; Nicholas et al, 2011) illustrated significant differences between big companies and SMEs in terms of structure, procedures, behaviour, processes, people, and contact. However, all these differences make e SMEs have the advantage of recognizing external and internal knowledge and building dynamic capabilities. In the context of intangible resources or invisible assets, intellectual capital represents important invisible assets, (Sydler et al, 2014; Kamukama, et al, 2011). Moreover, there is a broad consensus that intellectual capital includes the three main dimensions of human capital (HC), structural capital (SC), and relational capital (RC), (Edvinsson and Sullivan, 1996; Bontis, 1998). In addition, intellectual capital has been investigated in many theories such as human capital theory regarding human capital and the organization's productivity. Some research turned to social capital theory regarding relational capital. This is in addition to resource-based, and organizational learning theory. However, this understanding should be extended to consist of the acquisition of external knowledge and developing internal knowledge and capabilities. The firm's intellectual capital can be used to attain a superior performance of SMEs (Loucks, et al, 2010). The current research investigated the relationship between intellectual capital and firm performance, in the hightech SMEs sector, in which a few researchers have investigated the three main dimensions of intellectual capital in the high-tech SME sector. Furthermore, the specific aims through which intellectual capital influences firm performance are still under-researched, (Hsu and Wang, 2012; Mariano and Walter 2015; Engelman et al, 2017).

#### 1.2.2. Absorptive capacity

Cohen and Levinthal (1990) proposed a model of absorptive capacity called ACAP. It has been presented as an explicit process, such us learning, and an implicit process such as capability. Researchers such us (Zahra and George, 2002; Todorova and Dorisin, 2007) suggested a theoretical model to reconceptualise ACAP. Cohen and Levinthal (1990) have defined ACAP, as the firm's ability to value, assimilate, and apply new knowledge. While Zahra and George (2002) define absorptive capacity as 'a set of capabilities, which are organizational routines and strategic processes that help firms to acquire, assimilate, transform, and exploit knowledge to create value with a concentration on dynamic capabilities geared towards flexibility and strategic changing. Furthermore, their model classified ACAP into two main dimensions, which are potential absorptive capacity PACAP, and realised absorptive capacity RACAP. They also extended the construct from three capabilities into four dynamic capabilities.

PACAP and RACAP are separate dimensions and at the same time have complementary roles Lane et al, (2006). However, ACAP construct has an order, potential and realised ACAP are two dimensions working along and respectively: for example, firms cannot possibly exploit knowledge without first acquiring it. Similarly, firms can acquire and assimilate knowledge, however, they might not have the capability to transfer and exploit the new knowledge for profit generation, (Zahra and George, 2002; Jansen et al, 2005; Lane et al, 2006; William and Veronique, 2015). Researchers have used the ACAP construct to describe various organizational phenomena, which span multiple levels of analysis by invoking organizational learning, industrial economics and both resource-based and dynamic capabilities perspectives, (Todrova and Dorisin, 2007).

According to Lane et al (2006), the firm's ACAP is developed based on three main factors, which are: first, the investment in the firm's members' individual ACAP, in other words a reliance on the firm's human capital. Second, it develops cumulatively. Third, achieving internal communication and sharing knowledge. Sharing knowledge throughout the entire firm represents an important factor, due to new knowledge being applied most profitably by another department inside the firm. The ACAP construct is recognized as a firm's capability, a firm's resource (a knowledge base), both of them, or neither of them together. Furthermore, scholars highlighted the notion of ACAP based on two general perspectives: as a "stock" of prior related knowledge or as an "ability" to absorb knowledge. Simultaneously, absorptive capacity has been conceptualized and measured as either: (1) an asset, (2) a substantive (or ordinary) capability, or (3) a dynamic capability (Lane et al, 2006). Dynamic capability refers to "the capacity of an organization to purposefully create, extend, or modify its resource base" (Helfat et al. 2009, p. 4,). However, increased learning in a specific area enhances the organization's knowledge base in that area, which further increases a firm's absorptive capacity that in turn encourages more learning in this domain.

Cohen and Leventhal, (1990) ACAP is a result of:

- Individual skills
- Prior knowledge

- Firm specific competencies (internal capabilities)
- Access to knowledge resources outside firm (external linkages)

In terms of flexibility, absorptive capacity, ACAP makes firms more dependent on their ability to fully utilize resources than other types of firms (Engelen et al, 2014). ACAP is generally explained as a process of steps. ACAP dimensions will make sure the firm has key success factors to deal with a turbulent environment, by considering ACAP as a dynamic capability. In fact, dynamic capabilities such as ACAP are most valuable in dynamic and turbulent environments (Zahra et al, 2006). Therefore, organizations should allocate their investments in resources and capabilities, coordinate with their strategic stances (Teece, 2012). Thus, a firm's absorptive capacity is formed from an overlap in individual members' knowledge structures as well as the transfers of knowledge across and within organizational sub-units. Therefore, absorptive capacity is a function of the depth and breadth of a firm's knowledge structures, (Roberts et al, 2012). In the line with this idea, SME has the advantage of breathing in knowledge from the external environment and using it rapidly, due to the advantages of their structure, which do not slow down the application of the new idea.

Ultimately, absorptive capacity has been explored in different disciplines and fields, such as strategic management, international business, organizational economics, and technology management; however, a few researchers have explored the ACAP construct as dynamic capabilities in the field of intellectual capital. However, this research will build on previous work, to investigate and incorporate ACAP, into the field of intellectual capital, (Hsu and Wang, 2012; Mariano and Walter 2015; Engelman et al, 2017). Current research investigated ACAP in the field of IC according to Zahra and George's (2002) reconceptualization, which considers ACAP as two main dimensions and four dynamic capabilities.

#### 1.2.3. Firm performance

Firm performance is placed at the heart of a firm's survival. In management and business research, firm performance, is recognized as "a central outcome variable of interest, ranging from such disparate areas as human resources (HRs) and marketing to operations management, international business, strategy and information systems", (Singh et al, 2016: p 1). Organizational performance is the competency of an organization to transform resources within the firm in an efficient and effective manner to achieve organizational goals. Scholars

have defined organizational performance as a firm's ability to create action and acceptable results, (Anggadwita and Mustafid, 2014). Researchers aimed to explore how a firm's performance can be improved to support businesses and enhance their long-term survival and profitability, (March and Sutton, 1997; Bititci et al, 2012).

Firm performance is a broad concept consisting of financial and non-financial aspects, (Kaplan and Norton, 1992). In the last a few decades, different performance measurements were used to measure firm performance, as the time went by, researchers pinpointed some underlying deficiencies in these financial measures, because of its inability to reflect comprehensive performance information; and it is inadequate to establish the outlook of the future performance of firms. Therefore, non-financial performance measurements tried to cover this gap. Furthermore, many studies refer to organizational performance as financial and non-financial, (Hult et al, 2008; Rauch et al, 2009; Singh et al, 2016).

Financial measurements include the assessment of factors that use financial ratios as indicators for firm performance, such as sales, profitability, return on assets (ROA), and return on equity (ROE) (Singh et al, 2016). While the non-financial, which highlights different perspectives include goals such as satisfaction and global success, or waste reduction. Numerous amounts of literature have revealed a high diversity of performance indicators. Nevertheless, a common distinction exists between financial and non-financial measures. Furthermore, financial and non-financial measurements have advantages and disadvantages, (Rauch et al, 2009).

In some sectors, which are characterised as of high dynamism and technological turbulence, such as high-tech industries, organizations benefit from structures, which facilitate flexibility, and the fast process of making decisions Jansen et al, (2005). In addition, CEOs or managers are involved in all a firm's activities and processes, as well as the process of taking decisions (Nicholas et al, 2011). In this case, a firm's performance can be measured based on information collected from CEOs or managers, because their opinion is still available and valid to assess performance, by asking them to rate their firm's overall performance, for instance their market share, profitability, and employments growth (Stam et al, 2014; Singh et al, 2016).

Regarding the previous argument, the self-reported method was a good technique to assess the firm's performance in the high-tech sector. Furthermore, self-reported data offer a greater chance for assessing multiple dimensions of performance (Wiklund & Shepherd, 2005). Researchers such as Chandler and Hanks, (1993) supported the validity of using this technique to measure a firm's performance. Therefore, the current research has measured high-tech SME's performance based on self-reported methods, by focusing on financial outcomes and employability growth. Financial outcome measures are represented by a summated composite of four sub-dimensions (Cillo et al, 2010; Solomon et al, 2013), whilst growth is represented by the number of employees Wood et al, (2015).

Researchers such us Zahra (1996) asserted that there is a trade-off relationship between profitability and growth in sales, but also it can distinguish between measures of profitability and sales growth measures, (Combs et al, 2005). Therefore, firms may invest heavily in long-term growth in sales, while sacrificing short-term profits, (Stam et al, 2014). However, profitability has been used in much research as a suitable measure of performance, (Díaz-Díaz et al, 2008). Therefore, in the current research profitability, market share, sales, and cash flow are indicators that have been adopted to measure firm performance. Furthermore, employability growth in high-tech SMEs, is still a challenge, due to its operating in an intensive knowledge society.

The High-tech industry is a label term for many industries, whether the focus is on development or the use of technology to design their own products and develop their intangible core competencies (Joia and Malheiros, 2009). Thus, firm growth is quite an important indicator that informs management whether their "business is pursuing a scalable activity that creates needed jobs for others" (Wood et al, 2015: p: 131). Therefore, changing employment is a suitable measure of firm performance in SMEs. Due to these kinds of firms working in a turbulent environment and with strong competition, their competitive advantage may emerge and then decline or decay, (Liao and Rice, 2010). However, changing employment is quite often associated with the SMEs' goals and objectives, as well as cases of unavailability or unreliability of financial data. Ultimately, employability growth has been adopted. Choosing these indicators is associated with the SMEs goals in the context of achieving profitability and increasing employability, which have been recognized as the main function of SMEs.

Developing up and down stream integration of knowledge provides a better return on firms' performance. This integration could be achieved by focusing on two important variables (IC) and (ACAP) in firms. Therefore, current research proposes a model that integrates the effects of (IC) and (ACAP) on firm performance. Integration of firm knowledge resources is supposed to enhance performance and support firms to achieve superior performance. Furthermore, it involves creating resource heterogeneity and varying firm knowledge

resources that persist over time and provide a basis for the firm's performance, (Engelen et al, 2014).

In summary, previous research that has investigated intellectual capital has focused on different aspects, and various kinds of intellectual capital. However, in terms of literature in this arena, there is considerable ambiguity about the role of absorptive capacity in the field of intellectual capital. In addition, more evidence is needed on ACAP's relationship with a firm's performance, especially in the context of high-technology industries (Hsu and Wang, 2012; Kostopoulos et al, 2011; Tzokas et al, 2015). In times of great need, researchers have not shed light on the integration between IC and ACAP, therefore still more evidence is needed, which may involve making drastic changes to the firm's knowledge management as well as enhancing the firm's ability to survive and grow in a turbulent environment.

Furthermore, such integration focuses on both kinds of resources (internal and external) as well as dynamic capabilities such as IC, ACAP, and on developing a link between the firm's sources of knowledge, which are more likely to push firms to pay more attention to investing and managing knowledge resources. Despite the large amount of research that has been conducted in the fields of strategic management, the role of ACAP in the field of IC is still under investigated, (Hsu and Wang, 2012; Mariano and Walter, 2015; Engelman et al, 2017). Hence, this study bridges this gap in knowledge by investigating the mediating role of absorptive capacity (ACAP) on the relationship between intellectual capital (IC) and firm performance.

The following section states the rationale of the study and is presented to describe why this research is important and needs to be conducted in the high-tech SMEs sector.

### 1.3. Rationale of the study

Developing existing knowledge or acquiring new knowledge, and knowing how to use it to mix an outward-looking component with an inward-looking aspect and be able to apply it as new technological approaches, new products and new organizational capabilities, and to enhance a firm's performance, (Engelen et al, 2014) by using external and internal knowledge resources to develop firm performance, is becoming a major concern for firms.

Two main resources of knowledge are represented as vital elements for companies, which are intellectual capital and absorptive capacity.

Literature on absorptive capacity (ACAP) has revealed that absorptive capacity has been studied across the fields of strategic management, international business, organizational economics, and technology management, (Zahra and George, 2002; Mariano and Walter, 2015), in large companies and small medium-sized enterprises. Furthermore, the whole notion of IC as a resource with a non-physical existence with a high possibility of creating value can be represented as a wide spectrum of resources and factors, which are considered complementary to the value of financial capital (Calabrese, et al, 2013).

However, in today's turbulent environment firms needs to do more than survive, they need to grow, thrive and compete, (Zahra and George, 2002; Gibb and Blili, 2013). In terms of SMEs, the challenge is how to be able to survive and compete in a turbulent environment, (Heilmersson, 2014). Moreover, small medium-sized enterprises have no wide range of resources to develop their performance, like big companies do, (Hudson, et al, 2001).

Consequently, developing and enhancing a firm's performance is becoming an important goal. An increasing number of SMEs has caused competition to become increasingly fierce, (Anggadwita and Mustafid, 2014). Thus, all previous challenges led to making SMEs experience more severe challenges in being able to maintain their existence and expand their activities. In contrast, SMEs have fewer constraints in making decisions than large companies, because of SMEs' fewer intervening levels of managers or intervening boards of external directors, (Engelen et al, 2014). Simultaneously IC represented the most important production factor, due to representing knowledge, regardless of its nature whether internal, external, tangible or intangible. Knowledge is a vital area for most firms, especially those, which are operating in a knowledge intensive environment, such as high-tech SMEs (Hsu and Wang, 2012). Therefore, SMEs pay great attention to knowledge, and focus on how to increase and maximize knowledge resources and dynamic capabilities and use them perfectly.

Many researchers believe that SMEs have positive more features in their nature than big companies for example, organizational structure and the management system in SMEs is different from large organizations (Nicholas et al, 2011). In SMEs characterized as flexible, they tend to have fewer constraints in making decisions, furthermore the CEOs or managers make most of the important decisions, (Engelen et al, 2014). SMEs aim to achieve innovation and job creation, even though SMEs have a significant role as the backbone of the economy

in all countries (Anggadwita and Mustafid, 2014). However, a high percentage of them did not improve their business.

Previous studies in the context of absorptive capacity have focused on for instance, (Cohen and Levinthal's, 1990) ACAP conceptualization; (Zahra and George, 2002) and (Todorova and Durisin's, 2007) reconceptualization; (Lane and Lubatkin's, 1998) interorganizational learning; (Caloghirou et a'sl, 2004) internal and external capabilities; (Jansen et al's, 2005) managing absorptive capacity; and (Flatten et al, 2011; Rhodri and Wood, 2014) measuring absorptive capacity. Furthermore, there are often conflicting regarding to ACAP reconceptualisations (Roberts et al, 2012). Prior research contributed significantly to developing the construct of ACAP. Recently, academic research has agreed that the big challenge now is that firms are seeking to survive and thrive in today's highly turbulent business environments, which have become increasingly complex and dynamic (Seo et al, 2015; Heilmersson, 2014). Simultaneously, ACAP offers a bridge to link firms to the external environment and keep it up to date through two dimensions of ACAP, which are potential absorptive capacity PACAP and realised absorptive capacity RACAP, (Zahra and George, 2002). ACAP dimensions are reflected in an outward-looking component and an inwardlooking aspect (Engelen et al, 2014), due to the first one being concerned with acquiring and assimilating external knowledge, while the second one is concerned with transforming and exploiting acquired knowledge. Therefore, creating knowledge by integrating IC to ACAP dynamic capabilities is very necessary for growth and innovation, (Millan et al, 2014; Lopez-Ruiz, et al, 2014). Summarising, it is more likely to improve the firm's ability to adapt to working in a turbulent and high-velocity environment.

On the other hand, literature on intellectual capital has proved that intellectual capital has a positive influence on a firm's performance and is more likely to create a firm's value, (Bontis, 1998; Youndt and Snell, 2004; Calabrese, et al, 2013; Tsui et al, 2014; Grichnik, et al, 2014; Stam, et al 2014; Kim and Longest, 2014; Abhayawansa and Guthrie 2014; Chen, et al 2014). Investigating IC and ACAP along with the high-tech SMEs performance is very important to offer more evidence about incorporating IC-ACAP- and the firm's performance in a high intensity knowledge environment. Furthermore, the current study offers an overview of integrating internal and external firm knowledge resources to build or develop firms' dynamic capabilities. A long-term adjustment of the firm's knowledge resources is more likely to support firms adapting to new changing environments. The main aim of business is to develop new products (services and goods) and high-tech SMEs play an essential role in

improving the technological system that represents an important approach for firms in creating innovation, (Chen and Karami, 2010). High-tech SMEs are vital to society in applying this research and investigating how a firm's IC creates ACAP, or develops them and integrates them to influence firm performance. There is a small volume of literature that has investigated IC and ACAP along, in high-tech small and medium sized enterprises, or have incorporated ACAP in the field of intellectual capital. Thus, that refers to a gap in the knowledge, also there is a real need to bridge this gap, (Hsu and Wang, 2012; Mariano and Walter, 2015; Engelman et al, 2017). However, acknowledging policy makers, practitioners, and academia in the high-tech SMEs sector in particular has made a big contribution to the economy, though there are considerable gaps in the literature, which still need to be investigated.

Past research has extensively reviewed absorptive capacity, however up to date research findings have showed that ACAP is largely underdeveloped in the field of intellectual capital (Mariano, Walter, 2015). A critical assessment of what the mediating role of ACAP is on the relationship between intellectual capital and firm performance has not yet been conducted, conceptualising ACAP as dynamic capabilities, as highly recommended by (Roberts et al, 2012), in the field of intellectual capital. This research suggests that intellectual capital dimensions do not directly enhance firm performance, rather, they contribute to creating or developing a firm's potential and realised ACAP, as strong and complementary dynamic capabilities to effect firm performance. The construct of absorptive capacity facilitates the process of acquiring new knowledge and using acquired knowledge to commercial ends (Zahra and George, 2002) which in turn drives organizational performance. Thus, this study is a direct response to a gap in the literature. It focuses on to what extent absorptive capacity plays a mediating role in the relationship between IC and firm performance. In other words, the current research has investigated the mediating role of two dimensions of ACAP, which are potential and realised absorptive capacity on the relationship between three dimensions of IC, which are human, structural, and relational capital and firm performance in high-tech SMEs.

#### 1.4. Research objectives and questions

The research questions have been drawn from a recent literature review, which highlighted the fact that previous research undertaken in the areas of absorptive capacity has investigated absorptive capacity in the fields of strategic management, international business, organizational economics, and technology management. Researchers who have been exploring intellectual capital have focused on one or two dimensions of intellectual capital, only a few of them have examined the whole construct, such as (Millan, et al, 2014; Martin, et al 2013; Beckman and O'Reilly, 2007), while others have researched intellectual capital in conceptualizing methods for measuring intangible assets or IC, (Bontis 1998; Youndt and Snell, 2004; Mertins, et al, 2006; Sveiby 2010; Sydler et al , 2014; Gogan, 2014). Furthermore, researchers been studied (IC) and (ACAP) separately in big companies as well as small and medium sized enterprises. Therefore, in terms of studies limitations, there is a real need to explore IC and ACAP along especially in high-tech SMEs.

Researchers have measured (IC) using firms' financial statements, whilst others have conducted their research using different methodologies. Therefore, intellectual capital has received considerable attention in the academic arena and business. On the other hand, scholars who conducted their research on absorptive capacity have focused on investigating the effect of (ACAP) on performance, or have investigated ACAP to explore different organizational phenomena, therefore, it has been used as a moderator and mediator (Leal-Rodriguez et al, 2014; Englen et al, 2014). The most important fact is (ACAP) and (IC) formulate two critical knowledge variables for all firms in general and high-tech SMEs in particular. High-tech SMEs are considered thirsty for getting a new knowledge, while IC and ACAP, represent the two vital resources of knowledge. This has mixed the external and internal resources of a firm's knowledge of such resources to enable firms to make tectonic shifts in several aspects, for instance performance, innovation, creating dynamic capabilities. Prior research in the fields of intellectual capital and absorptive capacity has suggested several issues that need further investigation to be addressed such as investigating absorptive capacity in the field of intellectual capital, (Hsu and Wang, 2012; Mariano, Walter, 2015; Engelman et al, 2017).

The overall objective of this research is to investigate the mediating role of absorptive capacity on the relationship between intellectual capital and firms' performance in high-tech

small medium enterprises in the United Kingdom. This is based on CEOs and managers' perceptions, to improve a high-tech SMEs ability in the flow of knowledge and information, to enhance a firm's knowledge body.

Hence, the research questions and the relative hypotheses are developed based on the review of the literature. However, there are two main research questions, the first question aims to explore the direct relationship between intellectual capital and firm performance. The other question aims to investigate the mediating role of absorptive capacity on the relationship between intellectual capital and firm performance.

The objectives of this research are linked to research questions and hypotheses to achieve a kind of integration in the research findings.

This research sought to answer the following questions in an attempt to focus on important considerations for the SMEs sector. There are two main questions in this research, which will be answered completely by the end of the research.

**Research objective 1**: To investigate the relationship between intellectual capital and firm performance in high-tech SMEs.

**Research question 1**: What is the relationship between intellectual capital and firm performance in high-tech SMEs?

H1. There is a positive relationship between intellectual capital and firm performance in high-tech SMEs.

H1a. High performance firms put more emphasis on human capital in high-tech SMEs.

H1b. High performance firms put more emphasis on structural capital in high-tech SMEs.

H1c. High performance firms put more emphasis on relational capital in high-tech SMEs.

**Research objective 2**: To investigate the mediating role of potential and realised absorptive capacity on the relationship between intellectual capital and firm performance in high-tech SMEs.

**Research question 2**: What is the mediating role of potential and realised absorptive capacity on the relationship between intellectual capital and firm performance in high-tech SMEs?

Two main hypothesis propose to answer the second research question. Every single one has three sub-hypotheses.

# H2. Potential absorptive capacity fully mediates the relationship between intellectual capital and firm performance in high-tech SMEs.

H2a. Potential absorptive capacity mediates the relationship between human capital and firm performance in high-tech SMEs.

H2b. Potential absorptive capacity mediates the relationship between structural capital and firm performance in high-tech SMEs.

H2c. Potential absorptive capacity mediates the relationship between relational capital and firm performance in high-tech SMEs.

# H3. Realised absorptive capacity fully mediates the relationship between intellectual capital and firm performance in high-tech SMEs.

H3a. Realised absorptive capacity mediates the relationship between human capital and firm performance in high-tech SMEs.

H3b. Realised absorptive capacity mediates the relationship between structural capital and firm performance in high-tech SMEs.

H3c. Realised absorptive capacity mediates the relationship between relational capital and firm performance in high-tech SMEs.

The current study proposed a model and provided a theoretical framework for a firm's absorptive capacity, intellectual capital, and performance. It has integrated empirical evidence from selected firms from high-tech SMEs in three sectors "pharmaceutical, biotechnology, and publishing of computer games" in the United Kingdom.

#### 1.5. Significance of the research

This research has theoretical and practical significance. Theoretically, this research builds on previous studies related to intellectual capital, for instance (Bontis, 1998); and absorptive capacity in the field of strategic management such as (Zahra and George, 2002) also extends knowledge provided by previous empirical studies of the factors influencing firm performance. Moreover, this study extends previous studies that have investigated a firm's knowledge resources, intellectual capital and absorptive capacity by concentrating on one specific aspect, that is how intellectual capital influences organizational performance through absorptive capacity, specifically how intellectual capital creates or develop absorptive capacity as dynamic capabilities to enhance firm performance. In addition, this study researched one of the most important production factors, which is knowledge that is considered as critical factors for high-tech SMEs in a dynamic and turbulent business environment. High-tech SMEs are generally characterised as small and medium-sized firms with advanced knowledge and capabilities in technology, an educated workforce, and the ability to adapt quickly to fast changing environments, (Crick and Spence, 2005).

Other features include a strongly required high level of knowledge to maintain their existence, expand business, and overcome these challenges. Therefore, this study focuses on the SME sector, which is the most vital sector in the economy as an engine of economic dynamism, source of innovation, technological progress and employment. (Gibb and Blili, 2013). In furtherance of this contribution, with both IC and ACAP dealing with knowledge and capabilities, the current research attempts to investigate knowledge and dynamic capabilities and hypothesizes their relationships to enhance firm performance. Obviously, studies incorporating ACAP in the field of IC are scant. Therefore, the role of ACAP in the field of IC has been considered as underdeveloped, (Engelman et al, 2017; Hsu and Wang, 2012; Mariani and Walter, 2015). This research extends previous research on ACAP and IC, as well as a firm's performance by considering two dimensions of absorptive capacity, three dimensions of (IC), and two dimensions of firm performance by focusing on the financial outcome and employability growth. In fact, the results of this research will be used to understand better the influence of these variables on organizational performance.

In terms of practical significance, the current research is undertaken to find some answers that will generate a theoretical framework to guide SMEs CEOs and managers in focusing and exploiting internal and external resources of knowledge that come via intellectual capital and absorptive capacity. Indeed, knowledge gained from this research can help management to understand better the relationship between firm knowledge resources like intellectual capital, absorptive capacity and firm performance, as well as what the role of absorptive capacity is on this relationship. Admittedly, this research focuses on high-tech small and medium-sized enterprises in the UK, in order to highlight the processes of integrating newly acquired knowledge with the firm's base knowledge (Engelman et al, 2017) and dealing with new knowledge that is obtained through absorptive capacity, to develop a firm's efficiency in utilizing these resources of knowledge and enhancing the firm's ability regarding the flow of the new knowledge and information, and then to use it for commercial ends (Leal-Rodriguez et al, 2014).

In addition, in-depth analysis of intellectual capital and absorptive capacity, as well as firm performance in high-tech SMEs in the UK is more likely to offer help and support for management and policy makers for this vital sector (Hsu and Wang, 2012). Therefore, investigating and exploring absorptive capacity with intellectual capital becomes crucial to the need to better realize and understand related processes and mechanisms in the high-tech SME sector in leading exporter country of high-tech products such as UK. Ultimately, the current study offers constructive conclusions related to policy makers and management in the high-tech sector.

#### 1.6. Research methodology

The starting point in designing a research methodology was developing a framework (Karami, 2011). A vast amount of literature related to fields of present study has been reviewed to develop the conceptual framework of the study, for instance (Cohen and Leventhal 1990; Bontis, 1998; Kale et al, 2000 Zahra and George 2002; Lane et al, 2006; Hsu and Wang, 2012; Roberts et al, 2012; Leal-Rodrigueze et al, 2014; Engleman et al 2017; etc..). The conceptual framework of this research is discussed in chapter three. In this research, a quantitative study has been employed. In terms of research approach, a deductive approach has been adopted (Saunders et al, 2007). In terms of research target population, the high-tech SMES sector was the chosen population to apply the current research. In addition, the classification of "Standard Industry Classification" codes SIC has been used to select a

sample of high-tech. Investigating SMEs requires a large number of participants in the UK. To achieve a large number of participants for a wide geographical distribution of SME locations around the UK, a survey strategy has been applied. Primary data has been collected via questionnaires (Karami, 2011).

Indeed, there are many reasons for employing a quantitative research approach in this study. First, the objective of this research is to test theory based on data collection, research findings will confirm or reject the hypotheses. Second, quantitative research methods depend on a hypothesis, which is developed from theory (Saunders et al, 2007; Karami, 2011). Third, the nature of research variables such absorptive capacity required metrics to be measured holistically, (Lane et al, 2006; Flatten et al, 2011). Next, the interesting point in quantitative research is that the results of particular investigations can be generalised from a randomised sample to the entire population of the research. The population of this research was high-tech SMEs in the UK, and the sample is high-tech SMEs, which are operating in the subsections of pharmaceuticals, biotechnology, and the publishing of computer games. Structure equational modelling SEM methodology has been applied. In terms of data analysis, a SPSS, statistical package has been used, in particular AMOS 22 software. However, the research design and methodology of this research is discussed in chapter four.

#### 1.7. Structure of thesis

In order to achieve research objectives and answer research questions, this thesis has been organized and structured to take the reader from the research proposal to the research summary and conclusions. Therefore, chapter one introduces the research questions and objectives as well as research rationale and significance. Chapter two demonstrates a critical review of literature in the field of intellectual capital and absorptive capacity and firm performance in small and medium-sized enterprises.

Chapter three builds up a research model by proposing research questions and hypotheses and provides an overview of absorptive capacity, intellectual capital and firm performance in high-tech SMEs.

Chapter four provides the research methodology. It gives an overview about the research philosophy, research design, approach, method and strategy, it also discusses constructing

research questionnaires and the pilot study. A theoretical model of this research and research hypothesis of the direct effects of intellectual capital on firm performance as well as the indirect effects through absorptive capacity are also provided. The data analysis plans bring the chapter to an end.

Chapter five starts with a descriptive analysis then provides a statistical analysis through illustrating data frequencies and correlations among research variables. Structural Equational Modelling has been used to test the research model and test the research hypothesis through AMOS 22 software.

Chapter six is dedicated to revealing and discussing the research results and findings based on chapter five's outputs. Furthermore, it reviews intellectual capital, absorptive capacity, and the SMEs performance by comparing and linking current research results with prior research and literature in research fields.

Chapter seven is the final chapter of this study and it shows the research findings. It demonstrates the theoretical contribution of the research and highlights the policy and managerial implications. This chapter also considers research limitations and offers some suggestions for future studies.

# **2.**Chapter Two: Literature Review

#### 2.1. Introduction.

An increasing number of firms, identifying intangible assets and different kinds of capabilities, characterizes today's knowledge-based economy. Knowledge is their core competence and thereby acknowledges the significance of knowledge assets and dynamic capabilities in a firm's strategic profitability and performance (Hsu and Fang, 2009). Therefore, intellectual capital IC and absorptive capacity ACAP represent the most important elements for acquiring and creating a new knowledge or developing an existing one. It is particularly important in the context of small and medium sized enterprises (SMEs), as they are the driving force for any national economy. SMEs in such a knowledge-based economy increasingly utilise knowledge efficiently and SMEs enhance their innovation potential (Galabova and Ahonen, 2011; Huang et al, 2015).

Despite the significance enhancement of a firm's ACAP and management of IC in improving organizational performance, some studies have investigated intellectual capital partially in the arena of small and medium sized enterprises and family businesses by focusing on one or more dimensions of intellectual capital, but not the whole construct, for instance, (Clercq and Sapienza, 2005) relational capital; (McGuirk et al, 2015; Blanco-Mazagatos et al, 2018) human capital in SMEs. It only focuses on specific kinds of IC. Moreover, researchers investigated absorptive capacity in different disciplines and subjects to understand various organizational phenomena. Further studies have developed the concepts of ACAP such as (Cohen and Levinthal, 1990; Zahra and George, 2002; Todrova and Durisin, 2007), whilst others investigated ACAP in large companies (Jansen et al, 2005), and in small firms (Engelen et al, 2014).

Eventually, ACAP appeared and investigated across the fields of strategic management, international business, organizational economics, and technology management, (Zahra and George 2002). However, there is little evidence regarding investigating ACAP in the field of IC, (Hsu and Wang, 2012; Mariano and Walter 2015; Engelman et al, 2017). Therefore, this study investigated the mediating role of absorptive capacity on the relationship between intellectual capital and a firm's performance. This research is looking for the effects of intellectual capital on company performance, as well as looking for the effects of intellectual capital on the firm's performance through absorptive capacity. Furthermore, this research considers attempts to investigate ACAP in the field of IC and firm performance.

Despite this, intellectual capital is one of the key drivers of organizational-level performance, (Bontis, 1998; Teece, 1998; Youndt and Snell, 2004) in big companies and SMEs. The specific means through which IC influences organizational performance are still underdeveloped in big firms, as well as SMEs. In light of these facts, the present study examines the mediating role of absorptive capacity on the relationship between intellectual capital and firm performance in high-tech SMEs, by answering the following questions:

- 1- What is the relationship between Intellectual capital and firm performance in high-tech SMEs?
- 2- What is the mediating role of absorptive capacity on the relationship between intellectual capital and firm performance in high-tech SMEs?

In terms of resources and limitations, a few studies have focused on the extent to which ACAP mediates the relationship between intellectual capital and firm performance of high-tech small and medium sized enterprises. Therefore, this study will try to find answers to this. The research findings would provide valuable insights to CEOs, SMEs management, and policy makers to make significant contributions particularly to SMEs sector and economy. In terms of prior related studies, this chapter is devoted to highlighting the related literature. Moreover, the researcher has explained the purpose of the literature review, to determine some important points such as, reporting the results of researches in the same field, if the topic is researchable and also to determine the importance of the current research to prior research, (Creswell, 2003). Furthermore, it is going to extend the existing body of literature and propose suggestions for future research. The chapter focuses on: First intellectual capital, second absorptive capacity and then finally, the firm's performance. The related prior research is discussed under these three headings.

#### 2.2. Intellectual capital IC.

Over a few decades, the economy has distinguished just two elements of production, which were labour and capital. These factors are changed into information and knowledge, which replace capital and energy, therefore managing intangible resources such as knowledge is different from tangible and financial resources. However, that led to a tectonic shift in the approach to managing firms (Ben-Simchon, 2005). Nowadays organizations tend to be knowledge repositories by harmonizing knowledge assets and knowledge resources to survive and keep pace with a new market requirement. Therefore, intellectual capital represents the pivotal factor to increase the firm's ability to improve its performance and create a new competitive advantage (unique or sustainable) (Bontis, 1998; Veltri and Bronzetti, 2014).

Therefore, many theories lay behind varied literatures and perspectives in researching intellectual capital, for instance (human capital theory, organizational learning theory, information processing theory, Resource-based theory). Moreover, it suggested intellectual capital could create value and enhance organizational performance by lowering costs, increasing customer benefits, or doing some combination of the two, (Bontis, 1998; Youndt and snell, 2004). Abhayawansa and Guthrie (2014) reported that IC is a critical source of value for firms and the economy, but on the other hand, firms do not own or control all these knowledge resources. Researchers such as (Costa and Tamara, 2013; Calabrese, et al, 2013) argued that there are major challenges to reporting intellectual capital in a financial statement, because intangible resources represent the most difficult part of resources to manage, so it became more difficult to recognize the impact of each of the components of intellectual capital on SME performance.

However, evaluating the effectiveness of intellectual capital management is a most critical issue. Furthermore, some of intellectual capital measurements, which are available, do not offer a comparison of value that is created by integrating the intellectual capital components in the same sector. Simultaneously, scholars investigated intellectual capital as assets, for example (Rossi, et al, 2015) explored the strategic management of intellectual capital assets. Others investigated the effects of IC on firm performance such as (Bontis, 1998; Youndt and Snell, 2004). Many researchers were interested and moved a step further to explore the

management of intellectual capital and capture the dynamism of IC, such as (Isaac et al, 2010; Herremans, et al 2011), and intellectual property, (Hsu et al, 2014).

The most important fact is that there is a real necessity for a way that can offer management ability to compare among IC components in the same sector that will enable firms to recognize the most critical knowledge assets to increase and intensify investment. Sveiby, (1997) highlights intellectual capital valuation, likewise (Kianto, et al, 2013) who describes that knowledge is investigated from a value generation perspective. Therefore, this value is understood as intellectual capital and represents the most important knowledge resource. Veltri and Bronzetti (2014) mentioned that IC represented the key driver of competitive advantage of the third millennium enterprise firm, and the most critical issue is that of managing, measuring, and reporting intellectual capital.

Meanwhile, there is a limited consensus about the definition of intellectual capital, its shape, as well as its components, which have been explained by various disciplines. There is broad agreement that intellectual capital includes three main domains, human capital, structural capital, and relational capital, (Stewart, 1997; Bontis, 1998; Kamukama et al, 2011; Sydler et al, 2014; Abhayawansa and Guthrie, 2014; Tsui et al, 2014; Hsu & Wang, 2012). Many studies have proposed different definitions and approaches to the whole notion of IC for instance. Kamukama et al, (2011) states that intellectual capital is ownership of knowledge, technology, customer relations, experience, and specific skills that provide the organization with an edge in the market. It is considered that the commercial definition is similar to Skandias' definition for IC. Scholars such as (Cohen and Kaimenakis, 2007; Gibb and Blili 2013) described that intellectual capital represents all the intangible resources in firms, developing these kinds of resources, resulting in the market value of the company being much greater than its book value.

This is recognized as strategic intangible resources. The broad concept of IC is a combination of knowledge, capabilities and intangible resources that a firm has at its disposal, and effective management that can provide a firm with a sustainable competitive advantage based on these resources. Lopez-Ruiz et al, (2014) extended the concept of intellectual capital as a new standard of wealth and more importantly as an endogenous key factor of growth, it has been supported by the knowledge-based economy. Sydler et al, (2013) illustrated that in their definition for IC, there are three pillars of intellectual capital, they suggested a financial
model to measure three dimensions of IC. Other researchers suggested intellectual capital as "knowledge that can be converted to value" (Gibb and Blili, 2013:421).

Intellectual capital has been considered in different fields and areas, therefore researchers who are interested in this field showed that IC is broadly used as a tool to measure a firm's implicit value and a firm's gross performance, Tsui, et al, (2013). In furtherance to this point, intellectual capital has been recognized as a production factor and value generated through intangible assets are more likely to create a sustainable or unique competitive advantage, (Abhayawansa and Guthrie, 2014). According to Chen et al, (2014) intellectual capital includes important skills and knowledge which are referred to as valuable assets, of "firm-specificity", long-term investment, and continuous development. Furthermore, intellectual capital is a resource with a non-physical existence with a high possibility to create value and benefits. Calabrese, et al, (2013), explained that IC has the same importance as financial capital and IC represents a complementary to financial capital in value.

A wide spectrum of resources and factors can be represented as IC, (Cohen and Kaimenakis, 2007). Moreover, researchers explored whether interactive behaviours, organic renewal environments, and trust are leads to the intellectual capital management process, (Isaac et al, 2010); the relationship between intellectual capital and firm performance (Bontis, 1998; Youndt and Snell, 2004; Lu et al, 2014). While Wang et al, (2014) explained the importance of IC through analysing "cost efficiency" and "revenue efficiency". Costa (2012) investigates the relationship between IC management and firm performance, then stated that there is no absolute way to measure an intangible assets' value at a high level of accuracy. Researchers who explored knowledge-based intellectual capital in various way and perspectives such us (Hsu and Wang, 2012; Tsui et al, 2014; Turner, et al 2014). Table (2.1) demonstrated how researchers investigated intellectual capital in the literature and their key contributions.

Table 2.1	l Studies	regarding to	intellectual	capital.
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	Authors	Contributions
1	Radaelli et al, (2018); Ahmed,	Analysed one or two IC dimensions of human,
	(2018); Bendickson and Chandler,	social or structural capital
	(2017); Chadwick, (2017); Riley et	
	al, (2017); Morris et al, (2017);	
	Marvel et al, (2016); Grichnik, et	
	al,(2014); Stam, et al (2014); Phillip	

	and Kyle (2014); Millan, et al,	
	(2014); Martin, et al (2013); Moran	
	(2005), (Klaas, et al, 2010); Clercq	
	and Sapienza, (2006); Luo, et al	
	(2009); Kale et al, (2000).	
2	Subramony et al, (2018); Blanco-	Explored the relationship between HRM
	Mazagatos et al, (2018); Kianto et al,	practices and evaluated the appropriateness of
	(2013); Sheehan, (2013); Coca ,and	the performance measurement system
	Alberti (2009); Hudson, et al, (2001)	
3	Sveiby (2010); Yildiz et al, (2014);	Conceptualized methods for measuring
	Sydler et al , (2014); Mertins, et al,	intangible assets and IC
	(2006); Gogan (2014); Veltri and	
	Bronzetti (2014)	
4	Costa (2012);	Evaluated the efficiency and productivity of
	Wang ,et al (2014)	intellectual capital and changes in productivity
5	Mark et al, (2013) Corcoles &	Comparative studies to analyse SMEs IC in
	Ponce, (2012)	different countries and methodologies
6	Chen et al, (2014); Cohen and	Examined the interactions and relationship
	Nikolaos (2007); Jansen, et al (2011)	between various dimensions of intellectual
		capital
7	Kianto et al, (2013); Kamukama, etal	Investigated the impacts of IC management and
	(2011)	competitive advantage on financial
		performance and the competitiveness of
		companies/focused on financial aspects
8	Abhayawansa and Guthrie (2014)	Examined which type of IC information was
		considered important and used this within an
		analytical report
9	Calabrese, et al, (2013)	Obtained guidelines for IC management and
		investments
10	Turner et al, (2014)	Investigated how social and organizational
		capital was used by managers.
11	Engelman et al, (2017); Chen	Investigated intellectual capital, dynamism and

	(2008); Isaac et al, (2010);	capabilities
	Herremans et al (2011)	
12	Rossi et al (2015)	Investigated intellectual capital as assets
13	McDowell et al, (2018); Hussinki et al, (2017); Cabrita and Bontis (2008); Honig (2001)	Intellectual capital and business performance, or firm performance
14	Kitts et al, (2001)	Proposed a technique called IC mapping

As is clear in the table (2.1) researchers investigated various dimensions and models of intellectual capital in the literature and contributed to this field with different intellectual capital models. It is worthy for present research to highlight the main intellectual capital models.

## 2.2.1. Models of intellectual capital

Over a number of years, scholars and researchers have suggested different models of intellectual capital, for instance, (Stewart, 1997; Bontis, 1998) proposed a model that intellectual capital included three summative sub-components, namely human capital, structural capital, and customer capital. Bontis et al, (2000) operationalized these three sub-components of IC, which resulted in a positive link with improvement of a firm's performance. Others such as (McElroy, 2002) proposed another model which shifted customer capital to social capital. However, regardless of the differentiation in the labels, there is a broad consensus about these three domains of IC, which are human capital, structural capital, and relational capital (Stewart, 1997; Bontis, 1998; Isaac et al, 2010; Hsu and Wang, 2012; Sydler et al, 2013; Bellora and Guenther, 2013; Kianto, et al, 2013; Abhayawansa and Guthrie, 2014).

Simultaneously, many scholars have described the same kinds of IC, but in different ways, for example, (Bellora and Guenther 2013), divided IC into internal intellectual capital such as structural capital and external intellectual capital such as relational capital that shows firm's intellectual capital consists of internal and external elements. Researchers such as (Turner et al, 2014) classify IC into human capital, social capital, and organizational capital, while (Jen

Chen et al, 2014) show that the three dimensions of IC are human capital, organizational capital, and customer capital, focusing on the customer relationship in terms of relational capital, while others conceptualized relational capital broadly to include forward and backward relationships. Therefore, relational capital represents the relationship with the customer and suppliers.

Thus, the majority of the literature refers to three key dimensions of interconnected intellectual capital. Moreover, researchers refer to the link among IC dimensions and elements (Bontis, 1998). Intellectual capital is an essential determinant of current and future firm value, growth, competitive advantage, and performance. It is notable that values of intangible assets lie in their mixed strength and not in their separate characteristics. Abhayawansa and Guthrie, (2014) highlighted the notion of prior research which neglected to show the value generated by the interaction among different intellectual capital categories and between both financial and non-financial capital. In addition, both customer and structural capital are influenced by human capital, (Bontis, 1998; Millan, et al, 2013). Table (2.2) illustrates some research and how this research is classified or follows the classification of intellectual capital.

	Authors	Classifications
1	Hussinki et al, (2017); Bellora	human capital, structural capital, relational
	and Guenther, (2013); Kianto,	capital or customer capital
	et al, (2013); Abhayawansa and	
	Guthrie, 2014; (Edvinsson and	
	Sullivan, 1996); Stewart,	
	(1997); Bontis (1998)	
2	Turnar et al, 2014. Tsui, et al	Human capital, social capital, organization
	2014. Yildiz et al, 2014	capital
3	Chen, et al 2013.	human capital, structural capital, financial
		capital
4	$I_{\text{space of al}}(2010)$	humon conital organizational conital
4		numan capital, organizational capital,
		relational capital

1 a 0 10 2.2 interfectual capital classifications.
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5	Calabrese et al, (2013)	Human capital, structural capital

Bontis, (1998) shows firm intellectual capital in order, the first order represented the three dimensions of intellectual capital and the second order represented the whole firm's intellectual capital. Furthermore, he proposed that each dimension in the first order consisted of many components and factors. Figure 2.1 illustrates these orders, as we can see in the 1<sup>st</sup> order there is human capital, structural capital, and customer capital. In terms of customer capital, researchers have investigated relational capital in various ways, such as customer capital, which represents firm's individual relationships with customers; while others investigated forward and backward relationships (with customers and suppliers), and other researchers, who highlighted the whole concept through investigating relational capital as relationships with (customers, suppliers, and the interactions between firm employees).

Figure 2. 1 Orders of firm intellectual capital



Source: adopted from Bonties, (1998. P: 66)

In terms of intellectual capital classifications, the current study adopted the classification of intellectual capital that consists of three main dimensions: Human capital, structural capital, and relational capital based on (Bontis, 1998). The following part of the chapter explains these three dimensions in depth as well as current research on conceptualized relational capital broadly including internal and external relationships. Considering intellectual capital as intangible assets such as intellectual materials, intellectual property, knowledge, experience, and information, (Hsu et al 2014), stated that these assets can be captured, leveraged and formalized to provide a firm's higher-valued assets. In this sense and using these assets is more likely to improve a firm's member's ability to create innovation, which in

turn creates innovative solutions to work problems, creating knowledge through R&D, and managing positive relationships with the firm's network.

Intellectual capital is considered to be a firm's strategic renewal resources and IC dimensions working together, for instance human capital embedded in the firm's employees' brains, and structural capital in the firm's system (Bontis et al, 2001; Sydler et al, 2013), therefore using human capital through employees' skills to achieve R&D activities or to create patents, and also the firm's employees who are striving to build relationships with business partners based on trust or reciprocity. Even though some researchers have largely neglected the interactions among intellectual capital dimensions, all previous activities are tied and operated together, firm performance will be enhanced more than if it is not together. In furtherance of this point, structural capital offers a suitable mechanism to allow human capital to create value. In addition, scholars described that human capital represents the source of relational and structural capital, (Engelman et al, 2017) and also proposed relationships and alliances (Kale et al, 2000) as well as R&D activities and the firm's systems and routines run by human capital, and that come from human relationships, (Welbourne and Pardo-del-Val, 2009).

Ultimately, previous related research has investigated intellectual capital in large companies regarding assets and capabilities and whether they exist or not. It has also explored the effects on firm performance directly and indirectly and also investigated the effect of intellectual capital dimensions partially on an SME's performance. However, the present research aims to investigate the effect of the whole construct of intellectual capital on high-tech SME's performance operating in three sectors, namely pharmaceutical, biotechnology, and the publishing of computer games in the UK. Thus, this research investigated the effects of the three dimensions of intellectual capital on high-tech SMEs directly and indirectly through potential and realised absorptive capacity by focusing on financial outcomes and employment growth.

#### 2.2.1.1. Human capital

Human capital represents the key factor of creating competitive advantage (Jiang et al, 2012; Wright et al, 1994). Human capital is considered the human factor in the firm. It is everything related to employees such as intelligence, skills and expertise, (Coff, 2002; Kamukama et al, 2011). It gives the organization diacritical character: when employees leave the firm, they take it with them, because it is not owned by the firm. Human capital consists of different elements and factors. It differs from one classification to another. For instance, (Sydler et al,

2013) refers to human capital components as, knowledge, skills, experience, training and education, creativity, capacity, expertise, teamwork, problem solving capability, motivation, loyalty, and attitude. Therefore, human capital includes the majority of the implicit knowledge imbedded in the firm's employees or employees' brain. Rauch, et al, (2005) argued that human capital is considered as a critical resource especially in small firms, due to a lack of other resources. It has been explained that the only way to create company-specific resources is by focusing on human capital development, which leads to generating specific knowledge.

Human capital, represents a vital resource in creating a competitive advantage, increased employment growth in small-scale businesses (Rauch et al, 2005). Even though some scholars support the opinion that sales are the best measure of growth in different circumstances. Others believed that employment growth is the most meaningful measure, (Rauch et al, 2005). Therefore, Jen Chen, et al (2014) recognized human capital, as the knowledge and experience that employees and managers possess, whereas other scholars refer to educated people as a human capital (Millan, et al, 2013). It represents two points of view, the first one refers to human capital in terms of business and the second one refers to human capital in general.

Scholars found out that human dimensions of IC are different from other dimensions. It described it as an implicit knowledge, which exists in the heads of employees, as opposed to the other two kinds of intellectual capital, which exist in the firm's system and routines as well as the firm's intellectual property, and relations. Therefore, the term human capital development means increasing and improving the skills, experience, and knowledge of workers in the firm.

A major responsibility has to be taken by firms to develop and protect their human capital. Moreover, human capital is intangible, which means that it is embedded in the organization's human resources, whereas structural capital is intangible, which is embedded in the firm, (Calabrese et al, 2013). Researchers such as (Martin et al, 2013) highlighted the notion of distinguishing between human capital investments and human capital assets, through focusing on the dynamic approach of human capital. Others investigated the role of human capital in creating social capital, (Jansen et al, 2011), and critical factors for public policy makers and entrepreneurs, (Millan et al, 2013). Human capital in large companies has more chance to be developed rather than in small and medium sized enterprises, therefore researchers measured human capital using different methods in large and small firms. For

instance, (Grichnik et al, 2014) focused on the duration of the socialization rather than expertise gained, therefore they highlighted important resources to create and develop human capital in nascent businesses.

- Managerial experience.
- Entrepreneurial experience
- Academic education level.
- Business training.

Therefore, human capital has got considerable attention in prior research to reveal its impact on different activities and aspects. For example, (Riley et al, 2017) investigated the economic value to companies of investing in training of their workforce, their results asserted the view that HC investments are more likely to be of even greater economic value to companies, particularly when they have made complementary investments in physical capital and other activities.

Thus, prior research investigated human capital or resources of creating human capital whether they existed or not. A few researchers have addressed how firms enhance their performance relying on human capital (Bendickson and Chandler, 2017). However, this research investigated the effects of human capital in enhancing financial and non-financial performance of high-tech SMEs.

#### 2.2.1.2. Structural capital

Structural capital refers to how the people are connected within the firm's system. Structural capital is employed to reflect processes and procedures that are created by, and stored in, a firm's technology system, which enhances the speeds of knowledge flowing through the firm, (Carson et al., 2004; Youndt and Snell, 2004). Researchers such as Kamukama, et al, (2011) explained that structural capital is an inventory of knowledge, which is owned by the company and consists of, explicit knowledge, process optimization, the organization's culture, product innovation, information technology, and innovation among others. Sydler et al, (2013) illustrated that structural capital is related to the firm as a whole, and states it stays in the company, even if the employee leaves the company.

Hormiga and Canino, (2011) noticed that structure capital is the most complex dimension of intellectual capital to evaluate, because it is affected by many factors, such as, culture and behaviour. In addition, structural capital is the closest variable to absorptive capacity. In the case of dealing with absorptive capacity, it is a uni-dimensional concept based on static

theory and uses proxies to measure absorptive capacity. Even though the ratio of R&D expenditure has been adopted by many researchers to measure structural capital for instance (Chan et al, 2001), R&D expenditure has also been used to measure absorptive capacity.

#### 2.2.1.3. Relational capital

Relational capital is considered to be the value of the organization within firms and people with which to conduct business. Sydler, et al (2013) reveals that relational capital consists of relationships with lobby organizations, partners, external stakeholders, networking with suppliers and distributers and customer relationships. Therefore, they highlighted the whole concept of relational capital. As opposed to others who investigated only customer capital (Chen et al, 2014) or who solely focused on the internal relationships between the firm's employees.

Relational capital is described as the basis for collective activities and actions in society, (Burt, 2009). Customer relational capital is the knowledge relating to customers that enhances a firm's ability to realize customer needs and trends of product features, (Chen et al, 2014; Goffin and Koners, 2011). A firm's RC improves the quality of the firm's members and the richness of information exchanged among business partners. In terms of interaction and exchange of information, relational capital is the key factor for facilitating this action. Researchers argued that companies with high intellectual capital especially relational capital could keep pace gradually with customers' needs with regard to development, to ensure that they are able to predict the expected customer's needs and trends (Hsu and Wang, 2012; Dao, Zmud, 2013; Chen, 2014). That could be the key elements to acquire the customer's trust, which in turn affects firm performance.

Relational capital is a vital intangible asset, especially for SMEs and generally for companies, (Welbourne and Pardo-del-Val, 2009). It enables firms to deal with others and create collaborative agreements, it is more likely to support firms for achieving high performance. Thus, a high level of relational capital will enable firms to improve performance. Hence, this research investigated relational capital as internal and external relationships or forward and backward relationships, for instance relationships with partners, external stakeholders, networks with suppliers and distributers and the relationship with customers. As researchers have no agreement about the intellectual capital dimension, the components of each

dimension are classified in various ways. It is worth explaining how previous research dealt with intellectual capital components.

## 2.2.2. Components of intellectual capital dimensions

As explained before, intellectual capital consists of three main dimensions and each dimension includes elements or components. Many researchers have placed them into clusters and groups. For instance, (Costa, 2012) states that intellectual capital consists of a comprehensive amount of organizational knowledge, therefore he includes intellectual capital within a wide range of organizational knowledge. Intellectual capital has three main dimensions and a wide range of components for each dimension. Researchers classified intellectual capital dimensions into components based on the nature of the intellectual capital. Scholars and those interested in the field of IC, who investigated IC as assets, referred to some categories of IC. While others who investigated IC as knowledge capability or capacity, referred more or less to categories of IC, such as (Isaac et al, 2010; Herreman et al, 2011).

Thus, classifying the elements of each IC dimension is slightly different, but in general, it represents the IC concept. In addition, it might happen, due to the exploration of IC in different fields or disciplines or different theories behind the research. Table (2.3) illustrates the main three dimensions of intellectual capital and breaks down the elements of each IC dimension based on prior literature.

	References	Human capital	Structural capital	Relational
				capital
1	Sydler et al,	Knowledge, skills,	Trade marks, patents	Relationship
	(2013)	experience, training	licenses	with lobby
		and education,		organization,
		creativity, capacity,		partners, external
		expertise, teamwork,		stakeholders,
		problem solving		network with
		capability, motivation,		suppliers and
		loyalty, and attitude.		distributers,
				customers
				relationship
2	Bellora and	Employees, education,	Intellectual property,	Customers and
	Guenther,	training, work-related	management	market,
	(2013)	knowledge,	philosophy, corporate	distribution
		innovativeness of	culture, management	channels, firm
		employees	process, information	reputation,
			and networking system,	business
			infrastructure.	collaborations
3	Abhayawansa	Knowledge, skills,	relationship with	Intellectual
	Guthrie 2014	attitudes, abilities,	external stakeholders,	property,
		competences, qualities	suppliers,	intangible
		of a firm's employees, mechanisms, support and motivate performance, training and development, employee benefits, compensation schemes	customers, partners, government, community, perceptions	infrastructure
		and a favourable,		
		working environment.		

Table 2. 3 Componants of each IC dimension.

4	Maria, 2014	Training /qualifications	Registration	Managing
		and talents	organizational	customer
		management,	knowledge, existence of	satisfaction,
		assessment of know-	certification, social and	customer
		how and innovations,	environmental policies,	complaints
		teamwork,	award scheme,	system,
		development and	partnership, compliant	accessing new
		innovations investment,	system	market
		talent relation policy		
5	Calabrese et	Competence, Attitude,	Relationship,	
	al, (2013)	Intellectual	Organization, Renewal	
		Agility	and Development	
	Clarge and			Trust amount of
	Clercy and			Trust, amount of
	Sapienza,			social
	(2006)			interaction,
				amount of goal
				congruence
	1			1

# 2.2.3. Intellectual capital in small and medium sized enterprises

The importance of intellectual capital in big companies is known, but in small and medium sized enterprises it is still a subject for investigation in different sectors. Firm size can influence a firm's IC, because large firms, with more resources, are more likely to create or develop a higher IC than smaller firms do, (Su, 2014). Furthermore, measuring intellectual capital in small and medium sized enterprises is challenging, due to the lack of financial data related to intellectual capital in SMEs and the characters of SMEs themselves, see table (2.4). Even though measuring intellectual capital in SMEs considered as a big challenge to researchers, (McDowell et al, 2018) investigated the relationship between intellectual capital and SMEs performance based on business owners' perspectives. In this sense, others argued

that a turbulent business environment and increased competition require SMEs to continually change their traditional technique of conducting business and search for new updates and technologies, (Khalique et al, 2015).

SMEs management requires an understanding and the utilising of the most critical strategic assets of a knowledge-based economy. Therefore, many researchers have posited that intellectual capital is a vital resource for an SMEs success and that is tightly linked to their performance (Bontis et al., 2000; Chen et al., 2014; Daud and Yusuf, 2008; Hormiga et al., 2011; Khalique et al., 2011). The differences between large firms and SMEs are shown in Table (2.4), which focuses on five main key points, that are structure, procedures, behaviour, processes and people, and contact. It highlights the main differences between them.

Large organizations	Small and medium-sized organizations	
In terms	of structure	
<ul> <li>Hierarchical with several layers of</li> </ul>	<ul> <li>Flat with very few layers of</li> </ul>	
management	management.	
<ul> <li>Clear and extensive functional</li> </ul>	<ul> <li>Division of activities limited and</li> </ul>	
division of activities.	unclear.	
<ul> <li>High degree of specialization.</li> </ul>	<ul> <li>Low degree of specialization.</li> </ul>	
<ul> <li>Rigid structure and information flows.</li> </ul>	<ul> <li>Flexible structure and information</li> </ul>	
<ul> <li>Top management a long distance</li> </ul>	flows	
away from the point of delivery.	<ul> <li>Top management close to the point of</li> </ul>	
<ul> <li>Top management's visibility limited.</li> </ul>	delivery.	
<ul> <li>Multi-sited and possibly multinational</li> </ul>	<ul> <li>Top management highly visible.</li> </ul>	
<ul> <li>Many interest groups</li> </ul>	<ul> <li>Single-sited.</li> </ul>	
<ul> <li>Normally slow response to</li> </ul>	<ul> <li>Very few interest groups.</li> </ul>	
environmental changes.	<ul> <li>Normally rapid response to</li> </ul>	
<ul> <li>Low incidence of innovativeness.</li> </ul>	environmental changes.	
<ul> <li>Cultural diversity</li> </ul>	<ul> <li>High incidence of innovativeness.</li> </ul>	
	<ul> <li>Unified culture</li> </ul>	
In terms of Procedures		

Table 2. 4 The differences between large firms and SMEs.

*	Activities and operations governed by	*	Activities and operations not governed		
	formal rules and procedures.		by formal rules and procedures.		
*	High degree of standardization and	*	Low degree of standardization and		
	formalization.		formalization.		
*	System-dominated.	*	People-dominated.		
*	Rigid and unadaptable processes.	*	Flexible and adaptable processes.		
*	Incidence of fact-based decision	*	Incidence of "gut feeling" decisions		
	making more prevalent.		more prevalent.		
*	Fragmented decision makers.	*	Few decision makers.		
	In terms o	f Behav	iour		
*	Mostly bureaucratic.	*	Mostly organic.		
*	Strong departmental/functional mind-	*	Absence of departmental/functional		
	set.		mindset.		
*	Cultural inertia.	*	Corporate mind-set.		
*	Meritocratic.	*	Fluid culture.		
*	Rigid corporate culture dominating	*	Patronage.		
	operations and behaviours.	*	Operations and behaviour of employees		
			influenced by owners'/managers' ethos		
			and outlook.		
	In terms of	of Proces	sses		
*	Extended decision-making chain.	*	Short decision-making chain.		
*	Complex planning and control system.	*	Simple planning and control system.		
*	Strategic process generally deliberate	*	Strategic process incremental and		
	and formal.		heuristic.		
*	Formal evaluation, control and	*	Informal evaluation, control and		
	reporting procedures.		reporting procedures.		
*	Control-oriented	*	Result-oriented.		
	In terms of People				

*	Personal authority mainly low.	*	Personal authority mainly high.
*	Individual creativity stifled.	*	Individual creativity encouraged.
*	Dominated by professionals and	*	Dominated by pioneers and
	technocrats.		entrepreneurs.
*	Range of management styles:	*	Range of management styles: directive,
	directive, participative, paternal, etc.		paternal.
*	Individuals normally cannot see the	*	Individuals normally can see the results
	results of their endeavours.		of their endeavours.
*	Ample human capital, financial	*	Modest human capital, financial
	resources and know-how.		resources and know-how.
*	Training and staff development is	*	Training and staff development is more
	more likely to be planned and large		likely to be <i>ad hoc</i> and small scale.
	scale.	*	No specified training budget.
*	Specified training budget.	*	Low incidence of unionization.
*	High incidence of unionization.	*	Negligible resistance to change.
*	High degree of resistance to change.	*	Very few internal change catalysts
*	Potentially many internal change		
	catalysts.		
	In terms	of conta	act
*	Wide span of activities.	*	Span of activities narrow.
*	Extensive external contacts.	*	Limited external contacts.
*	Greater scope for an extended	*	Normally dependent on a small
	customer base.		customer base.
*	Large customer base.	*	Limited customer base.

Source: adopted from (Ghobadian and David, 1997 P: 128-129).

As we can see from Table (2.4), both large firms and SMEs have strength and weaknesses points compared to each other's. Ultimately, intellectual capital has the same nature, structure, model, and components in small and medium sized enterprises and large firms. Furthermore, researchers investigated intellectual capital in different SME industry sectors (Honig, 2001; Moran, 2005; Luo et al, 2009; Hsu and Wang, 2012; Yoo et al, 2016; Engelman et al, 2017; McDowell et al, 2018). Following prior research on intellectual capital, this research investigated the relationship of three dimensions of IC on performance of three high-tech SME sectors in the UK.

### 2.2.4. Measuring intellectual capital

Nothing is immeasurable: increasing ways that try to measure a firm's intellectual capital reflects the importance of IC for firms. Recent research acknowledges that intellectual capital represents the factor, which supports managers and executives to make dramatic changes in their firms. This importance comes from the advantages and benefits for IC in organizations, for instance increasing the value of tacit and explicate knowledge, it amplifies the bargain elements through mergers, and traditional accounting systems. Therefore, considerable attention has been paid to measuring intellectual capital and some research has suggested various definitions and approaches to capture the notion of intellectual capital. Prior studies resulted in different measurements based on different models and methodologies to measure intellectual capital, for instance (Bontis, 1998), who measures intellectual capital quantitatively, whereas (Sveiby, 2001; Sydler et al, 2014) use financial statement data. Bontis (2001) illustrates seven approaches of measuring intellectual capital, Skandia navigator, IC-index, technology broker, intangible assets monitor, economic value addition, citation-weighted patents, and research agenda.

Meanwhile, Sveiby (2010) suggested the classification of four approaches to measure intellectual capital: First, direct intellectual capital methods (DICM), which is a calculation of the value by estimating the dollar value and its different components. This approach includes six sub- methods. Second, market capitalization methods (MCM), in this approach the differences between companies' stockholder equity and the company market capitalization are evaluated and this approach involves three sub-methods. Third, return on assets methods (ROA), which includes five sub-methods, and this approach is widely used to measure a firm's performance. Lastly, is the scorecard method (SC), which identifies several components of intellectual capital or intangible assets and indicators. This approach contains seven sub-methods, these approaches have various advantages, especially the last one, because it offers a different way to measure a firm's intellectual capital from the bottom up. Scholars explain various approaches, and these approaches and methods have different benefits and deficiencies; for instance, some of these methods can contribute to illustrating the financial value of intangible assets. The most important aim of these measurements is to support managers to manage effectively all the firm's resources, (Bontis, 2001), especially intangible resources to improve the firm's performance and achieve a competitive position. Other scholars investigated two main groups to measure intellectual capital, for example (Yildiz et al, 2014) states that "market value, book value rate, Tobin's q rate, calculated intangible value". This method takes intellectual capital as a unified construct, as opposed to other models, which deals with IC depending on IC dimensions, such as "technology broker, "Skandia navigator", value added intellectual, intangible assets monitor coefficient". In the same field, researchers have conducted valid measures to assess a firm's intellectual capital, for instance (Bontis, 1998; Youndt and Snell, 2004; Isaac et al, 2010; Veltri and Bronzetti 2014). Gogan, (2014) attempts to design a new measurement model called an innovative model allowing for a deep analysis of organizations that could support suitable tools for a SME to manage their IC.

The most important finding is that high investment in intellectual capital is the key to success of firms in enhancing their performance. However, IC in different firms can be calculated and estimated by different methods using several indicators. Selecting a specific method to capture intellectual capital could be influenced by the size of the firm or the aim of measuring such intangible assets. Lopez-Ruiz, et al, (2014) proposed a methodology to assess intangible capital by focusing on the growth capacity of knowledge. Their results revealed big differences between various locations of intellectual capital. The top rankings are occupied by locations that maintain and focus on achieving a balance in human capital, as the most critical growth element. Therefore, the important resources of value added in economics of a knowledge are generated by using research, knowledge, brainpower, and technology.

Sveiby, (2001) noticed that it is obviously difficult, if not impossible to measure IC components quantitatively, based on an IC statement. In contrast, regardless of the IC statement, researchers have measured IC successfully by using quantitative methods, for instance (Bonties, 1998; Youndt & Snell, 2004; Isaac et al, 2010; Herremans et al, 2011; Bendickson and Chandler, 2017), due to most intellectual assets being considered off-balance assets (Hsu and Wang, 2012). Interested in field of intellectual capital, (Calabrese, et al, 2013) evaluated the contribution of each intellectual capital component into the firm's value generation process. In the line with this opinion, the output of this method supports the decision makers and provides them with guidelines to create and maintain a balance among intellectual capital components. In addition, they explained most of the organizations have only an ambiguous idea of how to run investments in intellectual capital and what they should get from these investments. Thus, many companies strive to achieve a balance in the process of investing in intellectual capital.

It can be clearly observed that firms are tending to overinvest in some intellectual capital components and ignore others. However, using various methods to measure and assess IC helps firms to avoid focusing on specific categories of IC and ignore the others. In addition, (Calabrese et al, 2013) suggested a model to evaluate IC, which allows the firm to capture and foster IC dynamics by "integrating fuzzy logic and Analytic Hierarchy Process" (AHP). Intellectual capital is a critical asset created by firms, at the same time firms are required to maintain competitiveness, as well as business performance, therefore a great measure of IC and the intelligent management of IC is more likely to achieve a perfect balance in the processes of knowledge investment.

Furthermore, Veltri and Bronzetti (2014) investigated a new approach to analysis and report intellectual capital by using the bottom-up approach instead of top down, and the most interesting fact is that they changed their research questions asking "how IC works in organization" instead of "what IC is?" This study was conducted on an non-profit organization (NGO). Current research adopted an intellectual capital measurements form (Isaac et al, 2010) to measure two main dimensions of intellectual capital, which are human capital, and structural capital. Focusing on relational capital measures has been adopted from (Kale et al, 2000; Isaac et al, 2010), to capture the whole construct of relational capital, in other words to capture the internal and the external relationships.

# 2.3. Absorptive capacity ACAP.

Absorptive capacity has been identified as the ability of firm to identify, assimilate, and apply external knowledge (Cohen and Levinthal, 1990): absorptive capacity offers an approach to conceptualize and figure out how firms acquire and exploit knowledge and the processes of knowledge flowing from outside into inside firm (Omidvar et al, 2017). The concept of absorptive capacity has been also used to explain different organizational phenomena. The concept has inspired and interested a wave of scholars over the last two decades as researchers have explored absorptive capacity antecedents (Jansen et al., 2005; Nooteboom et al, 2007), its consequences for innovation (Hurmelinna- Laukkanen et al., 2007; Tsai, 2001) absorptive capacity reconceptualization and competitive advantage (Escribano et al, 2009; Todorova and Durisin, 2007; Zahra and George, 2002), and the development of absorptive

capacity over time, (Omidvar et al, 2017). This section covers the absorptive capacity concept, reconceptualization, and measurements of the construct as follows:

#### 2.3.1. Absorptive capacity concept

A turbulent business environment has ensured considerable attention to knowledge as a crucial resource of superior performance. To achieve a performance firms are required to recognize new external knowledge, assimilate it, and exploit it for financial or commercial ends. This process is referred to as a concept of absorptive capacity (ACAP). Cohen and Levinthal, (1990) in their seminal work defined absorptive capacity as the "ability of a firm to recognize the value of new, external information, assimilate it, and apply it into commercial ends" (Cohen and Levinthal, 1990: p.128). Recently, absorptive capacity ACAP has played a significant role in different aspects of the field of business. The importance of ACAP has appeared across the fields of strategic management, international business, organizational economics, and technology management, (Zahra and George, 2002).

In a turbulent business environment, firms face intense rivalry, globalization, and a demand for innovation, therefore "absorptive capacity" is considered to be an obligation for business success (Lane et al. 2006). Researchers and other interested individuals have used ACAP to investigate and explore different organizational phenomenon. It is getting significant attention, as the focus on intangible assets such as knowledge, technology, and information strengthens: rapid responses and innovation, because of the impact of a changing business environment becoming more significant than ever. A previous definition of ACAP mentioned three dimensions, that of knowledge identification, assimilation, and exploitation to a commercial end. While the construct of absorptive capacity has got several reconceptualizations from (Zahra & George, 2002; Lane et al, 2006; Torodova & Durisin, 2007; Valberda et al, 2010), their reconceptualization focused on a related dimension of absorptive capacity, for instance a potential and realised absorptive capacity.

Researchers such as (Zahra and George 2002; Jansen et al, 2005; Leal-Rodrigous 2014) shed light on the multidimensionality of ACAP and the complexity of this construct. However past literature connected absorptive capacity to organizational competitive advantage, (Cohen and Levinthal, 1990), flexibility (Sterman, 2001), and innovation performance (Levinson and Asahi, 1995; Flatten et al, 2011). Researchers in fields of strategic management, innovation management, and organisational learning such as (Van Den Bosch 1999; Barkema and Vermeulen, 1998; Robert et al, 2012) particularly focused on explicit processes and mechanisms of absorptive capacity.

Many researchers investigated absorptive capacity in different methodologies and used several measurements to capture absorptive capacity. Therefore, it is known that absorptive capacity has been used to describe and analyse various complex organizational phenomena, (Zahra and George, 2002). Obviously, strategic management literature has described that there is a broad agreement that a firm's ACAP represented a major dynamic capability, when capabilities qualify as dynamic (Floyd and Lane, 2000; Zahra and George, 2002; Seo et al, 2015).

Although firms are exposed to the same amount of external knowledge within a cluster, firms might not get the same benefits, due to their different endowments of absorptive capacity, (Miguelez and Moreno, 2015). Previous argument refers to their view, which a firm's prior knowledge has a critical role in realising capacity. In order to reconfigure firms' resources, they have to renew their knowledge base and the skills necessary to compete in a high velocity environment. Engelen, et al (2014) connected the resource-based view RBV, and its dynamic capability extension to use absorptive capacity (ACAP) as a moderator of the relationship between entrepreneurship orientation and firm performance. They proved that absorptive capacity strengthens the entrepreneur orientation-performance relationship in dynamic markets. Previous study highlighted the notion of absorptive capacity as firm dynamic capabilities, as opposed to those who differentiated between ACAP and DC such as, (Hsu and Wang, 2012).

Huang et al, (2015) investigated the mediating role of absorptive capacity on the relationship between R&D investment and firm innovation. R&D spending is not the only source of ACAP, since employee skills, organizational memory, and prior organizational experiments and experiences contribute significantly to a firm's overall ACAP, (Engelen et al, 2014). This is in contrast, to those who used R&D investment as a proxy to capture and measure absorptive capacity, Flatten et al, (2011). Other researchers have shown that ACAP influences innovation (Tsai, 2001) and has made a significant contribution to firm performance both indirectly (Lane et al, 2006) and directly (Lichtenthaler, 2009). Researchers such as Lane et al, (2006) highlighted four research trends that have strongly combined with ACAP: organizational learning, strategic alliances, knowledge management, and the resource-based view. In addition, two general perspectives have showed absorptive capacity as a "stock" of prior related knowledge and an "ability" to absorb knowledge, (Roberts et al, 2012).

Researchers such as Lane et al (2006) illustrated that absorptive capacity has been conceptualized and measured as either (1) an asset, (2) an ordinary capability, or (3) a dynamic capability. An asset is defined as a tangible property or intangible asset that are owned or controlled by a firm, (Helfat and Peteraf, 2003). When absorptive capacity is viewed as an asset, it is conceptualized at the level of relevant prior knowledge possessed by the focal unit. In this sense, the researcher in theory deals with absorptive capacity as a kind of intellectual capital; due to this view, ACAP shows the same characteristics of intellectual capital, as well as nearly the same definition. Moreover, in line with this view, ACAP has been operationalized with variables that serve as proxies for the knowledge base, such as patents and R&D intensity, that are called a static perspective of knowledge (Roberts et al, 2012; Tsai 2001).

Researchers such as (Flatten et al, 2011; Roberts et al, 2012; Engelen et al, 2014) highly recommend dealing with absorptive capacity as dynamic capabilities and a multi-dimensional construct and proxies are not able to measure or capture the whole construct. Therefore, a firm's absorptive capacity is represented on in its dynamic capabilities. The firm's dynamic capability refers to "the capacity of an organization to purposefully create, extend, or modify its resource base" (Helfat et al. 2009, p. 4,). It is characterized from ordinary capability and dynamic capabilities. Absorptive capacity was measured as dynamic capabilities by (Jansen et al, 2005); and (Lichtenthaler, 2009). Table (2.5) shows how absorptive capacities are investigated in some prior research.

	Authors	Contributions
1	Cohen and Levinthal, (1990);	Conceptualization and reconceptualization of
	Zahra et al, (2002); Todrova	absorptive capacity
	and Durisin, (2007)	
2	Tsai, (2001); Huang et al,	Absorptive capacity and innovation
	(2015); Engelman et al,	
	(2017); Limaj and	
	Bernroider, (2017)	
3	Flatten et al, (2011)	Measuring absorptive capacity
4	Bayyurt and Akın, (2014)	The forging acquisition of knowledge and firm
		performance

Table 2. 5 Studies regarding absorptive capacity

5	Chen et al, (2014); Omidvar	The effect of various R&D organizational
	et al, (2017)	structures
6	Kostopoulos et al. (2011)	Absorptive capacity, innovation, and financial
	110510100105 01 41, (2011)	performance
7	Martin-de Castro, (2015)	Knowledge management and innovation in the
		high-tech sector
8	Ferreras-Mendez et al,	Absorptive capacity on depth and breadth of
	(2015)	external knowledge and firm performance
9	George et al, (2001)	Absorptive capacity on firm performance
10	Griffith et al, (2003)	R&D's role in supporting "absorptive
		capacity"
11	Engelen et al, (2014); Hsu	Connected RBV to DC
	and Wang (2012); Su,	
	(2014); Seo et al, (2015)	
12	Roberts, (2015)	Absorptive capacity and environmental
		dynamism

As we can see in Table (2.5) how literature explored absorptive capacity is based on several points of view. In a similar fashion Roberts et al, (2012) highly recommended for future research that absorptive capacity should be investigated as a capability rather than assets. Due to ordinary or dynamic capabilities that are reflected in the whole construct of absorptive capacity. This research investigated absorptive capacity as dynamic capabilities by following (Zahra and George, 2002).

#### 2.3.2. Absorptive capacity reconceptualization and dimensions.

Over the last three decades, the concept of absorptive capacity (ACAP) has received considerable attention in the literature and is still a controversial concept. Cohen and Levinthal (1990) conceptualize ACAP and define it as the firm's ability to identify, assimilate, and exploit knowledge that was gained from external sources. They proposed that absorptive capacity consists of three linked processes, as illustrated in the following figure. Figure 2. 2 A model of absorptiva capacity Cohen and Levinthal, (1990)



Source: adopted from (Todorova and Durisin, 2007. P: 775)

Cohen and Levinthal (1990) labelled the term absorptive capacity and explained that it consists of the capabilities to recognize the value of new knowledge, to assimilate it, and apply it to commercial ends. Other work from, (Zahra and George, 2002) broadened ACAP from the original three capabilities (identify, assimilate, and exploit) into four capabilities (acquire, assimilate, transform, and exploit) as well as those capabilities coming under two main dimensions, which are potential ACAP, and realised ACAP. Researchers and scholars such as (Jansen et al, 2005; Leal-Rodríguez et al, 2014; Engelen et al, 2014; Roberts, 2015) addressed two dimensions of ACAP, which are potential absorptive capacity (PACAP) and realised absorptive capacity (RACAP) separately, by following (Zahra and George's 2002) reconceptualization of absorptive capacity.

As we can see in figure (2.3) (Zahra and George, 2002) classified acquisition and assimilation capabilities as a potential absorptive capacity. Potential absorptive capacity is breath of a company's capability to value and acquire external knowledge, but the process of exploiting this knowledge is still not guaranteed. Whereas realised absorptive capacity is a function of the transformation and exploitation capabilities. It is processes of using the acquired knowledge to achieve financial ends. Realised absorptive capacity expresses a firm's capacity to capture and leverage the knowledge, which has been absorbed.



Figure 2. 3 A model of absorptive capacity Zahra and George (2002. P: 19)

Researchers have raised concerns regarding the conceptual distinction between potential and realised absorptive capacity (Todorova & Durisin, 2007), therefore they proposed another model for an absorptive capacity construct. As we can see in Figure (2.4), they argued that transformation capability is a part of simulation capability; further, they ignored the distinction between potential and realised absorptive capacity.

Figure 2. 4 A model of absorptive capacity Todorova and Durisin, (2007)



Source: Adopted from (Todorova and Durisin, 2007. P: 776)

Mariano and Walter, (2015) attempted to explore how the absorptive capacity construct develops and is investigated in knowledge management, and furthermore, they confirmed that

ACAP is still largely underdeveloped in the field of intellectual capital and knowledge management. Moreover, other scholars developed and validated a multidimensional measure of absorptive capacity, such as (Jansen et al 2005; Thomas and Wood 2014) based on (Zahra and George's, 2002) reconceptualization. In this sense, prior research has highlighted the notion that ACAP is a multidimensional construct.

However, this study follows the re-conceptualization proposed by (Zahra and George, 2002) that is illustrated in Figure (2.3), which is distinct from potential and realised absorptive capacity. Potential ACAP includes "acquisition and simulation" capabilities, whereas realised ACAP consists of "transformation and exploitation" capabilities. It can be clearly seen that, extant research has paid little attention to exploring absorptive capacity in the field of intellectual capital, (Engleman et al, 2017; Hsu and Wang, 2012; Mariano and Walter, 2015).

## 2.3.3. Absorptive capacity measurements.

Significant work has been done to measure and capture the construct of absorptive capacity. Researchers used different methodologies and several measurements to measure this and most often unidimensional measures have been used, (Flatten et al, 2011; Thomas and Wood, 2015). Therefore, many of them relied on proxies such as a firm's R&D intensity or the number of patents to capture the construct of absorptive capacity. (Cohen and Levinthal, 1990; Vinding, 2006; Tsai, 2001), as opposed to other team of researchers, who largely neglected using proxies to measure ACAP, due to their beliefs that absorptive capacity is a multidimensional construct, (Flatten et al, 2011). Even though some researchers neglected using proxies to measure absorptive capacity, proxies may still be valid measures to capture many variables. For instance, table (2.6) demonstrated some studies investigated different organizational factor based by using various proxies to measure these factors.

 Table 2. 6 Proxies as measurements

Author's name	Research topic	Proxy
Meeus et al,	Learning	R&D intensity
(2001)		
Muscio (2007)	Effects of cooperations in SME	Employees, which are assigned
Widselo, (2007)	Effects of co operations in Sivil	with R&D activities.

Tsai, (2001)	Firm performance and innovation success	R&D intensity	
Kostopoulos et	Absorptive capacity, innovation,	the firm's total R&D	
al, (2011)	and financial performance	expenditures,	
	Clarifying the Effect of		
Hsu and Wang,	Intellectual Capital on	R&D and marketing	
(2012)	Performance: The Mediating	development	
	Role of Dynamic Capability		
Huang et al	Absorptive capacity and	The	
(2015)	autonomous R&D climate roles	number of D &D employees	
(2013)	in firm innovation	number of K&D employees	

We can see in Table (2.6) how R&D has been used as a proxy to measure a firm's innovation, and absorptive capacity. The other researchers' team maintained that using proxies was a deficient method to capture the complexity and multidimensionality of the construct. Furthermore, using metrics enables researchers to capture every single dimension in the entire construct. In depth, absorptive capacity is recognised as a process of related steps. Zahra and George, (2002) doubt whether any single proxy such as R&D or the number of patents can fully capture absorptive capacity complexity. Meanwhile, R&D expenditure is not the only source of absorptive capacity, due to organizational memory and employees' skills contributing significantly to a firm's overall absorptive capacity; yet they are neglected by proxies, (Flatten et al, 2011). However, the use of proxies leads to dealing with ACAP as a static resource not as a process or capability, (Lane et al, 2006; Flatten et al., 2011). Obviously, these concerns raise a call for an empirical investigation of the absorptive capacity non-R&D context using metrics, which capture each single dimension from (Lane et al, 2006).

Moreover, absorptive capacity has a positive contribution to financial performance, (Kostopoulos et al, 2011) and it describes the level of the relationship between ACAP and financial return as a critical relationship. Therefore, this former of a critical relationship is probably harmful to a firm's performance at high levels, (Wales et al, 2013; Thomas and Wood, 2014). In addition, absorptive capacity makes a significant contribution to firm performance both indirectly (Lane et al. 2006) and directly (Lichtenthaler, 2009). However, as described by the literature, such a critical relationship between absorptive capacity and the

firm's performance requires an accurate measurement to measure the whole construct of absorptive capacity to know the impact on firm performance. Therefore, researchers conducted absorptive capacity measurements such as (Jansen et al, 2005), which was widely adopted by other researchers such as (Leal-Rodriguez et al, 2014; Engelen et al, 2014). Thomas and Wood, (2014) designed absorptive capacity measurements in the tourism sector, while (Pavlou and Sawy, 2006) measured a scale for three capabilities.

Research has revealed a gap in knowledge about the role of absorptive capacity in the field of intellectual capital, as well as the effect of intellectual capital on the firm's performance through absorptive capacity. Proposing a model reveals the relationship between intellectual capital and the firm's performance through the mediating effects of absorptive capacity. It is required to capture the complexity and multidimensionality of the absorptive capacity construct. Therefore, this research builds upon an alternative approach developed in a number of studies (Zahra and George, 2002; Jansen et al, 2005; Camisón & Forés, 2010; Flatten, et al 2011; Ceped-Carrion, et al 2012). The approach differentiates between the four components (acquisition, assimilation, transformation and exploitation) and between potential absorptive capacity (acquisition and assimilation) and realised absorptive capacity (transformation and exploitation). Thus, the perceptual scale of measurements has been adopted from (Jansen et al, 2005), it accords with this research's theoretical arguments.

# 2.4. Firm performance

### 2.4.1. Defining firm performance

Organizational performance is a broad concept that has many dimensions. In management literature, firm performance is distinguished as a central outcome theme of interest. It lies at the centre of the organization's survival. It represents wide spectrum from broad areas and discipline such as human resources, international business, strategy and information systems, and marketing to operations management, (Hult et al, 2008; Singh et al, 2016). Academic and interested parties have investigated these concepts in different fields and disciplines such as strategic management and organization. Organizational performance is defined in different ways, the majority of definitions highlighted both financial and non-financial aspects of performance, (Hult et al, 2008). Some of them shed light on financial aspects of performance

but on the other hand there are many scholars who focus on financial and non-financial aspects, because of their belief that financial aspects are often inadequate to reflect firm performance (Singh et al, 2016).

Non-financial performance usually takes into account some indicators, for instance product quality, growth in employee numbers, number of new products, and so on. In contrast to financial aspects of performance that depend upon financial indicators such as turnover, profitability, sales growth, financial outcomes and so on, and each method has pros and cons. Furthermore, some of these methods have deficiencies in measuring performance holistically. Baker and Sinkula, (2009) stated the important fact is that objective measures of performance have to be employed whenever possible. Virtually, quite often objective measures or data are not always available, for instance, when the firm is private and secondary data for measuring performance might be not available. In this case, the valid available choice is subjective measures or personal measures, that are self-reported. Stam et al, (2014) suggested that self-reported performance data are often easier to obtain in the context of small firms. Therefore, researchers can rely on the self-reported method, (Rauch et al, 2009). Moreover, self-reported data may offer greater opportunities for testing multiple dimensions of performance, furthermore, it offers comparison with competitors, (Wiklund & Shepherd, 2005).

In terms of the validity of using self-reported performance, researchers supported the validity of this method such as, (Brush and Vanderwerf, 1992; Chandler and Hanks, 1993). In addition, academics proved a correlation between subjective and objective measures of performance (Jennings and Young, 1990; Zott and Amit, 2008; Baker and Sinkula, 2009). Hence, organizational performance is the competency of an organization to transform the resources within the firm in an efficient and effective manner to achieve organizational goals. However, performance is a comprehensive and divergent concept. It is a mechanism to calculate the degree of achievement of a purpose in a system like a firm. In terms of SMEs, the ability of small and medium sized enterprises to perform depends on many factors and elements, which are closely tied and affect it directly and indirectly.

Baker and Sinkula, (2009) noticed that small firms are less likely to have the financial resources and market power. Furthermore, SMEs are characterised with limited growth and financial market limitations, these obstacles increase the focus on the SMEs performance. Sheehan (2014) states that small firms are relying increasingly on how to make use of available resources more effectively. SMEs have a narrow range of options to improve their

performance compared to large companies, which have many options. However, an important factor to improve the performance in big and small organizations is that of human resources. Human resources represent the success key factor for all firms regardless of their size, they also represent inimitable resources, whereas other resources are easier to imitate Sheehan (2014). In the context of investigating SMEs performance, numerous research has been conducted in this arena, by using different methods and performance dimensions. Table (2.7) shows some related research.

Author's	Research title	Performance	Sample or society
		indicators	
Moran, (2005)	Structural vs. relational	The managerial	Pharmaceutical firm
	embeddedness:	performance was	
	Social capital and	measured by:	
	managerial	- rate the quality of	
	performance	each manager's sales	
		contribution	
		-innovation	
		contribution	
Salojarvi et al	Knowledge	-Annual	SMEs
(2005)	management and	sales growth	
	growth in Finnish	-Age of the company	
	SMEs		
Sydler et al, (2014)	Measuring intellectual	long-term	Pharmaceutical
	capital with financial	profitability	and biotechnology
	figures: Can we predict		companies
	firm profitability?		
Nunes et al, (2012)	Is there a linear	Growth	non-high-tech vs.
	relationship between		high-tech SMEs
	R&D intensity and		
	growth? Empirical		
	evidence of non-high-		
	tech vs. high-tech		

Table 2.7 So	me performance	measurements
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	SMEs		
Hsu and Wang,	Clarifying the Effect of	-Return on assets	high-tech industries
(2012)	Intellectual Capital	-Return on sales	in Taiwan.
	on Performance: The		
	Mediating Role of		
	Dynamic Capability		
Padula et al,	SMEs inventive	-Inventive	Small and medium-
(2015)	performance and	performance	sized enterprises
	profitability in the	-profitability	
	markets for technology		
Singh et al, (2016)	Measuring	-Subjective	Four sets of
	Organizational	measurements	companies in four
	Performance:	-Objective	separate countries
	A Case for Subjective	measurements	
Measures			

Table (2.7) explained how researchers investigated organizational performance in different companies. In the line with prior research, current research investigated financial and non-financial performance in high-tech SMEs. Therefore, current research defines high-tech SMEs performance as the ability of transforming the resources within the firm in an efficient and effective manner to achieve positive financial outcomes and enhance employment growth.

#### 2.4.2. Performance measurements

In the last few decades, the most common and important performance indicators that have been used by firms are financial data, as researchers have found some underlying deficiencies in these financial measures, because of an inability to reflect comprehensive performance information and inadequacy to establish the outlook of future performance of firms. Nowadays firms work in a dynamic environment and a turbulent market; in order to survive and compete in such circumstances, they need to achieve a high level of performance. In fact, the firms, which have the ability to effectively measure and follow up their performance, will be able to achieve high levels of performance, (Cocca and Alberti, 2010). Therefore, many researchers have explained that performance measurement is a controlled way of monitoring methods. In furtherance of this point, others described performance measurements as an assessing system, which focuses on value and how firms are run. Thus, the effective performance measurement has to be dynamic and modified as circumstances change, in other words the perfect performance measures for specific circumstances now will not be the perfect measurement later. Cocca and Alberti (2010) mentioned that the big challenge for companies, in general and SMEs in particular is that of keeping the performance measures continuously updated, and they developed an assessment tool which is very suitable to evaluate the SMEs performance measurements system.

Therefore, many researchers investigated the multi-dimensionality of organizational performance such as (Santos and Brito, 2009). Therefore, a multi-dimensional model has been developed to avoid aspects of failure, which have happened in the prior measurements. A firm's performance has several dimensions in a model and the vast majority of performance measurement focuses on two main dimensions; effectiveness and efficiency. Efficiency refers to how economically the company's resources are used in performing given the level of stakeholder contentment, as opposed to effectiveness as a measure of to what extent stakeholder requirements are met, (Schiuma, 2009).

Therefore, some firms achieve high levels of performance and anticipated goals with greater efficiency and effectiveness than other firms do. In fact, there is a variety in the performance measurements and technique, for instance (Jansen, et al., 2006) commented that the competitive nature, market dynamics of SMEs, and the difficulty of acquiring access to past financial information from many firms, pushes scholars and researchers in this arena to rely on a survey-based approach to evaluate performance. In most cases, the performance of the company is measured by the interpretation of the owner or CEOs providing responses to the survey. Scholars have recommended that objective measures of firm performance should be used whenever possible, (Baker and Sinkula, 2009). Nevertheless, it is difficult if not impossible to apply it in all cases. Therefore, in this case the other option that is still available is to assess performance in personal measures, for example managers' perceptions of performance. Many researchers have proved that there is a correlation between subjective and objective measures of performance, therefore this choice is not that bad, (Baker and Sinkula, 2009; Singh et al, 2016).

However, many models can evaluate efficiency and effectiveness using multi-dimensional performance measurements. Hudson, et al, (2001) investigated ten approaches to measure SMEs performance and determined that the most important dimensions of performance, were quality, flexibility, time, finance, customer satisfaction, and human resources. Singh et al, (2016) investigated objective and subjective organizational performance, and focused specifically on subjective measurements proving that subjective measures are able to capture firm performance. Thus, in this research, financial outcome measurements and employment's growth have been applied.

# 2.5. Small and medium-sized enterprises SMEs.

There is no unique definition of small and medium enterprises or firms, so some definitions clearly cause actual obstacles. For example, some definitions rely on financial standards, which includes many problems related to inflation and money transactions. On the other hand, it can be clearly seen that many authors depend on the number of employees to define and classify it as a small or big firm. The Department of Trade and Industry shows the following definitions:

- Micro firm: 0 9 employees.
- Small firm: 10 49 employees.
- Medium firm: 50 249 employees.
- Big firm: over 250 employees.

The European Commission puts a specific definition for enterprise and specifies the main factors determining, whether a company is a SME:

#### 1. Number of employees and

#### 2. Either turnover or balance sheet total.

It is divided into three groups as shown in Table (2.8)

Company category	Employees	Turnover	Balance sheet total
Medium sized	< 250	$\leq$ 50 million euros	$\leq$ 43 million euros
Small	< 50	$\leq$ 10 million euros	$\leq$ 10 million euros
Micro	< 10	$\leq 2$ million euros	$\leq 2$ million euros

Table 2. 8 Definition of enterprises

Source: European commission (2005), enterprise and industry.

However, three points affect small and medium-sized enterprises, (Burns, 2001), market influence, independence, and personal influence. Hudson, et al, (2001) suggested that SMEs may differ from large firms in some features such as dynamic strategies, reactive, high innovatory, flexible structures, and a limitation of markets, or depending on a limited number of customers, personalized management and scarce resources, especially in terms of management as is explained in Table (2.4). To achieve superior performance and challenge the turbulent environment, SMEs have to challenge the greater external uncertainty of the environment together with internal challenges of consistency of their motivations and actions.

Beck and Demirguc-Kunt, (2006) states that SMEs are the "life-blood" of modern economies. The importance of SMEs to the industrialized world cannot be over emphasized, and the majority of jobs are created by SMEs. Thus, the economics of many countries grow based on the increasing number of SMEs in various sectors. For instance, the Department of business and innovation skills in the statistical release of Business Population Estimates for the UK displayed that the number of SMEs at the beginning of the year and the number of employees in this sector, table (2.9) demonstrated the number of SMEs and the number of employees in the UK during period of three years.

Table 2. 9 Small and medium sized-enterprises in the UK.

Years	Number of		Growth in the	Growth in employment
	registered	Employment	number of	
	business	in SMEs	companies	
2017	5.7 million	16.1 million	197,000 since	3.2 % compering to 2015.
	businesses		2016	2.5 % compering to 2014
2016	5.5 million	15.7 million	97000 since	Less than 0.6 %
	businesses		2015	compering to 2014
2015	5.4 million	15.6 million	146,000 since	
	businesses		2014	

Source: https://www.fsb.org.uk/media-centre/small-business-statistics

In terms of SMEs definitions there are considerable differences between SMEs definitions around the world. Table (2.10) illustrates SMEs definitions without recognizing between small and medium sized enterprises, in the US, European Union, Australia, and Canada. Table 2. 10 Different definitions of SMEs

Region	Definition	All manufacturing firms and non- exporting service firms a	Exporting service firms <sup>b</sup>	Farms
United	Number of employees	< 500	< 500	< 500
State	Annual Revenue	Not applicable	$\leq$ \$ 7 million	≤\$ 25
				million
European	Number of employees	< 250		
Union	Annual turnover	$\leq \in$ 50 million		
	Or			
	Balance sheet total	$\leq$ € 43 million		
Australia	Number of employees	$\leq$ 200 employees		
	Estimated value of	A \$ 22.500- A \$ 400.000	)	
	operations			
Canada	Number of employees	< 250		
	Annual Revenue	< C \$ 50 million		

Source: adapted from: U.S. and EU Export Activities, and Barriers and Opportunities Experienced by U.S. Firms. <u>https://www.usitc.gov/publications/332/pub4169</u>

Referring to table (2.10), it can clearly be seen that there are differences in the number of employees and turnover and between the definitions, which are applied by various regions. Furthermore, SMEs are represented as suppliers to large companies. Therefore, the impact of SMEs is much bigger than may be seen at first glance, so many large companies or

international companies created various SMEs to achieve integration in two ways with suppliers and the markets. However, many SMEs nowadays have a good international market share as well as competing with large firms. Heilmersson (2014) investigates the relationship between the strategies used by SMEs to survive and achieve international expansion and their performance in a disorderly market by focusing on the scale, scope and speed of organization internationalization.

Gibb and Blili, (2013) classified SMEs behaviour into five patterns, based on which may or may not be paying attention to the intellectual property issues which are represented as part of the firms' intellectual assets that can be legally protected. Their results reveal that performance is positively influenced by scope and speed as opposed to the scale of internationalization, which is not. This supports the point that SMEs have had a big role and integration with large international firms. SMEs have become much more important than ever and are taking part in improving the economy, reducing poverty and offering new jobs. Morrison, et al, (2003) state that most new jobs are generated from small businesses, they are distinguished, as they are pivotal contributors to economic growth and job creation. After all, SMEs occupy a large part of the economy, therefore it seems a vital environment in which to apply this research.

# 2.6. The relationship between IC, ACAP and firm performance.

It is notable that a firm's performance is influenced by many variables, as many researchers have explained. Scholars suggest that intellectual capital is considered a driving force of an important activity to improve the SMEs in various aspects, for instance bootstrapping activities, productivity, and a work system and so on (Bontis, 1998; Youndt and Snell, 2004; Hsu and Wang, 2012; Grichnik et al, 2014; Costa 2012). Researchers such as (Abhayawansa and Guthrie, 2014) found that the management of ICs have a significantly impact upon performance in terms of competitiveness. The direct relationship between intellectual capital and a firm's performance has been investigated in much empirical research, (Bontis, 1998; Bontis et al, 2000; Youndt and Snell, 2004; Bontis et al, 2007; Martin de Castro and Pedro, 2008; Kamukama et al, 2010; Zeghal and Maaloul, 2010; St-Pierre and Audet, 2011; Clarke

et al, 2011). This academic research has found that effective management of intellectual capital is more likely to achieve and manage high level of intellectual capital, which in turn strongly supports firms' successes.

The majority of this research has investigated the effect of intellectual capital on a firm's performance or the relationship between them and large companies or SMEs, but in terms of SMEs, some research has investigated the whole construct of intellectual capital. Other research has also investigated this relationship, including mediating or moderating variables, for instance, (Hsu and Wang, 2012) dynamic capabilities, (Nold, 2012) organizational culture, (Kamukama et al, 2011; Cheng et al, 2010) competitive advantage, (Vargas and Lloria, 2014) dynamizing of IC and learning flow. The current study extends the prior literature in the field of strategic management. It contributes to prior literature by investigating the impact of the whole construct of intellectual capital on high-tech SMEs' performance through absorptive capacity, considering absorptive capacity as a dynamic capability.

Referring to absorptive capacity as a dynamic capability has highlighted the dynamism of intellectual capital. Considering intellectual capital as a base knowledge underlying a firm's employees and the system makes intellectual capital meaningful to contribute to building a firms' absorptive capacity constructs. However, building a strong level of absorptive capacity as dynamic capabilities is supposed to enhance a firms' financial outcomes and increase employment growth. Hence, links and relationships between these key themes give a clear road map for managers or CEOs to focus on a firm's knowledge resources.
### 2.7. Research gaps in the literature

Reviewing literature in the subject field resulted in the following research gaps:

- Knowledge is considered to be one of the important resources and production factors for any firm (Abhayawansa and Guthrie, 2014; Crick and Spence, 2005). However, researchers such as (Ghobadian and Gallear, 1997; Hudson et al, 2001; Nicholas et al, 2011) stated that SMEs have less financial and knowledge resources than big companies do. To date, empirical results on the joint effect of intellectual capital and absorptive capacity on self-reported performance of SMEs is still scant, and researchers such as (Engelman et al, 2017; Hsu and Wang, 2012; Mariani and Walter, 2015) explicitly called for investigation of this issue by incorporating absorptive capacity in the field of intellectual capital.
- 2. A large amount of literature has investigated companies in the high-tech sector that operate in software development (Seleim et al, 2007); manufacturing sector (Tseng and Goo, 2005); technology sector (Shrader and Siegel, 2007) ; and (Mention and Bontis, 2012) in the banking sector, as opposed to current research that focuses on companies operating in biotechnology, pharmaceutical, and publishing of computer games, which still has not been investigated extensively.

The current research responds to this call to bridge this gap in knowledge. This study crystallises the idea of incorporating internal and external firms' knowledge resources to enhance firm performance to achieve market share, sales, cash flow, profit, and growth in turbulent business environments. Therefore, this research has investigated absorptive capacity as dynamic capabilities (Zahra and George, 2002; Jansen et al, 2005) as highly recommended by (Roberts et al, 2012). Simultaneously, it focuses on investigating the dynamism of intellectual capital and its effects on firm performance through absorptive capacity rather than the existence of intellectual capital in the firms.

#### 2.8. Chapter summary

This literature review has extensively reviewed prior related research to intellectual capital, absorptive capacity, and firm performance. Intellectual capital and absorptive capacity have been identified as a key resource of knowledge. The reason for developing such a study is that, first, the literature review confirmed that absorptive capacity is still largely underdeveloped in the field of intellectual capital. Second, some research has not investigated the whole construct of intellectual capital in the high-tech SMEs sector. Third, some research has not clearly addressed the mediating role of two dimensions of ACAP; potential ACAP and realised ACAP, on the relationship between the three IC dimensions (human capital, structural capital, and relational capital) and firm performance, by focusing on high-tech SMEs. Fourth, it has realised the notion of relying on internal resources and external resources of knowledge to enhance a firm's performance. Lastly, this research has highlighted the idea of investigating absorptive capacity in the field of intellectual capital, and what the effects of intellectual capital are on a firm's performance through absorptive capacity. The literature review consists of definitions and theoretical discussion on research variables that are studied which are intellectual capital IC, absorptive capacity ACAP, and high-tech SMEs' performance. The extensive review provides reasonable justifications for the variables to be studied in the context of SMEs.

# **3. Chapter Three: Research Model**

### 3.1. Introduction

Reviewing literature in chapter two shows that even though much work has been done to explore and conceptualise absorptive capacity and intellectual capital and their relationship with different variables in big organizations and small and medium-sized firms, still there are some limitations in these fields. These concepts of variable intellectual capital and absorptive capacity represent the main knowledge resources of firms' external resources and internal resources, (Engelman et al, 2017) or firms' capabilities whether ordinary or dynamic, (Roberts et al, 2012). However, there has been little concern about investigating absorptive capacity in the field of intellectual capital in small and medium-sized enterprises, (Hsu and Wang, 2012; Mariano and Walter, 2015; Engelman et al, 2017). Therefore, this study incorporated these two variables in terms of small and medium sized enterprises SMEs, by exploring the mediating role of absorptive capacity on the relationship between intellectual capital and firms' performance.

Literature has argued that SMEs have less resources than big companies do (Ghobadian and Gallear, 1997; Hudson et al, 2001; Nicholas et al., 2011), also knowledge is considered to be one of the most important resources and production factors. Therefore, SMEs should rely and develop themselves based on internal and external resources especially in the context of knowledge, while the most important knowledge resources for firms are intellectual capital and absorptive capacity. Furthermore, it became more important to highlight their proposed links and relationships. This chapter shows the proposed research model and variables definitions for addressing the research questions. The proposed model helps to develop a suitable methodology for the research. It consists of three main aspects.

Firstly, intellectual capital the independent variable and overview of three main dimensions, which are human capital, structural capital, and relational capital.

Secondly, absorptive capacity the mediating variable of this research. In particular, two dimensions of absorptive capacity are potential and realised capacities, that mediate the relationship between intellectual capital and firm performance.

Finally, firm performance the dependent variable, which includes two dimensions of performance that are the financial outcome and employment growth. A brief overview of

high-tech SMEs is also included. Additionally, a summary is presented, and this brings the chapter to a close.

### 3.2. Theoretical background

The main topics and variables in this study are discussed and illustrated in Chapter two. SMEs' importance and their role are well documented. Literature has investigated the impacts of absorptive capacity or intellectual capital and found that they are vast and far-reaching. However, previous research were focused on absorptive capacity and intellectual capital in large firms rather than SMEs. Even though a few researchers have investigated intellectual capital in SMEs, they just focused on one or two dimensions of the construct as shown in chapter two of this study. In addition, studies which have incorporated absorptive capacity in the field of intellectual capital are scant, (Hsu and Wang, 2012; Mariano and Walter, 2015; Engelman et al, 2017).

However, few researchers have incorporated absorptive capacity in the field of intellectual capital in the SME's sector. In other words, research on absorptive capacity is still largely underdeveloped in the field of intellectual capital. This research has investigated absorptive capacity as dynamic capability (Zahra and George, 2002; Jansen et al, 2005) as highly recommended by (Roberts et al, 2012), as opposed to researchers, who have investigated absorptive capacity as an asset or substantial capability, and measured absorptive capacities by using proxies such as the number of patents and R&D expenditure, which are still controversial measures (Flatten et al, 2011). Simultaneously, it focuses on investigating the dynamism of intellectual capital and its effects on firm performance through absorptive capacity rather than the existence of intellectual capital in firms.

Furthermore, literature about the high-tech industries' arena, particularly in SMEs, is scant. Concerning the role of absorptive capacity in the field of intellectual capital and firm performance in SMEs, the role has not been investigated in prior research. Thus, the gap in the literature required new research questions to address these shortfalls. Hence, this study investigated the mediating role of absorptive capacity on the relationship between intellectual capital and high-tech SMEs' performance, through presenting a model that proposed the dynamism of intellectual capital leading to building a firm's absorptive capacity cumulatively and enhancing the firms' financial outcome and employment growth. In order to develop an in-depth understanding of the research variables and their relationships in the current research model, the next section is devoted to highlighting definitions of intellectual capital, absorptive capacity, and firm performance. In addition it illustrates the links and relationships between them and defines a research hypothesis.

#### 3.2.1. Defining intellectual capital

Researchers such as (Bontis et al., 2000; Chen et al., 2014; Daud and Yusuf, 2008; Hormiga et al., 2011; Khalique et al., 2011) posited that intellectual capital is a vital resource for SMEs success. Harrison and Sullivan (2000) define intellectual capital as "Knowledge that can be converted into profit". Booth (1998) as the ability to translate new ideas into products or services. Both these definition explained intellectual capital function as similar to function of realized absorptive capacity. While Edvinsson and Malone (1997) defined intellectual capital as a broad as the procession of knowledge, applied experience, and organizational technology customer relationships and professional skills. Another definition is "resource with a non-physical existence with potential to generate future economic benefits" (Abhayawansa and Guthrie, 2014: p 70).

In this research, intellectual capital has been defined as the stored knowledge possessed by a firm and employees, which is explicit and implicit knowledge, personal and systematic knowledge possessed by employees and firms that are available to network relationships through interaction, composes of human, structural, and relational capital. Furthermore, this definition showed intellectual capital has two functions as an asset and as dynamic capabilities due to its focus on base knowledge in firms, as well as acquired knowledge, which comes through interaction; all that is able to rejuvenate firm resources. This research follows the previous definition.

#### 3.2.1.1. Human capital

Even when employees leave the firm, they take human capital with them, because it is the implicit knowledge which exists in the heads of people, basically it is not owned by the firm. Yet it still gives firm diacritical character, (Kamukama, et al, 2011). Researchers such as (Sydler et al, 2013) refer to the components of human capital, such as, knowledge, skills,

experience, training and education, creativity, capacity, expertise, teamwork, problem solving capability, motivation, loyalty, and attitude. Human capital is considered as a critical resource, especially in small firms, because it affects small business performance (Rauch, et al, 2005). Research in the field of intellectual capital stated that human capital is knowledge and experience that employees and managers possess, it could be a well-educated workforce or well-experienced employees in the firm (Millan, et al, 2013). Scholars such as Bontis et al, (2002) stated that human intellectual capital represents the value added by firms' workforces, when they employ their knowledge, experience, and other personal assets to produce new products that create wealth for their organizations. Cooper et al, (1994) asserted that performance in SMEs can be represented as functions of human, financial capitals and external factors. However human capital can be defined as knowledge, skills, competence, experience related to firms' employees that can add value to firms, when they use it that will result in enhancement in profitability, market share, sales, and employability.

#### 3.2.1.2. Structural capital

Structural capital is an inventory of knowledge, which is owned by the firm and includes, explicit knowledge, process optimization, organization culture, innovation, and information technology, (Kamukama, et al, 2011). It refers to how people are connected within the firm (Sydler, et al 2013). In addition, employees use this inventory of knowledge to support their business activities and processes. Therefore, it has more focus on "the knowledge embedded within the routines of an organization" (Bontis, 2002, p 45).

The key role for structural capital is to link resources of the firm through processes or routines, which create value for customers, and unique firm processes and routines, (Wilson,John P,2005). It consist of technologies or other mechanisms that support and help employees to generate revenues for firms, such as communication systems, data bases, procedures, technological systems, policies, and other devices, (Advinsson and Malone, 1997; Bontis, 2002). Therefore structural capital can be defined as processes or routines that link a firm's resources, which are more likely to create unique value for customers and enhancement in its processing of knowledge and achieving financial and non-financial outcomes.

#### 3.2.1.3. Relational capital

The concepts of relational capital highlight the value of a firm's relationships, the focus of relational capital is on organization, (Curado and Bontis, 2006). It consist of relationships with lobby organizations, business partners, external stakeholders, networks with suppliers and distributers, and customer relationships, (Sydler, et al 2013). It represents the most important elements needed to realize consumer needs and trends of product features. Companies with high levels of relational capital could keep pace with customers' needs with regard to development, to ensure that they are able to predict the expectations of the customers in advance, (Chen, et al, 2014; Dao and Roberts, 2013).

Therefore, a customer relationship is a kind of accumulated capital between a firm and its customers and suppliers, which includes connections outside the organization. Companies hope to enhance these relationships (Wang, 2014). In addition, Kale et al, (2000) noticed that strong relational capital between business partners and customers can be boost a timely and rapid exchange of knowledge. This research focuses on (Isaac et al, 2010) the investigation of relational capital broadly in SMEs. Relational capital facilitates the process of searching and recognizing marketing and customers trends. Therefore, relational capital can be defined as the valuable relationships of a firm within society and the people or entities surrounding it, or which exist in the same environment, and that help firms to enhance their market share, sales, and profitability.

#### 3.2.2. Defining absorptive capacity variables

Cohen and Levinthal, (1990) suggested that absorptive capacity is a firm's ability to identify valuable external knowledge, assimilate it and apply this new knowledge through innovation and competitive actions. Others highlighted the idea of absorptive capacity as "a firm's ability to learn new knowledge through its interaction with external partners, which requires sufficient technical understanding to capitalize that knowledge. This internal capability, is also usually referred as absorptive capacity" (Huang et al, 2015: p. 88). Strategic management suggested highlighted absorptive capacity as a major element of a firm's dynamic capabilities, (Floyd and Lane, 2000; Zahra and George, 2002; Jansen et al, 2005). Even though absorptive capacity has got considerable attention in empirical research, it is still

a controversial construct in terms of conceptualisation and reconceptualization. Zahra and George (2002) suggested that ACAP encompasses two main dimensions, potential and realised capacities, each dimension encompassing two capabilities: potential absorptive capacity (acquisition, assimilation), and realised absorptive capacity (transformation, and exploitation). According to Engelen et al, (2014) the conjunction of these four capabilities allows the firm to reconfigure its existing resource and capability bases. Hence, this study focuses on (Zahra and George's, 2002) recommendation to find out the integrated effects of these complementary capacities with intellectual capital upon high-tech SMEs performance. Therefore, absorptive capacity can be defined as internal capabilities resulting from individual skills, prior knowledge, company-specific competencies and external linkages, that enable a company to access to outside knowledge sources. It consists of two dimensions potential absorptive capacity and realised absorptive capacity.

#### 3.2.2.1. Potential absorptive capacity

Potential absorptive capacity is the ability of a firm to acquire new knowledge and assimilate it into firm systems and routines, it encompasses two dynamic capabilities, which are: knowledge acquisition and knowledge assimilation (Zahra and George, 2002).

• Acquisition

Leal-Rodreguaze et al, (2014) suggested that the major considerations, determining acquisition capability are the intensity, quality and speed of a firm's procedures to identify and generate knowledge. It is the primary capability, which reflects a firm's ability to identify and acquire knowledge from external sources. It concentrates on finding and acquiring external knowledge. It can be defined as a firm's capability to identify and acquire externally generated knowledge that is critical to its operations.

#### • Assimilation

Assimilation is the second capability that suggested by (Zahra and George, 2002). Assimilation can be define as a process of analysing and interpreting acquired knowledge and understanding the information obtained from external sources.

#### 3.2.2.2. Realized absorptive capacity

Realized absorptive capacity can be defined as the ability of a firm to transform the newly acquired knowledge and exploit it for commercial ends. It represents the second dimension of absorptive capacity. It encompasses two dynamic capabilities, which are: knowledge transformation and knowledge exploitation, (Zahra and George, 2002).

• Transformation

Zahra and George, (2002) suggested transformation capability as a step of adding or deleting knowledge or simply by interpreting the same knowledge in a different manner. Therefor it is the capability, which is responsible for making a congruence between the new and base knowledge. Moreover, it develops rapid activation for new knowledge, and operationalizes this knowledge into system of routines. Transformation represents the third capability or step of absorptive capacity. It can be defined as a firm's capability to develop and refine the routines that facilitate combining existing knowledge with the newly acquired and assimilated knowledge.

#### • Exploitation

Exploitation represents the last capability of absorptive capacity. It can be defined as a firm's ability to harvest and incorporate knowledge into its operations and products. Patterson and Ambrosini (2015) suggested that exploitation has a big role in generating core competencies and enhancing resources.

#### 3.2.3. Defining firm performance

Performance is the most concerning for management due to benefits that come as a result of performance. In general, firm performance has been defined as a set of indicators, financial and non-financial, capable of evaluating the degree to which firms' goals and objectives have been achieved, (Kaplan and Norton, 1992).

Firm performance has been defined in various ways, but the vast majority of these definitions have used financial and non-financial methods, (Hult et al, 2008; Rauch et al, 2009).

Financial performance is usually a focus on financial aspects. It is measured by financial indicators, for instance profitability and return on assets so on.

Both financial and non-financial methods have advantages and limitations (Rauch et al, 2009). Firm performance is a broad concept and a multidimensional construct that has been measured using a variety of indicators" (Stam et al, 2014.p.158). It is generally used as a mechanism to assess the degree of achievement of purpose in a system such as organization. In addition, organization performance is generally represented in terms of efficiency, financial outcomes such as profitability or financial ratio, and some operating factors, the majority of research in literature have been focused on firm performance in business. While other researchers state firm performance is definable as a firm's ability to create action and acceptable results, (Anggadwita and Mustafid:2014).

However, different performance indicators could measure the financial outcome of firms, growth, survival, and innovation, for instance growth in sales (Delmar et al, 2003); financial outcome (Solomon et al, 2013); employments growth (Wood et al, 2015; Cillo et al, 2010).

Moreover, researchers such as (Zahra, 1996) state that there is a relationship between performance indicators and describe this as a trade-off between achieving growth and profitability, suggesting that both capture distinct aspects of organization performance. Researchers suggested that smaller firms have different perceptions of performance from larger ones, (Gomez-Mejia etal., 2003).

In general terms of organizational growth, (Watson et al, 2003) state that organizations expect to be growing, when they have employees, with higher level of education and greater experience. In line with Watson, intellectual capital enhances firms' growth through improving firms' ACAP capabilities. Employment growth occurs, when the number of employees increases compared to the previous year. In terms of job creation, SMEs are often heralded for their productivity and job creation. Growth on the other hand, reflected through enhanced financial outcomes (Wood et al, 2015).

One of the unique characters of SMEs is their small market share, (Demick and Reilly, 2000) and cash flow constraint, (Burns, 2001). Therefore, increasing market share and sales on the one hand empowers the firm to expand activities. On the other hand, it enhances firm revenue.

In addition, small and medium-sized enterprises strive to improve cash flow and increase profit margin. Improving cash flow gives a company more flexibility and offers continuance in other functions. Research has connected cash flows with firm profitability (Dechow et al, 1998). Other have linked market share with firm profitability (Szymanski et al, 1993). In this study, financial performances are represented by a summated composite of four indicators, which are market share, sales, cash flow, and profit margin, Wood et al, (2015). While non-financial performance is represented by employments' growth.

Thus, intellectual capital in SMEs develops firms' ACAP dynamic capabilities, which in turn enhances firms' market share, increase sales, enhances cash flow, and profit margins, as well as achieving employment growth. Table (3.1) illustrates operational definitions of the research variables and the nature of these variables in this study.

Research	Nature of the	Operational definition	
· · · ·			
variable	variable in		
	current study		
Human	Independent	Human capital can be defined as knowledge, skills,	
capital	variables	competence, experience related to firms' employees that can	
		add value to their firms, when they use it that will result in	
		enhancement in profitability, market share, sales, and	
		employability.	
Structural		Therefore structural capital can be defined as processes or	
capital		routines that link a firm's resources, which are more likely	
		to create unique value for customers and enhancement in the	
		firm's processing of knowledge and achieving financial and	
		non-financial outcomes.	
Relational		Relational capital can be defined as the valuable	
capital		relationships of firms within society and the people or	
		entities surrounding it or which exist in the same	
		environment, and help the firm to enhance market share,	
		sales, profitability.	
Potential	Mediator	Is the ability of firm to acquire new knowledge and	
absorptive	variables	assimilate it into firm systems and routines, it encompasses	

Table 3. 1 Operational definitions of research variables

capacity		two dynamic capabilities, which are: knowledge acquisition
		and knowledge assimilation
Realised		Is the ability of firms to transform the newly acquired
absorptive		knowledge and exploit it into commercial ends. It represents
capacity		the second dimension of absorptive capacity. It encompasses
		two dynamic capabilities, which are: knowledge
		transformation and knowledge exploitation
Firm	Dependent	Is the ability of transforming resources within the firm in an
performanc	variables	efficient and effective manner to achieve financial outcomes
e		through enhancing market share, profitability, sales, and
		cash flow and enhance employments growth through
		increasing the number of employees.
Financial		Is a summative composite group of increased market share,
outcome		increased sales, improved cash flow, and increased profit
		margin
Employme		Represents the increase in the firm's number of employees
nts growth		

However, the current research proposes and test a causal model on the relationship between intellectual capital and firm performance, mediated by absorptive capacity. The proposed model will serve as a useful tool for analysing the integrated effects of intellectual capital and absorptive capacity upon financial and non-financial performance of high-tech SMEs. The research variables and their relationships in the model explained in detail as follows:

### 3.3. Intellectual capital and firm performance

As explained in chapter two of this research, intellectual capital has three main dimensions; namely human capital, structural capital, and relational capital. The relationships of these three dimensions of intellectual capital and their direct link to firm performance is hypothesized in one main hypothesis:

# H1. There is a positive relationship between intellectual capital and firm performance in high-tech SMEs.

The next step is to illustrate the direct relationships between these dimensions of intellectual capital and firm performance and highlighted relationships among research variables and to draw a research hypothesis. It is shown in the order of human, structural, and relational capital.

#### 3.3.1. Human capital and firm performance

Human capital lays at the heart of intellectual capital and it is defined and described as combined skills, knowledge, innovation, know-how, and the employees' ability, (Bontis et al, 2000). Likewise, (Wright et al, 1994) focused on reliance on RBV and asserted that in specific circumstances sustaining a competitive advantage can accrue from a core of human capital. The RBV theory reveals that firms assess the strength and weaknesses of their resources then decide to choose a strategy, which is achievable. Obviously, human capital is one of the underlying strategic resources, in both ways necessary and supportive for business success. Employees' skills and knowledge are fundamental in today's fast changing business environment, (Subramaniam and Youndt, 2005).

An employees' individual skills and knowledge is a subject addressed by human capital theory, (Hsu and Wang, 2012). Human capital theory shows that knowledgeable employees with high cognitive abilities are more likely to achieve highly efficient and productive activities, (Davidsson and Honig, 2003). It follows that capability, which constitutes the necessary required levels and blending of skills and knowledge to achieve tasks, which are under individual responsibilities, (Hitt et al, 2001). Firms specializing in advanced knowledge and technologies such as high-tech industries require individuals, who are excellent at problem-solving and who are highly knowledgeable, as well as being capable of taking effective decisions, (Hsu and Wang, 2012).

In the context of performance, human capital theory explored the worth of a firm's human resources, (Brown et al, 2007). Human capital concentrated on adding value to a business, eventually in terms of financial performance, exclusively by an inventory of human resources, (Dakhli and Clercq, 2004). Colombo and Grilli, (2005) asserted that firms with greater human capital are more likely to make better entrepreneurial judgments. Human capital contributes to firm's growth through employees that can enhance their job

performance and eventually improve business performance, (Hsu, 2008). Researchers such as (Dulewicz and Herbert, 1999) have shown that sophisticated and successful strategies must be highly concentrated on the competences of human resources that are related to the capabilities that are owned by individuals. It is expected that the greater a firm's inventory of human capital, the higher the level of financial performance the firm will achieve.

Human capital increases as an individual accumulates specific know-how, information, knowledge, and skills, that facilitate communications between them effectively and efficiently. This is more likely to reduce the margin of error in the process of making decisions, which will undoubtedly improve business performance, (Luthans and Youssef, 2004). Thus, high firm performance is more likely to focus on human capital. Hence, a direct relationship between human capital and firm performance is hypothesized:

H1 a. High performance firms put more emphasis on human capital in high-tech SMEs.

#### 3.3.2. Structural capital and firm performance

Structural capital usually refers to procedures and processes, which are created by, and stored in a company's system and accelerate the flow of knowledge through the firm, (Carson et al., 2004; Youndt et al, 2004). In the strategic management field, researchers have approached structural capital in a different way from the previous definition, (Kang and Snell, 2009). Researchers such us (Kang and Snell, 2009) divided organizational capital into mechanistic and organic capital that represented two alternative forms of the company's capital, which ultimately have different influences on the flow and integration of knowledge for the entire firm, (Hsu and Wang, 2012). Structural capital represents intangible assets, which can be traded, shared and reproduced throughout the entire organization, (Mehralian et al, 2013). In addition, a particular part of structural capital, such as patents and brands or trademarks can be legally protected, which comes through investment in research and development, (Roos & Roos, 1997). Researchers have asserted that structural capital consists of many elements, for instance mechanisms and structures of the organization, (Bontis, 1998), which improve the employees' approach to achieving better performance. Technological and organizational capital, (Youndit and Snell, 2004), both classifications are similar. However, technological capital can be seen as the combination of knowledge that directly connects functions and the development of activities for the entire technical system of the firm, which is responsible for gaining services and products, whereas the organizational capital refers to the combination of formal and informal, implicit and explicit knowledge that is an efficient and effective way of enhancing the organizational activity of the company.

Therefore, this aspect of structural capital includes culture, implicit and informal knowledge, structure, explicit and formal knowledge, as well as organizational learning that is both implicit and explicit and rejuvenating of knowledge processes, (Youndit and Snell, 2004). Ultimately, structural capital aspects support people in firms to enhance performance, in order to enhance overall firm performance. Hence, the direct relationship between structural capital and firm performance is hypothesized:

H1b. High performance firms put more emphasis on structural capital in high-tech SMEs.

#### 3.3.3. Relational capital and firm performance

Over the past a few years, researchers and scholars have conceptualized relational capital (Bontis, 2002; Reed et al, 2006; kale et al, 2000). Relational capital has gradually evolved into being represented as the initial factor for collective activity in communities, (Burt, 1992). Several researchers have investigated relational capital, for example (Moran, 2005) focuses on a specific level of relational capital, which is the individual level, whereas others, for instance (Kale et al, 2000) have focused on the organizational level of relationships among firms, or stakeholders, (Bontis and Fitz-enz, 2002), which contain social capital, also at the level of suppliers and customers (Stewart,1997). Relational capital includes relations with employees, competitors, suppliers, customers, and other organizational stakeholders (Kale et al, 2000; Isaac et al, 2010), and that ultimately leads firms to achieving positive commercial results. Mutual trust with business partners, for instance clients, suppliers, and stakeholders represents the core of relational capital.

Relational capital is defined "as the set of all relationships-market relationships, power relationships and cooperation-established between firms, institutions and people that stem from a strong sense of belonging and a highly developed capacity of cooperation typical of culturally similar people and institutions" (Welbourne and Pardo-del-Val, 2009.P:486). The previous definition can be considered as an inclusive definition for relational capital, due to it defining all relationships at different levels.

Moran, (2005) argued that social capital has been illustrated to improve an individual's knowledge. When an individual's knowledge is enhanced through internal and external

relationships, with the same firm's employees or with another firm's employees, they are more likely to enhance the way or manner of achieving functions and activities. Relational capital is caring resources' mobilization through relationships, (Hsu and Wang, 2012); also it is an important factor in developing relationships in the name of the firm, (Welbourne and Pardo-del-Val, 2009). Therefore, on the one hand, relationships are a good opportunity for firms' employees to enhance their knowledge and individual performance. On the other hand, firms tend to renew their knowledge and processes of functioning activities through the strong interactions with clients, suppliers, stakeholders, and business partners. Relational capital refers to available knowledge resources and continual relationships developing through the interactions among firms or individuals, (Shipilov and Danis, 2006).

The premise is that as companies work with customers, suppliers, as well as dealing with stakeholders and business partners, therefore the interaction among individual members of these entities and a firm's employees are more likely to develop close ties and relationships among them, which cumulatively facilitates its functions and activities, (Kale et al, 2000). Facilitating a firm's functions and activities, enables the interaction among individual members of firms, customers, suppliers, stakeholders and business partners to be more likely to enhance the firm's performance. Thus, the direct relationship between relational capital and firm performance is hypothesized:

H1c. High performance firms put more emphasis on relational capital in high-tech SMEs.

# 3.4. Intellectual capital, absorptive capacity and firm performance.

Organizational learning theory is concerned with the development of insights, knowledge and associations between past actions, the effectiveness of those actions, and future actions, (Roberts et al. 2012). On the other hand, intellectual capital and particularly human capital overlaps with organizational learning concerning individuals or employees. ACAP is recognized as a "result of individual skills, prior knowledge, firm-specific competencies (internal capabilities) and access to knowledge sources outside the firm (external linkages)" (Leal-Rodríguez et al 2014: p. 763).

Therefore, ACAP creates bridges between summated composite results of prior individual and firm knowledge with a new external stream of knowledge that comes from outside the firm. Gupta et al, (2006) asserted that exploration and exploitation determinants of absorptive capacity include organisational structure, management practices, and human capital. Obviously, intellectual capital is one of ACAPs' determinants, in other words having a high level of intellectual capital is more likely to improve the processes of gaining a new external knowledge and transforming it into commercial ends, or the existence level of intellectual capital helps to facilitate the flow of new knowledge to inside the firm. Thus, creating or developing a firm's dynamic capabilities starts from employing the results of the firm's internal knowledge resources. However, ACAP "refers to one of a firm's fundamental learning processes" (Thomas and Wood, 2014.p 40).

A firm could absorb knowledge from the outside, but it will do so only if the brains of the firm's individual members are seeking and receptive to that knowledge and it depends on what they already know as well as the availability of other resources and assets of the entire firm that can facilitate the flow of knowledge from outside to inside the firm. Hence, the previous argument explained the firm's ability to acquire new knowledge and merge this knowledge in the firm's system, which represents the firm's potential absorptive capacity. Zahra and George, (2002) argue that this totally depends on the firm's prior knowledge, individual skills, and firm-specific competencies (Roberts et al. 2012; Leal-Rodríguez et al 2014; Engelman et al, 2017). In other words, creating or developing a firm's potential absorptive capacity as dynamic capabilities "knowledge acquisition and knowledge assimilation" is usually caused by a firm's intellectual capital.

The current research focuses on (Zahra and George's, 2002) view that suggested that ACAP consists of four distinct but complementary dynamic capabilities: acquisition, assimilation, transformation, and exploitation. Several researchers agree with these four capabilities (Jansen et al, 2005; Leal-Rodriguez et al, 2014; Engelen et al, 2014; Soo et al, 2016). Researchers such as (Barney, 1991) suggested that the conjunction of those different dynamic capabilities leads a firm to achieve superior business performance, which quite often results in a competitive advantage. According to the theory, potential ACAP and realised ACAP consists of different dynamic capabilities. Potential ACAP makes the company more open to the acquisition and assimilation of new external knowledge (Lane & Lubatkin, 1998). Potential ACAP captures a company's capacity to recognize and acquire new external knowledge.

Notwithstanding, this capacity does not always drive the new knowledge into exploitation. Whereas, realised ACAP deals with dynamic capabilities of transforming and exploiting the new knowledge, (Leal-Rodrigues et al, 2014). In this sense, intellectual capital is more likely to affect firm performance through creating or developing potential and realised capacities. Obviously, building dynamic capabilities provides more linkages to intellectual capital. Therefore, when firms want to acquire new knowledge to develop their processes and products, it requires the firm to start reinforcing their intellectual capital. Thereby the potential development positively reflects the creation or the development of the firms' dynamic capabilities such as ACAP, (Hsu and Wang, 2012).

Both potential and realised capacities support firms to perform better, for instance gaining new knowledge that contributes to firm production processes or systems; thereby costs and time are reduced, or the acquired knowledge is used for product or process innovation, which highly improves firm performance. However, knowledge flows through a firm and the appropriate routines and processes, which are already part of these routines were created by the firm's structural capital and will develop the firm's knowledge transformation capability. Subsequently, it can facilitate these streams of knowledge and create efficient mechanisms for applying the new knowledge for commercial ends, (Roberts et al, 2012). In other words, gaining realised capacity enables organizations to develop new processes or modify existing ones, to convert the new knowledge into new products and harvest commercial outcomes, (Miguélez and Moreno, 2015).

This movement affects organizational performance regarding product and process innovation, also the firm becomes more flexible concerning the use of capabilities and resources as well as becoming more competitive, (Engelman et al, 2017). In terms of (RBV), two branches are put forward, the first one is a resources-based view that RBV is dynamic capabilities, and the second branch is a knowledge-based view (KBV). However, to gain new knowledge or capability implicit and explicit knowledge are required to be operationalized in firms, (Clarke, 2010; Huang, 2011). Researchers and interested in the field of strategic management and intellectual capital have argued that innovative companies, which achieve high financial and non-financial performance are more capable of modifying and extending the knowledge of individuals and creating intellectual capital to develop a "spiral of interaction" among its tacit and explicit knowledge. This occurs with new external knowledge, which is obtained through two capacities, potential and realised, including four dynamic capabilities of

absorptive capacity "acquisition, assimilation, transformation, and exploitation" (Zahra and George, 2002; Jansen et al, 2005).

Regarding the second branch of RBV, which is KVB knowledge, it is the most important and critical for firms; in addition to it being created by individuals and stored in their heads. Hence, human capital is important and stores knowledge, (Wang, et al, 2009; Leiponen and Helfat, 2010). Regarding the first branches, RBV is concerned with how firms' intellectual capital supports the gaining of new knowledge from the external environment through the functioning or developing of a firm's dynamic capabilities and using them to enhance the firm's complete performance. In addition, intellectual capital integrates with other kinds of resources, and capabilities, whether ordinary capabilities or dynamic capabilities, for instance the "acquisition, assimilation, transformation, and exploitation" of knowledge. Concerning SMEs resources, many of the small and medium-sized business do not possess all the necessary managerial expertise or resources to cover their business requirements, (Ghobadian and Gallear, 1997).

Therefore, knowledge resources represent a huge factor in developing the SMEs performance in an intensive turbulent business environment. Thus, ACAP and IC represent the sustainable resources of firms' knowledge, and strategic resources with a non-physical existence, and both highly contribute to firm performance (Youndt and Snell, 2004; Kostopoulos et al, 2011). However, the current research model has proposed that firm performance is highly influenced by intellectual capital through potential and realised capacities that have already been created, or have developed through a reliance on the firm's intellectual capital. In a high velocity business environment, this will involve starting with intellectual capital to build or develop a firm's absorptive capacity that influences a firm's performance. However, the relationship between the RBV as an intellectual capital, absorptive capacity and the performance of high-tech SMEs is still largely underdeveloped and requires more investigation, (Hsu and Wang, 2012; Mariano and Walter, 2015; Engelman et al, 2017). Regarding previous arguments and the suggestion of absorptive capacity constructed by (Zahra & George, 2002) that described absorptive capacity existing as two dimensions of capacities:

Potential ACAP: comprising knowledge acquisition and assimilation. Realised ACAP: centred on knowledge transformation and exploitation. These two capacities have different effects in the firms, where potential ACAP plays an important role in accumulating and rejuvenating an organization's knowledge and realised ACAP supports organizations to develop new capabilities or improve existing ones, (Leal-Rodríguez et al, 2014). Ultimately, both capacities are more likely to enhance a firm's performance. This is because intellectual capital is more likely to develop potential and realised capacities that can increase a firm's financial outcomes and employment growth. Thus, the indirect effects of intellectual capital on firm performance through potential and realised ACAP are hypothesized:

# H2. Potential absorptive capacity mediates the relationship between intellectual capital and firm performance in high-tech SMEs.

H2a. Potential absorptive capacity mediates the relationship between human capital and firm performance in high-tech SMEs.

H2b. Potential absorptive capacity mediates the relationship between structural capital and firm performance in high-tech SMEs.

H2c. Potential absorptive capacity mediates the relationship between relational capital and performance in high-tech SMEs.

# H3. Realised absorptive capacity mediates the relationship between intellectual capital and firm performance in high-tech SMEs.

H3a. Realised absorptive capacity mediates the relationship between human capital and firm performance in high-tech SMEs.

H3b. Realised absorptive capacity mediates the relationship between structural capital and firm performance in high-tech SMEs.

H3c. Realised absorptive capacity mediates the relationship between relational capital and firm performance in high-tech SMEs.

### 3.5. Research model

This chapter uses the literature summarised in chapter two regarding the related models. In this study, a research model is explained in figure (3.1). It is constructed based on the following three variables: Firstly, intellectual capital (Edvinsson and Sullivan, 1996; Bontis, 1998). Secondly, absorptive capacity (Zahra and George, 2002). Finally, firm performance, it consists of financial outcomes (Solomon et al, 2013; Cillo et al, 2010), and employment growth (Wood et al, 2015). This research model suggests that a firm's intellectual capital improves the firm's performance directly. Additionally, it also acts indirectly through creating or developing the firm's dynamic capabilities (Hsu and Wang, 2012) as two main capacities, potential and realised (Zahra and George, 2002).

The mediating role of these two capacities is more likely to enhance high-tech SMEs' performance, which has been measured in five indicators namely market share, sales, profitability, cash flow, and employment growth. The links and relationships between research variables are represented by research hypotheses in figure (3.1). It illustrates the conceptual framework of the study.

Prior literature showed that researchers and scholars have investigated absorptive capacity, intellectual capital, and firm performance separately using a number of models. Many models have investigated the two dimensions of absorptive capacity as a moderator or mediator for instance, (Engelen et al, 2014; Leal-Rodríguez et al, 2014; Engelman et al, 2017), absorptive capacity and financial outcome (Kostopoulos et al, 2011), intellectual capital and firm performance and dynamic capabilities (Hsu and Wang, 2012). Thus, relying on previous work that has been outlined in chapter two of this research, a model is proposed using the three main following dimensions:

- 1. Intellectual capital (Edvinsson and Sullivan, 1996; Bontis, 1998).
- 2. Absorptive capacity (Zahra and George, 2002).
- Firm performance financial and non-financial (Cillo et al, 2010; Solomon et al, 2013; Wood et al, 2015).

The proposed model suggests that firms' level of intellectual capital has direct positive effects on firm performance. It also suggested that intellectual capital has indirect effects through absorptive capacity. In other words, human capital, structural capital, and relational

capital enhance firm performance through creating or developing dynamic capabilities that have knowledge acquisition and knowledge assimilation as a potential absorptive capacity. In addition to this, human capital, structural capital, and relational capital enhance firm performance through creating or developing dynamic capabilities, which are knowledge transformation and knowledge exploitation, as a realised capacity. Potential and realised capacities represent a firm's absorptive capacity. Therefore, the present study develops a model to offer a full understanding about what are the effects of intellectual capital on firm performance through absorptive capacity are. The proposed model has been tested empirically in an intensive knowledge business environment.

Figure 3. 1 Research Model



#### 3.6. Chapter summary

The chapter described the conceptual framework and discussed its functions to achieve the research objectives and answer the research questions. It also put forward the research variables and constructed the research model. The key topics of this study are discussed in chapter two, to operationalize the research's independent and dependent variables. The literature on intellectual capital, absorptive capacity and firm performance has been synthesised in this chapter. This chapter discussed three main dimensions of intellectual capital, structural capital, and relational capital). Furthermore, it discussed the two main dimensions and four dynamic capabilities of absorptive capacity, potential absorptive capacity (knowledge acquisition and knowledge assimilation) and realised absorptive capacity (knowledge transformation and knowledge exploitation). Five performance measurements have been argued. Recent research has not investigated the mediating role of absorptive capacity on the relationship between intellectual capital and firm performance. Hence, this study attempts to investigate and explore relationships among variables as shown in figure (3.1).

## 4. Chapter four: Research methodology

### 4.1. Introduction

This chapter first discusses the research philosophy, approach, process, and method, then it displays various stages and procedures essential in conducting research, answering research questions and meeting research objectives. This chapter shows in detail the processes and procedures that are required to carry out this study. It discusses steps that had to be followed to complete the study (Easterby-Smith et al, 2010). Therefore, to meet the research objectives this chapter' covered nine sections starting with research objectives and questions, research philosophy, the research approach, the research process, research method, research design, research model, data analysis plan, and ethics issues. Each section discusses important issues regarding carrying out research. Hence, the first section highlights research objectives and questions as well as their propositions. The second and third sections shed light on research philosophy and approaches. The third, fourth, and fifth sections focus on research process, research method and design. Section six highlights research models. The seventh section discusses the plan for analysing data. Then the chapter ends with Section eight addressing ethical research issues.

### 4.2. Research objectives and questions

The main objective of this study is to examine the mediating role of absorptive capacity on the relationship between intellectual capital and firm performance in high-tech SMEs, in the -UK. Emphasis is placed on the effect of the three domains on intellectual capital, which are human, structural, and relational capitals, and two main dimensions of absorptive capacity, which are potential absorptive capacity and realised absorptive capacity, on two performance indicators that are financial outcome and employments' growth in SMEs. Therefore, the independent variables consist of intellectual capital, whereas the mediator variable absorptive capacity and firm performance represent the dependent variable. Concerning this topic, the research objectives, questions, and hypotheses are as follows:

**Research objective 1**: To investigate the relationship between intellectual capital and firm performance in high-tech SMEs.

**Research question 1**: What is the relationship between Intellectual capital and firm performance in high-tech SMEs?

# H1. There is a positive relationship between intellectual capital and firm performance in high-tech SMEs.

H1a. High performance firms put more emphasis on human capital in high-tech SMEs.

H1b. High performance firms put more emphasis on structural capital in high-tech SMEs.

H1c. High performance firms put more emphasis on relational capital in high-tech SMEs.

**Research objective 2**: To investigate the mediating role of absorptive capacity on the relationship between intellectual capital and firm performance in high-tech SMEs.

**Research question 2**: What is the mediating role of absorptive capacity on the relationship between intellectual capital and firm performance in high-tech SMEs?

Two main hypotheses were proposed to answer this research question. Every single one has three sub-hypotheses.

# H2. Potential absorptive capacity mediates the relationship between intellectual capital and firm performance in high-tech SMEs.

H2a. Potential absorptive capacity mediates the relationship between human capital and firm performance in high-tech SMEs.

H2b. Potential absorptive capacity mediates the relationship between structural capital and firm performance in high-tech SMEs.

H2c. Potential absorptive capacity mediates the relationship between relational capital and firm performance in high-tech SMEs.

# H3. Realised absorptive capacity mediates the relationship between intellectual capital and firm performance in high-tech SMEs.

H3a. Realised absorptive capacity mediates the relationship between human capital and firm performance in high-tech SMEs.

H3b. Realised absorptive capacity mediates the relationship between structural capital and firm performance in high-tech SMEs.

H3c. Realised absorptive capacity mediates the relationship between relational capital and firm performance in high-tech SMEs.

### 4.3. Research philosophy

Embracing research philosophy is considered an important approach to conducting a piece of research. It is already determined by the researchers' point of view or researchers' stance for creating new knowledge, (Easterby-Smith et al, 2002). However, research philosophy "refers to a system of beliefs and assumptions about the development of knowledge", (Saunders et al, 2016.P:124). In social science, scientists are divided into two teams, the constructionism and the positivism. Thus, two main traditional contrasting philosophies are available to be

adopted, when researchers want to carry out research between "positivism and interpretivism", (Johnson, 2004).

Positivism and interpretivism represent two major paradigms as a philosophical framework of research. Karami, (2011) states that the scientific view of sociology depends upon social facts and also positivists are concerned with sociology, behaviours that are singularly measurable and objective and are influenced by social facts. Therefore, the investigator or researcher cannot be affected by them, (Baxter and Jack, 2008). Furthermore, this philosophy shows that researchers' objectives are to develop theories and reality is independent, (William, 2001). On the other hand, the practice of research, especially in field of management reveals that there has been a trend away from positivism towards constructionism in recent years.

There have been many researchers who have adopted a pragmatic view, by deliberately combining methods drawn from both traditions. In contrast, nowadays positivism is widely used in social science and the aim is the discovery of theories that rely upon empirical studies, (Karami, 2011). It is commonly used for establishing causal relationships between variables, through establishing causal connections and linking variables. Usually, it has become essential to predict and anticipate the occurrence of a social phenomenon. This research philosophy offers clear explanations and interpretations of the phenomenon, (Thomas & Hunger, 2010). However, positivists try to find a causal relationship and discover how these relationships influence behaviour, by searching for a large sample that is selected randomly from a target population, (Gill and Johnson, 2010). Therefore, in social sciences, the researchers are much more likely to adapt the positivist philosophy for investigating different phenomena.

Other researchers have adopted the opposite philosophy, which is interpretivist and have believed that social reality is embedded in our mind, and the reality is not countable and objective, (Saunders et al, 2007; Blumberg et al, 2008). Moreover, the researchers are not detached and they are involved as a part of science. In addition, it requires the individual's observations in society, (Ghauri & Gronhaug, 2005). The reasons behind this are a focus on the micro-sociology element of a situation, as opposed to statistical and quantitative methods, which focuses on a sample to interpret human behaviour and generalize results. Table (4.1) illustrates the major features of the two philosophies of conducting research and creating new knowledge in social science.

	Positivism	Interpretism
Main	- Quantitative	- Qualitative
features	- Objective	- Subjective
	- Scientific	- Humanist
	- Traditional	- Phenomenological
	- Uses large samples	- Uses small samples
	- Not a natural location	- Natural location
	- Hypothesis testing	- Generating theories
	- Results with high reliability	- Finding with low reliability but high
	but Low validity	validity
	- Result generalized from sample to population	- Result generalized from one setting to
	sample to population	another similar setting

Table 4. 1 Major features of the two philosophies

Source: adapted from Karami, 2011

Saunders, et al (2007) explained the research methodology in a figure symbolically called the research onion, which includes six layers or steps. As shown in figure (4.1), we can see the first layer introduces a research philosophy, moving inside towards the research approach, further for methodological choice, after that come the research strategy and time horizons, ending with data collection and analysis.





Source: (Saunders et al, 2016. P:124)

In the context of research philosophy, (Saunders et al, 2007) illustrated three major ways of thinking: epistemology, ontology, and axiology. Each way contains meaningful differences, which are more likely to influence researchers' thinking about the research process. Research philosophy refers to a researcher's stance towards creating a new knowledge. When researchers attempt to conduct their research, they should holistically understand, which philosophical stances are taken and that the research philosophy that is adopted will contain assumptions about the way in which you view the world, yet these assumptions will underpin the research strategy and the methods or techniques, which will be chosen as a part of that strategy. However, the philosophy you embrace will be influenced by practical considerations. In addition, it gives the reader a clear view of assumptions which have been made before, for example (Saunders et al, 2007) mentioned that when the aim of research is to expand or create new knowledge, there has to be a perception of which philosophical stance is taken. Making a decision about a stance represents a crucial factor and should be considered carefully. The extant literature in management research has two views on undertaking research.

Ultimately, in this research, the researcher has considered a set of facts and reasons. Additionally, this research is scientific research and views reality as being based upon social phenomena. Current research proposed a theoretical model and aimed to establish causal link among research variables and testing hypothesis, (Trochim and James, 2001; Thomas & Hunger, 2010). Thereby positivism offers researchers a roadmap for finding a causal relationship and discovering how these relationships influence behaviour, by searching for a large sample that is selected randomly from a population, (Gill and Johnson, 2010). Thus, positivism has been chosen as the ontological position of this research and quantitative data is concerned with hypothesis testing to meet the research objectives and answer the research questions.

### 4.4. Research approach

It has been argued that, to develop and enhance the validity of the study, a research approach is required, (Creswell and Clark, 2007). Choosing a positivist stance from which to carry out the research became important, in order to decide which approach is the most suitable for the research to embrace, (Crandell et al, 2012). However, two main approaches are available in social science; the deductive approach and inductive approach, (Karami, 2011; Saunders, et al, 2007). Deductive and inductive approaches are completely different. Therefore, increasing the research efficiency requires a complete distinguishing and understanding of these two approaches (Boxter & Jack, 2008).

The deductive approach is often related to interpretivism philosophy, (Mellat-Parast nad Digman, 2007). Deductive approaches are generally associated with positivism philosophy. Moreover, this approach is well known in scientific research and includes developing a hypothesis and theories, so there is a deductive theory-based hypothesis confirmation, (Spector et al, 2014). Therefore, most often, but not always, numerical or statistical data play a role in the study (Stokes & Wall, 2014).

However, the deductive approach is known as the "top-down" approach, so the deductive method moves from the general to the particular and from theory to confirmation (Barratt et al, 2011; Karami, 2011). On the other hand, the inductive approach is more flexible than the deductive, due to there being no requirement to collect data to test a theory, however, the most important fact is that the researcher tries to realise and understand the context and how activities are managed (Blumberg et al, 2008).

The inductive approach is associated with actual life examples that need subjective analysis from the researcher (Hallebone and Priest, 2009). It called the "bottom-up" approach. It moves from specific observations to theory. In contrast, the deductive approach is more likely to be used with theories and assumptions to predict future results. There is no doubt that theories can be useful. They can support, organize and synthesize what we know about a phenomenon. In addition, predicting and controlling the future depends upon how strong a theory can be put forward. Moreover, theories are required to be tested, for every single theory we should expect to use a number of tests in order to confirm or disconfirm the theory's predictions, (Spector et al, 2014). Scholars have highlighted the main differences between the previous two approaches, for instance, (Hakim, 2003) who focused on major differences in the approaches' emphasis, which is shown in table (4.2).

Table 4. 2 Differences between deductive and inductive approaches.

Deductive	Inductive
- Scientific principles	- Understanding the meaning
- Move from theory to practice (data)	of reality and events
- Causal relationship between variables	- Dealing with qualitative data
- Quantitative data	- Structure are more flexible
- Structured approach	- Researcher involved as a part
- Independence researcher	of research
- Selecting sampling to generalize	- Bottom- up approach
conclusion	
- Top-down approach	

Source: adapted from Hakim (2003)

As we can see from the differences table, each approach is different, for instance inductive approaches are more flexible in terms of structure and that gives researchers a wide range of freedom in analysing research problems and describing results and going further into detail. On the contrary, a deductive approach is a more structured approach that offers researchers a guideline or road map to discover reality and create knowledge. To adopt a deductive approach many steps have to be followed. Figure (4.2) illustrates the process of the deductive approach in social science.

Figure 4. 2 Deductive approach



Source: Bryman and Bell, (2011)

Therefore, researchers propose a model and develop a conceptual framework and draw a research hypothesis. Empirical data has been used to test the hypotheses, (Saunders and Lewis, 2007; Saunders et al, 2007). According to (Bryman and Bell, 2011), there are six stages in the deductive approach. First, ideas are identified based on the literature. Second, a hypothesis is drawn from the literature. Third, data has been collected from a large number of firms.

Fourth, data is analysed through specific techniques and produces the research findings. Fifth, the hypothesis is tested to be confirmed or rejected. The final stage of the deductive approach is revision of the theory. Thus, this study attempts to address the associations between variables, starting from theory to hypotheses and testing the hypotheses.

Simultaneously, the nature of current research also requires the testing of the causal link among variables in research model, which makes the deductive approach seem a suitable approach to be adopted in this research.

### 4.5. Research process

There are different fundamental stages in the research process, which provide a roadmap with directions for carrying out a business research project, (Hair et al, 2015). These are apart from the type of fundamental research stages, which are common to all scientific investigations, (Karami, 2011. P: 11). Therefore, following a suitable research process is an aspect of the research methodology, due to there being no broad agreement about how to conceptualise a study. In addition, the research aims and the nature of research questions represents a dominant factors in deciding on the process of research.

Basically, the research process shows various facts about the steps in conducting research, for instance it provides a portrait to the reader about the way that it is been adopted by the researcher in conducting research. Research in business and management involves creating a new knowledge, by analysing, interpreting, reporting, and integrating the new knowledge with the prior one. It can be clearly seen that business and management research is not only the process of collecting and reporting information, but it represents a professional method or technique to create new knowledge, (Karami, 2011).

It is considered a more academic method of creating new knowledge than collecting and reporting information. However, (Easterby-Smith, et al 2008; Karami, 2011) mentioned that management research represents more distinct and unique forms than other research in the social sciences. It has a distinctive form and content, because of the unusual features that make it different. Researchers argued that business and management research is a professional research rather than academic or disciplinary research (Saunders et al, 2009; Karami, 2011). Figure (4.3) shows the order of each step in the research process.

Figure 4. 3 Research process



Source: Adopted from (Karami: 2011: p. 12)

Figure (4.3) illustrates the six steps in the process of research, starting from choosing a research topic and searching the literature, which is the first step in carrying out research. After that comes defining a gap in knowledge. Next, it is important to state the outline of the research and design the research and synthesise the initial idea. Then the researcher needs to

test the idea in the real world by collecting and analysing data. The final step requires results to be reported to complete the research project.

The starting point of any research is choosing the research topic, which is a general subject, related to an academic discipline or the researcher's interest in the field of study or general experience, (Karami, 2011; Gill and Johnson, 2010). Therefore, the topic of this research has been chosen relying on a preliminary review of the literature, which is conducted in the fields of intellectual capital and management. The researcher is interested in management because of his background and prior experience in this field. It therefore became necessary to search the literature for previous research and other relevant information that will provide a clear portrayal of the topics and research (Karami 2011; Sekaran and Bougie, 2010). However, the research process in management research begins with a research dilemma that triggers a need for the investigation (Karami, 2011; Blumberg et al, 2014).

Prior empirical research in the field of strategic management gives rise to a concern about SMEs managements about their firms' performance and the lack of resources financial and non-financial such as knowledge resources (Crick and Spence, 2005; Engelen et al, 2014), which is what the current research addresses. Moreover, there is scant research regarding to the topic of incorporating absorptive capacity in field of intellectual capital to enhance high-tech SMES market share, profitability, sales, cash flow, and employability growth, (Engelman et al, 2017; Hsu and Wang, 2012; Mariani and Walter, 2015). Hence, research problem identified as illustrated in chapter two of this research. Therefore, the aim of this research is to investigate the integrated effects of intellectual capital and absorptive capacity upon high-tech SMEs performance. In addition to this, two research questions are raised to resolve this dilemma.

The next step is deciding how to investigate current dilemma and bridge the gap in knowledge, therefore a causal link among the research variables is required, (Saunders et al, 2007; Hallebone & Priest, 2009) and the link has been revealed in the research model. In order to, establish causal relationships between intellectual capital, absorptive capacity and high-tech SMEs performance in the large widespread population of high-tech SMEs, which were geographically located across the UK, quantitative research was adopted to collect large amount of data and test theories and assumptions. Moreover, quantitative methods are considered to be the dominant approach in the area of SMEs (Bendickson and Chandler, 2017). To test the idea in the real world a questionnaire has been used to collect primary data
from a random sample of SMEs across the UK. The collated data required three level of analysis to test the research hypothesis and interpret results, therefore Structural Equational Modelling has been applied in this research. The final stage of this research was writing the report, which divided the thesis into seven chapters to cover entire the process and come up with findings and conclusions.

## 4.6. Research method

Researchers have argued that methodology represents the procedural framework within which research is conducted (Remenyi et al, 1998; Saunders et al, 2009). It is an approach to a problem, which can be employed through an operation. According to (Crandel et al, 2012; Stokes & Wall, 2014), a methodology is a set of general principles and a conceptual framework of ideas, and concepts that are combined together in order to carry out the piece of research. Therefore, the methodology is the system of organizing and structuring theoretical and practical actions. Thus, the methodology supports and provides a connection between the theory and a technique that provides a communication rule, which focuses on research routes to reach results. In this system, the rules are updates and procedures that are continuously improved. Researchers pay considerable attention to finding a new means of observations, analysis, inferences, and generalizations in social science. (Blumberg et al, 2008).

The main objective of the research methodology is that of facilitating a link between researchers who are willing to share common experiences in their research. A number of methodologies exist in social science and choosing a specific one is influenced by many factors, such as the researchers' beliefs and interests in knowledge, and resource availability, (Hair et al, 2007). Furthermore, others have highlighted the cost-benefits factors, such as the feasibility of embracing various methods, (Saunders et al, 2007). The previous points also are considered important in choosing a research approach. Cox et al, (2000) argued that the deductive approach is more suitable for quantitative research and the inductive approach is more associated with qualitative research. However, the research type relies upon the research objectives. Researchers have defined deductive research as a "study in which a conceptual and theoretical structure is developed and then tested", (Karami, 2011: P: 9). In a management research framework, research is focused on big firms rather than small.

However, other scholars have mentioned that there has been an increase in theoretical frameworks and research reliance on SME research in various subjects, (Das and He, 2006).

This study contributes to extant literature by proposing a model that requires adopting a positivist approach, a quantitative research method, and constructing a questionnaire, based on previous work. The focus will be on investigating the mediating role of absorptive capacity on the relationship between intellectual capital and firm performance in SMEs in the UK, and how absorptive capacity as dynamic capabilities, and mediates this relationship. Then it will explore how intellectual capital effects performance and supports an enterprise to enhance its performance to grow and compete in a turbulent business environment.

#### 4.6.1. Quantitative or qualitative method

Quantitative and qualitative are two different techniques of carrying out research, so some researchers are interested in embracing the qualitative approach and designing research to collect qualitative data, then using interpretative methods to analyse it (Ghauri & Gronhaug, 2005). Other researchers are interested in employing quantitative approaches to conduct their research, and collect quantitative data, by using surveys or statistical techniques and specific software to analyse it. (Karami, 2011; Blumberg et al, 2008). Furthermore, studies have adopted a mixed methods approach that mixes both quantitative and qualitative methods. Therefore, using two research strategy remains a valid method in social science to conduct research (Barratt et al, 2011).

The qualitative approach uses subjective data to realise and understand behaviour. Moreover, researchers have to be involved in part of the research. In contrast to quantitative methods, which are considered to be objective, researchers are independent of the studied phenomenon, (Mitchell & Jolley, 2012; Saunders et al, 2007). Quantitative research is considered to be interpretive more than qualitative research (Westerman, 2006). Quantitative approaches help researchers to develop a hypothesis, based upon literature and tested, by using statistical tools to test whether the hypothesis is accepted or rejected, (Baxter and Jack, 2008; Karami, 2011, Saunders et al, 2007). The table (4.3) illustrates the differences in five key points between quantitative and qualitative methods.

	Qualitative	Quantitative
Objective/	• Provides insight for	Generalizing results from
purpose	generalizing ideas, setting	sample to population.
	research problems	• Measuring various views in a
	• To understand underlying	chosen sample
	reasons for current thought	
Sample	• Small numbers or samples.	• Large numbers or samples
	• Non probability sampling	representing the population.
		• Probability sample
Data	• Interview / discussion.	Questionnaire.
collection	• Observation.	• Online questionnaire.
	• Cases	• Structured interviews
	• Focus groups	
	• Participating	
Data analysis	Mostly non-statistical	Statistical
Outcome	• Exploratory.	• Generalized result.
	• Findings cannot be	Conclusive
	generalized	

 Table 4. 3 Differences between qualitative and quantitative methods

Source: adapted from Blumberg et al, (2008)

As we can see from table (4.3), there are considerable differences between the two methods in the purpose of study, sample, and outcome. It is notable that prior empirical evidence and studies that have focused on small and medium businesses have conducted quantitative research (Hair and Sarstedt, 2014). Hair and Sarstedt, (2014) state that quantitative methods are becoming a dominant analytical tool used in empirical studies in family businesses as well as small and medium business research. Frequency of the Relative studies shows that quantitative methods and techniques are being applied in family business studies. Certainly, many articles utilize qualitative methods. Therefore, studying or researching the family business or SMEs' literature, as well as publishing in the relevant journals, can be difficult without at least basic information or a limited understanding of quantitative methods.

However, current research employs the quantitative method to expand knowledge in knowledge management, the field of intellectual capital, absorptive capacity and firm

performance to cover knowledge gaps in this area. Therefore, a descriptive analysis and inferential statistics using SPSS and AMOS software were employed, to analyse the data collected on small and medium enterprises in the United Kingdom.

## 4.7. Research design

In the context of research design, the nature of the research, philosophy, goals, questions, time and resources, are all factors that are considered to be important and helpful for researchers in choosing a research strategy (Grandell et al, 2012). Research designs are diverse in methods, data collection, analysis and measurement of data. However, to design research, the researcher should be aware of these stages (Ghauri & Cronhaug, 2005).

In terms of research design, Cooper and Schindler (2008) defined research design as the blueprint for fulfilling research objectives and answering questions. The questions of what researchers aim to discover and how has a powerful role in shaping the design of any piece of research and will determine the most suitable method to design research (Stokes & Wall, 2014). A given research methodology will run within a system of philosophical thinking. Indeed, the research methodology and philosophy will be fused to yield the research design. However, a research design can involve a wider range of complex options and decisions (Stokes & Wall, 2014). The quantitative method is suitable for developing theoretical constructs of the dimensions of ACAP and IC as well as firm performance. It seeks to explain the mediating role of absorptive capacity on the relationship between intellectual capital and explain the causes of changes in the SME's performance, primarily through measurement and quantitative analysis, to investigate the mediating role of ACAP on the relationship between human, structural, relational capital and the SME's performance. In this section, the research design is illustrated as methods of data collection, time horizons, the source of data, sampling, data collection instrument, constructing the questionnaire, and a pilot study.

#### 4.7.1. Methods of data collection

In field of management, researchers have considered various methods as explained subsequently below (Experiments, Survey, Case study, Action research, Grounded theory, Ethnographies, and Archival research), (Saunders et al, 2007). The most important is selecting the one that has to be associated and matches the research approach and philosophy, (Ghauri & Cronhaug, 2005). In addition, researchers may embrace combinations of data collection methods in one piece of research. Researchers such as (Saunders et al, 2007) have described that the most important fact is not the label that is attached to a particular technique, but in what way it enables the researcher to answer particular questions of research and meet the research objectives. Below is an explanation of research strategies that has been mentioned by, (Saunders et al, 2007).

First, experiments are a classical form of research. The purpose of experiment technique is to investigate causal links, whether a change in one independent variable generates a change in a dependent variable (Saunders et al, 2007). This technique enables researchers to evaluate the significance of relationships between variables and the size of change. It answers the how and why questions when used in explanatory or exploratory research, (Barratt et al, 2011). Second, a case study technique is defined by (Saunders et al, 2009; Flint et al, 2012) as a technique for doing research, which involves an empirical investigation of a particular contemporary phenomenon within its real life context using multiple sources of evidence. Moreover, it answers the what, how, and why questions. If the researchers wish to realise and gain a rich understanding of the context of the process being enacted and the research, a case study will be of specific interest (Yin, 2009). Third, action research: according to (Saunders et al, 2009) it was first used in 1946. It has been interpreted by management researchers in different ways. The literature review discussed action research as four themes. It is as research in action rather than research about action, (Brannick, & Coghlan, 2007).

In some cases, research relates to the involvement of practitioners in the research. The third theme emphasises the iterative nature of the process of diagnosing, planning, taking action and evaluating, while the final theme describes that action. Research should have implications beyond the immediate project. Fourth, classic grounded theory scholars such as (Glaster and Strauss, 1967) often propose that it is the best example of the inductive approach (Charmaz, 2008), while others view it as theory building through a combination of induction

and deduction (Saunders et al, 2009). Fifth, ethnography comes from the field of anthropology. It focuses on describing and explaining the social world and is associated with the inductive approach. This strategy is time-consuming, so it is not suitable for an investigator who has limitations on time (Blumberg et al, 2008). The research process requires a flexible response to change. Thus, the researcher will continually be developing new patterns of thought about what is being noticed. Sekaran & Bougie, (2010) discussed that the ethnographic technique as being much more naturalistic.

Furthermore, there are no tools to collect data when the researcher observes a phenomenon in its context. Sixth, archival research uses documents and administrative records as a principal source of data, (Saunders et al, 2009). It is clearly seen that archival research uses secondary data that has been issued by organizations originally for different purposes, also researchers measure, evaluate, interpret, and analyse the archived data, to conduct their studies, (Gill & Johnson, 2010). Furthermore, such sorts of data are used in archival research and are part of the reality being studied, because it is a product of day-to-day activities, (Hakim, 2000). Archival research helps researchers to focus their research questions on activities which have been implemented in the past and that have changed over time. The strength of this technique is that sometimes there may not be precise information, which is required to answer the research questions or meet research objectives, (Saunders et al, 2009). Therefore, existing data represents the most important factor. Researchers should take this into consideration, when trying to design their research to ensure the best use of data (Sekaran & Bougie, 2010). Seventh, survey technique is the adopted technique for the current research. The following section devoted to discuss this technique in depth.

#### 4.7.1.1. Survey

The survey technique is one of the most common and popular techniques of data collection in business and management research. It is very often used to answer what, where, who, how many and how much questions, (Saunders et al, 2007). It is associated with the deductive approach and descriptive research, (Karami, 2011). Surveys are popular techniques among business and management researchers because they help them to collect a large amount of data from a sizeable population in the fastest and most economical way, by using a questionnaire administrated to a sample. Researchers obtain quantitative data, then they

process it, by using descriptive and inferential statistics, (Sekaran and Bougie, 2010). A questionnaire is a structured framework, which includes a well-prepared set of questions or items (measures) and a designed scale, used by respondents to record answers, (Hair et al, 2015). It is often used to generate primary data. Data which is collected by questionnaires offer easy comparisons and allow access to information directly from people and firms. Moreover, it is very useful to suggest possible reasons for a specific relationship between variables and to create models of relationships.

Furthermore, survey techniques should give the researcher more control through sampling being used over the research process. It allows for creating findings that are representative of the population holistically; however, researchers should make sure that their sample is representative, that means that researchers have to choose a proper technique to select their samples, piloting their data, collection instruments and design. In addition, it costs less than collecting data from the whole population. Using a survey allows researchers to use three main widely common tools for collecting data, (Hallebone and Priest, 2009; Sounders, et al, 2009).

Firstly, the questionnaire represents the most popular tool that is sent electronically or by post, (Sekaran and Bougie, 2010).

Secondly, structured observations, which are most frequently associated with organization and methods research.

Lastly, structured interviews, in which standardised questions are asked of all interviewees.

On the other hand, (Barratt et al, 2011) state that there are some drawbacks to using questionnaires. For instance, the participants will be bored and will not answer the questions completely if the questionnaire is too long and there is a danger of a low response rate. The reasons for a low response would be the questionnaire design or the unfamiliarity of the participants with the research topic. These reasons would come from the less positive impact of research results on the sample in particular, and that is reflected in some cases by the weak connection or link between organizational research or an educational establishment and society. Therefore, researchers have tried to increase the rate of response by including freepost self-addressed envelopes to encourage the return of the questionnaires.

Stokes and Wall, (2014) state that there are three ways to conduct a questionnaire:

Conducting face-face questionnaires.

- Conducting postal questionnaires.
- Conducting email and online questionnaires.

Table (4.4) illustrates the advantages and disadvantages of postal questionnaires.

Table 4.4 A	Advantages	and disad	vantages of	postal c	uestionnaires
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	Advantages	Disadvantages
1	Cost per respondent is low compared with face	Low response rate
	to face interviews	
2	Beneficial when respondents are widely	Have no control over who
	dispersed	actually completes the
		questionnaire
3	Increases the accuracy of the answers given	The respondent might
		misunderstand a questionnaire
4	Respondents have a chance to check details, for	Questions are avoided which
	example, how many employees	leads to missing data
5	A respondent may feel they have anonymity	
	when responding to a postal questionnaire	

Source: adapted from Esterby-Smith et al, (2010)

However, questionnaires are not only a data collection tool used by researchers when they adopt a survey strategy, but they represent a good method to break down the main topic of the research into various parts and arrange the answers for these questions. In total, the results should meet the research objectives.

According to (Cooper and Schindler, 2008), a dominant method for quantitative research is survey measurement. Therefore, a survey technique is quite common to collect primary quantitative data to investigate a causal relationship. Hair et al, (2007), stated that the survey method was chosen, because it is a technique that uses several basic procedures to collect data from people in their social environment (Graziano and Raulin, 1997). Surveys were also carried out with the specific intent of generalizing the results to the population, because in this strategy researchers select samples from the population and ensure that this sample represents the target population.

Researchers such as (Coryn, 2007; Hair et al, 2007), have illustrated the advantages of using surveys. First, the method can be controlled. Second, it represents a good technique to obtain

data. Finally, it may be conducted with the intent of obtaining a general sense of what people feel. The survey method also has relatively high levels of validity, since questions can be posed directly tackling the underlying nature of a construct (Lyon, Lumpkin and Dess, 2000). Furthermore, surveys are considered to be an easy method to develop, and that contain a sufficiently comprehensive set of items to represent the subject issue of interest. Convergent and discriminant validity techniques are very important to determine the adequacy of such measures (Mason and Bramble, 1989). Furthermore, multi-item scales and survey techniques are useful for measuring current conditions within a firm with a high level of specificity (Lyon, Lumpkin and Dess, 2000). The scale items that have forced-choice responses can contribute to greater measurement validity. In addition, the survey technique can efficiently collect large amounts of data at relatively low cost and can be subjected to statistical analysis (Karami, 2011; Sounders et al, 2009).

To sum up, no data collection method is superior or inferior to any others and all methods are worthy, (Saunders et al, 2009). Therefore, this research employs a survey technique as the research strategy, which is quite often used in business and management research (Hallebone and Priest, 2009). Thus, the researcher used the survey to explore the mediating role of absorptive capacity on the relationship between intellectual capital and firm performance in the High-Tech small medium-sized enterprises sector of the UK.

#### 4.7.2. Time horizons

It is generally acknowledged that there is an important question that researchers should ask him or herself which is " Do I want my research to be snapshot or a diary", a snapshot refers to a process of taken research at a specific time, whereas a diary means a series of snapshots representing events over a given period, (Saunders et al, 2009). However, the answer to the previous question depends upon the research questions, which are drawn up before the research. The snapshot is known as Cross-sectional, while the diary perspective is called Longitudinal, for example a new training course or technology, from a perspective of more than one person is called cross-sectional research. On the other hand, if there is a possibility to look at a phenomenon over a time series, for instance tracking a new product from launch to maturity, this research is called longitudinal research. Longitudinal research requires external funding to protract the period of study. The majority of academic research for qualifications tend to be cross-sectional research, which offers researchers the chance to complete their research in a very limited period and it is more often associated with questionnaires (Greener, 2008).

#### 4.7.2.1. Longitudinal studies

Longitudinal research means observing events or people over time. Researchers are able to control the variables being studied.

#### 4.7.2.2. Cross-sectional studies

Cross-sectional research refers to the study of a specific phenomenon at a particular time. It often employs a survey strategy (Saunders et al, 2009). Moreover, many studies that have been conducted to assess organizational performance have used cross-sectional designs (Wiklund and Shepherd, 2005). Despite this, several methods of collecting data and choosing the specific method rely on different elements, for instance, the nature of research and methodology, it can be quantitative or qualitative, and data can be collected via questionnaires or interviews, (Baxter & Jack, 2008). Furthermore, the most important aspect comes after that, which is analysing and interpreting the collated data. Despite there being various data analysis methods available, choosing the correct analysis technique means that it has to match the research method, whether quantitative or qualitative and the research paradigm, which has been adopted, (Sekaran and Bougie, 2010). Ultimately, writing up findings from the research and reporting it in an academic way means the report or thesis should divided into several parts or sections and outlined carefully (Hallebone and Priest, 2009; Karami, 2011; Saunders, et al, 2009).

The research design employed in this study is a survey questionnaire that used cross-sectional data collected at a particular point of time to test the hypotheses. As it is always the case in survey research design, the information obtained will show the degree of association between the variables. Therefore, causal relationships can be inferred based on the results obtained. The research design was chosen to meet the requirements of this study because it seeks to provide reliable and valid outcomes. This research investigated what was the mediating role of absorptive capacity on the relationship between intellectual capital and performance based on CEOs or managers of High-Tech SMEs' perspectives. Therefore, Cross-sectional data have been collected. A large number of the sample were targeted from three high-tech SME

sectors, which are operating in the pharmaceutical and biotechnology arenas and the publishing of computer games.

#### 4.7.3. Source of data

This research targeted the SMEs' population of the high-tech sectors in the UK. Industry sectors are classified in the UK, as high-tech or low-tech, based on a "Standard Industry Classification" (SIC). Companies House Directory provides the researcher with a list of registered high-tech SMEs in the UK, based on previous classifications. The sample was framed and then narrowed down to focus on high-tech SMEs operating in (biotechnology, the pharmaceutical industry, and the publishing of computer games). This sectorial decision has been made due to there being little research investigating firms' knowledge resources and their integrated effects on these three industries. Mostly, researchers have focused on other industries in the high-tech sector such as communication technology (Hsu and Wang, 2012), IT and the semiconductor industry (Seo et al, 2015; Tzokas et al, 2015), computer manufacturing and software (Roberts, 2015) ... etc. However, results in this research could be generalised to the entire high-tech society of UK SMEs. High-tech sectors were based on (SIC) in the UK and are considered to be high knowledge intensity sectors, because they deal with a high level of knowledge that is acquired through R&D activities and patents (Kostopoulos et al, 2011; Roberts et al, 2012). SMEs society in the UK was chosen, due to the importance of SMEs in the economy and growth in developed countries, (Nicholas et al., 2011).

Therefore, this sector was a desirable and vital environment to investigate firms' knowledge resources, such as IC and ACAP. In addition to this, two main variables of this research IC and ACAP deal with knowledge, and high-tech SMEs are classified based on the intensity of knowledge and R&D expenditure. Moreover, high-tech SMEs are generally characterised as SMEs with an advanced knowledge, an educated workforce, capabilities in technology, and the ability to adapt quickly to fast changing environments, (Crick and Spence, 2005). In addition, the UK is considered to be a leading exporter of high-tech products and services. "The UK has the most enterprises in the high-tech knowledge-intensive services sector (180 257 enterprises), followed by France (141 647) and Germany (112 570)". (Eurostat Statistics Explained-High-Tech Statistics-Economic Data/ 2014). Ultimately, SMEs have fewer

chances to rely on external resources to enhance their ability to survive, grow, compete, and achieve superior performance in a turbulent environment, as explained in chapter two of the research literature review. Therefore, this research is conducted with a large number of participants, to strengthen the generalizability of results in this society and to be useful to a large number of SMEs. The role of the UK high-tech sector underlines this arena as suitable to be applied to this study and such a business environment seems very inspiring for conducting this research.

#### 4.7.4. Sampling

Whatever the nature of research questions and aims, researchers need to consider whether they need to use sampling or not (Saunders et al, 2009). Sampling helps researchers to draw findings and conclusions about the undertaken society by selecting a sample that represents the population (Blumberg et al, 2008). The population is used in a technical sense more than an everyday sense. Therefore, population means the entire sphere of the group in which the researchers are interested. That does not mean that the researcher should be examining the whole group, but it is possible to examine a representative sample from the group, (Stokes & Wall, 2014). Basically, the population is the full set of cases from which a sample is taken, while the sample is a subset unit of the population (Gill & Johnson, 2010). Regardless of whether the researchers plan used interviews, questionnaires, observation or any other data collection technique, there is an important dominant factor, which is that of selecting a sample; for instance, if researchers were interviewing a sample of employees from the firm about team-working, the population would be the firms' workforce. From this overall population, the labour researcher would select a smaller selection of people. Researchers in business research methods classified sampling techniques into two main categories "probability sampling and non-probability sampling" as illustrated in figure (4.4), (Saunders et al, 2009).





Source: adapted from (Saunders et al, 2009: p 213)

*Probability sampling* or representative sampling is most associated with survey-based research strategies. In this category of sampling each unit of the population has the same chance to be selected and there is an equal probability of selection (Sekaran and Bougie, 2010; Saunders et al, 2009). There are four main techniques that can be used to select a probability sample.

*Non-probability sampling* is sometimes called non-random sampling and the researcher selects some units purposefully of population for research. (Flint et al, 2012). Some business and management studies research questions, objectives, and the strategy that has been developed, may dictate non-probability sampling, to answer the research questions and meet the research objectives. There are five main techniques that can be used to select a non-probability sample, as explained in the figure (4.4), (Saunders et al, 2009).

It is important to explain stratified random sampling technique, which has been used in this research. This technique has many advantages, for example the population can be classified into various categories, for instance, a population of adults includes both sexes, also the employed and unemployed (Karrami, 2011). It is possible to use this technique when the population is non-uniform and based on this technique, the population can be classified into 2 or 3 strata, thereafter randomly or systematically selecting the samples from each stratum (Moore, 2009). Therefore, it shares many of the advantages and disadvantages of systematic

sampling or simple random sampling. Stratified random sampling is more likely to be representative, the most important factor is that the researcher should make sure that each of the strata is represented proportionally within their sample.

Researchers such as (Saunders et al, 2009) stated that stratified random sampling is a reliable technique and samples can be stratified by using more than one characteristic. In this study unit the population was chosen by using stratified sampling, due to this method allowing the selecting of a sample from high-tech SMEs, which are more likely to represent the population of high-tech SMEs in the UK, which has large number of companies. The sample is framed based on SIC codes to identify the companies. Researchers such as (Krejcie and Morgan, 1970) determine the percentage of the sample out of the population and based on this equation from the research sample as a whole, 1900 firms were selected. Table (4.5) illustrates the details of the chosen sample.

Industry sectors	Number of	Calculating the sample	The
	companies		sample
Pharmaceutical	2090	2090 / 4927 * 100 = (42.4%) * 1900 =	805
		(805)	
Biotechnology	1394	1394 / 4927 * 100 = (28.3%) * 1900 =	538
		(538)	
Publishing of	1443	1443 / 4927 *100 = (29.3%) * 1900 =	557
computer games		(557)	
Total	4927		1900

Table 4. 5 Selection of sample

As we can see in table (4.5), the whole sample was 1900 companies It consisted of (805) pharmaceutical firms, (538) biotechnology firms, and (557) publishers of computer games. In addition, table (4.5) illustrates how the research sample has been chosen carefully to cover the entire society, therefore the current sample is considered a representative sample for high-tech SMEs .

#### 4.7.5. Data collection instrument

Two main data collection methods are widely used in positivist research, these are interviews and questionnaires. A questionnaire is a list of items aiming to collect specific information from respondents that support researchers to answer research questions. Questionnaires are highly used in interviews also, particularly when researchers conduct structured or semistructured interviews. Many ways or techniques are available for researchers to use to complete questionnaires, for instance online or postal surveys, face to face, and telephone interviews. In terms of time consumption and cost, online and postal questionnaires are considered low cost and less time consuming. However, reviewing literature and related studies, helps the researchers to adopt the research questionnaire from prior research, which has been conducted in the same field. This point is explained later in constructing the questionnaire.

However, in this research the data collection instruments were the postal and online questionnaires. Furthermore, the final data have been collected via questionnaires from the selected sample. The research questionnaire has been adopted from prior research and amended after the pilot study to make it clearer and improved to match the management and activities in SMEs. The unit of analysis will be the CEO managers of the high-tech SMEs sector by focusing on their perspectives about absorptive capacity, intellectual capital and their role to enhance firm performance.

### 4.7.6. Constructing the questionnaire

The researcher reviewed a very large amount of literature related to the fields of intellectual capital, absorptive capacity, and firm performance. Based on prior related research, a conceptual framework and research hypotheses of this study were developed. After the research hypothesis and conceptual framework were drawn up, it became important to choose the suitable measurements for research variables and design the questionnaire. Therefore, prior academic theory and research were used literature to choose and select items from, for measuring variables. However, research measurements have been adopted from considerable research, due to high reliability and validity. Specific care has been taken to ensure that the items were applicable to the target sample. The questionnaires were designed in eight

sections (Appendix 5). The first two sections include demographic information about management and SMEs, which consists of "age, gender, work experience, education, and position. Regarding firms, the age of the firms, the location, size of the firm and the industrial sector, all were included in the questionnaire. Therefore, the first two sections focused on the firm and management to highlight the nature of management and firms.

Sections three and four of the questionnaire were designed to measure two dimensions of absorptive capacity. Section three was dedicated to measuring potential absorptive capacity, as two dynamic capabilities are (knowledge acquisition and knowledge assimilation). Section four was dedicated to measuring realised absorptive capacity, as two dynamic capabilities are knowledge transformation and knowledge exploitation. Two reliable and valid measures of absorptive capacity were available and they have been developed by (Jansen et al, 2005) and (Thomas and Wood, 2014). The first measurement was selected, which was developed by Jansen et al, (2005), due to them following the same concepts of absorptive capacity that were suggested by (Zahra and George, 2002). The second one was developed by (Thomas and Wood, 2014) that did not match the field of study, due to the design and it being developed specifically to measure absorptive capacity in the tourism field, which did not match this research field.

Sections five to section seven were dedicated to measuring three dimensions of intellectual capital, which are human capital, structural capital, and relational capital. This research attempts to measure the level of intellectual capital in the studied firms. Three measures of intellectual capital were available for use, they were developed by (Bontis, 1998; Youndt and Snell, 2004; and Isaac et al, 2010). In this research the intellectual capital measurement was based upon that chosen from (Isaac et al, 2010), due to it offering items to measure the firms' level of intellectual capital. The previous two measures were developed by (Bontis, 1998; Youndt and Snell, 2004) and were not suitable for this research, due to many of their subscale items dealing with outcome measures or measuring whether IC exists or not. The final section of the questionnaire was designed to assess firm performance in high-tech SMEs. It was divided into two sections, the first one that was the most challenging section, due to using main questions to measure the firms' financial outcomes by using four items. This part was a summated composite of four items, which are market share, sales, profit, and cash flow. The second part was organized to measure employment growth. Table (4.6) illustrates research including measurements, which were used to design this research questionnaire.

Field of research	Title of research	Authors	Research variables
Absorptive	Managing Potential	Jansen et al, (2005)	- Potential ACAP
capacity (ACAP)	and Realised Absorptive Capacity: How Do Organizational	Academy of Management	- Realised ACAP
Intellectual	Intellectual Capital	Isaac et al. (2010)	- Human capital
Capital (IC) Human and structural	Management Enablers: A Structural Equation Modelling Analysis	Journal of Business Ethics	- Structural capital
Intellectual	Intellectual Capital	Isaac et al, (2010)	- Relational
Capital (IC) Relational	Management Enablers: A Structural Equation Modelling Analysis	Journal of Business Ethics	capital
cuprui	LearningandProtectionofProprietaryAssets inStrategicAlliances:BuildingRelationalCapital	Kale et al, (2005) Strategic Management Journal	
Firm	Market information	Cillo et al, (2010)	- Firm
performance	approaches, product		performance
	innovativeness, and	Research policy	Financial outcomes
	firm performance:		
	the fashion industry		
Firm performance financial outcome	Survival of the fittest: Technical assistance, survival and growth of small businesses and implications for public policy	Solomon et al, (2013) Technovation	- Firm performance Financial outcomes
Employments	Roots, reasons, and	Wood et al, $(\overline{2015})$	- Firm
growth	resources: Situated optimism and firm growth in subsistence	Journal of Business Research	performance Growth
	economies		

Table 4. 6 Research used to design current research measurements.

#### 4.7.7. Measuring data

In this study, primary data was collected. There are various levels of measuring primary data. It can be measured in four levels. There are different kind of scales, nominal, ordinal, interval, and ratio. "Variables measured at the nominal or ordinal levels are discrete and referred to as either categorical or non-metric, while variables measured at the interval or ratio levels are continuous and referred to as quantitative" (Hair et al, 2015: p: 230). The scales that are used in this research were nominal, ordinal, and interval. Categorical and numerical data are measured by nominal and interval levels, for instance the demographic information about management and the firm. In this research, nominal and ordinal data has been used to collate information obtained through multiple choice questions about participants' age, gender, experience, level of education, and their position in the companies. Nominal and ordinal data has been based on multiple choice questions to know the age of the researched companies, their location, the number of employees, and which industry they operate in.

Simultaneously, the independent and dependant variables in this research were measured by an interval level five Likert scale (5 =strongly agree, 4 =agree, 3 =neutral, 2 =disagree, and 1 =strongly disagree). The participants were asked to indicate the extent to which they agree or disagree with statements. First, Intellectual capital is the independent variable in the current research model. It consisted of three dimensions human, structural, and relational capitals, each dimension requiring various items to be measured. The purpose of this study is to measure the level of intellectual capital and how managements deal with their intellectual capital in the researched firms. Therefore, twenty-two items have been dedicated to capture them as follows. Eight items devoted to measure human capital as a knowledge owned by firms' employees and developed through learning, training, and experience. Five items measure structural capital as the knowledge created and stored by firm's systems and procedures. Nine items allocated to measure relational capital as a firm's relationships with customers, suppliers, stakeholders, third parties, and interactions among its employees. Second, the mediator variable is absorptive capacity, which consists of two dimensions potential and realized capacities. In this research, twenty items have been dedicated to measuring and capturing absorptive capacity in five Likert scales. The participants were asked to indicate the extent to which they agree or disagree with statements. Eight items measure potential absorptive capacity as knowledge acquisition, and knowledge assimilation as firms' dynamic capabilities. Twelve items measure realised absorptive capacity as knowledge transformation, and knowledge exploitation as firms' dynamic capabilities.

Lastly the dependent variable has two dimensions and is measured by financial outcomes and employment growth. Five items have been dedicated to measuring performance. Regarding the first dimension of performance, the financial outcome, it was represented by a summated composite of four items: increased market share, increased sales, improved cash flow, and increased profit margin. The participants were asked to provide an assessment of the overall financial performance of their firms for the last three years by using an interval level five Likert scale (5 = excellent, 4 = very good, 3 = good, 2 = fair, 1 = poor). These financial performance indicators are correlated to each other: Solomon et al (2013), for instance; studies linking cash flow with profitability, such as (Dechow et al, 1998). Others proved a relationship between market share and profitability, such as (Szymanski et al, 1993). Employments growth was measured based on increasing or decreasing the number of employees compared to the last year in the researched firms, using an interval level. Table (4.7) illustrates research variables.

Research	Kind of the	Dimensions of the variable	Number of the items in
Variables	variable		the questionnaire
Intellectual	Independent	Human capital	Eight items
capital		Structural capital	Five items
		Relational capital	Eight items
Absorptive	Mediator	Potential absorptive capacity	Nine items
capacity		Realised absorptive capacity	Twelve items
Firm	Dependent	Financial outcome	One main question
performance			divided into four items
		Employments growth	One item

Table 4.7	Research	variables
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Concerning the level of measurement in this research, researchers such as (Cooper and Schindler, 2003), present a breakdown of the level of data that is used in business and management research. The table (4.8) explained all four levels of data, and how many of them were used in this research.

Table 4. 8 Levels of measuring data

Kind of	Characteristic	Basic	Level used in this	Sections numbers
data	of data	empirical	research	where has been
		operation		employed in
				research
				questionnaire
Nominal	Classification	Determination	Gender (female, or	Section one and
	but not order	of equality	male)	two of the
			Position (manager	questionnaire
			or not manager)	
			Level of Education	
			kind of company	
Ordinal	Classification	Determination	-Age	
	and order but	of greater or	-Experience	
	no distance or	lesser value	-Employment	
	unique origin		growth	
Interval	Classification	Determination	Five point Likert's	Section 3 to
	and order but	of equality of	scale	section 8 of the
	no distance or	intervals or	-Absorptive	questionnaire
	no unique	differences	capacity	
	origin		-Intellectual capital	
			-Firm performance	
Ratio	Classification,	Determination	Not used in this	
	order distance,	of equality of	research	
	and unique	ratios		
	origin			

Source: Adapted from Cooper and Schindler (2003)

## 4.7.8. Pilot study

A pilot study is an attempt to predict a suitable sample size and enhance the study design through a small-scale preliminary study, before conducting a full-scale study. The pilot study was carried out on a small sample or members of the same population to evaluate the contents and context of the research questionnaire's reliance on relevant theories, previous related studies, and what is understood by practitioners. A pilot study provides researchers with beneficial comments and advice, which helps them to get holistic depiction about the constructed research questionnaire and its validity. However, in this research, it was carried out on a focus group and the target sample was 10 lecturers at Bangor Business School and 25 CEOs and managers of high-tech SMEs. Both academics and practitioners provided constructive advice and comments, which improved the structure of the constructed questionnaire in terms of questionnaire contents and context. Regarding the questionnaire's ambiguity, many questions have been reformatted and amended to match the nature of SMEs and make them clearer and more understandable. The final version of the questionnaire was amended and reviewed, and then it was sent to the final sample through both the post and an online survey. Of the 1900 questionnaires sent, 239 questionnaires were received from high-tech small and medium sized enterprises. 215 questionnaires were usable, the other 24 questionnaires contained uncompleted information. The rate of response in this research was around 11 % percent.

Table 4. 9 Distribution of questionnaires.

Questionnaires distributed: 1900		
Received Questionnaires		
Completed questionnaire	239	
Usable	215	
Unusable	24	
overall response rate: 11%		

The collected data were entered onto the computer and analysed by SPSS and AMOS.

## 4.8. Research model

The research theoretical framework is a structured group of theoretical assumptions and notions that demonstrate the relationships between independent and dependent variables. It helps researchers to construct an action plan to categorise and organise research subjects, (Rowley and Slack, 2004). The research variables were operationalized and defined in chapter three of this research. However, research incorporated absorptive capacity in the field of intellectual capital is scant and still largely underdeveloped (Hsu and Wang, 2012; Mariano and Walter, 2015; Engelman et al, 2017).

Therefore, the limited amount of research has been the focus of examining the effects of the intellectual capital on SMEs' performance, and the effects of intellectual capital through absorptive capacity on the SMEs' performance. In other words, this research attempts to explore the direct effects of intellectual capital on SMEs' performance and the indirect effects through absorptive capacity. Moreover, few studies investigated the mediating role of absorptive capacity on the relationship between intellectual capital and high-tech SMEs performance. Reviewing the literature highlighted a knowledge gap and some questions regarding these issues need to be addressed. Hence, this research investigated the mediating role of absorptive capacity on the relationships of the three dimensions of intellectual capital on firm performance. Therefore, the conceptual framework of this study included three main variables. First, intellectual capital. Second absorptive capacity. Lastly, firm performance, as explained in the details in the next step.

#### 4.8.1. Intellectual capital variables

Intellectual capital has been recognized as consisting of important intangible assets that contribute and enhance a firm's success rate and generate the firm's value. In the context of intangible resources or invisible assets, intellectual capital represents the most important invisible assets, (Sydler et al, 2013; Kamukama, et al, 2011). It is what makes a firm worth more than the sum of its countable parts or the more than the firm's book value. On the other hand, literature on intellectual capital reveals that creating intellectual capital or building up a high level of knowledge is more likely to support a firm's ability to create value and enhance their performance, (Chen, et al, 2014; Calabrese, et al, 2013; Tsui et al, 2013; Grichnik, et al, 2014; Stam, et al, 2014; Kim and Longest, 2014; Abhayawansa and Guthrie, 2014).

A large amount of literature and perspectives (in organizational learning theory, information processing theory, resource-based theory, and knowledge based-view) suggested that intellectual capital could create value and enhance organizational performance by lowering costs, increasing customer benefits, or doing some combination of the two. Intellectual capital represents the pivotal factor to increase a firm's ability to improve performance and create a new competitive advantage (unique or sustainable). Researchers such as (Abhayawansa and Guthrie, 2014) report that IC is a critical source of value for firms and the economy, also firms do not own or control all these knowledge resources. Kamukama et al, (2011) state that intellectual capital is ownership of knowledge, technology, customer relations, experience, and specific skills that provide the organization with an edge in the market. Scholars such as (Cohen and Kaimenakis, 2007; Gibb and Blili, 2013) describe that intellectual capital represents all the intangible resources in the company. Costa, (2012) states that intellectual capital consists of a comprehensive amount of organizational knowledge and is considered to be the most important powerful engine of production. According to (Chung-Jen et al, 2014) intellectual capital includes important skills, knowledge, intangible assets, and relations, which are referred to as valuable assets. Obviously, intellectual capital is a resource with a non-physical existence with a high possibility of creating value and benefits and it comes through long-term investment in knowledge and continuous development. Calabrese, et al, (2013) explained that IC has the same importance as financial capital and IC is complementary to financial capital in value. Hence, all this literature confirmed the importance of the firm's intellectual capital in creating value, knowledge and performance. In the line with previous literature. Intellectual capital can be defined as the stored knowledge possessed by a firm and an employee, both explicit and implicit, and personal and systematic knowledge possessed by employees and firms that is available to network relationships through interaction. It consists of human, structural, and relational capital. Furthermore, this definition showed intellectual capital has two aspects: as an asset and as dynamic capabilities due to its focus on base knowledge in firms; as well as acquired knowledge, which comes through interaction, all that is able to rejuvenate firm resources. This research follows the foregoing definition.

This research focuses on exploring the effects of intellectual capital on firm performance. However, to achieve this aim, this study focused on three main dimensions of IC; human capital, structural capital, and relational capital, (Edvinsson and Sullivan, 1996; Bontis, 1998; Kamukama, et al, 2011; Sydler et al, 2014; Abhayawansa and Guthrie, 2014; Tsui, et al, 2014). Based on this classification, this study assesses IC in terms of HC, SC and RC. Furthermore, many researchers have measured intellectual capital, therefore measurements were available to select from, as explained in this chapter before going through the process of constructing the questionnaire. Table (4.10) illustrated the questions used to measure and capture the level of three dimensions of intellectual capital.

Table 4. 1	0 Measurements	of intellectual	capital

Variable	Items	References
	The knowledge of each co-worker/associate is not	
	really appreciated until that person leaves the	
	organization	
Human capital	Most co-workers/associates clearly understand	Isaac et al, (2010)
	why they do in their jobs	
	Extensive knowledge sharing occurs between	
	experienced and new people in our organization	
	Because knowledge is shared non-systematically	
	(e.g., sporadically, informally) dependency on a	
	few key individuals for success is high	
	Most co-workers/associates continue to use the	
	same procedures without asking, "Is there a better	
	way of doing this?"	
	We are able to link the success of our organization	
	to our knowledge and expertise	
	We often develop techniques or processes based	
	upon what we have learned from earlier	
	experience	
	It is easy to spread individual knowledge	
	throughout this organization for others to use	
Variable	Items	References
	People have access to the information systems	
	they need to fulfil organizational objectives	
Structural	Our organization possesses processes to develop	Isaac et al, (2010)
capital	fully its unique capabilities, skills, and knowledge	

	Features of our information systems capture the	
	knowledge that exists in this organization	
	Most co-workers/associates are familiar with	
	organization information systems that assist job	
	performance	
	We have good systems within our organization to	
	measure the value of our knowledge	
Variable	Items	References
	We maintain appropriate communication with our	
	stakeholders	
	Suppliers and customers have a clear picture of	
	who we are and what we offer	
	Our clients think we work toward their best	
	interests	
	We emphasize getting to know one another in this	
Relational	organization	Kale et al, (2000);
capital	There is close personal interaction between our	Isaac et al, (2010)
	unit and business partners	
	Our unit focuses on mutual trust with suppliers	
	and customers	
	We focus on high reciprocity with business	
	partners	
	We often foster long-term business relationships	
	that appear to have no short-term value	
	The structure within this organization promotes	
	caring relationships	

Source: Survey questionnaire

## 4.8.2. Absorptive capacity variables

Cohen and Levinthal (1990) suggested a possible broadly cited definition of ACAP, for the firm's ability to value, assimilate, and apply new knowledge to commercial ends. Others such as (Mowery et al, 1996) define ACAP as a broad set of skills required to deal with the

underlying component of transferred knowledge and the acquired knowledge required to be harmonised and incorporated into a firm's knowledge base and system. ACAP is a combination of effort and knowledge bases (Kim, 1998), other work from (Zahra & George, 2002), defined ACAP as a set of organizational routines and processes by, which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability.

In addition, previous studies by (Cohen and Levinthal, 1989, 1990; Tsai, 2001; Gupta & Govindarajan, 2000), highlighted three dimensions of absorptive capacity, which are knowledge identification, assimilation, and exploitation to a commercial end. Scholars later on reconceptualised and extended ACAP constructs such as (Zahra & George, 2002; Torodova & Durisin, 2007), who made significant contributions in ACAP literature. Absorptive capacity has been conceptualized and measured, as either (1) an asset, (2) an ordinary capability, or (3) a dynamic capability, (Lane et al. 2006). Two general perspectives showed absorptive capacity: as a "stock" of prior related knowledge and as an "ability" to absorb knowledge, (Roberts et al, 2012).

However, this study follows the re-conceptualization offered by (Zahra and George, 2002), which illustrated ACAP as two dimensions, potential and realised. Potential ACAP includes "knowledge acquisition and knowledge simulation", while realised ACAP consists of "knowledge transformation and knowledge exploitation". However in the line with previous literature absorptive capacity can be defined as internal capabilities resulting from individual skills, prior knowledge, company-specific competencies and external linkages that enable a company to access to outside knowledge sources; it consist of two dimensions potential absorptive capacity and realised absorptive capacity.

Following these concepts, the current study explores the effect of absorptive capacity on the relationship between intellectual capital and firm performance. This research measured ACAP as dynamic capabilities that mediate the relationship between intellectual capital and firm performance. Table (4.11) shows the questions used to measure and capture the whole construct of absorptive capacity as a multidimensionality construct.

Table 4. 11 Measurements of absorptive capacity

Variable	Items	References
	Our unit has frequent interactions with business partners	
	and clients	
	Employees of our firm in different departments are	
	sharing knowledge between them about various	
Potential	activities and tasks	
absorptive	We collect industry information through informal means	
capacity	(e.g. lunch with industry friends, talks with trade	
	partners)	
	Our unit periodically organizes special meetings with	
	customers or third parties to acquire new knowledge	
	Employees regularly approach third parties such as	
	accountants,	
	consultants, or tax consultants	
	We are slow to recognize shifts in our markets (e.g.	
	competition,	
	regulation, demography)	
	New opportunities to serve our clients are quickly	Jansen et al,
	understood	(2005)
	We quickly analyse and interpret changing market	
	demands	
Variable	Items	
	Our unit regularly considers the consequences of	
	changing market demands in terms of new products and	
	services	
	Employees' record and store newly acquired knowledge	
	for future Reference	
	Our unit quickly recognizes the usefulness of new	
Realised	external knowledge to existing knowledge	
absorptive	Employees hardly share practical experiences	
capacity	We laboriously grasp the opportunities for our unit from	

Source: Survey questionnaire

## 4.8.3. Firm performance variables

Firm performance represents the main third variable or the dependent variable in this study. Financial and non-financial measurements have been applied to measure performance, such as profitability and employments growth (Cillo et al, 2010; Solomon et al, 2013; Wood et al, 2015). Achieving profitability and growth in turbulent business environments were considered a major challenge for SMEs (Garengo et al, 2005; Heilmersson, 2014; Seo et al, 2015). Consequently, small medium-sized enterprises have no wide range of resources to develop their performance, like big companies, (Hudson, et al, 2001). On the other hand, SMEs are improving their technical and technological capabilities to meet the market's needs, (Garengo et al, 2005). Even though previous arguments have revealed some challenges faced by SMEs, but SMEs are still the backbone of the economy, and the highest employment provider. However, in this research firm performance can be define as the ability of transforming resources within the firm in an efficient and effective manner to achieve financial outcome through enhancing market share, profitability, sales, and cash flow and enhance employments growth through increasing the number of employees.

This research measured the SMEs financial outcome through four items referring to (Solomon et al, 2013; Cillo et al, 2010), which are market share, sales, cash flow, and profit margin. While employability growth is measured referring to (Wood et al, 2015), which

increases or decreases the number of employees. Table (4.12) breakdown the questions that were used to measure and capture financial outcomes and employability growth.

Variable	Items	References
	Please provide an assessment of the overall performance	
	of your firm in the last 3 years based on following items	(Solomon et al,
Financial	Increased market share	2013; Cillo et al,
outcome	Increased sales	2010)
	Improved cash flow	
	Increased profit margin	
Variable	Items	References
	Compared to last year, has your number of employees	Wood et al,
Employments	Increased	(2015)
growth	Stayed the same	
	Decreased	

Table 4. 12 Measurements of firm performance.

Source: Survey questionnaire

In addition, data dictionary breakdown all the research variables measurements, see (Appendix 1).

## 4.9. The proposed research model and hypotheses

The literature showed that a number of models were used by researchers and scholars to investigate absorptive capacity, intellectual capital, and firm performance separately. Many models investigated the two dimensions of absorptive capacity as a moderator or mediator for instance, (Engelen et al, 2014; Leal-Rodríguez et al, 2014), absorptive capacity and financial outcome (Kostopoulos et al, 2011), intellectual capital and firm performance and dynamic capabilities (Hsu and Wang, 2012). Thus, reliance on previous work outlined in chapter two and three of this research, the proposed model in figure (4.5) has been constructed using three main following dimensions:

1. Absorptive capacity (Zahra and George, 2002).

2. Intellectual capital (Edvinsson and Sullivan, 1996; Bontis, 1998).

3. Firm performance, both financial and non-financial (Cillo et al, 2010; Solomon et al, 2013; Wood et al, 2015).

The proposed model suggests that the firms' level of intellectual capital has direct positive effects on firm performance. It is also suggested that intellectual capital has indirect effects through absorptive capacity. In other words, human capital, structural capital, and relational capital enhances a firm's performance through creating or developing dynamic capabilities that include knowledge acquisition and knowledge assimilation, which is already represented as a potential absorptive capacity. In addition, human capital, structural capital, and relational capital enhance the firm's performance through creating or developing dynamic capabilities, such as knowledge transformation and knowledge exploitation, which have already been represented as realised absorptive capacity. The current model presupposes that the integrated effects of both intellectual capital and absorptive capacity will enhance firms' market share, profitability, sales, and employment growth.

Figure 4. 5 Developed research model



**Research Model** 

In this model, firms that focus on maintaining and leveraging high levels of human capital, structural capital, and relational capital are more likely to achieve a high level of performance in regard to market share, profitability, sales, and employment growth, which are the direct effects of intellectual capital on firm performance.

In addition, the current model suggests that maintaining and leveraging high levels of human capital, structural capital, and relational capital is more likely to create and develop firms' potential and realized absorptive capacity. These capacities in turn enhance and maximize the positive effects of intellectual capital on firm performance in regard to market share, profitability, sales, and employments' growth, which are the indirect effects of intellectual

capital on firm performance through absorptive capacity. However, the research hypotheses have been developed and presented as follows:

# H1. There is a positive relationship between intellectual capital and firm performance in high-tech SMEs.

H1a. High performance firms put more emphasis on human capital in high-tech SMEs.

H1b. High performance firms put more emphasis on structural capital in high-tech SMEs.

H1c. High performance firms put more emphasis on relational capital in high-tech SMEs.

H2. Potential absorptive capacity fully mediates the relationship between intellectual capital and firm performance in high-tech SMEs.

**H2a.** Potential absorptive capacity mediates the relationship between human capital and firm performance in high-tech SMEs.

**H2b.** Potential absorptive capacity mediates the relationship between structural capital and firm performance in high-tech SMEs.

**H2c.** Potential absorptive capacity mediates the relationship between relational capital and firm performance in high-tech SMEs.

## H3. Realised absorptive capacity fully mediates the relationship between intellectual capital and firm performance in high-tech SMEs.

**H3a.** Realised absorptive capacity mediates the relationship between human capital and firm performance in high-tech SMEs.

**H3b.** Realised absorptive capacity mediates the relationship between structural capital and firm performance in high-tech SMEs.

**H3c.** Realised absorptive capacity mediates the relationship between relational capital and firm performance in high-tech SMEs.

## 4.10. Data analysis plan

Researchers have often measured absorptive capacity through proxies, for instance, a firm's R&D expenditure or the number of patents (Tsai, 2001; Vinding, 2006). On the contrary, those who largely neglected using proxies to measure ACAP such as (Jansen et al, 2005; Todorova and Durisin, 2007; Flatten et al, 2011; Rhodri and Wood, 2014) stated using proxies are not able to capture the whole construct, (Roberts et al, 2012). Those researchers believed in notions of the multidimensionality construct of absorptive capacity, therefore, to capture the whole construct of ACAP, they highly recommended using metrics to measure ACAP dimensions.

Researchers and those interested in the field of intellectual capital have measured intellectual capital via different methods and methodologies, as explained in detail in chapter two. This research attempts to capture the whole construct of absorptive capacity and three dimensions of intellectual capital, therefore mono methods have been used, alongside a quantitative methodology. Research measurements were adopted from prior research to collect primary data after the pilot study, as explained before. The time horizon of this research can be described as cross-sectional data, due to it representing a suitable method to collect snapshot data from SMEs.

After collecting the questionnaires, the next step was coding them and entering data into SPSS. In this research Structural Equational Modelling was applied. Descriptive and statistical analysis and EFA were conducted by SPSS, and then CFA, to model fit and test the research hypothesis by using AMOS 22 software.

## 4.11. Ethical issues

The researcher and investigator should realise the norms of society. They must think carefully about how they will gain access to an appropriate source, due to the link and connection between researcher and the respondents consisting of a series of ethical issues (Karami, 2011).

Dealing with the participants represents the main issue in survey research. In the beginning, researchers must take into serious consideration the rights of the respondents and their responsibilities. Moreover, researchers should take in his or her account and make sure there is no risk for respondents. Furthermore, researchers should not put the anonymity of respondents in danger, due to researchers not being authorized or allowed to do it. Therefore, in the context of the study, ethics represents the appropriateness of the researcher's behaviour to the relationship of the rights of those who become part of the research (Saunders et al, 2009). In addition, in research ethics the important facts are that potential respondents have to be free to decide whether or not to take part in the research. Participants should not incur any cost by taking part in the research.

In this research, ethics approval was provided by CBLESS Research Ethics Committee (College of Business, Low, Education, and Social Sciences) Ethics Committee in Bangor University. See (Appendix 3).

In this research, the first step in sending the questionnaire was achieved by asking the participant if they were interested in taking part in this research through sending them a Participant Information Sheet with Participant Consent-Questionnaire, which was provided by CBLESS Research Ethics Committee, with the questionnaire, see (Appendix 4 and 5). Many participants revealed their interest in taking part in this research.

## 5. Chapter five: Data analysis and findings

## 5.1. Introduction

This chapter illustrated the entire process of analysing research data and the research findings as an outcome of the data analysis, which relied upon the empirical study in this research. The purpose of this chapter is to present the findings of the data analysis based on the empirical research. This chapter consisted of three sections. First, a descriptive analysis included analyses of the demographic information and described the sample. It helps to have a clear picture of data distribution and to select an appropriate statistical test for testing the research model and hypothesis. Second, data regarding intellectual capital, absorptive capacity, and firm performance have been analysed in high-tech SMEs in the UK. Finally, multivariate analyses among the research variables have been conducted, such as exploratory factor analysis (CFA), model fit amongst the variables using AMOS 22, and testing the direct and indirect effects with bootstrapping.
# 5.2 Descriptive analysis

In this research, the descriptive analysis concluded two aspects of managerial characteristics of the respondents and characteristics of studied firms.

## 5.2.1 Managerial characteristics of the respondents

The respondents belong to small and medium sized-enterprises in the UK, which operate in the biotechnology, pharmaceutical, and publishing of computer games industry. Of the 1900 questionnaires sent, 239 questionnaires were received from high-tech SMEs. 215 questionnaires were usable, the remaining 24 questionnaires were uncompleted information. The rate of response in this research was around 11 % percent. (38 %) of the respondents came from companies operating in the biotechnology sector in the UK. About (31 %) of the respondents are located in the pharmaceutical sector in the UK. About (16 %) of the studied companies are operating in the publishing of computer games sector in the UK, and (15 %) of the respondent firms are operating in other sectors.

The figure 5.1 shows the percentage of responsive firms from the research sector. This is biotechnology (38 %), pharmaceutical (31 %), publishing of computer games (16 %), and others (15 %). This part of the demographic information will focus on five points; the age of the respondents, their gender, experience, education, and their managerial position in the company.



Figure 5. 1 Industry sectors

#### 5.2.1.1 Age of the respondents

The age of respondents has been divided into four groups, the first group was (<20-29) years. (7.0 %) of the respondents were in this age band. The second group was (30-39) years. (9.3 %) of the respondents were in this age band. The third group was (40-49) years. (27.9 %) of the respondents were in this age band. The fourth group was (50-59 <). (55.8 %) of the respondents were in this age band. Based on the information above, it can clearly be seen that older top managers seemed to have more commitment compared to the younger managers. The age of the respondents is quite related to their work experience as explained in table (5.1). In addition, the question was asking about their total experience. However, the majority of these research questionnaire respondents represented the most experienced people in the researched companies. Figure 5.2 shows the percentages of participants in the groups.

Figure 5. 2 Age of the respondents



#### 5.2.1.2 Gender

The majority of respondents were male in researched SMEs, (74.4 %) of the respondents are men, while (25.6 %) are women. In terms of gender, data analysis revealed that most executives and managerial positions are occupied by males in high-tech SMEs, in the researched industry sectors, as shown in figure (5.3).

Figure 5. 3 Gender



### 5.2.1.3 Total work experience

Working experience represents the amount of knowledge and skills, which are owned by individuals. It is accumulative skills, attitudes, know how, and techniques. Scholars such as (Grichnik et al, 2014), used a specific part of working experience, which is managerial experience as an indicator to measure part of human capital in nascent venture firms. Working experience was measured by asking the respondents to indicate their total working experience band in years. The percentage of respondents who hold 0-5 years working experience was (5.6 %), and the percentage of respondents who hold 6-10 years working experience was (6.5 %), while the respondents who hold 11-15 years working experience was (12.1 %), and the respondents who hold 16-20 years working experience was (60.9 %). Finally, the respondents who hold 20- or more years working experience was (60.9 %). However, the majority of the respondents have had a large number of years work experience. In other words, the majority of the respondents represent human capital in their companies, based on their total working experience. Figure 5.4 shows a breakdown of the percentage of the total working experience.

Figure 5. 4 Work experience



Crosstablation (5.1) illustrated the total working experience of the research's participents with their age bands. Hence, briefly the findings demonstrate that 50% of the respondents, who had work experience of 21 years or more were in the age band of over 50 years. Table 5. 1 Participants age \* Working experience

		Participants age * W	orking ex	perience	Crosstabu	lation		
				Wo	rking expe	rience		
							21- or	
			5 or less	6-10	11-15	16-20	more	Total
Participants	20-29	Count	9	3	3	0	0	15
age		% of Total	4.2%	1.4%	1.4%	0.0%	0.0%	7.0%
	30-39	Count	2	7	7	2	2	20
		% of Total	0.9%	3.3%	3.3%	0.9%	0.9%	9.3%
	40-49	Count	1	3	10	25	21	60
		% of Total	0.5%	1.4%	4.7%	11.6%	9.8%	27.9%
	50-59	Count	0	1	6	5	108	120
		% of Total	0.0%	0.5%	2.8%	2.3%	50.2%	55.8%
Total		Count	12	14	26	32	131	215
		% of Total	5.6%	6.5%	12.1%	14.9%	60.9%	100.0%

#### 5.2.1.4 Educational level

One of the most important factors in gaining human capital (HC) and a person's knowledge and skills is education. The academic education level is considered to be one of the most important indicators for measuring a considerable aspect of human capital, (Grichnik, et al, 2014). Nonetheless, not the whole construct of human capital, due to the specific human capital coming through training and experience. Education is represented as one of the most important factors for managers. Managers in SMEs, who have had a level of formal education background can provide a varied range of innovative solutions for work problems. In addition, they are more likely to think in a different way, or a creative way of thinking. This kind of people are eligible to lead and develop firms in turbulent business environments. Scholars such as (Rauch et al, 2005) used the school degree and the degree of vocational training to measure the human capital of business owners in small-scale businesses. However, in this study the academic education level was measured using four options according to the UK educational system including: A levels, Bachelor degree, Master's degree and PhD. Figure 5.5 shows the respondents' level of education.

The number of respondents, who hold PhD degrees (62), and Masters' degrees (50), while the respondents who hold Bachelor degrees (59), and the respondents who hold A levels (44). In line with (Crick and Spence, 2005) high- tech SMEs, are characterized as SMEs with a well-educated workforce, the data analysis of the respondents' level of education revealed that the majority of them were well educated. Furthermore, table 5.2 illustrated the level of education and the respondents' age to show the age with the academic degree. Figure 5.5 displays the percentage of the education level of the researcher's respondents.



Figure 5. 5 Education level

Crosstablation (5.2) shows the breakdown of the level of education of the research's participents with their age bands. It can clearly be seen that the highiest two percent of respondents who hold a Batchelor degree and PhD degree were in the age band (50-59) years.

Total

15 7.0%

20

60

120

9.3%

27.9%

55.8% 215

100.0%

		Participants age	e * Education Ci	osstabulati	on	
				Educa	ation	
			A level	Bachelor	Master	PhD
Participants age	20-29	Count	2	6	5	2
		% of Total	0.9%	2.8%	2.3%	0.9%
	30-39	Count	2	6	6	6
		% of Total	0.9%	2.8%	2.8%	2.8%
	40-49	Count	10	14	17	19
		% of Total	4.7%	6.5%	7.9%	8.8%
	50-59	Count	30	33	22	35
		% of Total	14.0%	15.3%	10.2%	16.3%
Fotal		Count	44	59	50	62
		% of Total	20.5%	27.4%	23.3%	28.8%

 Table 5. 2 Participants age \* Education

### 5.2.1.5 Managerial position of the respondents

In this research, the target sample was the top management in high-tech SMEs. Small and medium sized-enterprises have a flat and flexible structure, which allows top management to be involved in all firm activity and decisions, (Ghobadian and Gallear, 1997; Hudson et al, 2001; Nicholas et al., 2011). In addition, applying new ideas is not influenced by bureaucracy, due to the low level of bureaucracy, Isaac et al, (2010). However, in this study, the manager's level within the company was used to investigate the respondents' position. It shows that (70.2 %) of the respondents were CEOs or senior managers in the researched firms. The descriptive analysis of the data reveals that (14.4 %) of the respondents were middle managers in high-tech SMEs, and (7.4 %) were supervisors. (7.9 %) of the respondents selected "other". This option included different positions, such as chief clinical officer, technical director, chairman, etc. Hence, based on the details of the respondents' position data analysis revealed that almost the vast majority of questionnaires in this study

(151) were completed by managers, who were completely involved and responsible for taking the important decisions of investing in knowledge and building dynamic capabilities, enhancing the level of intellectual capital, and improving performance in the surveyed firms. Figure (5.6) showed the managerial position of the respondents in the researched firms.





Table (5.3) shows a clear picture about the respondents' position and gender, as we can see 160 of the respondents were males, which represents 74.5 %. However, male respondents represent roughly three quarters of the respondents. Simultaneously, the ratio of CEO females to CEO males is roughly one to five. This percentage illustrates that most managerial positions in researched firms are undertaken by males.

Table 5.3	Position	in the	firm	*	Gender
-----------	----------	--------	------	---	--------

Position in the firm *	Gender Crosstabu	ilation											
	Count												
		Gender											
		male	female	Total									
Position in the firm	others	9	8	17									
	Supervisor	7	9	16									
	Middle manager	19	12	31									
	CEO	125	26	151									
Total		160	55	215									

Information in table (5.4) shows a breakdown of the demographic profile of the respondents in the studied SMEs, which already been discussed in previous tables and figures. It illustrates the general information about the personal and managerial characteristics profile of the respondents, for instance their age, education, gender position, and experience.

 Table 5. 4 Demographic profile of the respondents

Age of respondents	N, %	Level of education	N, %
or 20-29	15 (7.0%)	A level	44 (20.5%)
30-39	20 (9.3 %)	Bachelor	59 (27.4%)
40-49	60 (27.9%)	Master	50 (23.3 %)
50-59 or more	120 (55.8 %)	PHD	62 (28.8 %)
Respondents' Gender	N, %	Position in company	N, %
Male	160 (74.4 %)	CEO	151 (70.2 %)
Female	55 (25.6%)	Middle Manager	31 (14.4 %)
		Supervisor	16 (7.4 %)
		other	17 (7.9%)
Total work experience	N, %		
5 or less	12 (5.6 %)		
6-10	14 (6.5 %)		
11-15	26 (12.1 %)		
16-20	32 (14.9 %)		
21- or more	131 (60.9%)		

### 5.2.2 Characteristics of the studied firms

This study investigated high-tech SMEs operating in three sectors in the UK, which are biotechnology, pharmaceutical, and the publishing of computer games. This section on descriptive demographic information is devoted to highlighting the firms' characteristics such as, their age, location, number of employees, and industry sector.

#### 5.2.2.1 Age of firms

Collated data reveals that many SMEs in the pharmaceutical, biotechnology and publishing of computer games industries (32.1 %) are (21-25) years and over. 22.3 % of them are in the middle period of (11-15) years. Those remaining are respectively (16-20) years at (17.2 %), (6-10) years are 10.7 %, and lastly (1-5) are (17.7 %). Figure (5.7) shows the frequencies, percentage and the age band.





#### 5.2.2.2 Location

This research surveyed three sectors of high-tech small and medium-sized enterprises in the UK. In terms of the geographical distribution of the SMEs, the result of the data analysis reveals that most firms (80.9%) were in England, then (9.8%) of the researched SMEs were located in Scotland, while (4.7%) and (4.7%) were operating respectively in Northern Ireland and Wales. The geographical distribution percentages are shown in figure 5.8.





### 5.2.2.3 Number of employees

Data analysis shows that (48.4%) of the surveyed firms were small enterprises, and (41.9%) were considered as medium-sized enterprises, while (9.8%) were micro. Figure (5.9) showed the number and percentage of them.

Figure 5. 9 Size of firm and number of employees



Table 5.5 and figure 5.10 showed a breakdown of the number of employees across the industry sectors and as we can see (8) of the researched biotechnology firms were micro, while (45) of them were small, and the medium-sized enterprises were (29). (6) Of the researched biotechnology firms were micro, while (31) of them were small, and the medium-sized enterprises were (29). (3) Of the researched biotechnology firms were micro, while (16) of them were small, and the medium-sized enterprises were (15).

#### Table 5. 5 Number of employees \* Industry sector

Number of employees *	* Industry sector C	ross tabula	tion									
Count												
		Industry se	ector									
		Bio	Pharm	Publishing	Others	Total						
Number of employees	1-9/ Micro	8	6	3	4	21						
	10-49/ Small	45	31	16	12	104						
	50-249/ Medium	29	29	15	17	90						
Total		82	66	34	33	215						

Figure (5.10) depicted the numbers of employees across the three sectors.

Figure 5. 10 Numbers of employees in the three sectors



Regarding the age of firms and the number of employees, collected data have revealed that the number of employees in researched firms were higher in the age band (21-25 or more) than the other age bands for small and medium firms as shown in table (5.6).

Table 5. 6 Age of firm \* Number of employees

	Age of firm * Number of employees Crosstabulation												
			]	Number of emplo	yees								
					50-249/								
			1-9/ Micro	10-49/ Small	Medium	Total							
Age of firm	1-5	Count	6	22	10	38							
		% of Total	2.8%	10.2%	4.7%	17.7%							
	6-10	Count	3	15	5	23							
		% of Total	1.4%	7.0%	2.3%	10.7%							
	11-15	Count	5	18	25	48							
		% of Total	2.3%	8.4%	11.6%	22.3%							
	16-20	Count	4	20	13	37							
		% of Total	1.9%	9.3%	6.0%	17.2%							
	21-25	Count	3	29	37	69							
		% of Total	1.4%	13.5%	17.2%	32.1%							
Total	-	Count	21	104	90	215							
		% of Total	9.8%	48.4%	41.9%	100.0%							

### 5.2.2.4 Industry sectors

This study focused on three industry sectors in the UK, which operate in (Biotechnology, Pharmaceutical, and publishing of computer games). Data analysis of this research reveals that Biotechnology respondents were (82) respondents, while Pharmaceutical respondents were (66) respondents, Publishing of computer games respondents were (34) respondents, and respondents from firms operating in other sectors were (33). Figure (5.11) illustrated the results.





## 5.3. The descriptive statistics analysis

After the descriptive empirical analysis of demographic information for researched firms, it is important to describe the main features of the data, by using the descriptive statistics analysis. In this section of the research, the descriptive statistics analysis will apply for three main variables and their dimensions respectively, "Intellectual capital" (human capital, structural capital, and relational capital) "Absorptive capacity" (potential and realised absorptive capacity), and "Firm performance" (financial outcome and employments growth) to clarify its features distribution and give brief descriptions about the items that have been used to capture the research variables and also the mean as well as the standard deviation as explained in table (5.7).

Factor	Number of items	Mean	Standard deviation
Human capital	8	3.86	0.629
Structural capital	5	3.80	0.747
Relational capital	9	3.87	0.674
Potential ACAP	8	3.83	0.717
Realised ACAP	12	3.88	0.679
Financial outcome	4	3.51	0.857
Employments growth	1	2.43	0.641

Table 5. 7 Descriptive statistics analysis of the independent and dependent variables.

The output of data analysis of the researched variables in table (5.7) reveals that relational capital in high-tech firms are at a higher level (mean = 3.87), after that human capital and then structural capital in the next rank with a mean respectively of (3.86 and 3.80). These results propose that relational capital is one of the intellectual capital dimensions that is more significant than other dimensions. The first dimension for measuring intellectual capital is human capital and that has been measured and captured by eight questions. The second dimension is the structural capital that has been measured by five questions. The third dimension is relational capital that has been measured by nine questions. The participants have been asked to indicate the extent to which they agree or disagree with the statements and choose the level of their firm in one of five categories in every question.

The same table illustrated the output of analysing a firm's absorptive capacity, which was represented by the mediator variable. Absorptive capacity has been measured as two dimensions, every dimension consists of two dynamic capabilities. The output of SPSS revealed that realised ACAP in high-tech firms is at a higher level (mean = 3.88), then potential ACAP in the next rank with (mean 3.83), the results suggested that realised ACAP is more significant than the potential ACAP. The first dimension of ACAP consists of eight questions to measure two dynamic capabilities, which are knowledge acquisition and knowledge assimilation. In a research survey, five questions were devoted to capture knowledge acquisition and three questions to capture knowledge assimilation. The second dimension of ACAP consists of twelve questions, six of them to capture knowledge transformation capability and the rest of the questionnaire, the participants were asked to indicate the extent to which they agreed or disagreed with the statements in one of five categories in every question.

The results of dependent variable firm performance have been illustrated in the same table (5.7). It consists of four items to measure market share, sales, cash flow and profit margin. In addition, these items refer to the financial outcome of firms, Solomon et al, (2013). The value of all items' mean is higher than the value of the average. It also consists of one main question that was asked to the respondents was to compare their number of employees to the previous year and report the results in one of three categories (increased, stayed the same, and decreased) as a measurement for employment growth, therefore, this question is a three scale not a five scale. As we can see, the mean in this question is over the average, which means most firms have increased the number of employees compared to the previous year. The frequencies and percentage frequency of all answers has been measured and reported through descriptive analysis to give an initial idea about the answers.

### 5.3.1 The descriptive statistics analysis of intellectual capital.

In order to measure firms' intellectual capital, which is the independent variable in this study, twenty two questions had been devoted to capturing three dimensions, which were human capital (eight questions), structural capital (five questions), and relational capital (nine

questions), based on the theoretical background and prior literature from (Isaac et al, 2010; Kale et al, 2000).

### 5.3.1.1 Human capital

Human capital was measured with eight questions. The participants were asked to select the level of their firms' human capital based on five categories (from strongly disagree to strongly agree). Table (5.8) illustrates that all the means' value of the questionnaire items is higher than the average. As well as frequencies (F) and the percentage of frequencies (F%) for every item being high at neutral, agree, and strongly agree. Thus, it could be concluded that human capital in the researched firms was more than medium, and at a high level.

Human capital											Т	otal	Mean
	S d	Strongly disagree		Disagree		Neutral		gree	Strongly agree				
	F	F%	F	F%	F	F%	F	F%	F	F%	N	N %	
Q31. The knowledge of each co- worker/associate	6	2.8 %	11	5.1 %	41	19.1 %	88	40.9 %	69	32.1 %	215	100 %	3.94
Q32. Most co-workers/associates clearly understand "why"	2	0.9 %	8	3.7 %	29	13.5 %	120	55.8 %	56	26.0 %	215	100 %	4.02
Q33. Extensive knowledge sharing occurs	3	1.4 %	6	2.8 %	45	20.9 %	100	46.5 %	61	28.4 %	215	100 %	3.97
Q34. Because knowledge is shared non- systematically	1	0.5 %	42	19.5%	75	34.9 %	78	36.3 %	19	8.8 %	215	100 %	3.33
Q35. Most co-workers/associates continue to use the same procedures	4	1.9 %	32	14.9 %	56	26.0%	91	42.3 %	32	14.9 %	215	100 %	3.53
Q36. We are able to link the success of our organization	6	2.8 %	7	3.3 %	27	12.6 %	111	51.6 %	64	28.8 %	215	100 %	4.02
Q37. We often develop techniques or processes	2	0.9 %	6	2.8 %	29	13.5 %	106	49.3%	72	33.5 %	215	100 %	4.11
Q38. It is easy to spread individual knowledge	3	1.4 %	8	3.7 %	40	18.6 %	106	49.3 %	58	27.0 %	215	100 %	3.96

A bi-variate correlation analysis has been carried out between human capital items. According to the result of the Pearson correlation, there are significant and positive correlations between all items, which reflect the coherence in the measurements of human capital. Table (5.9) shows the correlations between the eight questions, which have been used to measure human capital. It provides a strong correlation between them, for instance (Q33 and Q36).

	0 51			0.1	
l'able 5.	8 The	descriptive	analysis	of human	capital
		1	2		1

Correlation	tobl	for (Uum	on Co	mital	)					
Correlations	s table		an Ce	ipitai	)					
	Mean	Std. Deviation	Q31	Q32	Q33	Q34	Q35	Q36	Q37	Q38
Q31. The knowledge of each co-worker/associate	3.94	.984	1							
Q32. Most co-workers/associates clearly understand			.378**	1						
"why"	4.02	.793								
Q33. Extensive knowledge sharing occurs	3.97	.856	.531*	.510*	1					
Q34. Because knowledge is shared non-systematically	3.33	.906	.414**	.268*	.371**	1				
Q35. Most co-workers/associates continue to use the same procedures	3.53	.979	.409*	.362**	.427*	.471*	1			
Q36. We are able to link the success of our organization	4.02	.898	.435*	.484**	.493**	.266*	.256**	1		
Q37. We often develop techniques or processes	4.11	.809	.530*	.527*	.591	.367*	.334*	.491**	1	
Q38. It is easy to spread individual knowledge	3.96	.855	.469*	.448*	.566*	.442**	.483*	.438*	.451*	1

#### Table 5. 9 Correlations table for (Human Capital)

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

### 5.3.1.2 Structural capital

Structural capital has been measured with five questions. The participants had been asked to select the level of structural capital of their firms based on five categories (from strongly disagree to strongly agree). Table (5.10) illustrates that all the means' value of the questionnaire items is higher than the average. As well as this, the frequencies and the percentage of frequencies for every item is high at neutral, agree, and strongly agree. Thus, it could be concluded that structural capital in the researched firms was more than medium and high.

Structural capital											Т	otal	Mean
	S d	Strongly disagree		Disagree		Neutral		Agree		trongly agree			
	F	F%	F	F%	F	F%	F	F%	F	F%	N	N %	
Q39. People have access to the information systems	3	1.4 %	9	4.2 %	43	20.0 %	97	45.1 %	63	29.3 %	215	100 %	3.96
Q40. Our organization possesses processes	3	1.4 %	11	5.1 %	49	22.8 %	98	45.6 %	54	25.1 %	215	100 %	3.87
Q41. Features of our information systems capture	5	2.3 %	19	8.8 %	56	26.0 %	92	42.8 %	43	20.0%	215	100 %	3.69
Q42. Most co- workers/associates are familiar	3	1.4 %	13	6.0 %	44	20.5 %	108	50.2 %	47	21.9 %	215	100 %	3.85
Q43. We have good systems within our organization	2	0.9 %	23	10.7 %	72	33.5 %	77	35.8 %	41	19.1 %	215	100 %	3.61

Table 5. 10 The descriptive analysis of structural capital

A bi-variate correlation analysis has been carried out between structural capital items. According to the result of the Pearson correlation, there are significant and positive correlations between all items, which reflect the coherence in the measurements of structural capital. Table (5.11) shows the correlations between the five questions, which have been used to measure structural capital. It provides a strong correlation between them, for instance (Q39 and Q43).

 Table 5. 11 Correlations table for (Structural Capital)

Correlations table for (Structural Capital)											
	Mean	Std. Deviation	Q39	Q40	Q41	Q42	Q43				
Q39. People have access to the information systems	3.96	.888	1								
Q40. Our organization possesses processes	3.87	.893	.713*	1							
Q41. Features of our information systems capture	3.69	.966	.604*	.612*	1						
Q42. Most co- workers/associates are familiar	3.85	.878	.605*	.679*	.524*	1					
Q43. We have good systems within our organization	3.61	.944	.470**	.564*	.592*	.516*	1				

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

#### 5.3.1.3 Relational capital

Relational capital was measured with nine questions. The participants were asked to select the level of relational capital of their firms based on five categories (from strongly disagree to strongly agree). The table (5.12) illustrates that all the means' value of the questionnaire items is higher than the average. As well as this, frequency and percentage of frequency for every item is high at neutral, agree, and strongly agree. Thus, it could be concluded that relational capital in the researched firms was more than medium and high.

Table 5. 12 The descriptive analysis of relational capital

Relational capital											T	otal	Mean
	S c	strongly lisagree	Di	sagree	N	leutral	A	gree	St	trongly agree			
	F	F%	F	F%	F	F%	F	F%	F	F%	N	N %	
Q44. We maintain appropriate communication	5	2.3 %	8	3.7 %	29	13.5 %	93	43.3 %	80	37.2 %	215	100 %	4.09
Q45. Suppliers and customers have a clear picture	3	1.4 %	15	7.0 %	36	16.7 %	108	50.2 %	53	24.7 %	215	100 %	3.89
Q46. Our clients think we work toward	5	2.3 %	6	2.8 %	39	18.1 %	101	47.0 %	64	29.8 %	215	100 %	3.99
Q47We emphasize getting to know one another	3	1.4 %	11	5.1 %	47	21.9 %	87	40.5 %	67	31.2 %	215	100 %	3.94
Q48. There is close personal interaction	8	3.7%	6	2.8 %	52	24.2 %	74	34.4 %	75	34.9 %	215	100 %	3.93
Q49. Our unit focuses on mutual trust	4	1.9 %	6	2.8 %	43	20.0 %	86	40.0 %	76	35.3 %	215	100 %	4.04
Q50. We focus on high reciprocity	5	2.3 %	13	6.0 %	49	22.8 %	93	43.3%	55	25.6%	215	100 %	3.83
Q51. We often foster long-term business relationships	3	1.4 %	24	11.2 %	57	26.5 %	90	41.9%	41	19.1 %	215	100 %	3.66
Q52. The structure within this organization promotes	1	0.5 %	28	13.0 %	81	37.7%	76	35.3 %	29	13.5 %	215	100 %	3.48

Nine questions were used to measure relational capital; a bi-variate correlation analysis has been carried out between these questions, and the result of the Pearson correlation revealed that there are significant and positive correlations between all items, which reflect the coherence in the measurements of relational capital. Table (5.13) shows the correlations between the eight questions, which have been used to measure relational capital. It provides a strong correlation between them, for instance (Q44 and Q45).

Table 5. 13 Correlations of (Relational Capital)

Correla	ations	of (Relation	onal (	Capit	al)						
	Mean	Std. Deviation	Q44	Q45	Q46	Q47	Q48	Q49	Q50	Q51	Q52
Q44. We maintain appropriate communication	4.09	.927	1								
Q45. Suppliers and customers have a clear picture	3.89	.901	.492**	• 1							
Q46. Our clients think we work toward	3.99	.896	.597*	.577*	1						
Q47We emphasize getting to know one another	3.94	.928	.526*	.491*	.522*	1					
Q48. There is close personal interaction	3.93	.748	.584*	.482**	.603*	.698*	1				
Q49. Our unit focuses on mutual trust	4.04	.913	.536*	.516*	.594*	.537*	.575*	1			
Q50. We focus on high reciprocity	3.83	.955	.481**	.399**	.473**	.438**	.499*	.586*	1		
Q51. We often foster long-term business relationships	3.66	.957	.367**	.452*	.372*	.364**	.400**	.342	.409**	1	
Q52. The structure within this organization promotes	3.48	.900	.371**	.320**	.347**	.382**	.373**	.316**	.320**	.283**	° 1

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

### 5.3.2 The descriptive statistics analysis of absorptive capacity.

In order to measure potential, and realised absorptive capacity, which represents the mediating variables as dynamic capabilities, four capabilities were used in this study (Acquisition and Assimilation) to measure potential absorptive capacity, while (Transformation and Exploitation) were used to measure realised absorptive capacity (Zahra and George, 2002). Based on the theoretical background and literature review, the first two variables consisted of eight questions to measure and capture potential absorptive capacity, while realised absorptive capacity, the third and fourth capabilities, consisted of twelve questions to measure and capture realised absorptive capacity.

#### 5.3.2.1 Potential absorptive capacity

Table (5.14) illustrated that all the means' value of the questionnaire items is related to measuring potential absorptive capacity which is higher than the average. As well as this, frequency and percentage of frequency for every item is high at neutral, agree, and strongly agree. Thus, it could be concluded that the potential absorptive capacity in the researched firms was more than medium and high.

Absorptive capacity											Т	otal	Mean
	S d	trongly isagree	Di	sagree	N	eutral	А	.gree	St	Strongly agree			
Potential absorptive capacity / Acquisition	F	F%	F	F%	F	F%	F	F%	F	F%	N	N %	
Q11. Interactions with business partners and clients	1	0.5%	7	3.3%	49	22.8%	77	35.8%	81	37.7%	215	100 %	4.06
Q12. Employees of our firm sharing knowledge	1	0.5 %	6	2.8 %	44	20.5%	99	46.0 %	65	30.2 %	215	100 %	4.02
Q13. Industry information through informal	1	0.5 %	19	8.8 %	67	31.2 %	86	40.0 %	42	19.5 %	215	100 %	3.69
Q14. Meetings with customers or third parties	3	1.4 %	18	8.4%	55	25.6 %	100	46.5 %	39	18.1 %	215	100 %	3.71
Q15. Employees regularly approach third parties	0	0.0 %	28	13.0 %	67	31.2 %	77	35.8 %	43	20.0 %	215	100 %	3.62
Potential absorptive capacity/Assimilation	F	F %	F	F %	F	F %	F	F %	F	F %	N	N %	
Q16. Slow to recognize shifts in our markets	1	0.5 %	13	6.0 %	61	28.4%	100	46.5 %	40	18.6 %	215	100 %	3.76
Q17. New opportunities to serve our clients	1	0.5 %	10	4.7 %	39	18.1 %	118	54.9 %	47	21.9 %	215	100 %	3.93
Q18. We quickly analyse and interpret	1	0.5 %	12	5.6 %	50	23.3 %	107	49.8 %	45	20.9 %	215	100 %	3.85

Table 5. 14 The descriptive analysis of potential absorptive capacity

A bi-variate correlation analysis has been carried out between potential absorptive capacity items. According to the result of the Pearson correlation, there are significant and positive correlations between all items, which reflect the coherence in the measurements of potential absorptive capacity. Table (5.15) shows the correlations between the eight questions, which have been used to measure potential absorptive capacity. It provides a strong correlation between them, for instance (Q13 and Q15).

Correlations ta	ble for	potential absor	ptive ca	apacity						
	Mean	Std. Deviation	Q11	Q12	Q13	Q14	Q15	Q16	Q17	Q18
Q11. Interactions with business partners and clients	4.06	.880	1							┢
Q12. Employees of our firm sharing knowledge	4.02	.814	.630*	1						┢
Q13. Industry information through informal	3.69	.901	.539*	.534*	1					┢
Q14. Meetings with customers or third parties	3.71	.906	.605*	.581**	.568**	1				┢
Q15. Employees regularly approach third parties	3.62	.947	.608*	.546**	.604**	.568*	<sup>4</sup> 1			┢
Q16. Slow to recognize shifts in our markets	3.76	.838	.142**	¢.242**	.146*	.171*	.049	1		┢
Q17. New opportunities to serve our clients	3.93	.791	.175*	.213**	.147*	.148*	.065	.666*	1	┢
Q18. We quickly analyse and interpret	3.85	.829	.078	.228**	.101	.155*	.036	.649*	.632*	*1

#### Table 5. 15 Correlations table for potential absorptive capacity

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

### 5.3.2.2 Realised absorptive capacity

Table (5.16) illustrates that all the means' value of the questionnaire items related to measuring realised absorptive capacity and was higher than the average. As well as this, frequency and percentage of frequency for every item is high at neutral, agree, and strongly agree. Thus, it could be concluded that realised absorptive capacity in the researched firms was more than medium and high.

Absorptive capacity											T	otal	Mean
	St	trongly							Str	ongly			
	di	isagree	Dis	agree	N	eutral	Α	gree	a	gree			
Realised absorptive capacity											N	N %	
/ Transformation	F	F%	F	F%	F	F%	F	F%	F	F%			
Q19. Our unit regularly considers the	4	19%	11	5.1	71	33.0	93	43.3	36	16.7	215	100	3.97
consequences		1.5 /0		%	/1	%	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	%	50	%		%	
Q20. Employees' record and store newly	6	2.8 %	10	4.7	71	33.0	96	44.7	32	14.9	215	100	3.74
	0	2.0 %	10	%	/1	%	70	%	52	%		%	
Q21. Our unit quickly recognizes the	5	23%	18	8.4	68	31.6	91	42.3	33	15.3	215	100	3.60
usefulness	5	2.3 70	10	%	00	%	71	%	55	%		%	
Q22. Employees hardly share practical	6	28%	7	3.3	71	33.0	122	56.7	9	12%	215	100	4.05
experiences	0	2.0 /0	ŕ	%	/1	%	122	%	,	4.2 /0		%	
Q23. We laboriously grasp the opportunities	3	14%	12	5.6	90	41.9	03	43.3	17	79%	215	100	3.78
	5	1.4 /0	12	%	70	%	)5	%	17	1.9 /0		%	
Q24. Our unit periodically meets to discuss	1	0.5 %	10	4.7	60	27.9	111	51.6	33	15.3	215	100	3.76
consequences	1	0.5 %	10	%	00	%	111	%	55	%		%	
Realised absorptive capacity / Exploitation	F	F %	F	F %	F	F %	F	F %	F	F %	Ν	N %	Mean
Q25. It is clearly known how activities within	6	28%	11	5.1	16	21.4	16	21.4	103	47.9	215	100	4.09
our unit	0	2.8 70	11	%	40	%	40	%	105	%		%	
Q26. Client complaints fall on deaf ears	3	1 / 0%	6	2.8	58	27.0	131	60.9	17	70%	215	100	3.91
	5	1.4 70	0	%	50	%	151	%	17	7.9 70		%	
Q27. Our unit has a clear division of roles and	5	2204	15	7.0	22	14.9	05	44.2	69	31.6	215	100	3.95
responsibilities	5	2.3 70	15	%	32	%	95	%	08	%		%	
Q28. We constantly consider how to better	3	1 / 96	15	7.0	17	21.9	01	42.3	50	27.4	215	100	3.97
exploit knowledge	5	1.4 70	15	%	47	%	91	%	39	%		%	
Q29. Our unit has difficulty implementing	3	1 / 0%	6	2.8	71	33.0	127	59.1	8	37%	215	100	3.69
new products and services	5	1.4 70	0	%	/1	%	127	%	0	5.7 70		%	
Q30. Employees have a common language	3	14%	13	6.0	38	17.7	97	45.1	64	29.8	215	100	3.95
	5	1.4 /0	13	%	50	%	,,	%	-	%		%	

#### Table 5. 16 The descriptive analysis of realised absorptive capacity

Twelve questions were used to measure realised absorptive capacity, the bi-variate correlation analysis has been carried out between these questions, and the result of the Pearson correlation revealed that there are significant and positive correlations between all items, which reflect the coherence in the measurements of realised absorptive capacity. Table (5.17) shows the correlations between the twelve questions, which have been used to capture absorptive capacity. It provides a strong correlation between them, for instance (Q27 and Q28).

	Correla	ations table	of realis	ed abso	orptive	capacit	у						
	Mean	Std. Deviation	Q19	Q20	Q21	Q22	Q23	Q24	Q25	Q26	Q27	Q28	Q29
Q19. Our unit regularly considers the consequences	3.67	.877	1										
Q20. Employees' record and store newly	3.64	.889	.690*	1									
Q21. Our unit quickly recognizes the usefulness	3.60	.926	.652*	.636*	1								
Q22. Employees hardly share practical experiences	3.56	.751	.551**	.631*	.513**	¢1							
Q23. We laboriously grasp the opportunities	3.50	.778	.567*	.506**	.548*	.508**	1						
Q24. Our unit periodically meets to discuss consequences	3.76	.780	.730*	.606*	.640*	.567**	.533**	1					
Q25. It is clearly known how activities within our unit	3.82	.933	.189**	.257**	.174*	.192*	.095	.265**	1				
Q26. Client complaints fall on deaf ears	3.71	.710	.091**	.117*	.115*	.113**	.097**	.140*	.516**	1			
Q27. Our unit has a clear division of roles and responsibilities	3.95	.977	.148*	.155*	.131	.153*	.157*	.226**	.596*	.494*	1		
Q28. We constantly consider how to better exploit knowledge	3.87	.941	.234**	.236**	.232**	4.153*	.138*	.323**	.587**	.553**	.568**	* 1	
Q29. Our unit has difficulty implementing new products and services	3.60	.673	.119	.101	.048	.132	.068	.129	.546	.515**	.457**	*.423*	1

#### Table 5. 17 Correlations table of realised absorptive capacity

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

### 5.3.3 The descriptive statistics analysis of firm performance.

To measure high-tech SMEs performance, which is the dependent variable in this study, five questions had been devoted to measuring five performance factors, based on the theoretical background and literature from (Cillo et al, 2010; Solomon et al, 2013; Wood et al, 2015). The participants were asked to provide an assessment of the firm's overall performance in the last three years in every question in one of five categories (from strongly disagree to strongly agree), for items namely increased market share, increased sales, increased cash flow, increased profit margin, and increase in the number of employees. The result of the

descriptive analysis of firm performance from SPSS is shown in table (5.18). Results indicate that the level of all items is more than the average and tend to be high. These results reveal that research firms achieved satisfactory performance during the three years. Table 5. 18 The descriptive analysis of firm performance/ financial outcome.

Firm performance/ Financial											T	otal	Mean
outcome													
		Poor		Fair		Good	V	ery good	Е	xcellent			
											Ν	N %	
	F	F%	F	F%	F	F%	F	F%	F	F%			
Q53. Increased market share	5	2.3	28			27.0%		367%		20.9 %	215	100	3.60
	5	%	20	13.0%	58	27.070	79	30.7 /0	45	20.7 70		%	
Q54. Increased sales	5	23%		13.5%	57	26.5 %	75	349 %	19	22.8	215	100	3.62
	5	2.3 70	29	13.370	51	20.5 70	15	54.7 70	77	%		%	
Q55. Improved cash flow	5	2.3%	32	1/19%	68	31.6	63	29.3 %	47	21.9	215	100	3.53
	5	2.370	52	14.9 /0	00	%	05	27.5 70	7/	%		%	
Q56. Increased profit margin	7	3 3%	32	1/1 9 %	69	32.1%	68	31.6	30	18.1	215	100	3.46
	ĺ	5.570	52	14.9 /0	0)	52.170	00	%	57	%		%	

A summated composite of four questions have been employed to measure financial performance in addition to one question being used to measure non-financial performance. A bi-variate correlation analysis has been carried out between performance items. According to the result of the Pearson correlation, there are significant and positive correlations between all items, which reflect the coherence in the measurements of firm performance. Table (5.19) shows the correlations between the five questions, which have been used to measure firm performance. It provides a strong correlation between them, for instance (Q53 and Q56), which show the strong link between increases in market share and profit margin.

Correlations table for Firm Performance											
	Mean	Std. Deviation	Q53	Q54	Q55	Q56	Q57				
Q53. Increased market share	3.60	.830	1								
Q54. Increased sales	3.62	.783	.662*	1							
Q55. Improved cash flow	3.53	.962	.661*	.717*	1						
Q56. Increased profit margin	3.46	.853	.543**	.670	.708*	1					
Q57. Number of employees	2.37	.621	.821	.324*	.564*	.399	1				

Table 5. 19 Correlations table for Firm Performance

\*\*. Correlation is significant at the 0.01 level (2-tailed).

\*. Correlation is significant at the 0.05 level (2-tailed).

The results of mean in table (5.19) showed that all items have high mean value except one item (Q 57= 2.37), which is still consider high value, because this is the only item in a questionnaire consisting of three scale point instead five point scale.

## 5.4. Measurement scales

The research questionnaire developed from a reliance upon the prior related literature and most recent empirical research. It consisted of eight short sections and (56) questions. The first section included five questions that measured demographical characteristics of participants. The second section included four questions, which measured companies' demographical characteristics. All questions in these two sections were multiple choice.

The third and fourth sections consisted of eight and twelve questions respectively, which captured and measured absorptive capacity ACAP, the mediating variable of this research (8 questions), for potential ACAP and (12 questions) for realised ACAP. Sections five, six, and seven consisted of twenty two questions devoted to measuring and capturing intellectual capital IC, which is the main variable of this research, (8 questions) for human capital, (5 questions) for structural capital, (9 questions) for relational capital. The final section of this questionnaire consisted of five questions measuring the main third variable of this research,

which was firm performance. Regarding financial performance, the financial outcome was measured in four items; market share, sales, cash flow and profit margin and one question devoted to measure employment growth. All the research questionnaire items from sections three to section eight were measured and assessed through five-point Likert scales. The respondents were asked to indicate the extent to which they agreed or disagreed with the statement.

Absorptive capacity ACAP involved two main dimensions, potential and realised (ACAP) (Zahra and George, 2002), every single dimension consisted of two capabilities. PACAP includes knowledge acquisition and knowledge assimilation capabilities, while RACAP includes knowledge transformation and knowledge exploitation capabilities. Twenty questions were adopted from the previous empirical research that was conducted by, (Jansen et al, 2005). Intellectual capital (IC) included three main dimensions, which are human capital, structural capital, and relational capital. Thirteen questions have been adopted from (Isaac et al, 2010) to measure HC and SC, while nine questions were adopted from (Isaac et al, 2000) to measure relational capital.

Firm performance was measured in five questions. The financial outcomes were adopted from (Cillo et al, 2010; Solomon et al, 2013), and the non-financial performance was adopted from, (Wood et al, 2015). The descriptive statistics for the research variables in the model and bi-variate correlations are shown in table (5.20). It illustrated the correlations among research variables and the results identify the significant and positive correlations among research variables. It is useful to look at the results of bi-variate correlations among the research variables, before testing the model and getting the results of the regression to have a whole depiction about the relations or the links among the research variables. The results revealed that significant and positive correlations between intellectual capital and financial outcomes respectively, relational capital (y=.318 P<.000), structural capital (y=.190 P,.05), and human capital (y= .160, P, .01). In addition, according to the result of the Pearson correlation, there are positive and significant correlations between observed variable potentials and realised absorptive capacity and the firm's performance respectively (y=.435, P.000), (y=.199, P.000). If we focus on the correlations among the independent variables, it seems as if there are positive significant correlations. However, a Structural Equational Modelling (SEM) analytical approach is required to test the research hypotheses.

Correlations among research variables										
		Human	Structural	Relational	Potential	Realised	Financial			
		capital	capital	capital	ACAP	ACAP	outcome			
Human	Pearson	1								
capital	Correlation	1								
Structural	Pearson	350**	1							
capital	Correlation	.339	1							
Relational	Pearson	195**	306**	1						
capital	Correlation	.105	.500	1						
Potential	Pearson	125	261**	208**	1					
ACAP	Correlation	.125	.204	.298	1					
Realised	Pearson	373**	377**	185*	163*	1				
ACAP	Correlation	.373	.577	.105	.105	1				
Firm	Pearson	160*	100**	318**	/35**	100**	1			
performance	Correlation	.100	.190	.516		.199	1			

#### Table 5. 20 Correlations among research variables

# 5.5. Data measurement process

Researchers and scholars such as (Biedenbach and Muller, 2011, P: 23), specify the aim of validity analysis, which is "to test the coinciding degree of the measurement content to the research objectives". In this research, factor analysis has been applied, both exploratory and confirmatory for the initial model and then the main model was tested.

### 5.5.1 Exploratory factor analysis

Measuring sample adequacy, Bartlett's sphericity and KMO's test were used to test whether variables were suitable to scrutiny with factor analysis or not. When the value of Bartlett's test and KMO are significant Bartlett's test is (<0.05 in general), and KMO is greater than 0.5 (Biedenbach and Muller, 2011), then the variables are suitable for dealing with it through factor analysis. This is based on (Schriesheim and Eisenbach's, 1995) proposed use of

exploratory factor analysis (EFA), when testing factor structures of the survey. The results of applying EFA reveals Bartlett's sphericity and KMO's test as shown in table (5.21) and factors loading as illustrated in table (5.22). A number of items were dropped, due to low loading or do not load in three variables. In detail two items were dropped from the human capital variable, which is Q (34 and 35), also two items in the relational capital variable, which is Q (51 and 52), because of low indicator loading and cross-loading. In addition, Q (57) does not loading in pattern matrix at all, therefore the employments growth variable has no loading in the initial model. The result of the Bartlett test indicates that the collection is well correlated, and the factor analysis is feasible.

Table 5. 21 Kino and Dartieus Test	Table	5.	21	KMO	and	Bartlett's	Test
------------------------------------	-------	----	----	-----	-----	------------	------

KMO and Bartlett's Test									
Kaiser-Meyer-Olkin Mea	asure of Sampling	843							
Adequacy.		.015							
Bartlett's Test of	Approx. Chi-Square	5365.858							
Sphericity	df	903							
	Sig.	.000							

In this research, Structural Equational Modelling (SEM) has been applied to test the relationships among research variables by using AMOS 22. A maximum likelihood method analysis is performed, as well as factors extraction based on eigenvalue. The pattern matrix in table (5.22) showed factor loading of the questionnaire items in the Pattern Matrix.

			Pa	ttern Matrix <sup>:</sup>	a					
	Factor									
	Acquisi tion	Assimilat ion	Transfor mation	Exploitatio n	Huma n capital	Structur al capital	Relation al capital	Firm performanc e		
Q11	.792									
Q12	.733									
Q13	.710									
Q14	.763									
Q15	.806									
Q16		.806								
Q17		.784								
Q18		.773								
Q19			.864							
Q20			.759							
Q21			.778							
Q22			.731							
Q23			.727							
Q24			.749							
Q25				.770						
Q26				.771						
Q27				.752						
Q28				.669						
Q29				.699						
Q30				.778						
Q31					.615					
Q32					.691					
Q33					.813					
Q36					.663					
Q37	1				.780					

### Table 5. 22 Pattern Matrix

Q38					.673				
Q39						.873			
Q40						.883			
Q41						.750			
Q42						.670			
Q43						.647			
Q44							.760		
Q45							.654		
Q46							.796		
Q47							.706		
Q48							.777		
Q49							.776		
Q50							.640		
Q53								.683	
Q54								.840	
Q55								.885	
Q56								.824	
Extraction M	Extraction Method: Maximum Likelihood. Rotation Method: Promax with Kaiser Normalization. <sup>a</sup>								
a. Rotation co	onverged in	n 6 iteratior	ıs.						

Table (5.22) summarizes the results of the exploratory factor analysis, after dropping some items to avoid cross loading and low loading. The result reveals that all research variables except the number of employees' variable have significant factor loading values (FL> 0.5).

### 5.5.2 Confirmatory factor analysis

In the process of designing and developing survey tools, it is very important and significant to use suitable constructs, especially in management research. However, developing new scales of measurements or constructs seems quite complicated. Researchers such as (Joreskog and Sorbom, 1996) state that researchers try to pre-test their scales or constructs of prior empirical research to ensure the validity and reliability of their research. Therefore (Kline, 2013; Preedy and Watson, 2009) defined confirmatory factor analysis (CFA) as a dominant technique and special form of factor analysis to test whether collected data fitted the research hypothesized measurement model of the study or not. Even though there are different indicators that determine the fitness of the model in this research, CFA has been applied to validate the study scales. Kline, (2013) suggested that the absolute fit indicates as Chi-squared test, GFI, AGFI and RMSEA. Results from the CFA reveal that the scales are Uni-dimensional, also that they have a high validity and reliability.

Figure 5. 12 CFA Initial model



The important aspect of any model is the goodness of fit that reflects the predictive power and estimated outer and inner model relationships. A goodness of fit consists of many indicators such as the chi-square ( $\chi$ ) test and the normed-chi-square test ( $\chi$  /df), goodness of fit index (GFI), comparative fit index (CFI), and the root mean squared error of approximation (RMSEA). In terms of chi-square/df value, if it becomes less than 3 and more than 1, it could be concluded that the data has a good fit. If the research model chi-square/df value is 1.341, it is acceptable (see table 5.24). According to (Bentler and Bonett 1980; Bentler 1990) NFI and CFI indexes were applied to evaluate the research model's best fit to the data. To get a decent model fit, these indices have to be higher than 0.9 and the lowest acceptable value for this index in a complex model is 0.8, (Akers et al, 1994).

In addition, (Judge and Hulin, 1993) argued that the GFI index should be higher than 0.70 in complex models. The results values of GFI, NNFI and CFI index in the initial model were GFI= 0.887; NFI=0.90; CFI=0.960, respectively which were represented as satisfactory results, (Hopper et al, 2008). The root mean squared error of approximation (RMSEA) was 0.04 and PCLOSE .998; it is acceptable and satisfactory too, see table (5.27). According to the described criteria for each index, all the values are acceptable based on model fit statistics and support the validity of the research model according to the empirical data. Researchers such as (Hu and Bentler, 1995; Hooper et al, 2008) showed, which indices should be reported for a model fit and also reported a variety of indices, which is important see table (5.23), because different indices reflect a different aspect of model fit. In addition, it is not realistic or compulsory to report every index in the software output.

	Fit index	Combinational Rules
1	NNFI (TLI) and SRMR	NNFI of 0.96 or higher and an SRMR of
		.09 or lower
2	RMSEA and SRMR	RMSEA of 0.06 or lower and a SRMR
		of 0.09 or lower
3	CFI and SRMR	CFI of .96 or higher and a SRMR of
		0.09 or lower

Table	5.	23	Fit	index
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Source: Adopted from (Hooper et al, 2008.p:59)

Table 5. 24 CMIN

Model	NPAR	CMIN	DF	Р	CMIN/DF
Default model	115	1114.199	831	.000	1.341
Saturated model	946	.000	0		
Independence model	43	5775.156	903	.000	6.396

### Table 5. 25 RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.044	.900	.794	.720
Saturated model	.000	1.000		
Independence model	.197	.281	.247	.268

### Table 5. 26 Baseline Comparisons

Modal	NFI	RFI	IFI	TLI	CFI	
Wodel	Delta1	rho1	Delta2	rho2		
Default model	.886	.789	.941	.935	.960	
Saturated model	1.000		1.000		1.000	
Independence model	.000	.000	.000	.000	.000	

### Table 5. 27 RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.040	.034	.046	.998
Independence model	.159	.155	.163	.000

# 5.5.3 Convergent validity and reliability

In the next step, convergent validity was calculated based on the critical ratios from the AMOS output by entering a correlation table and standardized weights regression into a validity master on a stats tool package. All of the items' AVE were above 0.5. Therefore, it confirmed that there is no convergent validity concern as illustrated in table (5.28).

	CR	AVE	MSV	MaxR( H)	Relatio nal Capital	Acquis ition	Assimi lation	Transforma tion	Exploit ation	Human Capital	Struc tural capit al	Firm Perform ance
Relatio nal Capital	0.8 79	0.54 8	0.16 2	0.88 2	0.74 0							
Acquis ition	0.8 73	0.57 9	0.09 5	0.93 5	0.19 3	0.76 1						
Assimi lation	0.8 47	0.64 9	0.25 8	0.95 2	0.40 3	0.23 0	0.80 6					
Transf ormati on	0.8 98	0.59 6	0.17 7	0.96 8	0.18 4	0.12 4	0.12 4	0.772				
Exploit ation	0.8 62	0.55 7	0.13 4	0.97 3	0.18 0	0.09 5	0.20 7	0.339	0.74 6			
Human Capital	0.8 34	0.50 2	0.17 7	0.97 7	0.19 1	0.02 5	0.21 7	0.421	0.26 7	0.70 9		
Structu ral Capital	0.8 71	0.62 9	0.19 6	0.98 0	0.30 3	0.07 9	0.44 3	0.317	0.36 6	0.38 7	0.7 93	
Firm perfor mance	0.9 09	0.66 6	0.25 8	0.98 4	0.36 6	0.30 8	0.50 8	0.158	0.27 5	0.15 4	0.2 16	0.816
No Valid	ity Conce	rns										

Table 5. 28 Convergent validity

Scales items are calculated in table (5.29). Cronbach's alphas are used to confirm the reliability of data, all items exceeded the threshold limit (0.7) (Nunnally, 1978) and were accepted. Nunnally, (1978) explained that a coefficient of 0.7 is acceptable for use, while others such as (George and Mallery, 2003) considered a coefficient of 0.9 or higher as evidence of strong reliability.

Regarding the reliability of the measures, the CFA was conducted using AMOS 22. The results showed a decent model fit for the initial model, satisfactory reliability and validity for the scales, see table (5.29). Cronbach's alpha is above the 0.70 level recommended by the literature (Hair et al., 2001). Scale composite reliability indexes are higher than 0.70. The measurement model shows appropriate indices of goodness-fit: a non- significant $\chi^2$ , GFI, CFI and IFI above 0.90, and RMSEA below 0.08.

Construct	Indicators	Factor	Composite	AVE***
		Loading*	reliability**	
Human capital	HC1	.615	.85	0.502
	HC2	.691		
	HC3	.813		
	HC6	.663		
	HC7	.780		
	HC8	.673		
Structural capital	SC1	.873	.876	0.629
	SC2	.883		
	SC3	.750		
	SC4	.670		
	SC5	.647		
Relational capital	RC1	.760	.889	0.548
	RC2	.654		
	RC3	.796		
	RC4	.706		
	RC5	.777		
	RC6	.776		
	RC7	.640		

Table 5. 29 Measurement Model
Knowledge Acquisition	PACAP1	.792	.872	0.579
	PACAP2	.733		
	PACAP3	.710		
	PACAP4	.763		
	PACAP5	.806		
Knowledge Assimilation	PACAP6	.806	.847	0.649
	PACAP7	.784		
	PACAP8	.773		
Knowledge	RACAP1	.864	.897	0.596
Transformation	RACAP2	.759		
	RACAP3	.778		
	RACAP4	.731		
	RACAP5	.727		
	RACAP6	.749		
Knowledge Exploitation	RACAP7	.770	.876	0.557
	RACAP8	.771		
	RACAP9	.752		
	RACAP10	.669		
	RACAP11	.699		
	RACAP12	.778		
Firm Performance	FP1	.683	.887	0.666
	FP2	.840		
	FP3	.885		
	FP4	.824		

Notes: (1). Factor loading is significant when it is above 0.5; (2). Scale reliability is satisfactory when it is above 0.7; (3). Convergent validity is satisfactory when it is above 0.50

#### 5.5.4 Model fit statistics

After testing the initial model and checking the model fit and covariate the related factor to get decent model fit, it is time to test the whole model and examine the relationships based on the standard weight regression and P value, which was already generated by AMOS 22. Examining the main model or the whole model showed better results than results of the initial model, in the contents of the model fit indices such as GFI, NNFI, CFI, RMSEA, and PCLOSE indices. As we can see, most of the results both enhanced and showed a more accurate fit.

Figure 5. 13 Main model fit



#### Table 5. 30 CMIN

Model	NPAR	CMIN	DF	Р	CMIN/DF
Default model	62	286.528	238	.010	1.204
Saturated model	300	.000	0		
Independence model	24	2650.669	276	.000	9.604

#### Table 5. 31 RMR, GFI

Model	RMR	GFI	AGFI	PGFI
Default model	.040	.907	.883	.720
Saturated model	.000	1.000		
Independence model	.238	.334	.276	.307

Table 5. 32 Baseline Comparisons

Model	NFI	RFI	IFI	TLI	CEI
Model	Delta1	rho1	Delta2	rho2	CFI
Default model	.892	.875	.980	.976	.980
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

#### Table 5. 33 RMSEA

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.031	.014	.043	.996
Independence model	.201	.194	.208	.000

#### 5.6. The statistical data analysing and testing hypothesis

This research aims to analyse the relationship between intellectual capital (human, structural, and relational) and the SMEs performance through the mediating role of absorptive capacity. The research hypothesis was tested by applying the Structural Equation Modelling (SEM) methodology. AMOS 22 software was used to test the proposed model and analyse the relationships among the research variables in the entire model. It will be noticed in the structural model that there are four latent variables namely human, structural, relational capital, financial outcome, while potential, and realised absorptive capacity were observed variables. To test the relationships in this model, AMOS 22 was used.

It can be clearly viewed on figure (5.12) that there are many items to measure each main variable. This study had three main hypotheses, which are indicated on the main structure model. The results of the standard weighted regression and P-value are illustrated in tables (5.34). The research hypothesis was tested in three steps. Firstly, the direct effects were tested without a mediator. Secondly, the direct effect was tested with a mediator. Lastly, the indirect effect was tested with bootstrapping confidence (2000). The results of testing the direct and indirect effect on AMOS 22 are revealed in table 5.34. There is a positive and significant direct relationship between (relational capital, human capital, and structural capital) respectively and firm performance, (.328, P.000) (.433, P.048), and (.097, P.05).

Regarding the direct relationships with the mediators, relational capital has a strong positive relationship with firm performance through potential ACAP (.226 P .003), as well as through realised ACAP (.228 P .003). Simultaneously, potential ACAP partially mediates the relationship between relational capital and firm performance, the indirect effects significant at (.000).

Even though human capital and structural capital have a significant direct effect on high-tech SMEs performance in the researched firms, the value of the effect was totally changed after introducing the mediator variables. However, the indirect effect showed that potential and realised ACAP fully mediated the relationship between human capital and firm performance at levels of (< .05) and (.000) respectively. Simultaneously, potential and realised ACAP fully mediated the relationship between structural capital and firm performance at the level of (< .05).

Table 5. 34 Testing research hypotheis

Relationship	Direct without	Direct with mediator	Indirect /
	mediator		Bootstrapping
HC PACAP FP	.433 P (.048)	.027 P (.721)	.046 Sig
			Fully Mediator
HC RACAP FP	.433 P (.048)	.028 P (.718)	.000 Sig
			Fully Mediator
SC PACAP FP	.097 P (.05)	004 P (.955)	.020 Sig
			Fully Mediator
SC RACAP FP	.097 P (.05)	005 P (.954)	.049 Sig
			Fully Mediator
RC PACAP FP	.328 P (.000)	.226 P (.003)	.000 Sig partial
			mediating
RC RACAP FP	.328 P (.000)	.228 P (.003)	.188 N/S

The most remarkable result is that potential and realised absorptive capacity fully mediate the relationship between human, and structural capital and high-tech SMEs performance and were significant at the (.000 and < 0.05) levels. Meanwhile, potential absorptive capacity partially mediates the relationship between relational capital and high-tech SMEs performance at level (.000).

#### 5.7. Chapter summary

This chapter reveals that the process and procedures of analysed data, that were collected via postal and online questions through descriptive and statistical analysis. Descriptive analysis offered clear demographic information about the researched firms and the respondents' backgrounds and their profiles, who are running high-tech SMEs in the United Kingdom. The descriptive analysis presented this information and characters through frequencies, mean, standard deviation, graphs, and tables. Simultaneously, SEM analysis for statistical data analysis was applied in this research. The results of data analysis are discussed and summarized regarding the research hypotheses and path analysis.

The finding of this study reveals that there is a strong direct relationship between relational capital and firm performance, as well as absorptive capacity fully mediating the relationship between human structural capital and firm performance. Successful SMEs are more involved in the process of using their intellectual capital in acquiring new knowledge and exploiting it to commercial ends, such as increasing market share, cash flow, sales, and profit. Moreover, the firms' level of intellectual capital, or leveraging new capabilities, resulted in a high performance in the researched SMEs. Meanwhile, relational capital has strong direct effects on a firm's performance rather than indirect effects through absorptive capacity.

However, in researched high-tech SMEs, the management focuses on the process of obtaining new knowledge and developing routines that are reliant upon intellectual capital then using the new knowledge to enhance the firm's performance. In other words, intellectual capital in high-tech SMEs is more likely to be exploited for acquiring new dynamic capabilities or developing existing ones to achieve high performance. The other main conclusion is that, to increase market share and enhance cash flow as well as growing sales, and profit, SMEs have to use their intellectual capital to develop and create dynamic capabilities, which in turn will result in enhancing the firm's performance. 6. Chapter six: discussion

#### 6.1. Introduction

This chapter discusses the research questions and hypothesis, in addition to the results of the data analysis and interprets the results of the research, which were illustrated in chapter five. A discussion is conducted to present the findings related to the research hypothesis of the proposed model and the conformation of the current research with the prior empirical research. This chapter addresses the discussion on two levels. The first level discusses the relationships between three dimensions of intellectual capital and firm performance. It provides a critical discussion about human capital, structural capital, and relational capital, and their effects on high-tech SMEs performance. The second level discusses the results of two dimensions of firm absorptive capacity; potential and firm performance. It consequently highlights how human and structural capital enhance firm performance through absorptive capacity in high-tech SMEs.

#### 6.2. The research hypothesis

This study proposes a model, it consists of both direct and indirect effects. Using AMOS 22 methodology to analyse the direct and indirect relationships, and testing the research hypothesis, are required for a decent model fit. The AMOS methodology has many benefits and the important one is that it allows for a disentangling direct, indirect and total effects of the model variables. In this sense, and before testing the research hypothesis, the important part of any proposed research is getting a decent fit for the research model. Therefore, goodness of fit of the model is a crucial factor to reflect the predictive power of the estimated inner and outer model relationships. Scholars such as (Bollen 1989; Judge and Charles, 1993), suggest the main indicators for the model fit and its thresholds, which have already been explained in chapter five of this research. For instance, the chi-square ( $\chi$ ) test and the normed-chi-square test ( $\chi$ /df) will be applied. A Goodness of fit index (GFI), the root mean squared error of approximation (RMSEA) and (PCLOSE), and the comparative fit index (CFI).

The resulting values of ( $\chi$ /df), (GFI), (CFI), (RMSEA), and (PCLOSE) in this model were (1.204), (0.907), (0.980), (0.031), and (0.996) respectively. These results can be considered as satisfactory results and a decent model fit, which is offered to be a worthy model to test the research hypothesis. This research consists of three main hypotheses H1, H2, and H3. The first hypothesis represented the direct relationship between intellectual capital and high-tech SMEs' performance. The first hypothesis (H1) consists of three sub-hypotheses (H1 a, H1 b, and H1 c). The second hypothesis (H2) represented the mediating role of potential absorptive capacity on the relationship between intellectual capital and firm performance. It consists of three sub-hypotheses (H2 a, H2 b, and H2 c). While the third main hypothesis (H3) represented the mediating role of realised absorptive capacity on the relationship between intellectual and firm performance hat is represented by (H1) will be discussed.

#### 6.3. Intellectual capital and firm performance.

This research investigated the mediating role of two main dimensions of absorptive capacity on the relationship between intellectual capital and firm performance. It focused on two main aspects; firstly, highlighting the relationships between intellectual capital and firm performance in high-tech SMEs in the UK, and the second one addressing two dimensions of absorptive capacity separately and highlighting their mediating role on these relationships between intellectual capital and firm performance. This aspect is devoted to discussing in depth the results of data analysis regarding the direct relationship between intellectual capital dimensions, human, structural, and relational capital respectively with firm performance, by focusing on financial performance.

The first question and its related hypothesis of this research is about the relationship between intellectual capital and firm performance:

Q1. What is the relationship between intellectual capital and firm performance in high-tech SMEs?

### H1. There is a positive relationship between intellectual capital and firm performance in high-tech SMEs.

H1a- High performance firms put more emphasis on human capital in high-tech SMEs.

H1b- High performance firms put more emphasis on structural capital in high-tech SMEs.

H1c- High performance firms put more emphasis on relational capital in high-tech SMEs.

To answer this research question, the relationships between intellectual capital and firm performance were specified in three directions. By proving or rejecting those hypotheses, the main hypothesis H1, will be proved or rejected.

Relationships				
Human capital	→ firm performance			
Structural capital	firm performance			
Relational capital	→ firm performance			

#### 6.3.1. Human capital and SMEs performance.

It can clearly be seen that figure 6.1 comprises three main direct paths that illustrate the connections between intellectual capital and firm performance. Exploring the relationship between human capital and firm performance reveals that support does exist for the direct relationship between human capital and firm performance. In other words, human capital has a directly significant effect on firm performance in the researched firms (.433, P = .048), therefore the result does support research hypothesis H1a.

This result agrees with (Watson et al, 2003) regarding human capital and profit, and growth; (Youndt and Snell, 2004; Bosma et al, 2004). It also agrees with (Unger et al, 2011) even though they found a small significant relationship between HC and success, but it is still in agreement with the current research result. This result also agreed with (Soriya and Narwal, 2012) in the pharmaceutical sector; (Seleim et al, 2007) in software sector; (Shrader and Siegel, 2007) in technology sector; and (Mention and Bontis, 2012) in the banking sector. The data analysis reveals that SMEs have significantly better performance in increasing market share, sales, cash flow, and profit margin, when they have a high level of human capital.

There are different indicators to measure human capital, such as the level of education or experience (Grichnick et al, 2014), as well as many measurements: for instance (Bontis, 1998; Yondt and Snell, 2004) to measure the value of human capital or to measure whether human capital exists or not. In this study, measurements have been adopted to measure the level of human capital. Furthermore, these results disagreed with (Wang and Chang, 2005) their results asserted that human capital has no significant effects on SMEs performance, which was conducted in the information technology industry in Taiwan.

#### 6.3.2 Structural capital and SMEs performance.

Regarding the relationship between structural capital and firm performance, the result reveals that support does exist for the direct relationship between structural capital and firm performance. In other words, structural capital has a directly significant effect on firm performance in the researched firms (.097 P .05). Therefore, the result does support research hypothesis H1b. This result agrees with (Bontis et al, 2000; Youndt and Snell, 2004; Wang and Chang, 2005). The data analysis reveals that SMEs have significantly better performance in increasing market share, sales, cash flow, and profit margin, when they have a high level of structural capital. Furthermore, structural capital is employed to reflect processes and procedures in SMEs, which means that, when firms have good or sophisticated processes and procedures, they will improve performance.

#### 6.3.3 Relational capital and SMEs performance.

In terms of the relationship between relational capital and firm performance, the result reveals that support does exist for the direct relationship between relational capital and firm performance. In other words, relational capital has a directly significant effect on firm performance in researched firms (.328, P .000). Therefore, the result does support research hypothesis H1c. This result agrees with (Bontis et al, 2000; Youndt and Snell 2004; Wang and Chang, 2005). Welbourne. Pardo-del-Val (2009) reveals that small firms place more value and emphasis on relational capital, and showed in their research results that firm performance was positively influenced by relational capital.

The data analysis reveals that SMEs have significantly better performance in increasing market share, sales, cash flow, and profit margin, when they have a high level of relational capital.

The whole results of testing the direct effect of intellectual capital are illustrated in table (6.1).

Relationships	Direct effects	$\mathbb{R}^2$
	without mediator	Value
Human Capital Firm performance	.433 P (.048)	
Structural Capital Firm performance	.097 P (.05)	.15
Relational Capital Firm performance	.328 P (.000)	

Table 6. 1 The direct relationship between IC and Firm performance &  $R^2$ .

Figure (6.1) shows the direct effects of three dimensions of intellectual capital on firm performance separately as the result of every single hypothesis mentioned on the path.

Figure 6. 1 Model 1 The Direct effects.



Figure 6.1 shows model one highlighting the direct effects of intellectual capital on firm performance. It has been measured directly without introducing the mediator variables. As we can see, human capital, structural capital, and relational capital have a significant and positive effect on high-tech SMEs performance. While figure (6.2) is the output of the system that illustrates in depth how the process of testing relationships between research variables has been done using AMOS 22, it also shows the factors of loading and strength of the relationships on this figure throughout the test.

Figure 6. 2 AMOS output for direct effects



Note: this is part of the main model represents direct relations only. Latent variables are human capital, structural capital, relational capital, and firm performance.

Achieving a high level of performance in high-tech SMEs shows a significant and positive relationship with the level of intellectual capital in the firm. The data analysis illustrates that SMEs performance has been significantly and positively influenced by the overall level of the firms' relational capital .328 P (.000). Regarding the research measurements of relational capital, the questionnaire has been measured at three levels of relations and interactions, first with customers and suppliers, second with business partners and third parties, third between the firm's employees, therefore the internal and external relationships have been measured.

Researchers have investigated firm performance in diverse ways and used different methodologies. In this study, firm performance has been measured by a summited composite group of four indicators in the research questionnaire; increased market share, increased sales, improved cash flow, and increased profit margin. Szymanski et al, (1993) highlighted the link between market share and profitability, while (Dechow et al, 1998) reveal a relationship between cash flow and profitability. However, these measurements were correlated as well as suitable to use in SMEs, due to the SMEs nature and flat structure. Therefore, the participants were asked to provide an assessment of the overall performance of their firms in the last 3 years.

The results revealed that increasing market share and sales, as well as enhancing cash flow, and profit margin significantly depends on how the firms maintain an appropriate communication with customers, stakeholders and suppliers, as well as business partners depictions about the firms' products, reputation, and mutual trust. In addition, is management's efforts to create internal interaction between their employees. Simultaneously, data results demonstrated that SMEs performance is significantly influenced by a firms' employees' human capital level (.433, P .048). Regarding the research measurements of human capital, the questionnaire has been measured developing and managing human capital and how it effects and increases market share and sales, as well as enhancing cash flow, and how the profit margin is positively and significantly influenced by human capital.

Furthermore, data results showed that SMEs performance is significantly influenced by firms' structural capital level (.097, P .05). Regarding the research measurements of structural capital, the questionnaire measured firms' capabilities and skills of developing unique processes and routines of reserving, accessing and using firms' knowledge and information. Furthermore, it measures how it increases market share and sales, as well as enhancing cash flow, and how profit margins are significantly influenced by the way of developing a firms' capabilities and skills of reserving, accessing and using firms' knowledge and information.

Ultimately, the results approved the importance of having and managing a high level of human, structural, and relational capital in the researched high-tech SMEs, in order to enhance their performance. In terms of direct effect, the results of this research show a need to pay considerable attention to how small, medium sized enterprises enhance their performance through the management of their level of intellectual capital, and to which extent achieving satisfactory performance relies on firms' intellectual capital. Thus, reliance on the result of the SEM analysis concludes that in firms operating in these three sectors of high-tech, developing and investing in intellectual capital, it is not the firms' choice, because the firms' financial outcome and profitability are required by management to pay attention to developing and investing in human, structural, and relational capital. In other words, human, structural, and relational capital in high-tech SMEs increase market share and sales, as well as enhancing cash flow, and profit margins. It has a positive and significant effect (.433, P.048); (.097, P .05); (.328 P .000) respectively. This research results agreed with many previous studies in various industries, for instance (McDowell et al, 2018) in SMEs; (Narwal and Soriya, 2012) illustrated that IC played an important role in enhancing profitability; in the field of IT (Chang, 2007; Seleim et al, 2007); while in the field of pharmaceuticals (Sharabati

et al., 2010; Narwal and Soriya, 2012) as well as results of (Hermans and Kauranen, 2005) biotechnology firms, reveal that a suitable balanced combination of human, structural, and relational capital implies value creation potential and an increase in future sales. These results also agreed with (Tseng and Goo, 2005) study, which shows a positive relationship between intellectual capital and corporate value in the manufacturing sector. Regarding financial performance, the current research results agreed with (Hussinki et al, 2017). The research results also agreed with (Chen et al, 2005) who revealed that the intellectual capital of the firms was significant in influencing its financial performance. However, the research results in terms of structural capital and relational capital disagreed with (Mention and Bontis, 2013), who conducted their research in the financial sector, but it agreed in terms of human capital effects on firm performance.

# 6.4. The mediating role of absorptive capacity on the relationship between intellectual capital and SMEs performance

This study has used Structural Equations Models (SEM) to test the relationship between variables by AMOS software. The second question and its related hypothesis in this research is about the mediating role of absorptive capacity on the relationship between intellectual capital and firm performance:

Q2. What is the mediating role of absorptive capacity on the relationship between intellectual capital and firm performance in high-tech SMEs?

Two main hypotheses were put forward to answer this research question. Every single one has three sub-hypotheses.

H2, Potential absorptive capacity mediates the relationship between intellectual capital and firm performance in high-tech SMEs.

H2a. Potential absorptive capacity mediates the relationship between human capital and firm performance in high-tech SMEs.

H2b. Potential absorptive capacity mediates the relationship between structural capital and firm performance in high-tech SMEs.

H2c. Potential absorptive capacity mediates the relationship between relational capital and performance in high-tech SMEs.

### H3, Realised absorptive capacity mediates the relationship between intellectual capital and firm performance in high-tech SMEs.

H3a. Realised absorptive capacity mediates the relationship between human capital and firm performance in high-tech SMEs.

H3b. Realised absorptive capacity mediates the relationship between structural capital and firm performance in high-tech SMEs.

H3c. Realised absorptive capacity mediates the relationship between relational capital and performance in high-tech SMEs.

Firstly, the data was analysed through the measures of Standardized Regression Weights, and P value from Regression Weights for the direct effect. Regarding the indirect effect, relationships have been tested separately, due to the indirect effect going through other variables, when the model has more than one mediator, Standardized Indirect Effect-Bootstrap confidence was used to test for an indirect effect. It is notable that in this research the variables are as follows:

The independent variable = Intellectual capital (Human, Structural, and Relational).

The dependent variable = Firm performance.

The mediator variable = Absorptive capacity (Potential and Realised).

The research model in figure 6.7 showed that absorptive capacity has two main dimensions; potential and realised ACAP, (Zahra and George, 2002). The mediating model tested whether intellectual capital effects firm performance through potential and realised absorptive capacity or not. The results of testing the direct effect reveals that there was a strong and

positive relationship between the three dimensions of intellectual capital and firm performance. Therefore, the first main hypothesis H1, (IC- FP) has been accepted.

Then the second step of testing relationships was testing the direct effects of the same three dimensions of intellectual capital on firm performance with the presence of the mediator variables to check if the direct effect will be changed or not after introducing the mediator variables. The results of AMOS 22 revealed that when introducing potential and realised ACAP as a mediator figure (6.4), human and structural capital no longer has a strong or positive significant direct effect on the SMEs performance; for instance, the effect of structural capital turned to a negative insignificant effect (-.004, P .955) and the effect of human capital became insignificant (.028 P .718). On the other hand, the effect of relational capital changed, but was still significant at the level of (0.005).

However, the results of this test were still insufficient condition for an indirect effect. In this research, the indirect effects have been tested with bootstrapping (2000). Regarding the second main hypothesis, which focused on the mediating role of potential absorptive capacity on the relationship between intellectual capital and firm performance, the indirect effect of absorptive capacity has been tested separately by reliance on a research hypothesis. Firstly, the mediating role of potential absorptive capacity tested the relationship between intellectual capital (human, structural, and relational) and firm performance. Secondly, the mediating role of realised absorptive capacity tested the relationship between intellectual capital (human, structural, and relational) and firm performance. Secondly, the mediating role of realised absorptive capacity tested the relationship between intellectual capital (human, structural, and firm performance; these were tested one by one as explained in table (6.2).

Variables tests	Path
Testing the mediating role of potential ACAP on the	$HC \rightarrow PACAP \rightarrow FP$
relationship between intellectual capital and firm	SC → PACAP → FP
performance	$RC \rightarrow PACAP \rightarrow FP$
Testing the mediating role of realised ACAP on the	$HC \rightarrow RACAP \rightarrow FP$
relationship between intellectual capital and firm	$SC \rightarrow RACAP \rightarrow FP$
performance	$RC \rightarrow RACAP \rightarrow FP$

Table 6. 2 Testing path.

# 6.4.1. Mediating role of potential absorptive capacity on the relationship between intellectual capital and firm performance

Potential absorptive capacity represented the first dimension of absorptive capacity that consists of two capabilities, which are knowledge acquisition and knowledge assimilation. Therefore, firms required a new knowledge and the required knowledge flowed into the firm's system and routines through potential absorptive capacity. Furthermore, SMEs may acquire and assimilate external knowledge and information, but not all the acquired knowledge is useful for firms, (Engelen et al, 2014), were on the same lines with this point, that a firm has to be very careful in terms of investing in new knowledge and capabilities.

It is incapable of creating value or turning it into commercial ends, if there is a lack of capabilities to transform the new external knowledge and exploit it. Thus, potential and realised ACAP have a complementary effect rather than independent one. Both potential, realised ACAP turn on and contribute to enhancing firm performance (Leal-Rodregous, 2014). In line with this idea, the mediating role of potential ACAP has been tested. Testing the mediating role of potential ACAP means exploring the ability of the firm to create or develop capabilities of acquiring and assimilating knowledge as explained in figure (6.3).

Figure 6. 3 Model 2 Indirect effects IC- PACAP- Performance



Note: \_\_\_\_\_ Strong and significant indirect effects; ...... Not significant direct effects; \_\_\_\_\_ Not significant direct effects.

Figure (6.3) shows the indirect effects of three dimensions of intellectual capital on firm performance through potential absorptive capacity. It shows the result of every single hypothesis mentioned on the path. As we can see, the only variable which has a double effect directly and indirectly is relational capital and it keeps both effects significant.

While figure (6.4) represents the output of the system that illustrates in depth how the process of testing indirect effects has been conducted using AMOS 22, it also shows factors such as loading and how the direct effect of human and structural capital changed from positive to negative. While the direct effects of relational capital stayed positive, the value slightly changed after introducing potential absorptive capacity as a mediator variable through the test. Testing H2 required exploring the mediating role of potential ACAP on three paths of relationships as explained in the next step.

Figure 6. 4 AMOS output for indirect effects



6.4.1.1 Potential absorptive capacity mediates the relationship between human capital and the SMEs performance.

The indirect effect tested the three paths with the mediator variable, and without, as shown in figure (6.4). The paths shape the mediated relationship and how potential absorptive capacity mediates the relationships of intellectual capital dimensions and firm performance. The direct relationships have been tested without a mediator, and then with a mediator. However, introducing potential absorptive capacity as a mediator variable made significant changes to the direct relationship between the independent variables and dependent variable. The direct relationship between human capital and firm performance was (.433, P .048), which is positive and significant, then the result for the direct relationship with the presence of a mediator variable became insignificant (.027, P .721), which means potential absorptive capacity has changed the strength and the direction of human capital effects on firm performance.

Testing the indirect bootstrapping reveals the level of indirect effect and it was significant at (.046) see table (6.3), which means that the whole effect of human capital on firm performance turned through potential absorptive capacity. In other words, potential absorptive capacity fully mediated the relationship between human capital and firm performance in high-tech SMEs. This result means that the whole effects of human capital on firm performance turned through potential ACAP introducing potential ACAP as a mediator as it changed the direction of the effects from direct to indirect. Therefore, this result supported H2a.

Potential absorptive capacity consists of two capabilities; knowledge acquisition and knowledge assimilation (Zahra and George, 2002). In this sense, employees' skills, experience, know-how, attitude, and team work combine inside the firm to help it to create or enhance the firm's ability to identify the value of external knowledge and acquire it. Furthermore, managing and developing SMEs human capital contributed significantly to creating or developing the firms' dynamic capabilities, such as knowledge acquisition, and knowledge assimilation. In turn, both these capabilities positively and significantly enhanced firm performance. Concerning the results, they agreed with (Lieberman and Asaba's, 2006) results about absorptive capacity mediating learning, which in turn is part of human capital.

6.4.1.2 Potential absorptive capacity mediates the relationship between structural capital and SMEs performance.

The direct relationships were tested without a mediator, and then with a mediator. However, introducing potential absorptive capacity as a mediator variable completely changed the direct relationship between structural capital and firm performance. The direct relationship between structural capital and firm performance was (.097 P .05), which is positive and significant, then the result for the direct relationship with the existence of a mediator variable became negative and insignificant (-.004, P .955), which means that the potential absorptive capacity has changed the strength and the direction of the structural capital effect from positive to negative.

Testing indirect bootstrapping reveals the level of indirect effect, and it was significant at (.020) (see table 6.3), which means that the whole effect of structural capital on firm performance turned totally through potential absorptive capacity. In other words, the potential absorptive capacity fully mediated the relationship between structural capital and firm performance in high-tech SMEs. This result means that the firm's processes, routines, R&D activities, patents, and the firm's embedded knowledge is used to create and develop firms' dynamic capabilities, which are knowledge acquisition and knowledge assimilation. Therefore, this result supported H2b.

Potential absorptive capacity consists of two capabilities; knowledge acquisition and knowledge assimilation (Zahra and George, 2002). In this sense, managing and developing SMEs' structural capital leads to creating or developing firms' knowledge acquisition capability, and also creates and develops firms' assimilating capability; in turn both these capabilities positively and significantly enhance firm performance. Structural capital seems the closer variable to absorptive capacity, for instance researchers investigated absorptive capacity as a uni-dimensional construct, using R&D expenditure as a proxy for measuring ACAP (Kostopoulos et al, 2011; Hsu and Wang, 2012), or the number of patents, (Flattin et al, 2011). Other researchers considered R&D and the number of patents (Sydler et al, 2013) as parts of structural capital. In addition, the dynamic nature of ACAP, is not reflected by using a single static proxy, it is better captured by measures that reflect the nature of its dynamical processes (Lane et al, 2006).

## 6.4.1.3 Potential absorptive capacity mediates the relationship between relational capital and SMEs' performance

The direct relationships have been tested without a mediator, and then with a mediator. However, introducing potential absorptive capacity as a mediator variable between relational capital and firm performance meant that the effects of relational capital on firm performance changed slightly. The direct relationship between relational capital and firm performance was (.328, P .000), which is positive and significant, then the result for the direct relationship with the presence of a mediator variable changed slightly, but it was still positive and significant (.226, P .003), which means that potential absorptive capacity does not change the direction of the effects.

Testing the indirect bootstrapping reveals the level of indirect effect, and it was significant at (.000) see table (6.3), which means a little part of the relational capital's effect on firm performance turned through potential absorptive capacity. In other words, the potential absorptive capacity partially mediated the relationship between relational capital and firm performance in high-tech SMEs. In this sense, managing and developing SMEs' relational capital leads to enhancing firm performance directly and indirectly. This result means that relationships with customers, suppliers, business partners, and between firms' employees have two effects on firm performance.

The first one, which is the direct effect that is caused, increases market share, profitability, sales, and cash flow. The second effects is the indirect effect, which means all these external and internal relationships help to create or develop a firms' dynamic capabilities, which are knowledge acquisition and knowledge assimilation. Therefore, this result confirmed H2c. These results of the partial mediating role of potential absorptive capacity agreed with (Kale et al's, 2000) study, they suggested that relational capital is more likely to help firms successfully balance and manage the process of acquiring new capabilities, with protection and development of the existing one, because the level of relational capital facilitates learning through interaction between business partners, customers, suppliers, and between firm's employees.

Potential absorptive capacity consists of two capabilities; knowledge acquisition and knowledge assimilation (Zahra and George, 2002). However, managing and developing SMEs' relational capital helps to create or develop firms' capabilities regarding knowledge

acquisition and knowledge assimilation; in turn both these capabilities enhance firm performance. Relational capital has dual effects on SMEs' performance, which are direct and indirect effects. Relational capital is more likely to support firms to access new markets (Maria, 2014), therefore it has significant effects on increasing market share and sales.

Relationships	Direct without a	Direct with a	Indirect /
	mediator	mediator	Bootstrapping
$HC \rightarrow PACAP \rightarrow FP$	.433 P (.048)	.027 P (.721)	.046 Sig
			Full Mediator
$SC \rightarrow PACAP \rightarrow FP$	.097 P (.05)	004 P	.020 Sig
		(.955)	Full Mediator
RC→ PACAP→ FP	.328 P (.000)	.226 P (.003)	.000 Sig
			partial mediating

Table 6. 3 Testing the indirect effects of IC- performance through potential ACAP.

Hence, to elaborate the whole mediating effects of potential ACAP on the relationship between intellectual capital and firm performance in the studied firms, there is an explanation here about the characters of high-tech SMEs and the proposed model. Crick and Spence (2005) defined High-tech SMEs, generally characterised as small and medium-sized firms with advanced knowledge and capabilities in technology, an educated workforce, and the ability to adapt quickly to fast changing environments. Simultaneously, high-tech SMEs are considered to be intensive knowledge firms, therefore they already have a level of intellectual capital.

Regarding these characters of high-tech SMEs and referring to prior studies, which supported there being positive effects of intellectual capital on firm performance such as (Sharabati et al, 2010; Soriya and Narwal, 2012) in the pharmaceutical sector; (Hermans and Kauranen, 2005) in the biotechnology field; and (Tseng and Goo, 2005) in the manufacturing sector. However, the results of this study proved that potential ACAP positively mediated the relationship between intellectual capital and firm performance. Thus, the mechanism of the process of the mediating role of potential ACAP is shown to be firms' intellectual capital striving to create or develop the capabilities of the firm. Creating or developing firms' dynamic capabilities such as knowledge acquisition and knowledge assimilation happens as a result of having intellectual capital in the studied firms.

Therefore, the dynamic nature of these two capabilities (Robert et al, 2012), creates new resources and develops or renews firms' base knowledge, (Leal-Rodreguse, 2014). Simultaneously, this process positively enhances firm performance. Ultimately, the firms' level of intellectual capital helps high-tech SMEs to create new capabilities and develop existing ones, which in turn renews the firm resources dynamically to enhance financial outcomes. In other words, potential absorptive capacity facilitates the effects of intellectual capital outcomes.

# 6.4.2. The mediating role of realised absorptive capacity on the relationship between intellectual capital and firm performance

Realised absorptive capacity represented the second dimension of absorptive capacity that consists of two capabilities, which are knowledge transformation and knowledge exploitation. Using knowledge for commercial ends may be impossible for firms, if firms have not acquired and assimilated this knowledge previously. Similarly, SMEs may acquire and assimilate external knowledge and information, but they will be incapable of creating value or turning it into commercial ends, if they have deficiencies in their capability to transform the new external knowledge and exploit it. Thus, potential, realised ACAP has a complementary effect rather than independent. Both potential, realised ACAP turns on and contributes to enhancing firm performance (Leal-Rodregous, 2014). In line with this idea, the mediating role of potential ACAP has been tested, and here the mediating role of potential ACAP. Testing the mediating role of realised absorptive capacity, means testing the effect of the knowledge, which has already been acquired and flows into the firm's process and routines. In other words, it means testing how the firms dealt with the process to exploit and apply this worthy knowledge and use it.



#### Figure 6. 5 Model 3 Indirect effects IC- RACAP- Performance

Note: \_\_\_\_\_ Strong and significant indirect effects; ...... Not significant direct effects; \_\_\_\_\_ Not significant direct effects.

Figure (6.5) showed the indirect effects of three dimensions of intellectual capital on firm performance through realised absorptive capacity, the result of every single hypothesis mentioned on the path. Figure (6.6) represents the output of the system that illustrated in depth how the process of testing indirect effects was done on AMOS 23. In addition, it shows factor loading and how the direct effects changed from positive to negative concerning human and structural capital, as opposed to the effects of relational capital that maintained positive and significant direct effects, after introducing realised absorptive capacity as a mediator variable through the test. The result reveals that there are no indirect effects between relational capital and firm performance through realised absorptive capacity.



Figure 6. 6 AMOS output for indirect effects

6.5.2.1 Realised absorptive capacity mediates the relationship between human capital and SMEs performance.

The indirect effect tested on the three paths with the mediator variable and without is shown in figure (6.5). The paths' shape shows the mediated relationship, and how realised absorptive capacity mediates the relationships of intellectual capital dimensions and firm performance (see table 6.4). The direct relationships were tested without a mediator, and then with a mediator. However, introducing realised absorptive capacity as a mediator variable made significant changes in the direct relationship between the independent variables and dependent variable. The direct relationship between human capital and firm performance was (.433, P .048), which is positive and significant, then the result for the direct relationship with the existence of a mediator variable became insignificant (.028, P .718), which means realised absorptive capacity has changed the strength and the direction of human capital effect on firm performance. Testing the indirect bootstrapping reveals that there were strong significant indirect effects at level (.000) (see table 6.4), which means the whole effect of human capital on firm performance turned through realised absorptive capacity. In other words, the realised absorptive capacity fully mediated the relationship between human capital and firm performance in high-tech SMEs. This result means that employees' skills, experience, know-how, attitude, and team work combined inside the firm help to create or enhance the firm's ability to transform and refine the created routines and processes, which had already been acquired through potential absorptive capacity and combined with the firm's knowledge and then exploited it for commercial ends. In other words, it helps firms use the new or the developed knowledge to create the firms' dynamic capabilities, such as knowledge transformation and knowledge exploitation. Therefore, this result supported H3a.

Realised absorptive capacity consists of two capabilities; knowledge transformation and knowledge exploitation, (Zahra and George, 2002). In this sense, the SMEs human capital is engaged in contributing significantly to the process of creating or developing firms' capabilities, knowledge transformation and knowledge exploitation; in turn both these capabilities positively and significantly increase the firm's market share and profitability as well as increasing its sales and cash flow. These results agreed with (Tsai, 2001) who describes that ACAP significantly effects business unit innovation and firm performance; profitability (Naramsihan and colleagues, 2006); firm performance, (Lane et al, 2001).

6.5.2.2. Realised absorptive capacity mediates the relationship between structural capital and SMEs performance.

The direct relationships have been tested without a mediator, and then with a mediator. However, introducing realised absorptive capacity as a mediator variable changed the direct relationship completely between the structural capital and firm performance. The direct relationship between structural capital and firm performance was (.097 P .05), which is positive and significant, yet the result for the direct relationship with the presence of a mediator variable became negative and insignificant (-.005, P .954), which means realised absorptive capacity had changed the strength and the direction of the effect from positive to negative.

Testing the indirect bootstrapping reveals the level of indirect effect, and it was significant at (.049) (see table 6.4), which means the whole effects of structural capital on firm performance turned through realised absorptive capacity. In other words, realised absorptive capacity fully mediated the relationship between structural capital and firm performance in high-tech SMEs. This result means that the firm's processes, routines, R&D activities, patents, and the firm's embedded knowledge turned to create and develop the firm's dynamic capabilities, which are knowledge transformation and knowledge exploitation. Therefore, this result confirmed H3b.

Realised absorptive capacity consists of two capabilities; knowledge transformation and knowledge exploitation (Zahra and George, 2002). In this sense, managing and developing SMEs structural capital leads to facilitating the process of combining new knowledge, which has already been acquired through potential absorptive capacity and incorporating it with a firm's base knowledge and creating or developing the firm's dynamic capabilities, such as knowledge transformation and exploitation; which in turn affects both of these capabilities positively and significantly, thus enhancing firm performance. Structural capital seems the closer variable to absorptive capacity: for instance researchers investigated absorptive capacity as a unidimensional construct, using R&D expenditure (Kostopoulos et al, 2011; Hsu and Wang, 2012), or the number of patents, (Flattin et al, 2011). Other researchers considered R&D and the number of patents (Sydler et al, 2013) as parts of structural capital. In addition, the dynamic nature of ACAP, is not reflected by using a single static proxy, it is better captured by measures that reflect dynamic processes (Lane et al, 2006).

## 6.5.2.3 Realised absorptive capacity mediates the relationship between relational capital and SMEs performance.

The direct relationships have been tested without a mediator, and then with a mediator. However, introducing realised absorptive capacity as a mediator variable between relational capital and firm performance has slightly changed the effects of relational capital on a firm's performance, but the effects are still positive and significant. The direct relationship between relational capital and firm performance was (.328, P .000), which is positive and significant, and then the result for the direct relationship with the presence of a mediator variable became (.228, P .003), which means realised absorptive capacity does not considerably change the effect. Testing the indirect bootstrapping reveals that the indirect effect was insignificant at (.188) (see table 6.4). Regarding this result, one could realise that absorptive capacity does not fully or partially mediate the relationship between relational capital and firm performance. Therefore, H3c was rejected.

In other words, this result means that relationships with customers, suppliers, business partners, and between a firm's employees in high-tech SMEs has no role in shaping or refining the routines and processes, which have been acquired, through potential absorptive capacity to create or develop a firm's dynamic capabilities, such as knowledge transformation and knowledge exploitation. In this sense, managing and developing SMEs' relational capital leads to enhanced market share, profitability, sales, and cash flow, but only directly.

Relationship	Direct without	Direct with mediator	Indirect /
	mediator		Bootstrapping
$HC \rightarrow RACAP \rightarrow FP$	.433 P (.048)	.028 P (.718)	.000 Sig
			Full Mediator
$SC \rightarrow RACAP \rightarrow FP$	.097 P (.05)	005 P (.954)	.049 Sig
			Full Mediator
$RC \rightarrow RACAP \rightarrow FP$	.328 P (.000)	.228 P (.003)	.188 N/S

Table 6. 4 Testing the indirect effects of IC- performance through realised ACAP.

Hence, to elaborate the complete mediating effects of realised ACAP on the relationship between intellectual capital and firm performance in the studied firms, an explanation is given about the characters of high-tech SMEs and the proposed model. In this part, knowledge has been acquired and assimilated and has become part of the firm's intangible assets, refined and combined with the firm's base knowledge, as well as its being ready to contribute to commercial ends, (Zahra and George, 2002). In addition, the role of realised absorptive capacity starts here, it consists of two capabilities; knowledge transformation and knowledge exploitation. The first capability developed and refined the routines and processes, which facilitated incorporating and combining existing knowledge and the newly acquired and assimilated knowledge. Then realised absorptive capacity is responsible for the emphasis on the application of the new knowledge. Realised absorptive capacity is a dimension of harvesting all the new knowledge and using it for commercial ends.

However, the results of this study proved that realised ACAP positively mediated the relationship between a firm's human and structural capital and firm performance. These results are opposed to the relational capital results, which reveal that realised absorptive capacity has no mediating role on the relationship between relational capital and firm performance. Thus, the mechanism of the process of the mediation role of realized ACAP is that firms' human and structural capital drives to develop and refine routines and processes as well as combining the newly knowledge with the firm's base knowledge and using it for commercial ends, through transformation and exploitation capabilities to increase market share and sales, or to enhance profit and cash flow. As a result of having a high level of human and structural capital in the firm, it is able to create or develop realised absorptive capacity. Therefore, the dynamic nature of these two capabilities (Robert et al, 2012), will contribute to renewing the firm's knowledge resources or knowledge base, (Leal-Rodreguse 2014).

Ultimately, intellectual capital in high-tech SMEs contributes to increasing the market share, profitability, increasing sales, and cash flow directly by relational capital (relationships with customers, suppliers, business partners, and between firms' employees). Additionally, it happens indirectly through human capital (employees' skills, experience, know-how, attitude, and teamwork) and structural capital (firm's processes, routines, R&D activities, patents, and the firm's embedded knowledge) through realised absorptive capacity.

Relationship	Direct without a	Direct with a	Indirect /
	mediator	mediator	Bootstrapping
HC → PACAP → FP	.433 P (.048)	.027 P (.721)	.046 Sig
			Full Mediator
HC → RACAP → FP	.433 P (.048)	.028 P (.718)	.000 Sig
			Full Mediator
SC → PACAP → FP	.097 P (.05)	004 P	.020 Sig
		(.955)	Full Mediator
$SC \rightarrow RACAP \rightarrow FP$	.097 P (.05)	005 P	.049 Sig
		(.954)	Full Mediator
RC → PACAP → FP	.328 P (.000)	.226 P (.003)	.000 Sig
			partial mediating
$RC \rightarrow RACAP \rightarrow FP$	.328 P (.000)	.228 P (.003)	.188 N/S

Table 6. 5 Testing the effects of IC- performance through PACAP and RACAP.

# 6.5. The mediating role of ACAP on the relationship between IC and high-tech SMEs performance in the studied sectors.

This study proposed a model explaining the effects of intellectual capital on high-tech SMEs, through two dimensions of absorptive capacity. As explained in the research model in figure (6.7) regarding the direct and indirect effects, the figure illustrated the relationships among the research variables. As we can see, potential and realised absorptive capacity fully mediated the effects of human and structural capital. In addition, potential absorptive capacity partially mediated the relationship between relational capital and firm performance, contrary to realised absorptive capacity having no mediating role on the relationship between relational capital and firm performance.



Figure 6. 7 The main model with direct and Indirect effect IC- ACAP- Performance

Note: \_\_\_\_\_ Strong and significant indirect effects; ...... Not significant direct effects; \_\_\_\_\_ Not significant direct effects.

Figure 6. 8 AMOS output for the main model.



Note: Latent Variables human capital, structural capital, relational capital, and firm performance. Observed variables' potential absorptive capacity and realised absorptive capacity.

Research hypothesis	Results		
HC $\rightarrow$ FP/ Direct effects	Supported .433 P (.048) Positive &		
	Significant		
SC $\rightarrow$ FP/ Direct effects	Supported .097 P (.05) Positive &		
	Significant		
RC → FP/ Direct effects	Supported .328 P (.000) Positive &		
	Significant		
HC $\rightarrow$ PACAP $\rightarrow$ FP/ Indirect	Supported .046 Sig Fully Mediator		
effects			
SC $\rightarrow$ PACAP $\rightarrow$ FP/ Indirect	Supported .020 Sig Fully Mediator		
effects			
$RC \rightarrow PACAP \rightarrow FP/ Indirect$	Supported .000 Sig Partial Mediator		

effects				
HC →	RACAP → FP/ Indirect	Supported .000	Sig	Fully Mediator
effects				
SC →	RACAP → FP/ Indirect	Supported .049	Sig	Fully Mediator
effects				
RC →	RACAP	Rejected .188		Not significant
effects				

The research model is concerned with the three distinct sub-constructs of intellectual capital and two dimensions of ACAP. Elaborating the information in table (6.6), this study offers rich results, which shows that potential ACAP completely mediated the link between HC-firm performance and SC- firm performance. Simultaneously, potential ACAP partially mediated the link with RC- firm performance. Meanwhile, realised ACAP completely mediated HC- firm performance as well as SC-firm performance links. The results revealed that human capital is a crucial factor in creating firm's dynamic capabilities, particularly in a high intensity knowledge environment. Structural capital was employed to reflect processes and procedures that are created by, and stored in, a firm's technology system, which enhance speeds of transferring knowledge through the firm, (Carson et al., 2004; Youndt and Snell, 2004).

Regarding the RC-firm performance link, realised ACAP does not affect the direct link and it has no mediating role between them. These results support the research conceptualization of the mediating role of ACAP between intellectual capital and firm performance in high-tech SMEs. We derive this finding from two effects: firstly, HC and SC have indirect effects on firm performance through ACAP rather than direct effects, in other words firm performance has been influenced by HC and SC indirectly through ACAP. Second RC has significant direct effects on firm performance and partial indirect effects through potential ACAP. In other words, relational capital has direct effects on firm performance rather than indirect. There is plausibly support for a complete mediation, the findings supported that HC and SC were derived through both potential and realised ACAP and strongly contributed to firm performance.

However, HC and SC played a central role not only in firm performance, but also in new knowledge absorption and creating dynamic capabilities. Therefore, a firm's intellectual

capital represents a crucial tool to enlarge the firm's capacity of knowledge in high-tech SMEs. Resource Based View (RBV) theory highlighted the powerful effects of dynamic capabilities on a firm's performance, for instance innovation in processes and products, which drives and stimulates for dynamic capabilities that enhance the SMEs performance, (Rosenbusch et al., 2011). Nowadays, the success of any firm relies on continuous innovation, and on retaining employees rather than high employee turnover (Hsu and Wang 2012). Furthermore, developing potential and realised ACAP requires skills and knowledge of individuals as well as the knowledge embedded in firms such as the system, routines, the firm's memory, and intellectual rights, for instance patents, brands, R&D, and innovation. In addition, forward and backwards relationships with customers and suppliers or between firm's employees or business partners play a dyadic role directly and indirectly in developing firm performance. It affects it indirectly in terms of gaining a new knowledge through these relationships and circulating the acquired knowledge among the firm's employees. The direct effects were represented by the positive effects of these relationships in building trust (Kale et al, 2000) and creating cooperation with customers, suppliers, business partners, and the firm's employees, which increased market share and sales as well as profitability.

Hence, long-term human, structural, and relational capital accumulation was more likely to develop ACAP dimensions, and in turn achieve positive financial outcome. It has been recognized that intangible resources alone improve the level of performance, but they are not able to create a level of performance, they are acquired through capabilities, (Szulanski, 1996). Scholars such as (Dutta et al, 2005) stated that capabilities are the transformational processes to utilize and convert resources into an organization's output, (Hsu and Wang, 2012). Therefore, it is notable that utilization and deployment of resources are essential to combining and incorporating capabilities to improve a firm's performance.
## 6.6. Chapter summary

In this chapter, a comprehensive model that includes intellectual capital, absorptive capacity, and firm performance has been discussed and empirically tested. It is concluded that there is a significant relationship between intellectual capital and an SMEs performance in the high-tech sector, and absorptive capacity positively mediates this relationship between intellectual capital and firm performance in the researched firms. The finding of this study reveals that there is a strong relationship between human capital and firm performance. Moreover, relational capital positively and significantly effects firm performance. It can be interpreted that firms achieved successful performance in terms of increasing market share, sales, and profitability with this way of managing their level of human and relational capital.

Therefore, human and relational capital represented a favourable choice for small medium enterprises to improve their performance, more than structural capital. The other conclusion is that, to enhance small and medium sized enterprises' performance through absorptive capacity, they need to focus on human and structural capital to create or develop ACAP dynamic capabilities, which positively effect firm performance. In addition, focusing on developing human and structural capital increased the firm's ability to create and develop potential and realised ACAP as dynamic capabilities and balance them to achieve profitability and increase market share, sales, and profitability, rather than focusing on relational capital. In this chapter the discussion reveals that the most successful high-tech SMEs were ones that focused on creating dynamic capabilities by using their intellectual capital.

# 7. Chapter seven: Conclusion

## 7.1. Introduction

The main objectives of this research have been to investigate the effects of intellectual capital on firm performance and the mediating role of absorptive capacity on this relationship in the high-tech SMEs of the UK. To approach this conclusion chapter, it is appropriate to highlight the work that has been done in previous chapters to give a clear picture of this study.

Chapter one highlighted the objectives and scope of the research. It illustrated the main work in the field of intellectual capital and firm performance. Then it illustrated the research objective, questions and epitomized the research design and methodology very briefly. Chapter two discussed intellectual capital and absorptive capacity in the context of small and medium-sized enterprises. It illustrated the theories and definitions of human capital, structural capital, and relational capital. This chapter reviewed the construct of absorptive capacity by focusing on potential and realised absorptive capacity and their dynamic capabilities; also discussed was firm performance in SMEs. Furthermore, various research variable measurements were discussed.

Chapter three outlined the research aims and questions; in it as well were discussed literature regarding intellectual capital absorptive capacity, and firm performance. In this chapter a conceptual framework was developed. In chapter four research design and methodology has been discussed. It shed light on research philosophy, research approach, research strategy, and the pilot study of this research; further, it explained the proposed model in this research with a hypothesis and the relationships of variables, intellectual capital, absorptive capacity and SMEs performance.

Chapter five of this research shows three levels of data analysis, it started with a descriptive analysis, which gave a clear picture of the research data and the respondents. Then a statistical analysis through SEM was conducted. After that, a path analysis ending with testing the research hypothesis by using AMOS 22 was conducted. Chapter six showed and discussed the findings from analysing the research data, and interpreted the results, as well as reviewing the results in terms of intellectual capital, absorptive capacity, and firm performance in the studied high-tech SMEs. Moreover, it reviewed the impact of intellectual capital on firm performance directly and indirectly through potential and realised ACAP. The current chapter linked and compared the findings and results of current research with prior literature.

Chapter seven, is concerned with the research findings. It is devoted to explaining the research contribution. It focuses on the theoretical contribution of the research as well as policy and managerial implications. The chapter ends with a consideration of the limitations of the study and puts forward some topics for further studies.

## 7.2. Revisiting the research objectives and questions.

The research questions have been drawn from the literature review, which sets out that the majority of prior studies show absorptive capacity has been explored and investigated in various disciplines and fields such as strategic management, international business, organizational economics, and technology management to analyse and interpret various organizational phenomena, (Zahra and George, 2002). However, research, which has incorporated absorptive capacity and intellectual capital, is still scant, (Hsu and Wang, 2012). In addition, research has focused on absorptive capacity and intellectual capital in large firms rather than SMEs. Although some research has investigated intellectual capital in SMEs, most of it has focused on one or two dimensions of the IC construct (Radaelli et al, 2018; Ahmed, 2018; Bendickson and Chandler, 2017; Riley et al, 2017; Morris et al, 2017; Marvel et al, 2016; Grichnik, et al, 2014; Stam et al, 2014).

However, absorptive capacity is still largely underdeveloped in the field of intellectual capital, (Mariano and Walter, 2015; Engelman et al, 2017). Hence, this research incorporates absorptive capacity in the field of intellectual capital in the high-tech SMEs sector, with the main objective of this study being to bridge the gap in the literature. Therefore, this research has investigated the mediating role of absorptive capacity as dynamic capabilities and has two dimensions (Zahra and George, 2002) on the relationship between intellectual capital and firm performance in the high-tech SMEs of the UK. Thus, the objective is to develop a body of knowledge through empirical investigation.

The interest of this research is that intellectual capital affects firm performance through potential and realised absorptive capacity rather than directly affecting it. Prior studies have highlighted the positive and significant effects of intellectual capital on firm performance in IT (Chang, 2007; Seleim et al., 2007; Mention and Bontis, 2013); financial sectors (Chen et al., 2014), while in the fields of pharmaceuticals and textiles (Sharabati et al., 2010; Soriya

and Narwal, 2012); biotechnology (Hermans and Kauranen, 2005), and the manufacturing sector (Tseng and James Goo, 2005). Some researchers believe that SMEs are sometimes unsuccessful in terms of achieving a high level of performance, due to SMEs having less resources than big companies, such as human and financial resources, as well as SMEs having a lack of contact with external networks, such as business partners, customers and suppliers (Ghobadian and Gallear, 1997; Nicholas et al, 2011; Voss et al, 1998; Hadjimanolis,1999; Bartlett and Bukvi, 2001; Tidd et al., 2005).

To answer research question one, the relationship between the three dimensions of intellectual capital, namely human capital, structural capital, and relational capital has been identified and investigated in high-tech SMEs, by exploring their effect on the firm's performance. Intellectual capital effects on four indicators of firm performance, namely market share, profit margin, sales, and cash flow were also investigated. To answer research question two, potential and realised absorptive capacity are introduced as mediating variables on the relationship between the three dimensions of intellectual capital and firm performance. The proposed model in this research proposes that the firm's intellectual capital helps in creating new dynamic capabilities, or developing existing ones under two dimensions of absorptive capacity and through four dynamic capabilities, intellectual capital enhances market share, profitability, sales, and cash flow. Intellectual capital and absorptive capacity are represented as vital internal and external knowledge resources.

## 7.3. Summary of the key findings

In this section of the research, the main conclusions of the study are revealed and discussed. Two main propositions have been outlined in this research and the major findings are explained below.

- The overall results of the data analysis reveal that there is a positive and significant relationship between human capital, structural capital, and relational capital upon the high-tech SME's performance. Therefore, a high level of intellectual capital leads to achieving better performance in high-tech SMEs.
- Human and relational capital are factors that have more positive and significant direct effects on a high-tech SME's performance. Therefore, the SMEs which have placed an emphasis on these two factors have performed better than SMEs, which have not.
- Human capital is the only factor that is embedded in the employees' heads. Therefore, when firms place an emphasis upon having employees with good skills, experience, know-how, problem-solving skills, attitude, and team work, it leads to better performance.
- Relational capital is one of the dimensions of intellectual capital, which has a strong impact upon the SME's performance in enhancing their market share, profitability, and sales. Therefore, maintaining and managing appropriate communication with business partners, suppliers, customers, stakeholders, third parties, and interactions among firm's employees leads high-tech SMEs to increase their market share, sales, and profitability.
- The descriptive analysis reveals that most of the researched firms have a high level of human capital as indicated by the respondents' level of education and total working experience. Therefore, SMEs operating in the high-tech sector tend to foster and leverage their intellectual capital to improve and rejuvenate their absorptive capacity,

which in turn increases opportunities for firms to successfully apply new knowledge towards financial and non-financial ends.

- The findings showed that potential absorptive capacity positively and significantly fully mediated the relationship between human capital, structural capital and the SME's performance. Human capital and structural capital influenced the SME's performance fully through potential absorptive capacity. Therefore, firms that focus on human and structural capital can create or develop knowledge acquisition and knowledge assimilation as dynamic capabilities, which in turn enhances the high-tech SME's performance.
- Data analysis reveals that potential absorptive capacity partially mediates the relationship between relational capital and firm performance. Therefore, relational capital plays a dyadic role. Furthermore, it has direct effects on firm performance and indirect effects through contributing partially to creating or developing knowledge acquisition and knowledge assimilation as dynamic capabilities, which in turn enhance the SME's performance.
- The findings showed that realised absorptive capacity positively and significantly fully mediated the relationship between human capital, structural capital and the SME's performance. Human capital and structural capital fully influenced the SME's performance through realised absorptive capacity. Therefore, firms that focus on human and structural capital are able to create or develop knowledge transformation and knowledge exploitation as dynamic capabilities, which in turn enhance the high-tech SME's performance.
- The findings revealed that realised absorptive capacity has a non-significant mediating role on the relationship between relational capital and the SME's performance. Therefore, firms that focus on relational capital can enhance their performance rather than creating or developing knowledge transformation and exploitation. Relational capital has no effects on knowledge that has already been acquired, assimilated, and that has become part of the firm's routine and base knowledge. Thus, relational capital has strong effects on the processes of recognizing

and increasing the flow of external knowledge from being external to internal to a firm.

Intellectual capital factors in high-tech SMEs crucially drive the absorption of external knowledge and the process of incorporating new knowledge with the existing and exploiting it for commercial ends. That is, the greater level of intellectual capital, the greater the impact of absorptive capacity on the firm's performance. This finding suggests that managing a high level of intellectual capital help firms to increase the pace of the processes from absorption of new knowledge to exploiting it for commercial ends and to keep operating these procedures continually.

## 7.4. Theoretical contributions

This study offers two main contributions towards research regarding strategic management and the field of intellectual capital in the context of SMEs. The first contribution has to do with the direct effects of intellectual capital, which have been discussed in previous management research. The second contribution, this study has come up with is the indirect effects of intellectual capital through absorptive capacity as a mediator variable between intellectual capital and firm performance in a high intensity dynamic business environment.

With regard to research contribution, intellectual capital and absorptive capacity are interesting fields for scholars: in large firms and SMEs, for instance in the field of intellectual capital, (Bontis, 1998; Youndt and Snell, 2004; Isaac, et al, 2010; Hsu and Wang 2012; Costa 2012 and Chen, et al 2014) have developed and investigated the construct in different sectors. However, current research has provided remarkable managerial and theoretical implications. In addition, it is believed that the outcome of intellectual capital and absorptive capacity in high-tech SMEs has had a complementary role. Therefore, incorporating absorptive capacity in the field of intellectual capital can yield a superior financial outcome.

Even though current and prior research acknowledges that resources of SMEs can be limited, SMEs can still achieve successful performance, (Nooteboom, 1994). The small size enables SMEs to move faster and adapt quickly to fast changing environments, (Crick and Spence, 2005). The flexible structure of SMEs does not slow down the application of new ideas (Herremans et al, 2011). The main contribution of this study was that of examining the impact of intellectual capital on high-tech SMEs performance in a high intensity dynamic environment. Hence, this research contributes to the existing literature on intellectual capital, precisely concerning intellectual capital and firm performance literature, by providing evidence regarding the effect of intellectual capital on enhancing market share, sales, profitability, cash flow, and employability.

The second main contribution of this research is to introduce potential and realised absorptive capacity as a mediator variable on the relationship between intellectual capital and firm performance. Concerning to the construct of absorptive capacity researchers, such as (Cohen and Levinthal, 1990; Zahra and George, 2002; Jansen et al, 2005; Lane et al, 2006; Todrova and Dorisin, 2007; Roberts et al, 2012; Patterson and Ambrosini, 2015; Mariano and Walter, 2015) have conceptualized and reconceptualised the construct, while also investigating the construct to interpret different organizational phenomenon. Along with the main contribution, this study contributes to the field strategic management by utilizing a context having clear metrics for intellectual capital and absorptive capacity, two dominant concepts that can be difficult to capture empirically, (Bendickson and Chandler, 2017). This offers the ability to demonstrate how SMEs performance has been enhanced through the integration between intellectual capital and absorptive capacity, also how firms use external knowledge and ultimately enhance financial performance.

The present study investigated to what extent ACAP mediates the effect of intellectual capital on firm performance, by investigating absorptive capacity as dynamic capabilities, more specifically, current research integrates intellectual capital and the influence of absorptive capacity on performance under the umbrella of (RBV). Intellectual capital factors in high-tech SMEs crucially drive the process of absorption of external knowledge and the process of incorporating new knowledge with the existing, (Hagemeister and Rodriguez-Castellanos, 2010), to exploiting it for commercial ends. It has been argued that SMEs are focusing mainly on internal resources of knowledge more than using external resources (Nooteboom, 1994). With regard to a turbulent business environment, high-tech SMEs tend to develop their internal resources such as intellectual capital and create or develop dynamic capabilities to acquire new knowledge or capabilities (Hsu and Wang, 2012). Moreover, there is a role for SMEs in the economic development of countries (Beck and Demirguc-Kunt 2006; Nicholas et al., 2011).

The theoretical association between intellectual capital and SMEs performance has been argued in the literature for several years. This study has proposed a model that supposes that intellectual capital directly and indirectly affects a firm's performance through absorptive capacity. In furtherance of this contribution, existing literature and prior research have been noted as contributing few attempts at incorporating absorptive capacity in the field of intellectual capital and investigating them as intangible knowledge resources. It seems that there is a gap in this aspect, (Engleman et al, 2017; Hsu and Wang, 2012; Mariano and Walter, 2015) therefore this empirical research has dealt with firms' intangible resources by measuring the influence of intangible resources on a firm's performance. Likewise, the study contributes to the literature on intellectual capital and absorptive capacity by combining both concepts in one model.

## 7.5. Policy implications

In chapter two of this thesis, the importance of small and medium-sized enterprises in specific industrial sectors on the national economy of the UK has been discussed. SMEs are the engine of economic growth and of achieving financial outcomes. Policy makers have paid considerable attention to the high-tech industry, to achieve or boost economic growth and prosperity, (Coad and Reid, 2012). Thus, the findings of this research might be beneficial for policy makers in terms of their decisions on SMEs' development.

It can be a good input for formulating and constructing effective policies to enhance economic growth, particularly in a turbulent environment. The findings of this research reveal that high-tech SMEs, which rely on intellectual assets and processes, are more likely to succeed and achieve a high-level of performance, which in turn contributes to the national economy.

The findings of this research in terms of potential and realised absorptive capacity and intellectual capital, may possibly catch the attention of policy makers as a way of offering alternative knowledge resources. These results reveal that enterprises, which acquire knowledge and technologies and exploit the new knowledge and technologies achieve both a high level of, and more successful performance, which guide policy makers to focus supporting such projects.

In addition, the chapter concluded that the attitudes and knowledge of CEOs and managers of SMEs are highly supportive of the application of new ideas and new knowledge, that can directly and indirectly enhance their firm's performance. Therefore, specific training or the scaling up of capabilities programs will affect their techniques for exploiting acquired knowledge, which in turn help firms to be successful.

There is potential implication related to Brexit. It is still a negotiable topic until the EU and the UK reach an agreement for applying it, and investment, market share, profit margin, and growth remain sensitive issues in this context. However, it is clear UK firms will be influenced by Brexit regarding how and where they carry out their businesses or even create new firms (Cumming and Zahra, 2016). Therefore, and to reduce the potential effects of Brexit, policy makers need to be more focused on supporting innovative projects, which continually create new knowledge or developing existing areas through the integration between firms' intellectual capital and absorptive capacity. This in turn enables domestic or nascent projects for adopting new knowledge as growth and economic contribution.

If the Brexit proceeds, some benefits will be available for SMEs for instance regulations and barriers imposed by the EU will be removed, offering faster and easier flow of commerce. In addition Brexit will be resulting in changing UK government's financial policies which more likely to develop more international expansion in business with North America and Canada, (Smith, 2016; Cumming and Zahra, 2016), which opens a door for potential new knowledge and technologies. Therefore, policy makers could take into account any changes in trade and financial policies those may affect SMEs after Brexit. Therefore, formulating effective policies are essential to support high-tech SMEs for creating links and connections in new markets that enable them to seizing a new knowledge and technologies from the new opportunities after Brexit.

## 7.6. Managerial implications

The findings of this research have revealed that an awareness of CEOs and managers in hightech SMEs assists them in gaining new knowledge from an external environment. Such a knowledge can be leading to innovative way of dealing with any new ideas. This management's style helps to enhance the efficiency of applying the new idea and new knowledge. Furthermore, it is concluded that intellectual capital plays a considerable role in creating dynamic capabilities, which increases the firm's ability to purposely rejuvenate their knowledge resources and renew intellectual assets. However, the current study implies that improvement in a firm's absorptive capacity, which is developed by intellectual capital, precedes the enhancement of firm performance. Therefore, managers and CEOs should pay attention for developing intellectual capital to achieve competitive advantage in their business.

If a firm has managed a high level of intellectual capital and that level does not create or improve a firm's dynamic capabilities, the firm's performance will not be enhanced either. When this happens, management must carefully check the mechanism of how their intellectual capital has been managed in their firms, or the way of investing in their intellectual capital. The findings showed that, in high-tech SMEs, intellectual capital integrated with dynamic capabilities strengthened what already existed and further more it explores new opportunities. Therefore, it represents the starting point in building a firm's capabilities, which in turn lead firms to enhance performance and succeed.

Continuous innovation is considered as a measure of success for any company based on retaining well-educated employees, who have skills and knowledge rather than high workforce turnover, (Hsu and Wang, 2012). Therefore management may pay considerable attention for human and structural capital to create or expand the processes of continuous innovation that come through intellectual capital.

The results indicate that levels of intellectual capital can turn into positive financial outcomes via enriching the firm's absorptive capacity and it can build or develop capabilities to enhance firm market share, sales, profitability, and growth. Therefore CEOs and managers of SMEs should develop and use their intellectual resources to develop their companies' capabilities in acquiring and assimilating new knowledge to increase the efficiency of flowing of useful knowledge from outside to inside firms, as well as in transforming and

exploiting this knowledge for achieving positive financial outcomes and employability growth.

In addition, the findings reveal that relational capital contributes to enhancing financial outcome directly and indirectly through absorptive capacity. Therefore, CEOs and managers should focus heavily on developing relationships with customers and suppliers as well as strong ties among employees. This might involve expanding activities for sharing and exploiting knowledge.

Current research findings encourage CEOs and managers particularly in the high-tech sector to focus on intellectual capital, in order to enhance absorptive capacity and create dynamic capabilities in their firms. This is due to dynamic capabilities, which are playing a crucial role in achieving financial performance in terms of increased market share, which is one of SMEs challenges (Nicholas et al, 2011) profitability, sales, and cash flow.

Another practical implication of the current results serves as a call for managers or CEOs to attract unique resources and develop internal capabilities that lead to enhance financial performance. Small and medium-sized enterprises are considered as highly strategic flexible firms, and better in refining processes and routines and dynamic capabilities and enhancing performance (Kelly, 2007). Previous research has revealed that SMEs performance is more likely to be linked to knowledge about the market place and available chances and opportunities, in addition to the needed strategic approach to utilize the advantage of such opportunities, (West & Noel, 2009; McDowell et al, 2018). Based on current research findings, SMEs need to use both people and dynamic capabilities to enhance firm performance. Therefore, understanding how to support and facilitate a firm's intellectual capital and absorptive capacity as dynamic capabilities is a key factor to enhance financial performance.

It is an extremely necessary for CEOs and managers to find the equilibrium level in the investments in potential and realised capacities. As it is concluded, dynamic capabilities help firms to recognize and acquire new external knowledge, and then assimilate it into the firm's routines and processes. Therefore managers should put equal emphasis on both investment in acquiring new knowledge and exploiting that new knowledge to achieve the most satisfactory and successful financial outcome.

## 7.7. Limitations of the study

This research has some limitations. First, it has focused on high-tech SMEs in the UK, in pharmaceutical, biotechnology and publishing of computer games industries. Although the sample used from these three sectors was representative, but collecting data from a wider range of industries could help to generalise the results into the entire SME sector.

Second, this study covered absorptive capacity in terms of organizational level, not the individual level. However, examining these two concepts together is hardly feasible, as absorptive capacity at the individual level tangles with human capital. Therefore, further studies may be required to examine whether present findings regarding the organizational level of absorptive capacity apply to the individual level of absorptive capacity.

Third, with regard to the research methodology, this research benefits from a hypothetivedeductive approach, which is quantitative in nature. Therefore, quantitative data should be collected using questionnaire due to the large widespread population size of small and medium sized enterprises, which were geographically located across the UK. The response rate was slightly low and increasing the rate of response was the biggest challenge, which the researcher faced. Therefore, further research can use a combination of quantitative and qualitative data.

Fourth, this research takes place in a particular geographical context (UK) and in high-tech sector. Therefore, further research is required to investigate whether present findings apply to other sectors such as large companies, and in different countries.

Finally, even though the Brexit referendum and negotiation rounds have created uncertainty in the UK markets, all potential effects are still preliminary. Further research is required to investigate how the present finding might apply in case of proceeding Brexit.

## 7.8. Suggestions for future research

This research has developed a sound and rich theoretical model, which has been tested with reliable primary data. Taking the main findings and limitations into consideration revealed that there are new avenues for further research.

First, the research was carried out in three sectors of high-tech SMEs. Concerning some limitations those were discussed earlier, and to address the first one, the researcher highly recommends conducting similar research in other high-tech sectors and industries. Moving this research forward to other study settings and contexts could provide further insight and interpretation.

Second, even though this study covered absorptive capacity in terms of organizational level, still highly valuable to carry out study about absorptive capacity on the individual level in SMEs' context.

Third, clearly, the current research focused on SMEs located across the UK. Hence, the suggestion for future studies is to conduct the research in other geographic areas, for instance the USA, Australia, Canada or in Asian developed countries. The findings of this research are then more likely to offer help in providing a comprehensive depiction and approach towards absorptive capacity as dynamic capabilities and its role in the relationship between IC and firm performance in SMEs internationally.

Fourth, the large population of high-tech SMEs and their extensive spread across the United Kingdom, make it both a vital environment and a highly desirable location in which to replicate this research with different methodologies such as qualitative methodology to determine and analyse in depth whether the same relationships exist or not, as well as to be able to generalise from the empirical findings.

Finally, it is recommended to carry out a comparative study of this research in case of Brexit is proceeded. Hence, the suggestion for future studies is to conduct similar research by focusing on two geographical groups of high-tech SMEs located in the EU and the UK to offer a comprehensive depiction about the potential effects of Brexit on firms' knowledge resources and performance.

# Appendix

## 1. Data dictionary

	Number of	Variable code name in SPSS	Variable	Measurement scale
	question	and AMOS		
	1	Participants age	Age band	1= < 20- 29
				2= 30 - 39
				3= 40-49
				4= 50- 59 <
	1	Gender	Gender	1= Male
				2= Female
	1	Working experience	Total working	1= 0- 5
			experience	2= 6-10
				3= 11-15
ution				4= 16-20
orma				5= 20 or more
l inf	1	Education	Level of	1 = A level or less
nera			education	2= Bachelor 3= Master
Ge				4= PHD
	1	Position	Position in the	1 050
			firm	1= CEO 2= Middle manager
				3= Supervisor
	1	Firm age	Age of firm	1 = < 1-5
				2= 6-10
				3= 11-15
				4= 16-20
				5= 21-25<
	1	Location	Firm location	1= England
				2= Northern Ireland
				3= Scotland
1	1	1	1	1

				4= Wales
	8	Employee's no	Size of company	1=1  to  9 2= 10 to 49 3= 50 to 249
	1	Industry	Industry	1= Pharmaceutical
			sector	2= Biotechnology
				3= Publishing of computer
				games
				4= Others
	I	Potential absorptive cap	acity = Potential	ACAP
	5	ACQUISITION	Knowledge	5= Strongly agree
	Includes		acquisition	4= Agree
	revers			3= Neutral
ity	coded			4= Disagree
apac	items			5= Strongly disagree
ive c	3	ASSIMILATION	Knowledge	5= Strongly agree
orpt	Includes		assimilation	4= Agree
l abs	revers coded			3= Neutral
entia	items			4= Disagree
Pote				5= Strongly disagree
		Realised absorptive cap	acity = Realised	ACAP
	6	TRANSFORMATION	Knowledge	5= Strongly agree
	Includes		transformation	4= Agree
	revers			3= Neutral
ity	coded			4= Disagree
apac	items			5= Strongly disagree
ive c	6	EXPLOITATION	Knowledge	5= Strongly agree
orpti	Includes		exploitation	4= Agree
labs	revers			3= Neutral
lised	coded			4= Disagree
Rea	items			5= Strongly disagree
	1	Intellectu	al capital	1
	8	HumanCap	Human capital	5= Strongly agree

	Revers			4= Agree
	coded			3= Neutral
				4= Disagree
				5= Strongly disagree
	5	StructurCap	Structural	5= Strongly agree
			capital	4= Agree
				3= Neutral
				4= Disagree
				5= Strongly disagree
	9	RelatinCap	Relational	5= Strongly agree
			capital	4= Agree
				3= Neutral
				4= Disagree
				5= Strongly disagree
		Firm per	formance	
	4	Performance	Financial firm	5= Excellent
			performance	4= Very good
				3= Good
e				2= Fair
nanc				1= Poo
rfon	1	FP5	Employment	3= Increased
n pe			growth	2= Stayed the same
Fin				1= Decreased

### 2. Formal letter

YSGOL BUSNES BANGOR BANGOR BUSINESS SCHOOL



Dear Sir/ Madam

15 November 2016

#### Re: Mr. Saher Ajeeli Doctoral Research

I have the pleasure of informing you that Mr. Saher Ajeeli is carrying out a research for his PhD on "Absorptive capacity, intellectual capital, and firm performance" at the Bangor Business School, Bangor University, UK.

Your firm has been selected, from among all firms operating in your business sector, to take a part in this research. I would like to emphasize that your participation is very important for the research. The result of this research will be presented in aggregate form, and in such a way that no single respondent can be recognized. Please note that all information gathered in this survey will be held in the strictest confidence, and will never be disclosed to third party. More specifically, the gathered data will be used solely for academic and scientific purposes.

Saher's questionnaire contains more details of the planned project. He is intending to provide a summary of his research findings to the participants. If you wish to receive a copy of the research summary, please enclose your business card to the completed questionnaire. By proceeding to complete the enclosed questionnaire, you confirm that, you have read and you understand the enclosed information sheet. Your participation is voluntary and your details as well as all the information you provide will be treated as strictly confidential.

I would like to take this opportunity to thank you in advance for your time and participation in this project. Please return the completed questionnaire using provided freepost envelop. Please do not hesitate to contact me if you require more information.

Yours sincerely, Dr. Azhdar Karami

Senior lecturer in strategic management Project supervisor

PRIFYSGOL BANGOR FFORDD Y COLEG, BANGOR, GWYNEDD, BANGOR UNIVERSITY COLLEGE ROAD, BANGOR, GWYNEDD, YSGOL BUSNES BANGOR BANGOR BUSINESS SCHOOL PRIFYSGOL BANGOR BANGOR UNIVERSITY BANGOR, GWYNEDD LL57 2DG

YR ATHRO / PROFESSOR JONATHAN WILLIAMS PENNAETH YSGOL / HEAD OF SCHOOL

## 3. Ethical approval

#### COLEG BUSNES, Y GYFRAITH, ADDYSG A GWYDDORAU CYMDEITHAS COLLEGE OF BUSINESS, LAW, EDUCATION AND SOCIAL SCIENCES



13 April 2016

Dear Saher

#### Re: The Mediating Role of Absorptive Capacity on the Relationship between Intellectual capital and Firm Performance in High-Tech SMEs, UK

Thank you for your recent application to the CBLESS Research Ethics Committee.

The committee has considered your application and I am now able to give permission, on behalf of the CBLESS Research Ethics Committee, for the commencement of your research project.

I wish you well with your research.

Yours sincerely

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Dr. Diane Seddon Chair, College Ethics Committee

cc - Professor Azhdar Karami

PRIFYSGOL BANGOR, CANOLEAN WEINYDDOL BANGOR, GWYNEDD, LL572DG

FPŐN: +++ (0) 1248 383231

BANGOR UNIVERSITY ADMINISTRATIVE CENTRE, BANGOR, GWYNEDD, LL57 20G

TEL: +++ (0) 1248 383231 FAX: 144 (0) 1248 383228 YR ATHRO/PROFESSOR PHIL MOLYNEUX 14, 1640, 1620 DEON Y COLEG/DEAN OF COLLEGE

Registered charity number: 1141565

FFACS: +++ (0) 1248 383228 EBOST: Chless@hanger.ac.uk EMAL: Chless@hanger.ac.uk

www.bangor.ac.uk

### 4. Participant consent-questionnaire

College of Business, Law, Education and Social Sciences, Bangor University Hen Goleg, Bangor University, College Road, Bangor, LL57 2DG

Tel: (01248) 388 220 Registered charity 1141565



#### PARTICIPANT CONSENT - QUESTIONNAIRE

Please tick the boxes that apply to you. I confirm that I have read and understand the information sheet for this study

I understand that my participation is voluntary and that I am free to withdraw at any time without giving a reason

I understand that my details will be stored on a **confidential database** 

I understand that all in stated purpose	nformation I provide will be treated as <b>strictly confidential and will be</b> used for t
Name:	·
Address:	
Post code:	
Telephone number:	
Signature:	
Date:	
	Please return this form in the freepost envelope provided.

Thank you.

### 5. Participant information sheet

College of Business, Law, Education and Social Sciences, Bangor University Hen Goleg, Bangor University, College Road, Bangor, LL57 2DG



Tel: (01248) 388 220 Registered charity 1141565

#### PARTICIPANT INFORMATION SHEET

Absorptive Capacity, Intellectual capital and Firm Performance in SMEs, UK

#### Introduction:

You are being invited to take part in a research examining absorptive capacity and intellectual capital on firm performance. Before you decide whether or not to participate in this study, it is important for you to understand why the project is being done and what it will involve. Please read the following information and discuss it with your colleagues and/or senior executives if you wish.

What is the purpose of the study? This study seeks to:

The overall purpose of this study is to formulate helpful advises and provide a model about absorptive capacity, intellectual capital and firm performance in SMEs. Turbulent business environment, also strong competition pushed SMEs managers to pay attention on firm's knowledge, which are acquired via absorptive capacity or intellectual capital. Therefore, we ask the specific questions below in our research.

**Research question 1:** What is the relationship between Intellectual capital and firm performance in SMEs?

Research question 2: What is the mediating role of absorptive capacity on the

relationship between intellectual capital and firm performance in SMEs?

Why have I been chosen? Your organisation has been randomly chosen for this study.

#### Do I have to take part?

It is up to you to decide whether or not to take part. Your decision will not affect any aspect

#### What will happen if I decide to take part?

You are invited to take part in a **confidential** survey to answer questions about your organisation's absorptive capacity, intellectual capital and performance, including you're the challenge you might face and how you manage these.

A questionnaire (structured and open) will be distributed to you either by post, an online survey, at a mutually convenient time at the office or at an agreeable alternative venue. This would normally not take more than 10 minutes nonetheless there is also the alternative of a questionnaire pick up date/time or can be email back to the researcher. There is also the opening of more information to be given if you need to contribute beyond what was covered. There are no right or wrong answers and the questionnaire will be completed in English language.

#### Will my taking part in this study be kept confidential?

Yes. Your contact details will be stored on a **confidential** database. The information you share will be treated **in confidence**.

#### What will happen if I don't want to carry on with the study?

You are free to withdraw from the study at any time without giving a reason. If you decide to withdraw, your decision **will not** affect the study.

#### What will happen to the results of the study?

The findings from this study will be the subject of academic analysis and inform a doctoral thesis which will be submitted towards a PhD degree at Bangor University.

#### Who is organising and funding the research?

The project is being organized and funded by the researcher: **Saher Ajeeli** as part of his requirement for the completion of his Doctoral degree.

#### What happens if I have any concerns about this project?

If you are concerned about any aspect of this project and would like to speak to someone please contact Dr. Azhdar Karami Project Supervisor. His email address is (a.karami@bangor.ac.uk) and his telephone number is (01248 38 8350)

#### **Contact for further information:**

If you would like more information, please contact **Saher Ajeeli** by email (elp495@bangor.ac.uk).

#### Next steps:

If you decide that you would like to take part, please complete and return the enclosed **consent form** to Bangor University in the freepost envelope provided or email as desired. You do not need to use a stamp.

Thank you for kindly taking the time to read this information.



My name is Saher Ajeeli. I am a PhD student in "Bangor University, Business school" conducting research about the role of absorptive capacity on the relationship between intellectual capital and SMEs performance in the UK. The research will help in understanding and analyzing the role of absorptive capacity and intellectual capital in enhancing firm performance. I would like to emphasize that your participation is very important for the research. Results of this research will be presented in aggregate form, and in such a way that no single respondent can be identified. Please note that all information gathered will be used solely for academic and scientific purposes. Thank you for participating in this survey.

#### Section 1: Demographic information

1.1 Please indicate your age band (years)

○ < 20- 29 ○ 30 -39 ○ 40-49 ○ 50- 59 <

1.2 Please indicate your Gender

Male Female

1.3 Total working experience (in years)

0-5 6-10 11-15 16-20 20 or more

1.4 Please indicate your level of education

A level or less Bachelor Master PHD

1.5 What is your position in the firm

CEO Middle Manager Supervisor Other please specify.....

#### Section 2: Company information

2.1 Age of your firm in (years)

() <1-5 () 6-10 () 11-15 () 16-20 () 21-25 <

#### 2.2 Where is the firm located

England Northern Ireland Scotland Wales

2.3 How many employees are employed in your firm



#### Section 3

3. Using the following scale, please indicate the extent to which you agree or disagree with the statements

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Our unit has frequent interactions with business partners and clients	0	0	0	Ö	0
Employees of our firm in different departments are sharing knowledge between them about various activities and tasks	0	0	0	0	0
We collect industry information through informal means (e.g. lunch with industry friends, talks with trade partners)	0	0	0	0	0
Our unit periodically organizes special meetings with customers or third parties to acquire new knowledge	0	$\bigcirc$	0	0	0
Employees regularly approach third parties such as accountants, consultants, or tax consultants	0	0	0	0	0
We are slow to recognize shifts in our markets (e.g. competition, regulation, demography)	Ö	0	0	0	0
New opportunities to serve our clients are quickly understood	0	0	0	0	0
We quickly analyse and interpret changing market demands	$\bigcirc$	0	0	$\bigcirc$	$\bigcirc$

#### Section 4

## 4. Using the following scale, please indicate the extent to which you agree or disagree with the statement

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
Our unit regularly considers the consequences of changing market demands in terms of new products and services	O	0	O	nOn	0
Employees' record and store newly acquired knowledge for future reference	0	0	0	0	0
Our unit quickly recognizes the usefulness of new external knowledge to existing knowledge	0	0	0	0	0
Employees hardly share practical experiences	0	0	0	. 0	$\bigcirc$
We laboriously grasp the opportunities for our unit from new external knowledge	0	0	0.	0	.0
Our unit periodically meets to discuss consequences of market trends and new product development	0	0	0	0	0
t is clearly known how activities within our unit should be performed	0	0	0	0	0
Client complaints fall on deaf ears in our unit	0	0	$\bigcirc$	0	0
Our unit has a clear division of roles and responsibilities	0	0		a C) so	O
We constantly consider how to better exploit knowledge	0	. 0	0	0	0
Our unit has difficulty implementing new products and services	0	0	0	0	0
Employees have a common language regarding our products and services	0	0	0	0	0

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2



#### Section 5

5. Using the following scale, please indicate the extent to which you agree or disagree with the statements

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
The knowledge of each co- worker/associate is not really appreciated until that person leaves the organization	0	0	0	0	0
Most co-workers/associates clearly understand "why" they do what they do in their jobs	$\bigcirc$	0	$\bigcirc$	0	$\bigcirc$
Extensive knowledge sharing occurs between experienced and new people in our organization	0	0	0	0	0
Because knowledge is shared non-systematically (e.g., sporadically, informally) dependency on a few key individuals for success is high	$\bigcirc$	0	0	0	0
Most co-workers/associates continue to use the same procedures without asking, "Is there a better way of doing this?"	•O•	O.	0	0	0
We are able to link the success of our organization to our knowledge and expertise	$\bigcirc$	0	$\bigcirc$	0	0
We often develop techniques or processes based upon what we have learned from earlier experience	0	0	0	0	0
It is easy to spread individual knowledge throughout this organization for others to use	0	0	0	0	0

#### Section 6

6. Using the following scale, please indicate the extent to which you agree or disagree with the statements

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
People have access to the information systems they need to fulfill organizational objectives	0	Q	0	0	0
Our organization possesses processes to develop fully its unique capabilities, skills, and knowledge	0	0	0	Ó	0
Features of our information systems capture the knowledge that exists in this organization	0	0	Q.	0	O.
Most co- workers/associates are familiar with organization information systems that assist job performance	0	0	0	0	0
We have good systems within our organization to measure the value of our knowledge	0	0	0	0	0

3



#### Section 7

7. Using the following scale, please indicate the extent to which you agree or disagree with the statements

	Strongly agree	Agree	Neutral	Disagree	Strongly disagree
We maintain appropriate communication with our stakeholders	O	Ó	0	0	0
Suppliers and customers have a clear picture of who we are and what we offer	0	0	0	0	$\bigcirc$
Our clients think we work toward their best interest	0	Ő	0	Ö	0
We emphasize getting to know one another in this organization	0	0	$\bigcirc$	0.	$\bigcirc$
There is close personal interaction between our unit and business partners	0	0	0	0	0
Our unit focuses on mutual trust with suppliers and customers	$\bigcirc$	$\bigcirc$	0	$\bigcirc$	$\bigcirc$
We focus on high reciprocity with business partners	0	Ó	0	0	0
We often foster long-term business relationships that appear to have no short-term value	0	$\bigcirc$	0	0	0
The structure within this organization promotes caring relationships	0	0	0	n O i	0

#### Section 8

8.1 Please provide an assessment of the overall performance of your firm in the last 3 years based on following items

	Very				
	Excellent	good	Good	Fair	Poor
Increased market share	0	0	Q	0	O
Increased sales	0	0	0	0	0
Improved cash flow	0	0	O	0	Ó
Increased profit margin	0	0	0	0	0

4

#### 8.2 Compared to last year, has your number of employees

1	Increased	Staved the same	Decreased
6 J	moreased	otayeu the same	Decreased

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