



**The Effects of Inbound Open Innovation Activities on Organisational
Innovativeness: An Intra-Organisational Level Analysis**

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of Philosophy Degree in Business Administration**

Submitted by

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Declaration

The declare that this thesis titled “*The Effects of Inbound Open Innovation Activities on Organisational Innovativeness: An Intra-organisational Level Analysis*” is the author’s genuine and authentic research work. The researcher also declares that the thesis is the author’s work alone, except where due acknowledgement has been made. This thesis has not been previously submitted and formed the basis to qualify for the award of any previous academic award, associateship, fellowship, or any other recognised title either in whole or in part. The content of the thesis is the result of work that has been undertaken since the official commencement date of the approved research programme. Any paid or unpaid editorial work carried out by a third party is acknowledged and, ethics procedures and guidelines have been followed.

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Abstract

This study aims to examine the impact of inbound open innovation activities (IOI activities; independent variables) on organisational innovativeness (OGI; dependent variable) with absorptive capacity (ABCAP) playing a moderating role. That is, a focus on the role and behaviour of individual members operating in the open innovation (OI) environment during technology in-flow. This investigation seeks to determine both the social and the dynamic capability perspective of gaining individual members readiness to innovate and thus improve technology implementation successes.

This study adopted a sequential explanatory mixed-method design approach to achieve the goal of the study. Quantitative data was collected first using a survey instrument and questionnaire to collect data. A sample of 285 responses comprising senior staff members from 7 operational areas of the Ghana Revenue Authority was gathered. The qualitative data was obtained using a semi-structured interview guide to collect data from 5 individual employees. This study also integrated the social capital and dynamic capabilities theories to understand the individual-level behaviour of employees. This study also tested the hypothesised relationships using structural equation modelling among the various individual determinants.

This study shows that inbound open innovation activities have a multi-dimensional impact on organisational innovativeness. Based on the study's findings, the impact of inbound open innovation collaboration and employee involvement positively and significantly impact organisational innovativeness. Technology scouting, however, has a positive but insignificant impact on organisational innovativeness.

In terms of originality and value, this study used social capital and dynamic capability theories as an alternative theoretical guidepost to individual-level open innovation studies, the use of individual-level absorptive capacity as moderators and studying the individual member's behaviour in the open innovation environment in the public sector in Ghana, specifically the Ghana Revenue Authority. This study also revealed that both social capital and dynamic capabilities theories are critical determinants in the relationship between inbound open innovation activities and organisational innovativeness at the individual level. In addition, this study contributes to enhancing understanding of the individual-

level capabilities perspective of open innovation. Therefore, inbound open innovation activities at the intra-organisational level are a crucial determinant in the individual member's readiness, ability and capacity to innovate. This study's findings highlight the critical role of individual employees (not only R&D and specialised departments) in the open innovation environment and individual absorptive capacity in public sector organisations, especially revenue administrations in developing countries.

Keywords: Inbound open innovation, absorptive capacity, organisational innovativeness, social capital, dynamic capabilities

List of abbreviations

ABCAP	Absorptive Capacity
ASYCUDA	Automated System for Customs Data
AGFI	Adjusted Goodness of Fit Index
AMOS	Analysis of Moment Structures
AVE	Average Variance Extracted
CD	Customs Division
CF	Comparative Fit
CG	Commissioner General
CFA	Confirmatory Factor Analysis
CMB	Common Method Bias
CMV	Common Method Variance
DC	Dynamic Capability
DTRD	Domestic Tax Revenue Division
DVLA	Driver and Vehicle Licensing Authority
DV	Dependent Variables
EI	Employee Involvement
EIC	External Integrative Capability
EXT	External
ICUMS	Integrated Customs Management System
GCNet	Ghana Community Network Services Limited
GES	Ghana Education Service
GFI	Goodness of Fit Indices
GRA	Ghana Revenue Authority
IC	Integrative Capability
INT	Internal
IOI	Inbound Open Innovation
IV	Independent Variables
LP	Leverage Point
MD	Mahalanobis Distance
MMR	Mixed Method Research

NFI	Normed Fit Index
NIH	Not Invented HERE
NNFI	Non-Normed Fit Index
NSH	Not Sold Here
OGI	Organisational Innovativeness
OI	Open Innovation
PACAP	Potential Absorptive Capacity
PS	Public Sector
PSO	Public Sector Organisation
RACAP	Realised Absorptive Capacity
RGD	Registrar General Department
RMSEA	Root Mean Square Error Approximation
RMSR	Root Mean Square Residual
SC	Social Capital
SSD	Support Services Division
SEM	Structural Equation Modelling
SPSS	Statistical Package for Social Sciences
TLI	Tucker-Lewis Index
TS	Technology Scouting
UNIPASS	A single entry/uni-pass
US	United States

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Chapter One: Introduction

The focus of chapter one is to provide an overview of the thesis and its structure. It presents the objectives and the theoretical background of the study, the research objectives and questions; the problem statement; the definitions of key terms used; the delimitations and limitations of the study; and the significance and structure of the study. The chapter concludes with a summary.

1.1 Background of the study

The open innovation (OI) phenomenon initiative emphasises open collaboration and openness to a large group of actors, innovation intermediaries and highlights innovation in services and products, including business models (Chesbrough, 2006; Ollila & Elmquist, 2011; Chesbrough, 2017). Open innovation also relates to the organisation's capability to interact with other organisations in the innovation process to exchange information and harness the flow of knowledge across the organisation's boundaries (Chesbrough, 2003; Chesbrough et al., 2006). It is a phenomenon that involves cooperation between internal and external partners in the innovation process by allowing knowledge, ideas and technology to purposively flow across organisational boundaries, which fits the organisation's business model (Oltra et al., 2017; Matulova et al., 2018). In effect, the OI paradigm means practices that involve the engagement of stakeholders in the organisation's innovation activities (Saidi et al., 2019). Open innovation has thus become the emerging paradigm for managing innovations and understanding the processes involved (Chiaroni et al., 2011a). The OI paradigm operates on the principle that:

knowledge and the best skills may be inside or outside the company; internally developed research is part of the company's result and is complemented by external research; it is not necessary to be the first to develop a research to enjoy its positive results; building an appropriate business model is more efficient than reaching a market before the competitors; the company wins if it makes the best use of internal and external ideas; and companies may share the benefits provided by intellectual property (Lopes & de Carvalho, 2018, p.291).

However, the OI literature has predominantly focused on organisational performance (Ollila & Elmquist, 2011; Bogers et al., 2017; Lopes & de Carvalho, 2018), and to a large extent, the benefits and costs associated with creating and capturing value from inbound open innovation (IOI) activities (Lakemond et al., 2016; Greco et al., 2019). Accordingly, the focus of OI in the private sector is to create value by developing products and services. In contrast, the public sector (PS) focuses on creating public value by delivering improved service (Kankanhalli et al., 2017). For instance, the Customs division of the Ghana Revenue Authority has implemented several imported IT-enabled systems to improve trade clearance processes, promote trade and improve revenue (De Wulf, 2005; Addo, 2016; Addo & Avgerou, 2020). For this reason, the organisation has always been addressed as the unit of analysis (Bogers et al., 2017).

In Ghana, external technology and new ideas to create public value saw the implementation of a Customs management technology (TradeNet). The Ghana Community Network Services (GCNet) was tasked to automate, integrate and modernise customs clearance processes, promote transparency in trade and increase revenue mobilisation (De Wulf, 2005; Adaba & Rusu, 2014; Addo, 2016). Before implementing TradeNet, Customs implemented the Automated System for Customs Data (ASYCUDA), developed by the United Nations for developing countries in 1985 to assess duties and taxes (Adaba & Rusu, 2014). Unsatisfied with the performance of previous services providers (GCNet and West Blue), the government of Ghana procured the services of another information technology-enabled service provider (Ghana Link-UNIPASS) to improve revenue, facilitate trade, modernise customs operations and operate as a national single window (Addo & Avgerou, 2020)

According to Osei-Kojo (2017), the use of technological innovations (e-government) by public sector institutions: the Customs Division (CD) of the Ghana Revenue Authority (GRA), Parliament, the Driver and Vehicle Licensing Authority (DVLA), Ghana Education Service (GES) and the Registrar General's Department (RGD) have significantly improved the delivery of services and satisfied citizens who transact businesses using electronic means.

Therefore, the recent reviews of the OI literature show much interest in examining the relationship between IOI and innovation performance (West & Bogers, 2014; Greco et al., 2015). Thus, organisations need new ideas and technologies to facilitate innovation (Gupta et al., 2007).

Innovation is conceptualised from two perspectives. The first approach conceives innovation as a product or outcome (*the what part*), while the second approach perceives innovation as a process (*the how*) (Saran et al., 2009; Crossan & Apaydin, 2010; Taştan & Davoudi, 2017; Damanpour et al., 2018). Innovation can either be understood as a process of how new ideas emerge or the outcome (the new idea, technology) (Gupta et al., 2007). Thus, innovation in organisations encompasses new or improved products/services, processes, branding, marketing, new businesses, design methods (*the what aspect of innovation*) and collaborative arrangements (*the process of innovation*) (Matulova et al., 2018).

As an output, successful innovations drive economic growth, creates wealth and raises the standard of living of the people, drives up human productivity, increases competitive advantage, creates new employment opportunities, leads to the creation of new goods and services and therefore, and often considered “a desideratum in politics, in the public, and, not least, in innovation-related research” (Witt, 2016, p.6). Innovation is therefore considered the desired standard in human activity. Unsurprisingly, the positive effects of successful innovations in the private and the public sectors have attracted calls for more innovative efforts (Witt, 2016).

As a result, organisations that pursue innovations either use a closed or open innovation model (Chesbrough, 2003; 2012; Chesbrough & Crowther, 2006; Inauen & Schenker-Wicki, 2012; Witt, 2016). The closed innovation efforts relate to organisations with inward-focused culture pursuing innovations by using the science and technology base of the organisation to develop products internally (e.g., AT&T's Bell Laboratories, IBM's TJ Watson Research Center, Xerox PARC) (Chesbrough, 2012) or in-house (internal) knowledge exploitation and distribution (Inauen & Schenker-Wicki, 2012). Interestingly, closed innovation is highly practised in the high tech sector (Inauen & Schenker-Wicki, 2012; Chesbrough, 2012). The closed innovation model is guided by the principle that the:

smartest people in the area work internally in the company; the research-related income is generated and applied internally; the company believes that being the first to place an innovation on the market will make it a winner; the company also believes that being the creator of the best ideas will make it a winner; and intellectual property is controlled (Lopes & de Carvalho, 2018, p.291).

Traditionally, large organisations focused on closed innovations to protect their activities led by their Research and Developments (R&D) departments (Antikainen et al., 2010). Nevertheless, with the increasing need to cooperate with external partners in the innovation process, opening up the organisation's boundary to external innovations is now necessary because it can discover new complementary knowledge that it cannot generate (Almirall et al., 2016).

Gradually, organisations are abandoning the notion that acquiring new ideas or technology is solely done through internal R&D mechanisms (Gans & Stern, 2003; Chesbrough & Brunswicker, 2014). Further, organisations' benefits from spending and developing internal R&D have reduced leading to a fundamental shift from internal R&D development to externally generating new ideas that enhance organisational performance (Enkel et al., 2009). For instance, the broad search for external technology by SMEs (manufacturing) to improve their product performances has yielded both incremental and radical benefits (Uduma et al., 2015). This shift towards generating new ideas from external sources motivates organisations to continuously and broadly search the technological environment.

Scholars (e.g. Durst & Stähle, 2013; Brunswicker & Chesbrough, 2018) suggest several reasons for this shift towards the OI phenomenon, such as technological and product complexities, increasing cost of innovation, the risks associated with innovation, and the need to get products to the market within a short time which requires businesses to engage with external partners, share ideas, knowledge and technology; the need to develop inter-organisational networks, reorganize the structures of the organisation, evaluate its processes, knowledge and information technology (IT) management systems (Chiaroni et al., 2011; Bae & Chang, 2012).

In modern times, emphasis on the study of innovation has shifted from closed to OI (Chesbrough, 2003; Chiaroni et al., 2011; Alexy et al., 2013; Felin & Zenger, 2014; Saidi et al., 2019). Organisations now collaborate with partners and stakeholders to exchange ideas, knowledge, resources and technology across their boundaries (Randhawa, Wilden, & Hohberger, 2016; Grama-vigouroux, Saidi, Berthinier-poncet, & Vanhaverbeke, 2019). This new form of collaboration has led to the decline in the traditional closed innovation approach in many industries (Chesbrough, 2003; Chesbrough & Bogers, 2014; Lopes & de Carvalho, 2018; Grama-vigouroux et al., 2019).

Significantly, current discussions on the evolution of the OI paradigm demonstrates that the phenomenon is focused on performance, i.e., both organisational r; and innovative performance (Schroll & Mild, 2012; Ghassim & Foss, 2018; Lopes & de Carvalho, 2018; Locatelli et al., 2021).

So, in recent times, studies on the OI phenomenon and organisation performance have witnessed significant and considerable growth (Dahlander & Gann, 2010; (Le et al., 2019). Research in OI is dominated by the IOI dimension compared to the outbound and coupled OI modes (Enkel et al., 2009; Giannopoulou et al., 2010; Chesbrough & Bogers, 2014b; Aschehoug et al., 2019). That is, the majority of the efforts in OI research are focused on obtaining external ideas, solutions and technologies to solve organisational challenges (Spitsberg et al., 2013; Lopes & de Carvalho, 2018).

Thus, empirical evidence abounds of the effect of IOI on organisations' performance (Parida et al., 2012; Sisodiya et al., 2013; Wang et al., 2015; Hochleitner et al., 2017; Moretti & Biancardi, 2018; Tajudeen et al., 2019). Again an organisation's access to external technology through IOI is also recognised as an important source of innovativeness (Duysters & Lokshin, 2011). Similarly, IOI activities are significantly and positively related to customer performance, financial performance, new product/service performance (Cheng & Huizingh, 2014), and product innovativeness and performance (Rubera et al., 2016).

Moreover, Klimas and Czako (2018) and Bature et al. (2018) identify Organisational Innovativeness (OGI) as the critical driver to enable performance. Individual employees, managers, and actors openness to external technology promote their willingness to change

and be creative (Lumpkin & Dess, 1996). Earlier, Ince et al. (2016) suggested that both technological innovativeness (capabilities to acquire and deploy technology) and absorptive capacity (ABCAP) may enable actors in OI to open up and promote the needed change willingly. Therefore, open innovation activities lead to OGI in inter-organisational dealings (Alexiev et al., 2015). Accordingly, OGI enables innovation generation, which is necessary for innovative performance and competitive advantage (Joshi et al., 2015).

While OGI influences performance, it is influenced by organisational antecedents (expected organisational characteristics that can either facilitate or hinder innovativeness) (Hult et al., 2004; Peng, 2007; Radas & Božić, 2009; Shoham et al., 2012; Joshi et al., 2015; Ahrens et al., 2017). Specifically, OGI is influenced by both internal and external factors (Radas & Božić, 2009). For instance, Tuominen et al. (2004) found that the ability of organisations to identify and make use of emerging technological opportunities (adaptability) comprises the skills and competence to use the technology.

Recent developments in the OI paradigm have also highlighted the increased role of employees (Ter Wal et al., 2011; Salter et al., 2014; Ter Wal et al., 2017). Research in Employee involvement (EI) shows that it can be instrumental in enhancing the innovativeness of organisations. For instance, Bhappu and Schultze (2018) found that engaging employees in an organisation lead to higher growth and survival because they are focused and connected. This implies the readiness and capability of employees to work for their organisations to exceed expectations motivated by its workplace culture. Further, Akhmetshin et al. (2019) argue that employees are considered the “most important and valuable resource used to produce goods and services” (p.50) and should be especially engaged during turbulent times through effective internal communication. Again, EI leads to both individual and improved organisational performance, increased profitability and a key determinant in organisational effectiveness (Osborne & Hammoud, 2017). These findings emphasise the critical role of employees in achieving organisation performance.

The issue of Technology Scouting (TS) in OI (Wang et al., 2018; Yoon et al., 2018; Stute et al., 2021), has received critical scholarly attention. The OI literature also suggests that the ability of the organisation to put innovative ideas or technology to practice and hence improve organisational performance, requires the organisation to develop internal relevant

capabilities to enhance accessibility and integration (Wu et al., 2013). Hence, researchers have started analyzing the influence of TS to detect opportunities and threats in the technological environment (Monteiro & Birkinshaw, 2016; Tajudeen et al., 2019). Relevant studies on OI research reveal there is a relationship between TS and OGI in the Small and Medium Enterprises (SMEs) sector (Parida et al., 2012; Akinwale, 2018) as well as the manufacturing and high-tech sectors (Frishammar & Hörte, 2005; Alexy et al., 2012). Similarly, Wang et al. (2015), also identify TS as a crucial element of OI (especially in the public sector).

The moderating role of ABCAP measures its influence or impact on organisational performance. Organisations with higher ABCAP dramatically benefit from the inflows of knowledge influencing its performance (Escribano et al., 2009a). Further, the extent to which an organisation responds to external knowledge-gathering, coordination, filtering, dissemination and implementation is determined by its ABCAP (Liao et al., 2003). According to Liao et al. (2003), the performance of SMEs increases when external resource acquisition capabilities and internal organisation knowledge dissemination (integration) is well developed. Absorptive capacity as a moderator statistically influences the performance of organisations as it serves as filtering and a means of integrating external stimuli (Gkypali et al., 2018). That is, ABCAP as a moderator influences the relationship between an organisation's search strategy and innovativeness. Another empirical study on ABCAP as a moderator indicates that it is a source of competitive advantage and leads to performance especially in turbulent knowledge industries (Escribano et al., 2009). As a multi-dimensional construct, ABCAP relates to both the internal dimension (individual) and the external organisational dimensions (Chesbrough & Bogers, 2014; Bogers et al., 2017; Gkypali et al., 2018; Distel, 2019; Russo-Spena & Di Paola, 2019). Hence ABCAP (internal and external dimensions) and OI (in-bound, out-bound and coupled) are connected as they focus on the same practices because "open innovation is not possible without absorptive capacity" (Vanhaverbeke et al., 2008, p.16).

The academic literature therefore, recognises the critical role IOI, EI TS and ABCAP as having a relationship with improved organisational performance in OI activities (Escribano et al., 2009; Rohrbeck, 2010; Chiaroni et al., 2011; Uzokurt et al., 2013; West

& Bogers, 2014; Wang et al., 2015; Parveen et al., 2015; Danquah & Amankwah-amuah, 2017; Akinwale, 2018). Specifically, facilitating knowledge transfer from external sources in OI requires combining knowledge inflow activities (such as IOI and TS) with internal factors (such as EI), and capabilities (such as ABCAP) to improve an organisation's performance, facilitating interaction and information flow among stakeholders.

The capacity, openness and inclination to use novel technology in the PS impacts the implementation of the imported technology (Al-Obthani & Ameen, 2019). Innovativeness is enhanced by internal and external factors and important cultural antecedents at the intra-organisational level, encouraging innovation behaviours (Tsai & Yang, 2013). Also, the success of PS innovativeness depends on two critical factors of employee job satisfaction and organisational commitment (Tajdini & Tajeddini, 2018).

Extant literature indicates that for organisations to be successful in implementing OI, they must address micro foundation issues. These issues relate to individuals, innovation processes and organisational structures (Felin et al., 2012b ; Zynga et al., 2018; Yun & Liu, 2019) to achieve innovativeness. For instance, to achieve a breakthrough in innovation activities, organisations are required build the individual member's innovation capabilities to enable them recombine, transform and integrate internal and external resources (Cheng & Chen, 2013). Particularly, some studies suggest that the role of individuals as scouts or gatekeepers may contribute to OI implementation success (Lazzarotti et al., 2015). Further, organisations can overcome barriers in the OI process by balancing internal capabilities and external resources which require them to have core competence in management, R&D and market exploitation (Pontiskoski & Asakawa, 2009).

Hence, studies focused on OI have shown that organisations need to balance between internal and external sources of knowledge to achieve superior performance (Vanhaverbeke et al., 2008; Clausen, 2013; Ahn et al., 2016; Akinwale, 2018). For instance, organisations need to combine internal knowledge through training, continuous improvement and developing the knowledge of R&D staff with knowledge from internal sources (Svetina & Prodan, 2008) and the use of internal capabilities and external

resources (Pontiskoski & Asakawa, 2009) to achieve innovation performance. Similarly, organisations that possess both potential and realized absorptive are can integrate external resources resulting in improved innovation performance (Crescenzi & Gagliardi, 2018).

In this regard, simultaneously examining the combined effect of IOI, EI and TS on OGI and investigating the specific influence of ABCAP contributes to understanding how organisations benefit from IOI activities in the OI process.

1.2 Problem statement

The background of the OI literature clearly shows an awareness of the relevance and benefits of IOI, TS, EI and ABCAP in adopting OI in PSOs. Despite this increasing awareness and attention, innovativeness research in the PS is small, scattered and lagging behind private sector innovation research (Joseph & Van Lill, 2013; de Vries et al., 2016; Mergel, 2018). Again, there is a lack of clarity in understanding the various mechanisms by which PS employees can proactively innovate (Vivona et al., 2020).

Ollila and Elmquist (2011) suggest that every organisation that engages in OI faces two key challenges: dealing with actors between the two organisations and the challenges of dealing with internal employees. Further, the study of OI in organisations lacks multilevel analysis. Various aspects of the OI dimensions (IOI, EI, TS and ABCAP) are not connected and traced to advance theoretical concepts and successfully understand individual members capacity implement OI (Salvato & Rerup, 2011). As such, studies in OI treat the organisation as a complete unit instead of focusing on the internal and external processes of IOI (Podmetina et al., 2018). Thus, investigating of how IOI processes are managed to achieve innovative outcomes may enhance individual members ability to effectively absorb outside-in knowledge (Salter et al., 2015; Bogers et al., 2017) and promote OGI.

Similarly, Santos (2015) laments that little attention is devoted to examining the role of individuals in OI. Hence, it is unclear how individuals can contribute to its success and how “the organisation can benefit from individual orientation to new ideas and external sources of knowledge”(Santos, 2015, p.159). This apparent lack of focus on the micro-level OI seems to defeat the early argument that the availability of individuals with high

skills, capabilities, ideas and labour mobility constitutes critical factors needed to drive the shift towards OI (Chesbrough, 2003). As such, limited studies have investigated what makes up an individual employee ability to collaborate and integrate external knowledge effectively. Further, studies on the intra-organisational level fail to recognise the holistic effect of the network of individuals and functional departments in OI (Colombo et al., 2011). Both networks of individual employees and functional departments absorb knowledge from external sources in diverse ways. Overall, the literature on intra-organisational-level OI analysis is scant even though the innovativeness strategies highly depend on the individuals responsible making OI a success (Antoncic et al., 2007; Bogers et al., 2017).

At the intra-organisational level, Bogers et al. (2017) observe that an organisation's strategy to implement OI successfully depends on the individual members. Individual employees in an organisation utilise the various resources, collaborate with external partners and capture value for the organisation and the critical factor in the organisation's innovation strategy (Hernandez-Espallardo et al., 2018). , Individual employees in an organisation form are the most critical source of sustainable innovation and competitive advantage (Santamaría et al., 2009) (Hana, 2013). Employees can help improve organisations performance using their abilities and knowledge to acquire technologies, generate ideas, proffer solutions to organisational challenges and improve services (de Jong & Den Hartog, 2010). However, Bogers et al. (2017) lament that the OI literature lacks clarity with regards to *how all employees* (both R&D and non-R&D employees) and managers are involved in the innovation process and their abilities to collaborate; and why certain employees are more willing to embrace technology in-flows than others. Thus, there are challenges at the individual employee level regarding to how members are selected (e.g., based on expertise, capability) to join the innovation team (Ollila & Elmquist, 2011).

Also, how the organisation can embrace change suggested by employees (TS) through the development, identification and integration processes to implement OI from the bottom-up is under-explored (Monteiro & Birkinshaw, 2016; Bogers et al., 2017). The OI research is dominated by technologies imposed on individuals by the organisation (IOI) or other

sources (Bogers et al., 2017). Accordingly, Wang et al. (2015) suggest the extension of TS research into other sectors (*such as the public sector*) accounting for the contingency effect of ABCAP, which may strengthen IOI activities on OGI.

To account for the multilevel effect on IOI, EI and TS on OGI, Bogers et al. (2017) call on researchers to draw on individual level ABCAP to understand the differences in their ability to effectively contribute to external knowledge identification, assimilation and integrating it with internal knowledge. Individual-level ABCAP facilitates members ability to learn about the external environment and benefit from individual capabilities (Emre Yildiz et al., 2019).

Further, while Bature et al. (2018) and Klimas and Czakon (2018) identify OGI as a key driver to innovation performance, the literature on individual innovativeness is unclear how and where individual employees can be encouraged to achieve OGI (Standing et al., 2016).

In Ghana, particularly Customs, studies have investigated how implemented technologies impacted its performance (De Wulf, 2005; Addo, 2016; Osei-Kojo, 2017; Addo & Avgerou, 2020). However, despite the various technologies implemented by Customs, there are still challenges. Addo (2016) found that, despite the implementation of the TradeNet, there was still corruption at customs – both formal and informal personal practices. Further, Addo and Avgerou (2020) found that despite implementing several information technologies to manage customs systems, there is still street-level petty corruption.

Notably, Bogers et al. (2017) bemoan the fact that spite recognising the role of individual factors in enhancing innovation performance, the individual-level factors that determine the level of openness is less investigated. Bogers et al. (2017) identify the role of the individual employees as an effective means of implementing OI strategies. Specifically, Bogers and Horst (2014) identify the individual employees' involvement (engagement, collaboration, participation) as critical to innovation implementation success. Ashton and Stacey (1995) also suggest that getting the right people in the organisation to develop and promote ideas leads to "real organisational change" (p.1). For instance, the role of gatekeepers and technology champions (TS) (Ullrich & Vladova, 2016). Similarly,

Ullrich and Vladova (2016) suggest that understanding the role of individual employees in the organisation is the primary contributor to success.

The individual OI is deeply rooted in individual members' intention to act, their experiences and preferences, and behaviours that shape the organisation's strategy (Ahn et al., 2017). Individual-level OI involves unpacking or decomposing aggregate organisational-level concepts in the form of individual-level action and interaction to understand how individual-level factors impact organisations and understand the mechanisms that overall individual actions lead to outcomes (Contractor et al., 2019). For instance, organisational level concepts and outcomes such as organisational capabilities, strategies and performance can only be understood by understanding the way individual members act and interact – their behaviours (Contractor et al., 2019; Locatelli et al., 2021). Therefore, the capabilities of an organisation can only be determined by understanding the individual-level capabilities. Similarly, solving the challenges of petty corruption at Customs (Addo, 2016; Addo & Avgerou, 2020) may require an understanding of the individual members motivations and capabilities.

This study thus adopts an integrated approach because of the systemic nature of innovativeness in the PS by examining IOI, EI and the TS unit's role simultaneously. This approach is considered the most appropriate because it enables a common understanding of the various actors of perceived innovation and a better accountability of the actors (Bloch & Bugge, 2013); facilitates understanding of the processes and structures of OI at the organisational level (Bogers et al., 2017); helps to understand the human side of OI (individual-level) (Sartori et al., 2017; Ahn et al., 2017) and influences stakeholder engagement for value creation (Saidi et al., 2019). Further, an integrated approach to openness enhances cooperation among stakeholders (both internal and external) (Wagner, 2011) and provides stakeholders with perspectives and insights that enhance their potential to exploit innovative opportunities (Behnam et al., 2018). Overall, adopting the integrated ensures that TS activities may compensate the limitations posed IOI activities and vice versa. For instance, IOI has limitations on internal knowledge generation (ideation) and strategy; but this may be compensated by TS activities of creating general

awareness of market trends, technological opportunities and related threats (Spitsberg et al., 2013).

An examination of the individual employees operating in the OI sphere is important because employees (such as scouts, gatekeepers) form the building blocks of the organisation's innovation capabilities and the key resource of the organisation's innovation (Standing et al., 2016; Zynga et al., 2018). As such, the capabilities of the GRA, is an aggregate of the individual capabilities. Employees play various roles in OI that spans across the boundary of the organisation. They facilitate internal and external development of knowledge, collaborate with external partners and coordinate internal innovation and innovations between partners outside of the organisation (e.g., technology scouts coordinating with external sources of knowledge) (Dahlander et al., 2016; Bogers et al., 2017). Employees are thus the bridge between the organisation and its external partners (Zynga et al., 2018). Nevertheless, studies on how individuals operating in the OI arena interact with its environment is underexplored.

Generally, the methodological approach to OI research is mainly quantitative, qualitative and conceptual involving case studies, questionnaires, interviews, panel data and online surveys (Santos, 2015; Hossain et al., 2016). In the PS, in particular, OI current studies are qualitative in nature through the use of case studies and without a theoretical foundation (Kankanhalli et al., 2017). The phenomenon of OI involves several actors and various relations to enable the exploration and creation of knowledge, thus research in this context using different approaches such as focus group, Delphi methods, mixed-method, experimental economics, industry and policy level surveys, and large scale primary data to collect data concerning the individual level openness and analysis is encouraged (Santos, 2015; Hossain et al., 2016).

This study argues that the developing an organisation's innovative capability cannot be completely understood without understanding the *actions, capabilities, attitudes, interactions and motivations of the individual employees, functional units and other stakeholders*. Therefore, an individual-level point of view, provides the platform and the lens to investigate the collaborations, involvement and capabilities at the individual level (Bogers et al., 2018; Yun & Liu, 2019).

In all, the study investigates the role of external partners as sources of technology and internal staff (all employees and not only R&D staff) in ensuring the successful implementation of technology in the PS (Damanpour et al., 2018). Simultaneously investigating the role of external partners and internal capabilities may provide further understanding of innovation adoption processes and contributions from employees in ensuring successful technology implementation (Damanpour et al., 2018). Regarding the successful implementation of external technology, Crossan and Apaydin, (2010) suggest that understanding how innovation capability delivers successful innovation outcomes is critical to managing innovation creation. After all, the main concern of the OI literature is *when and how (innovativeness)* OI strategies improve organisational success (Hung & Chou, 2013; Rubera et al., 2016). In this regard, Kankanhalli et al. (2017) assert that “the specific innovation outcomes are viewed as less important than implementing an open innovation perspective” (p.10).

However, adopting an integrated approach to OI means that managers must possess the ability to utilize internal capabilities, possess ABCAP to enable them understand and identify the appropriate external innovations; the ability to motivate individual employees to embrace external technology, influence external partners to fully cooperate and build trust among the actors (West & Gallagher, 2006; Lichtenthaler, 2011). This integrated approach is a complex and challenging task for managers to manage (Behnam et al., 2018).

In conclusion, the literature on OI has mainly discussed organisations’ OI activities from the perspective of external knowledge sourcing and collaboration (use of external information and competences) with little attention paid to investigating internal practices (conditions) which must be considered before admitting and supporting external partnership (Kratzer et al., 2017). This failure to incorporate internal factors in the OI persists, although the decision to adopt external knowledge begins with internal analysis of an organisation’s goal and capabilities (strength and weakness analysis) before determining the level of openness and partnership benefits (opportunity and threat analysis) and implementation analysis measures (Ullrich & Vladova, 2016). Further, intra-

organisational dimensions (internal factors) form an important but poorly investigated part in the context of the PS (Santoro et al., 2019).

Therefore, OI research focusing on how individual organisation members pursue OI strategies is overlooked (Bogers et al., 2017), especially in the PS of a developing country.

1.3 Aim of the study

This research aims to empirically investigate and develop an integrated framework to explain the correlational relationship of an organisation's IOI activities on OGI with ABCAP as a moderator by combining and using an alternative and novel theoretical foundation of SC and DCs. To achieve the research aim, two closely related gaps in the OI literature that was previously overlooked is examined. First, integrated IOI activities are underexplored at the individual level and the PS. Second, most of the literature on OGI focuses on organisation performance rather than the individual level innovativeness and in the PS.

Therefore, this research aims to examine the individual-level capabilities of OI in a revenue administration of a developing country by focusing on the actions, attitudes and experiences of employees in the open innovation environment. This approach takes into consideration the acquisition of technology and internal practices.

Therefore, this study aims to link previously unconnected individual-level micro-foundations of OI by integrating the constructs IOI, EI and TS and measuring their impact on OGI. This relationship is moderated by ABCAP and underpinned by the social capital and dynamic capabilities theories. These constructs have often been studied in isolation and at the organisational level. Therefore, the individuals' role and their motivations in engaging in OI activities are not well examined.

1.4 Objectives of the study

The study objectives and questions are stated based on the key constructs of the IVs and the moderators. Study objective one represents three IVs of inbound open innovation (technology inflow), employee involvement and technology scouting. Objective two represents six moderating variables of knowledge recognition capacity, knowledge acquisition capacity, knowledge assimilation capacity, knowledge capture capacity, search capacity and integrative capacity, while the third objective represents the

qualitative aspect of the thesis. Based on the overarching aim of the research, the objectives of the current study are to:

1. Examine the effects of IOI activities on public sector organisational innovativeness.
2. Investigate the moderating effect of internal and external absorptive capacities on the relationship between inbound OI activities and organisational innovativeness.
3. Understand how inbound open innovation activities contribute to OGI in the PS.

1.5 Research questions

To achieve the aim of the thesis, this research identifies the intra-organisational level (individual) of OI in terms of their influence and contribution to the success of the OI implementation. Question one represents the three independent variables while question number eight is qualitative. Questions two to seven represent the six moderating variables. Thus, the problem statement indicated above provokes the following critical research questions which the thesis seeks to answer:

1. What are the effects of IOI activities on organisational innovativeness in the Ghanaian public sector?
2. What is the moderating effect of knowledge recognition capacity in the relationship between inbound open innovation and organisational innovativeness?
3. What is the moderating effect of knowledge acquisition capacity in the relationship between inbound open innovation and organisational innovativeness?
4. What is the moderating effect of knowledge assimilation capacity in the relationship between employee involvement and organisational innovativeness?
5. What is the moderating effect of knowledge capture capacity in the relationship between employee involvement and organisational innovativeness?
6. What is the moderating effect of search capacity in the relationship between technology scouting and organisational innovativeness?
7. What is the moderating effect of integrative capacity in the relationship between technology scouting and organisational innovativeness?
8. How do IOI activities contribute to public sector innovativeness?

1.6 Delimitations of the study

This thesis was conducted within the IOI domain of the OI phenomenon. Specifically, the inbound aspect relates to external technology or knowledge acquisition processes; it does not include knowledge search breadth and depth; EI covers training, effective communication/information sharing, participation in decision making and reward/motivation; TS relates to monitoring and scanning for emerging technologies and threats while absorptive capacity was represented by knowledge recognition capacity, knowledge assimilation, search capacity, knowledge acquisition capacity, knowledge capture and integrative capacity. As the dependent variable, OGI includes the willingness (readiness), possibility and capacity to implement an organisation's new technology. Further, the study was conducted within the Ghana revenue authority between the period September to October 2019. Data was gathered from only senior staff members of the organisation.

1.7 Contributions of the study

This current study focuses on individual-level roles and behaviour and makes three vital theoretical implications. This study, therefore, answers the question of whether IOI activities impacts organisational innovativeness. The findings from this study highlight IOI collaboration and employee involvement positively and significantly related to OGI and the process also determines the type of capabilities individuals need to engage in IOI, activities.

First, the study's primary theoretical contribution is by investigating the various interactive roles of individual employees in the open innovation environment and their effect on organisational innovativeness moderated by absorptive capacity and by drawing from the social capital and the dynamic capabilities theories. Research on this perspective of OI, particularly in the PS, is underexplored, despite the potential, favourable and strong implication on public and human service organisations (Bogers et al., 2017; Shin & Choi, 2019). Previous studies such as (Hung & Chou, 2013; Sisodiya et al., 2013; Moretti & Biancardi, 2020) examined IOI on performance at the firm level. Also, Amah and Ahiauzu (2013) and, Bakotić and Rogošić, (2017) examined EI as an organisational-level construct. Similarly, studies such as (Rohrbeck, 2010; Wang et al., 2015; Wang et al.,

2018; Wang & Quan, 2019) investigated technology scouting impact on performance at the firm level. For this reason, strategically focusing on investigating the IOI activities - OGI relationship is considered a potential solution to addressing organisational challenges (Liao et al., 2010; Tsai & Yang, 2013; Acar & Ozs, 2018) and addressing the role and behaviour of individual employees in the open innovation arena. This increases understanding of the processes involved in OI, the determinants, moderators and the outcomes within and outside the organisation (Bogers et al., 2017).

Second, in employee involvement several studies on the role of employees in the OI arena have suggested the human side of employees on organisation's motivations and performance. For instance, previous studies on the role of employees discussed the size of an organisation's employees and inbound open innovation performance (Naqshbandi, 2018), employee involvement in organisational performance (Rangus & Slavec, 2017), employees technological willingness and performance (Walczuch et al., 2007), employee network and open innovation performance (Whelan et al., 2011), the influence of human-related factors on individual innovativeness (Parzefall et al., 2013), employee diversity and organisation performance (Bogers et al., 2018), and the effect of employee training and development on performance (Sartori et al., 2017). Specifically, Parzefall et al. (2013) identify individual level factors relating to their ability (technical skills, cognitive capabilities, expertise, knowledge) and willingness (satisfaction and motivation) of individual employees to implement innovation. However, these studies have not indicated individual employees' roles and capabilities to implement innovations successfully. By investigating the multiple roles of employees in the OI arena, this study contributes to the OI literature by unpacking the specific roles and processes by which the role of employees influences OGI. Drawing from the dynamic capability theory, this study has demonstrated the types of capabilities employees need to enhance OGI. By so doing, this study adds to the literature on the human side of OI.

Third, the study identifies intra-organisational level capabilities that are needed for OGI. Thus, it contributes to the recent debates of how organisations internal openness (facilitating information exchange) and external factors (collaboration in OI) enhance an organisation's performance and impacts innovation capabilities (Pustovrh et al., 2017;

Shi & Wu, 2017; Ghassim & Foss, 2018). By classifying ABCAP into six dimensions: recognition, acquisition, capture, assimilation, search, and integrative capacities, the study responds to calls for more studies in focusing on the intra-organisational determinants of ABCAP (Bogers et al., 2017; Lowik et al., 2017). This study thus enhances understanding of the intra-organisational level dynamic capabilities and explains why individuals who engage in ABCAP differ. Specifically, this study increases understanding of the intra-organisational level elements of ABCAP that constitute the foundation of the organisation's innovative capabilities. The study thus provides a fine-grained perspective of how intra-organisational capabilities influence vital stakeholders' (managers, non-managers and external partners) in OGI.

Fourth, the alternative unique theoretical foundation of SC and DC theories contributes to this study's novelty. Past studies in OI have been dominated by theories of ABCAP, DCs, the resource-based view and exploration and exploitation to understand knowledge and technology acquisition at the organisation level (Randhawa et al., 2016). Studies suggest that the individual using the social network, understanding the organisation's shared objectives, and trust in the interactive relationship enables them to recognise opportunities in the external environment and facilitate internal information exchange processes (Tsai & Ghosal, 1998; Ramos-Rodríguez et al., 2010). Besides, social capital also facilitates individual innovativeness through interactions (Weerakoon et al., 2019). The social capital theory thus suggests the mechanism by which resources, opportunities could be recognised through information exchange and trust and understanding of human behaviour. Social capital thus demonstrates the potential of individuals to benefit from a relationship and networks (Adler & Kwon, 2002). The literature contends that SC has a multidimensional impact on OI. This may serve as a motivator/a boost or a barrier to innovativeness (Eklinder-frick et al., 2014); a mechanism to achieving OGI (Weerakoon et al., 2019).

On the other hand, dynamic capabilities theory underpins individual capabilities to access the recognised resources, transform and re-align its internal competencies, integrate, deploy and absorb external knowledge (Teece, 2007; Lin et al., 2016; Ferreira et al., 2018). Therefore dynamic capabilities consist of individual capabilities that change the form of

resources (Adeniran & Johnston, 2012). Past studies on DCs suggest that it supports organisations to successfully adopt external technologies and integrate with internal capabilities at the intra-organisational level by simultaneously managing resources and people using relational, sensing, seizing, transforming, absorptive and integrative capabilities (Lin et al., 2016; Bogers et al., 2019).

Social capital allows individuals to build networks and relationships, while dynamic capabilities allow individuals to act and thus support innovation creation. The current study increases understanding of intra-organisational-level dimensions of OI that is the foundation of innovative capabilities of the organisation (Schneckenberg et al., 2015)

The combination of these theories gives a better understanding of the innovativeness of individuals in the organisation. Previous studies combining social capital and dynamic capabilities focused on organisation's performance (Schenkel & Teigland, 2016) and an understanding of the techno-economic performance development in the Lahti region of Southern Finland (Pihkala et al., 2007).

Fifth, the study introduces individual ABCAP to account for the contingency effect of IOI, EI and TS to better understand their influence on OGI. Drawing on the ABCAP literature at the individual level, it enhances understanding why individuals operating in the OI environment differ in their ability to effectively identify outside knowledge, transform, assimilate and integrate it with internal capabilities to create innovation (Bogers et al., 2017). This is an additional novelty. The introduction of ABCAP as a moderator contributes to understanding how the ABCAP process unfolds through individual actions and interactions. This process model perspective is key because the core contribution to the ABCAP literature is developing a process model showing how individual employees absorb new knowledge from external sources (Sjödin et al., 2019). Huang and Rice (2009) and Escribano et al. (2009a) emphasise the moderating influence of ABCAP on an organisation's ability to innovate. Further, Zobel (2017) suggest that the presence of ABCAP in OI activities enables the organisation to capture value. Absorptive capacity and OI are related, and organisations that possess ABCAP can identify external sources of knowledge and efficiently exploit them (Escribano et al., 2009a). This study theoretically confirms the multidimensional moderating role of ABCAP between IOI

activities and OGI, thereby given a new and unique insight into understanding the various components of fine-grained interaction effects. Previous studies suggest that the presence of both potential absorptive capacity (PACAP) (recognition and assimilation, search or sensing capabilities) and realised absorptive capacity) RACAP (knowledge capture, integrative capacity) lead to innovation success (Zahra & George, 2002; Zobel, 2017), especially in IOI (Nitzsche et al., 2016). This study findings suggest otherwise. This study finds that individuals with PACAP may not contribute towards innovation success while those with RACAP may work towards a successful OI project. Therefore, the current study contends that individuals vary in their ability to effectively contribute to IOI activities because of their levels of ABCAP (Bogers et al., 2017). Therefore, the study makes a novel contribution to the OI literature by clearly explaining how ABCAP influences internal and external practices at the micro-level.

Sixth, this study contributes to the OI literature by investigating the relevance of OI in new context – the public sector of a developing country that has been less explored (Lalic et al., 2017; Mergel, 2018). Most of the OI studies is dominated by Europe, with the United States of America (USA) indicating that there is a gap in Asia (except China and South Korea), Africa (such as Ghana) and other developing economies Lalic et al., 2017; Le et al., 2019)). As a developing country, Ghana mostly relies on external technology to accelerate its innovation activities. Hence, the need to comprehensively examine factors that influence organisational readiness to implement externally acquired technologies is appropriate. Findings from a developing economy apart from Europe and the USA would enhance understanding of the OI phenomenon and its implications because cultural differences (values, norms, beliefs) and the behaviour of individuals can either promote or inhibit innovation (Reaei et al., 2018). Thus, obtaining evidence from a developing country such as Ghana indicates that OI research is not only relevant in the USA and the developed economies (Le et al., 2019).

Seven, this study also clarifies the mechanisms by which PS employees can contribute by proactively taking part in the OI process. Vivona et al. (2020) observed that while employees were critical to the success of the organisation in the OI environment, the mechanisms by which they could contribute was not clear. This study findings clearly

shows a holistic approach by which individual members can proactively contribute to innovation creation.

Eighth, individuals and technology scouts in an organisation absorb knowledge from various sources in diverse ways (Colombo et al., 2011). Therefore, their motivations and capabilities may differ. This study demonstrates the motivations behind non-R&D employees, the needed capabilities to innovate, and the technology scouts.

Ninth, the study makes a methodological contribution by using a mixed-method approach (quantitative and qualitative) to collect data to enhance the understanding, role and influences of various actors and relations in OI activities

Tenth, this study enriches the OI literature by proposing the integrated social dynamic approach to open innovation - using the collaboration, involvement and scouting (CIS) framework. This approach emphasises more openness to OI by collaborating with partners in the innovation process, involving employees (managers, non-managers and specialised units such as the IT or scouting unit) and key actors. By applying this CIS framework, the individual behaviour, roles, motivations and capabilities can be identified.

This study also makes unique contributions to managerial practice:

First, this study offers empirical support for the suggested model indicating that IOI activities and practices are essential sources of innovating employee readiness. Hence managers as agents of innovation must commit to and pay attention to this.

Second, managers must consider as a key priority the involvement of employees (both scheduled and non-R&D staff) in external technology acquisition processes (Phipps et al., 2013). Employees involved in IOI activities consider it an obligation to create innovation, a form of job satisfaction, increase productivity and a way of enhancing understanding between management and employees (Hansen et al., 2017).

Third, as generally observed, internal employees do not often determine the source and type of external technology to be procured (Kim & Chang, 2009). Therefore, PS managers

must take caution in implementing external technologies as employees may exhibit Not-invented-here (NIH) attitudes.

Fourth, by shedding light on the moderating role of ABCAP in the link between IOI activities and OGI, this study provides PS managers with a practical EI approach to further increase OGI individual employees.

Fifth, the outcomes of this study provide guidelines in promoting innovation creation activities. Implications of the study based on the findings are provided in Chapter 5.

According to Cricelli et al. (2016), there is increasing gap between industry and academia because of the decreasing influence of conference and scientific journal and the marginal role of research institutions in organisations. This study bridges this gap by making both theoretical and practical recommendations.

1.8 Definitions of key constructs

Table 1.1 Definitions of key constructs in the study

Construct	Definition
Open innovation	“A distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model” (Chesbrough & Bogers, 2014, p.12)
Inbound open innovation	This describes the purposive inflow of knowledge with respect to technology exploration and activities of innovation to acquire and benefit from outside sources of knowledge (technology) (Mazzola et al., 2016)
Outbound open innovation	This refers to the process by which organisations make a profit by taking ideas to the market, selling intellectual property and increasing technology by making available ideas (technology) to the external environment (Enkel et al., 2009)
Technology scouting	A systematic process by which organisations assign part of their employees or engage professional external consultants to scan and monitor the environment and gather information in the field of science and technology and through which they facilitate or execute technology sourcing (René Rohrbeck, 2010) to assist in organisational innovative efforts (Akinwale, 2018)
A capability	The ability of the organisation to perform by exploiting resources and following business processes and routines that enable them to transform an input into output (Javidan, 1998; Hart & Dowell, 2011)
Employee involvement	Employee involvement describes the recognition by workers in an organisation that they have participative decision making powers to influence the way work is organised and executed; provided with the needed training to do the work; receive the necessary information relating to the work and rewarded for executing the work to achieve organisational innovativeness (Fenton-O’Creevy, 2001; Sims, Serbrenia & Sims, 2002; Riordan, Vandenberg, & Richardson, 2005)
Organisational innovativeness	The willingness, capacity, ability and commitment by employees to innovate and openness to identify, adopt, develop or implement new ideas or technologies (Kessler et al., 2015; Binder et al., 2016)
Absorptive capacity	This refers to the individuals’ capability to acquire and assimilate inbound OI and to transform the assimilated knowledge into improved performance (Zahra & George, 2002).
Market turbulence	The degree of change in the composition of customers, their behaviours and preferences (Kohli & Jaworski, 1990 ;Jaworski & Kohli, 1993) that may affect organisational innovativeness
Technology turbulence	The degree of technological change of product and process technologies used to transform inputs into outputs (Kohli & Jaworski, 1990; Jaworski & Kohli, 1993)

1.9 Organisation of the study

The study is delineated into five distinct chapters.

Chapter one: This is the introductory chapter as it captures the study background, problem statement and purpose. The chapter also discusses the gaps motivating the study and general contributions. The aim of the study, research questions and objectives are set in this chapter.

Chapter two: This chapter reviews the extant literature and critically examines the theoretical foundations and rationale of the arguments on IOI, EI, TS, ABCAP and OGI. The conceptual framework of the study is also developed in this chapter. In this chapter, discussions on the various approaches that researchers use to study OI, including the various measures used to understand the nature of OI and its influences on PS innovativeness, are studied. The chapter continues with critical reviews of the existing forms of OI and models used in an attempt to measure OI and the explore their influence on organisations. The theoretical model to test the role of IOI activities on OGI in the PS is proposed in this chapter based on the concepts that emerged from the literature review. The chapter also develops relevant and testable hypotheses for the study considering the research questions, theory discussion, logic and empirical aspects.

Chapter three: This chapter presents the methodological aspects of the study. The chapter discusses the research philosophy, methodological paradigm, research design and approach, the study population, data collection tools and statistical analysis. This chapter also justifies all decisions taken on sampling, data collection and analysis methods.

Chapter four: This chapter presents the data analysis and results of the quantitative data collected for the study and the qualitative findings. The methods used for the data collection, analysis and interpretation, quality checks, correlation analysis, path analysis and the reliability and validity of the analyses are presented here.

Chapter five: This is the concluding chapter of the study. It discusses the study results and concludes after critically evaluating the results and relating them to past studies. The concluding chapter discusses answers to the research questions posed in the introductory chapter and revisits the study objectives. It also highlights the significance of the research

proving the contributions made to knowledge in both theory, and practice. Limitations arising out of the study are indicated and recommendations for the future are study stated.

Chapter Two: Literature Review

2.1. Modes of open innovation in the private and public sectors

Research on the phenomenon identifies two main types of OI: inbound and outbound OI (Singkarin & Liu, 2012; Naqshbandi et al., 2014; Martín-de Castro, 2015; Chesbrough, 2017; Lopes & de Carvalho, 2018; Sivam et al., 2019). Similarly, Van Der Meer, (2007) identifies two modes as knowledge importing and knowledge exporting mechanisms while van de Vrande et al. (2009) described the two main knowledge transfer mechanisms as knowledge exploration and knowledge exploitation. A key idea in OI is that knowledge can be transferred across a business firm's boundaries. Internal knowledge diffuses to outside the firm, while at the same time external knowledge penetrates within. Under the OI paradigm, all knowledge (internal and external) can find their way to commercialisation for existing or new markets by crossing the firm's boundaries. The academic definition of OI links the two main types of OI including other means of resource acquisition. Enkel et al. (2009) however added a third activity of OI called coupled OI. Thus, the OI phenomenon comprises three streams: inbound, outbound and coupled OI (Oltra et al., 2017). Following the inbound, outbound and coupled classification trends, Ahn et al. (2013) similarly identify three modes of OI based on the directional flow of knowledge, idea or technology: inflow, outflow and a bidirectional. Studies in OI often deal with the inflow/exploration and outflow/exploitation processes across the organisation's boundaries, hence the OI paradigm focuses more on these two streams (Huizingh, 2011).

The main idea in OI paradigm is that knowledge (internal and external) can be moved across the organisation's boundaries (Ahn et al., 2013). Internal knowledge can be transferred outside the organisation, while external knowledge flows into the organisation.

Inbound OI refers to internal use of external knowledge by establishing relationships with external partners and accessing resources to improve organisation's performance (Chesbrough, 2017) and innovativeness. This mode is also referred to as knowledge importation, exploration or knowledge in-flow.

Out-bound OI refers to external exploitation of internal knowledge by allowing unused and underutilised resources to go for others to use in their business models (Chesbrough,

2017). That is, a situation where organisations collaborate with external partners to make use of their underutilised technological resources or ideas thereby building their technological capabilities/competencies through commercialisation which includes the process of authorisation (free OI) and outsourcing (Zhao et al., 2016). This process is also described as *outflow* of knowledge involving licensing out or selling underutilised technologies (licensing-out), spin-off part of the organisation to develop and commercialise disruptive technologies (venturing/spin-off) and using an internal part of the organisation to develop a new market and test consumers responses (open sourcing) (Ahn et al., 2013).

The *coupled process* refers to “co-creation with (mainly) complementary partners through alliances, cooperation, and joint ventures during which give and take are crucial for success” (Enkel et al., 2009, p.313). This is also a *bidirectional flow* of knowledge which involves undertaking R&D projects with outside partners (Co-R&D) and or acquiring potential firms or building alliances to absorb their ideas or knowledge (M&A or alliancing) (Ahn et al., 2013). The coupled OI process involves a combination of inbound process (to obtain external knowledge) with the outbound process (to bring ideas to market) by jointly developing and commercialising innovation at the same time. Zhao et al. (2016) however describe the *coupled process as integrated inbound and outbound OI* where the organisation imports technological resources and exports internally developed technology in the innovation process - a process that combines openness in resource acquisition and exploitation. Figure 2.1 depicts the three categories of OI.

In this current study, OI is defined as “the simultaneous use of internal and external resources to strengthen the innovation capabilities of a firm and improve innovation performance” (Mention & Asikainen, 2014, p.237). This definition emphasises the role of both internal and external elements. The concept suggests an innovation creation process where organisations deliberately or willingly make their boundaries permeable to enable them internalise external knowledge by collaborating with external partners (Naqshbandi & Kamel, 2017). To achieve this, the organisation may be required to establish a network of relationships with other organisations. This implies accessing and acquiring resources such as technologies, knowledge and ideas.

Recent OI studies in the PS show that it has different strategies to leverage external resources and knowledge. According to Yuan and Gasco-Hernandez (2019), OI strategies in the PS can be categorised into three events: *crowdsourcing*, *challenges and contests* and *hackathons or app contests*

Crowdsourcing events describes processes by which governments leverage the collective intelligence of online users by calling on large, often undefined online platform users, “to solicit ideas, feedback and content so that many different people can contribute to the solution of a complex government task” (Yuan & Gasco-Hernandez, 2019, p.3). Crowdsourcing approach is normally used by PS managers when they lack the resources and expertise to solve a public problem (Mergel & Desouza, 2013).

Challenge and contests are new approaches of engaging external stakeholders or citizens online in solving public challenges, designing solutions and processes to implement new policies (Mergel & Desouza, 2013). According to Mergel (2018), the United States government agencies use this approach to post problems related to their agencies, collect feedback, evaluate and analyse the ideas with the goal to discover factors that may drive or inhibit innovation implementation, hence enhance government innovation. This approach is also used to discover new ideas from stakeholders to solve both social and technological challenges (Mergel & Desouza, 2013).

Civic hackathons also known as app contests are government sponsored events which normally last between one to two days where governments engage their citizens and the software development community using open government dataset to promote and design digital solutions or applications that solve public problems (Johnson & Robinson, 2014; Yuan & Gasco-Hernandez, 2019). Civic hackathons normally present particular challenges where government require participants to develop apps aimed at meeting the needs of society and local government, and participants rewarded (Johnson & Robinson, 2014). Civic hackathons events provide the platform to engage the public and build relationships, build digital prototypes and create awareness in government about OI and open government (Yuan & Gasco-Hernandez, 2019).

2.2 Open innovation research – a review of current trends

In the first decade of this century, OI research has changed and reshaped the way we think about “the nature of organisations and how they acquire and commercialise innovations” (West & Bogers, 2017, p.5). Therefore, the concept of OI has recently attracted a lot of attention, both in practice and in academia. One of the key reasons is that the OI concept fits very well with a lot of trends and contexts in the broader perspective of management (Huizingh, 2011) such as the financial sector (Widayat & Masudin, 2020) and by SMEs (Guertler & Sick, 2021). As such, the OI concept is one of the main key research areas in the academic circles and a topic for debate by innovation and management scholars in recent past, with many questions still requiring further investigation (Chiaroni et al., 2011). This phenomenon still persists in spite of the fact that there is an increasing trend of adoption of OI by organisations (Cricelli et al., 2016). The phenomenon emphasises the use of knowledge and resources external to the organisation. That is an important strategy combining internal and external knowledge in implementing technologies (Huizingh, 2011). In this regard, the OI model relies on inter-organisational relationships to implement external ideas and also commercialise internal ideas that do not fit the organisation’s business model (Chesbrough, 2006). Indeed, OI is broad and enables organisations to pursue new opportunities that empower employees and other stakeholders to confront challenges from both internal and external sources and improve innovativeness (Sivam et al., 2019). Thus, the basic context of OI is opening up the innovation process to all key stakeholders to enable knowledge and resources to move freely, exchanged and transformed to create value and foster stronger innovation culture (Huizingh, 2011). This is the future of OI – a future that is more extensive, collaborative and engaging with a large group of stakeholders (Chesbrough, 2017).

Initially, the works on OI primarily focused on research and development (R&D) processes, but several areas of research such as innovation management, strategy, organisational behaviour, technology management, general management among others have grown out of this perspective (Gassman et al., 2010). Open innovation has followed different paths, which shows the multidimensional nature of the concept (Latouche, 2019). This section examines some of the pillars of OI, the trend of OI (Bogers et al., 2017) and the various established perspectives and research landscape of OI, and the human side of

OI all in an attempt to get a holistic understanding of the concept and identify important gaps in the literature.

At the annual meeting of the Academy of Management on OI research landscape and emerging themes comprising several scholars, several opportunities for future research at various levels of analysis were identified: intra-organisational, organisational, inter-organisational, extra-organisational, and industrial, regional and societal (Bogers et al., 2017). These levels also had gaps for future research from various perspectives and emerging themes. This study only focuses on the intra-organisational level.

While admitting that the success of OI strategies relied on employees, relatively little is known about how individuals within organisations handle challenges and strategies relating to OI (Bogers et al., 2017, p. 6). To fill this gap, it was suggested that future research should aim at investigating the factors that can enhance the ability of employees to deliver OI and also motivate both employees and managers. Also, research should examine how managers select from various inbound OI opportunities. In doing this, the research should draw on the absorptive capacity literature at the individual level. Further, there is the need to examine the mechanism that permits organisations to adapt to changes such as inbound OI implementation or technology scouting as suggested by individual employees. Particularly, there is the need to distinguish between internal and external mechanisms of OI so as to accommodate valuable suggestions from employees and external partners. Doing this will help understand the role and perception of employees in OI activities. Further, employees may perceive the adoption of OI strategy as a threat to their job, hence exhibit NIH syndrome. To avoid this, it is critically important to examine the “the impact of division of labour” (p.7) – how technology scouting units are involved in the adoption, development, identification and integration of external knowledge from external sources. As the organisation moves towards OI, this level of analysis help understand and explain the behaviour of individual characteristics, challenges, customer (employee) integration and rapid changes in technology. The scholars also identified two major perspectives of intra-organisational studies and other emerging themes that deserve future investigation as indicated in Table 2.1 shows some emerging themes of intra-organisational level OI research.

Table 2.1: Emerging themes of intra-organisational level OI research

Level of analysis	Dimension	Emerging themes	Important contingencies	Possible empirical studies
Intra-organisational	Organisational behaviour	Employee commitment, resistance to change, identity, motivation, communication, and learning of individual employee involvement in OI	The extent of OI challenges and organisational, costs and contradictions	How employees are formally engaged in IOI Workshops and other meetings with R&D (other technical departments) employees on how to overcome the NIH syndrome and adapt change/
	Organisational design	Both formal and informal structures as well as managerial processes that enable various forms of openness	Strategic objectives, HR management and stages of growth	Investigation involving methods such as surveys, qualitative and sequence analysis Determine when various routines, incentives, policies, and practices are needed to engage and use in OI

Source: Bogers et al. (2017).

Santos (2015) examines the trend and influences of OI research using bibliometric analysis methodology - analysing references; identifying frequently used words in abstracts; analysing the references' titles and identifying thematic areas of research. The study concluded that the main level of analysis in OI is the firm (organisation). Therefore, to understand the influence and relevance of OI research, other levels of analysis (such as the micro-level level) must be considered in future studies. The study thus identifies

several gaps including how individual orientation can contribute to OI activities emphasizing that this level (individual level analysis) has received little attention in the OI literature. Such future investigations should consider the various economies geographic locations because OI activities are focused on U.S. and Europe. In Europe, majority of the studies focused on the North and Central countries, with little attention on Southern countries (except for Italy) or Eastern Europe; the OI phenomenon is also barely investigated in African countries (Santos, 2015).

In terms of methodology, the research finds that OI studies are mainly empirical, case studies and the use of questionnaires. To enrich the concept, other methodologies such as focus groups, online platforms or the Delphi method; forecasting methods or mixed methods should be used to collect data for analysis as the phenomenon involves various actors. Hossain et al. (2016) also suggest that in terms of *methodology*, many studies in OI adopted quantitative approach using online survey and panel data followed by qualitative using interviews and a few studies using conceptual approach. *Surprisingly, only one study used the mixed method approach.* While OI studies concentrated at the *organisation level, research at the national, industry and policy level is scarce.* Future empirical investigations on the applicability of OI at the industry, national, regional and global levels are needed. The perspective of the user is recognised as an important aspect of the OI process. But, guidelines on how organisations engage users in OI are still limited. Knowledge about mechanisms to successful operation of OI platforms is limited. Studies on the success factors of OI have also been scantily investigated. Table 2.2 shows various themes, existing studies and avenues for future studies in OI.

Table 2.2: Themes, existing research and research gaps in OI

Theme	Existing research	Future research avenues
<i>Area of study</i>	• Developing OI concept • Focus on high-tech firms • Focus on large firms • Focus on western firms • Focus on inbound OI	• Studies with the SME context • Beyond high-tech-firms • Public sector studies • Focus on developing countries • Outbound OI • Coupled OI • Open business model • Determine performance of OI (innovativeness) • Open service innovation • IP management
<i>User perspective</i>	• Integrating users into OI processes • Generating ideas from external sources • Incentives and motivations of users	• OI platform processes • How and when to initiate innovation • Problem solving approach as a profession • Individual idea generation and interactions among users and the organisation
<i>Material and Methods</i>	• Single case studies • Use of panel data • Surveys using online platforms • Interviews • Quantitative approach • Qualitative approach • Conceptual approach	• International firm surveys • Regional surveys • National surveys • Longitudinal studies • Policy level studies • Industry level studies • Large scale primary data • Generalisability • Mixed methods research approach
<i>Scholars</i>	• Studies dominated scholars from USA and Europe • Scholars form only a small percentage of research institutes	• More research scholars and institutes • Studying OI in the context of developing economies such as Brazil, India, China

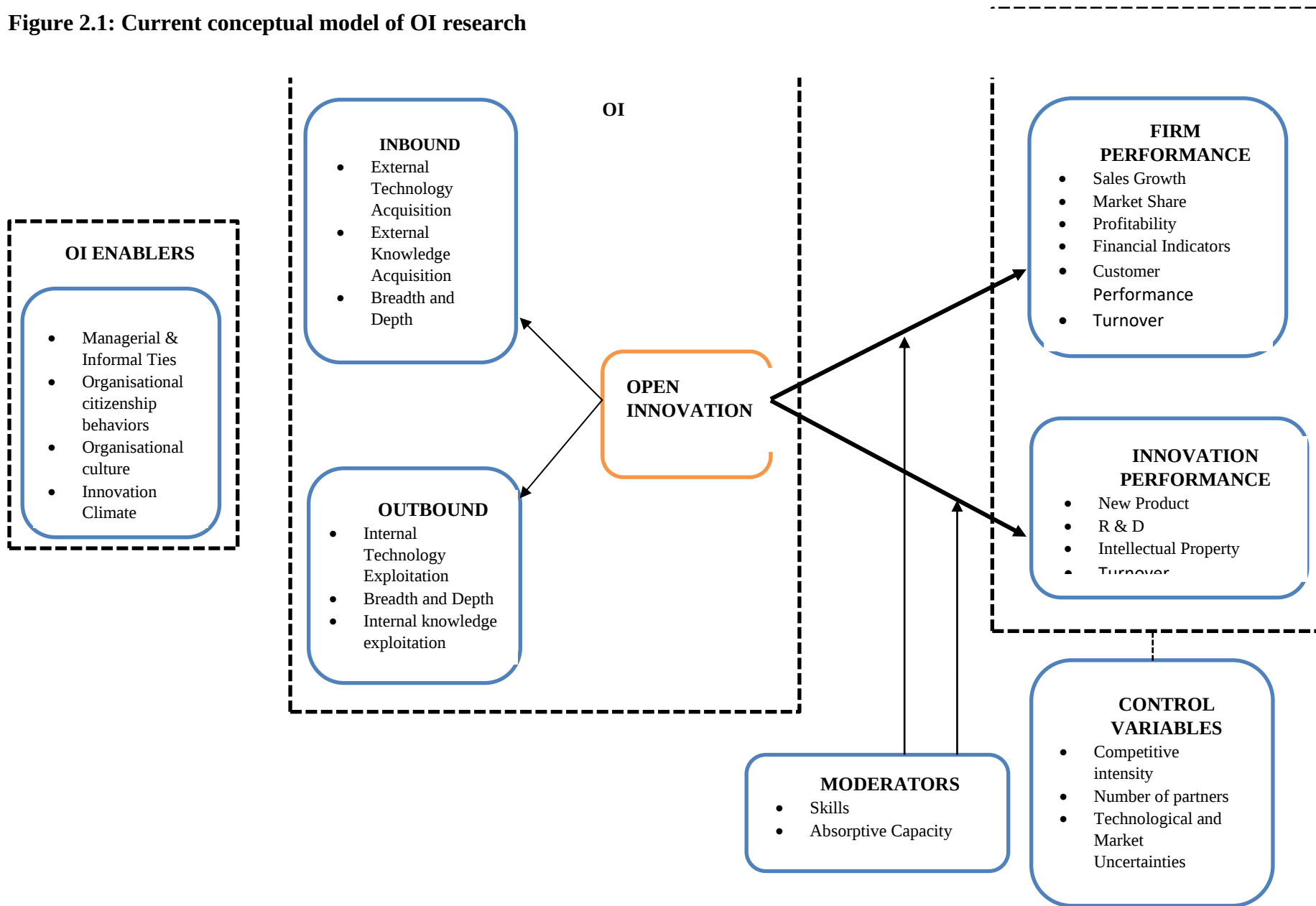
Source: Hossain et al. (2016)

Saidi et al. (2019) present a new perspective and discuss a comprehensive stakeholder approach to understand the nature of collaboration among them in moving from closed to open innovation or the adoption and implementation of OI. They identified factors that influence this relationship as: knowledge, collaboration, the organisation, strategic vision and financial issues. These factors could facilitate or hinder innovation.

In recent years, trend analysis in the OI paradigm reveals various outcomes. For instance, Cricelli et al. (2016) conclude that customers, suppliers and partners constitute the most important sources of innovation while universities and non-profit research institutions constitute the least sources of innovation (Cricelli et al., 2016). Again, there is a decreasing influence of conferences and scientific journal on organisations which increases the gap between industry and academia.

Lopes and de Carvalho (2018) investigates the evolution of the OI paradigm and identify the key variables of the construct since its evolution including the outcome variables, analysis of the moderator variables effects, control variables, antecedents and enablers. These variables are grouped into OI antecedents, contingent variables (control and moderators), OI constructs (inbound and outbound) and performance variables. Figure 2.1 shows the various variables and their dimensions. The study identifies two main independent variables (inbound and outbound OI) and two main outcomes (performance and innovation outcomes).

Figure 2.1: Current conceptual model of OI research



Source: Lopes and de Carvalho (2018)

The study concludes by suggesting future research directions to enrich the concept. Thus, future research is required to determine:

- the impact of OI on organisational and innovation performance using quantitative measures by considering the contingent variables
- identify key success factors that give an organisation a sustained competitive advantage using the OI business model
- analyse organisations transition from closed to OI as most of the studies examine the current situation of the organisation.

This review of the current trends in OI studies indicates the interest of organisations in adopting OI, especially IOI. Whereas Cricelli et al. (2016) identified the increasing interest in *inbound and coupled adoption of OI as well as breadth and depth search of technology*, no hypothesis was formulated. So, to understand the impact of IOI on innovativeness, this study formulates and tests hypotheses.

2.3 The intra-organisational perspective of the IOI paradigm

Further, OI is analysed from different levels. The literature addresses OI from four different levels (Vanhaverbeke, 2006). The first level is the *intra-organisational* level or networks which examines how the internal capabilities of organisations help improve the assessment, integration and externally acquired knowledge. The next level of analysis is the *organisation*. Another level is the *dyad level* - that looks at the interest of two or more organisations in the relationship tied to each other through equity or non-equity alliances, corporate venturing investments, etc. The final level of analysis is the *inter-organisational* level or network which consists of national and regional innovation systems. Similarly, Randhawa, Wilden and Hohberger (2016), suggest that the discussion on OI should focus on *the network point of view* - that is how partners in the OI network benefit from the relationship; the *perspective of the users of innovation*; the *community perspective* that examines the role of community-based innovation systems and integrating it into the main OI research. The third group of OI analysis proposed by West et al. (2006) categorized OI levels of analysis into *individual and group level*, *inter-organisational perspective* or

network, *industry and sector, national institutions and innovation systems and firm organisation level network*. Again, Bogers et al. (2017), analysed OI research into five levels: *intra-organisational, organisational, extra-organisational, inter-organisational and industry, regional innovation systems and society*.

While the OI literature has identified several perspectives of research, the current study focuses on the intra-organisational perspective. The intra-organisational level, which is also the user perspective or individual level analysis discusses OI research at the individual, group, team, project, business unit and functional areas level (Vanhaverbeke, 2006; West et al., 2006; Fleming & Waguespack, 2007; Chesbrough & Bogers, 2014; Randhawa et al., 2016) including the challenges and motivations of individuals in OI adoption. *For instance, while individuals are considered the most important factor in the innovation and knowledge management process (de Sousa, 2006), little is known about how individuals are handling challenges in the OI processes (Bogers et al., 2017).*

Intra-organisational level analysis is important because it is responsible for creating knowledge, obtaining, transforming, integrating, information sharing, and knowledge absorption within the organisation and its innovativeness (Colombo et al., 2011; West & Bogers, 2014a). Simply acquiring valuable technology or new ideas from outside into the organisation does not guarantee results (Tsai & Wang, 2009; Clausen, 2013; Flor, Cooper, & Oltra, 2018); it needs to be integrated and combined with other processes and internal knowledge to achieve the desired outcome for the organisation (Chesbrough, 2011). This include internal mechanisms of building ABCAP/internal technological capabilities which are critical in determining organisation's performance and sourcing external technology or knowledge (Vanhaverbeke et al., 2008; Robertson, Casali, & Jacobson, 2012; Clausen, 2013).

This means to benefit from OI activities, employees or internal R&D remain very critical to its success. For example, analysing OI strategies at this level enables the organisation to address the challenges of changing the organisational not-invented-here (NIH) / not-sold-here (NSH) syndrome, and organisational inertia and appropriately respond to challenges of external knowledge inflows (Chen, 2013 ; Burcharth et al., 2014; Salter et al., 2014; Nakagaki et al., 2015; Antons & Piller, 2015; Kratzer et al., 2017. Further,

understanding the role of individuals help in identifying the risks and their level of openness to OI; enhances effective engagement of employees and shows the commitment of management (Kuye & Sulaimon, 2011; Bogers & Horst, 2014); and increases understanding of the role of the TS unit in the external knowledge acquisition process (Alexy et al., 2012; Lopez-Vega et al., 2016; Bogers et al., 2017). *Intra-organisational OI which is cognitive, social and structural in nature also determines the overall innovativeness of the organisation* (Bogers et al., 2017). Indeed, the effective management of intra-organisational relationships is a critical factor and a key prerequisite for the successful management and performance in various contexts (Tuominen et al., 2000) including organisational innovativeness.

Consequently, there is the increasing recognition that some aspects of the organisation need to be considered as the unit of analysis (such as the intra-organisational level) to enrich our understanding of the antecedents, mediators, moderators, processes, individual role and theoretical integration to reshape discourse and policy about the characteristics of organisations (West & Bogers 2017).

To address the above concerns, this study extends the study of IOI beyond the high-tech sector to the public sector and in a transition economy. The level of analysis is at the individual level using integrated theories of SC and DCs. This will contribute to the OI paradigm from a more nuanced perspective. Achieving this will help enhance the impact of OI on other fields and address the theoretical and empirical difficulties. It will also afford better decision making among managers and provide guidelines in effective OI collaborations across the value chain – from employees to external partners. Also, adopting a DC approach, this study aims to assist managers in the PS to identify opportunities for OI and a broader organisation reconfiguration to capture value from those opportunities.

2.4 Intra-organisational level (internal) capabilities, external factors and success factors of IOI

Through literature review, several factors of successful open innovation have been identified. Particularly, accessing external resources requires the organisation to possess internal capabilities or innovations. Internal innovations enable an organisation to effectively access, tap, use, internalize, and exploit such external technology or knowledge to enhance internal innovation capabilities and development (Oke et al., 2013). In the OI paradigm, internal innovation is “supplemented by systematic scanning for external knowledge, (facilitated by firm investments in absorptive capacity) with firms maximizing the returns that accrue from both sources” (West & Gallagher, 2006, p.3). It thus represents the internal efforts made by the organisation to discover, access, assess, acquire and develop new and valuable technological solutions (Caloghirou et al., 2004). These internal capabilities form an integral part of the organisation’s innovation processes which facilitate innovation activities (Pustovrh et al., 2017a). Table 2.3 presents some internal capabilities needed for IOI and applied theories.

Table 2.3: Internal capabilities in IOI and applied theories

Capabilities	Author (s)/year	Theory (ies)
Absorptive capacity, investment in research and development, training (HR development), scanning the external environment for information and knowledge (scientific or business journals), strategic alliances and participations in competitions	(Caloghirou et al., 2004)	Knowledge-based view
Clear organisational strategy, support from management, available R&D activities (such as finance), available HR, internal employee reward and motivation system, culture of creativity and innovation	(Pustovrh et al., 2017a)	Theory of the firm and the RBV
Research and development, marketing capabilities and manufacturing capabilities	(Su et al., 2009; Bogers et al., 2011)	Strategic theory of the firm and absorptive capacity
Investment in R&D (expenditure and expertise of employees) and human capital (training in technical and scientific fields) and educated employees	(Spithoven et al., 2011; Spithoven & Teirlinck, 2015)	Absorptive capacity, RBV and transaction cost theory and relational view
R&D, continuous interactive learning, employees' skills, internal education and training programmes	(Svetina & Prodan, 2008)	Innovation theory
Internal research and development	(Grimpe & Kaiser, 2010)	Resource-based view
Technological capabilities, commercialisation capabilities, knowledge environmental awareness, marketing skills and interactive ability	(Malerba & Torrisi, 1992)	Evolutionary theory

Table 2.3 continued Internal capabilities in IOI and applied theories

Capabilities	Author (s)/year	Theory (ies)
Cross functional collaboration (integration and cooperation between functions), environmental capabilities, internal practices (goal clarity, management support and knowledge management), and organisational culture (environmental goals)	(Melander, 2018)	Theory on collaborative green product innovation (relational issues, knowledge sharing, capabilities and governance)
Investment in absorptive capacity, knowledge depth and breadth sourcing, employee training	(Ketata et al., 2015)	Capability based view
Entrepreneurial orientation (innovativeness, risk-taking and proactiveness), technological capabilities (technological knowledge, trade secrets, technical know-how generated by R & D and other technology-IP) and financial resources	(Lee et al., 2001)	Resource-based view, Social capital
Internal R&D, collaboration with production, sales/marketing and management	(Lassen & Laugen, 2017)	Transaction costs theory, resource dependency and network approach
Broad skills, processes, procedures, organisational structures, decision rules, and disciplines	(Teece, 2007)	Dynamic capabilities

Source: Author's compilation, 2020

The review of the internal capabilities of the organisation indicates that they are viewed as both individual and group constructs. For instance, Bogers et al. (2011) treat internal capabilities as ABCAP at the functional level comprising: R&D, marketing and manufacturing. *R and D* internal capabilities are needed to absorb knowledge from public

research organisations for product innovation; *manufacturing capabilities* are important to absorb both supplier and competitor knowledge and *marketing capabilities* are important to help absorb customer and competitor knowledge for enhanced innovation performance.

Again, internal capabilities are recognised as resources and capabilities. For instance, as a resource, it enables the capacity to innovate; as a capability, it enhances the ability to innovate and as a form of collaboration, it enables willingness to innovate. However, these capabilities must be combined with external resources and search processes such as the way external partners are selected and their attributes, partners skills and expertise, alignment of objectives, managing relationships (communication, trust) and knowledge management (networking, competence and knowledge access (Melandar, 2018). Emphasising the importance of internal capabilities (R&D and educated employees), Spithoven and Teirlinck (2015) established a positive relationship with external resource acquisition. Further, internal capabilities have stronger effect on innovation activities such as the acquisition of external resources and innovativeness (Pustovrh et al., 2017a).

Also, innovation activities by organisations is affected by key factors such as *internal technical ability, absorptive capacity, relational ability and the external environment* (Zhao et al., 2016). The internal technical capability relates to the internal capability of the organisation to obtain technology innovation and achieve innovativeness which includes the competence to search, select, absorb, learn, innovate, convert and diffuse technology. According to Zhao et al. (2016), internal technical ability also includes organisational knowledge needed for operations and the ability to increase/share the organisation's knowledge to gain acceptance and adoption. Organisations also depend on ABCAP to enable them utilise external resources and improve innovation activities.

External capabilities on the other hand supplements the organisation's innovation processes and influences its innovativeness (Lee et al., 2001; Pustovrh et al., 2017). Table 2.4 shows some external capabilities in OI research.

Table 2.4: External capabilities/factors in OI

Type of capability/network	Author (s)/year
Available infrastructure, Available technology and resources and available HR on the job market	(Pustovrh et al., 2017a)
Partnership-based network (cooperative or collaborative, strategic alliance, equity investment, venture capital investment), sponsorship based-networks (funding to promising ventures, funding from banks)	(Lee et al., 2001)
Scanning external environment for information (use of technical reports and publications, databases, conferences, the internet, reverse engineering) and cooperating with external actors (academic and research institutions)	(Caloghirou et al., 2004)
Suppliers, customers, competitors, university and research institutions	(Su et al., 2009)

Source: Literature review, 2020

Lee et al. (2001) conclude that external networks are critical to the success of organisations especially through strategic alliances, suppliers and customers. Similarly, Caloghirou et al. (2004) find that scanning the external environment for knowledge and strategic alliances have positive effect on innovation. Also, partnering with universities and research institutions has a significant effect on innovativeness (Su et al., 2009).

The above brief review suggests the importance of both internal and external factors and the need to combine them to achieve innovativeness. Hence, internal capabilities may not be enough for innovation activities, it requires a linkage with external capabilities (Caloghirou et al., 2004; Su et al., 2009).

Whereas the combination of both internal and external capabilities (IOI activities) may lead to OGI, this process is facilitated by certain activities (Sulaymonov & Du, 2020):

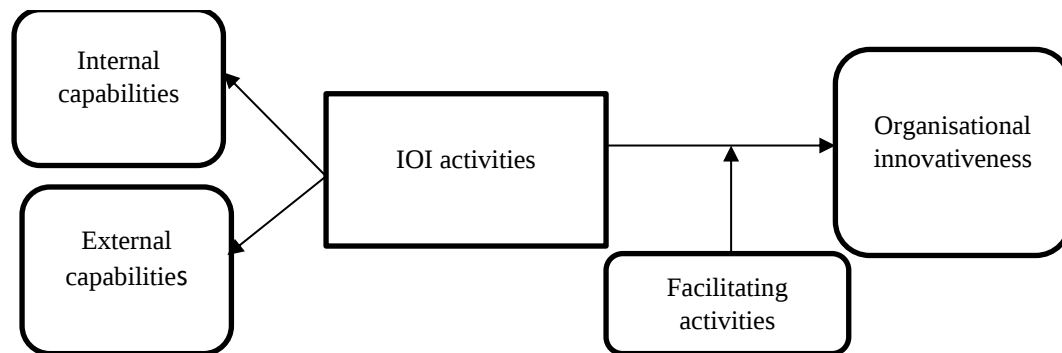
- top management support
- motivation for OI employees
- enhancing OI culture
- increased investment for OI
- using the required blend of knowledge and skills

Other enablers (Pustovrh et al., 2017a) include:

- Perceived support for innovation
- Use of external R&D for innovation
- Presenting external ideas to internal R&D staff
- Change organisational structure
- Set up special unit for individual innovation

These factors facilitate IOI to achieve organisational innovativeness. Figure 2.2 shows a diagrammatic representation of the relationship between internal and external capabilities and organisational innovativeness. Figure 2.2 depicts IOI activities and its influence on OGI moderated by facilitating activities such as ABCAP.

Figure 2.2: The relationship between capabilities, IOI and OI



Source: Author's construction, 2020.

Social capital enables external networks and innovativeness through cooperation and understanding. Similarly, relational ability enables the organisation to interact with various networks in the external and internal environments. In sum, the success factors of OI are both external and internal. These factors may affect OI activities and innovation creation, adoption and acceptance. Therefore, future research is required to understand how organisations use these factors in OI activities (Zhao et al., 2016) to achieve organisational innovativeness.

Further, Nitzsche et al (2016) suggest factors that enables IOI success. These include *openness*, *absorptive capacity* and *flexibility*. *Openness* consists of two dimensions of open innovative culture and connectivity. *Open innovative culture* concerns internal

openness of employee's mindset and their individual capability and action directed toward innovation creation and creativity. Open innovation culture helps overcome NIH syndrome. *Connectivity* on the other hand, deals with how the organisation interacts with external partners. *Absorptive capacity* emphasises the capacity to acquire knowledge from the external environment through recognition, assimilation and applying that knowledge. This capacity helps organisations obtain external resources. Particularly, ABCAP is important for OI as it emphasises the external dimension of innovation (Chesbrough, 2006; Van De Vrande et al., 2010). Absorptive capacity is also understood as a core dynamic capability in OI environments because it has a very strong effect on organisational success (Nitzsche et al., 2016). *Flexibility* as a core capability of organisations refers to the ability of the organisation to cope with changes emanating from the dynamic environment as a result of open innovation activities. In all, these factors facilitate external technology acquisition and the activities involved in these processes may lead to organisational innovativeness.

Open innovation is thus built on two pillars of internal technology capabilities and external technology sourcing by understanding employees' attitudes and behaviours in order to overcome NIH syndrome, organisational risk-taking; and also offer management support for innovative behaviour (hire the right people, provide enough funds to source technology, personal involvement by management in the innovation process, rewards for innovative ideas Etc.) (Herzog & Leker, 2010).

2.5 Inbound open innovation research

The inbound open mode is predominantly researched compared to the outbound (Enkel et al., 2009; Schroll & Mild, 2011; Aschehoug et al., 2019). The main concept of IOI is to absorb knowledge, such as through in-licensing, technology acquisition, scouting, funding start-ups, collaboration, or joint development of new external knowledge from outside the organisation's environment to the inside (Singkarin & Liu, 2012; Sulaymonov & Du, 2020). It also means the acquisition and or sourcing of external knowledge for an organisation's internal use by adapting and integrating with internal resources to achieve organisational objectives, be it pecuniary or non-pecuniary (Dahlander & Gann, 2010). According to Ahn et al. (2013) the IOI process denotes inflow of knowledge, technology

and ideas into the organisation. In short, IOI means the importation of knowledge from the organisation's environment (Sulaymonov & Du, 2020).

Opening up to outside sources of knowledge gives organisations the opportunity to gain knowledge to increase the totality of available technological opportunities. A lot of knowledge sources that organisations need to achieve innovation can only be found in the external environment. Hence, failure to open up to the outside environment may be an indication of organisational myopia and an over-concentration on internal sources of knowledge and less attention to external sources (Laursen & Salter, 2006). Increasingly, external sources of knowledge are becoming important sources of innovations as well as valuables for markets (West et al., 2006) as organisations monitor the environment to enable them acquire both technology and knowledge in addition to in-house R&D (Spithoven et al., 2009).

Recent studies in IOI has emerged with various strategies *as collaborative or cooperative search* (Parida et al., 2012; Wang et al., 2015; Hochleitner et al., 2017; Akinwale, 2018); search breadth (SB) or broad search (BS) and search depth (SD) or intensive search (IS) (Laursen & Salter, 2006a; Chiang & Hung, 2010; Chen et al., 2011; Cui et al., 2015; Ferreras-Méndez et al., 2015; Greco et al., 2016; Shi & Zhang, 2018; Triguero et al., 2018); *external technology acquisition, external knowledge acquisition and knowledge breadth and depth* (Lopes & de Carvalho, 2018a); *exploiting outside knowledge (in-sourcing), investing in potentially innovative companies to obtain new ideas (venture investment), and involving customers in the innovation process (customer involvement)* involving two modes of pecuniary (financial) and non-pecuniary (non-financial) IOI (Dahlander & Gann, 2010; Chesbrough & Brunswicker, 2013; Lalic et al., 2017).

Generally, the definitions and strategies of OI are aimed at improving organisations and innovative performance (Lopes & de Carvalho, 2018a) with less emphasis on technology readiness. The IOI phenomenon is also described as a form of *collaboration, a process, practices, a mind-set, a choice and an outcome*.

Inbound open innovation as a *collaborative effort* enables organisations to obtain resources through collaboration with partners. *Collaboration* as a factor in OI management refers to the extent to which a partner is embedded in the network, and the

ability of the organisation to solve problems, promote its vision or recognise the benefits derived from the collaboration (Saidi et al., 2019). It involves getting the right partners with the right knowledge, right organisational culture and values (Bigliardi & Galati, 2016). In fact, establishing partnerships in OI is the main objective of large organisations (Chesbrough & Brunswicker, 2013a). These collaborations take different forms: technology sourcing, vertical technology collaboration (VTC), horizontal technology collaboration (HTC) and technology scouting (Parida et al., 2012; Wang et al., 2015).

VTC refers to collaborative innovation relationship with users, potential users, and end users or with suppliers (Parida et al., 2012). This form of collaboration is often focused on the contributions of the customers as a source of quality information and knowledge aimed at improving internal innovation processes, service delivery and capabilities (Wang et al., 2015). Accessing information and ideas from willing customers enables the organisation to provide services that meet their requirements which can influence innovativeness (Akinwale, 2018). *Knowledge from suppliers* in IOI process benefits the organisation by way of reducing the time that it takes to develop and introduce new products and services, improve product quality and reduce the cost of development (Greco et al., 2015). HTC activities refer to the organisation's collaboration with partners that are not part of the value chain (Parida et al., 2012). That is the ability of the organisation to cooperate with partners and link with competitors that give the organisation the opportunity to gain new knowledge and technologies beyond its boundaries (Wang et al., 2015). Technology sourcing refers to an OI activity that involves the use or buying of external technology through IP agreements to improve innovativeness (Parida et al., 2012). Further, TS as a form of IOI collaborative effort is a systematic internal function of searching or scanning the innovation environment to detect technological opportunities and threats and create awareness about the trends in the external environment (Parida et al., 2012).

According to Greco et al. (2015), the activities involved in collaborative IOI include strategies of search depth and search breadth, knowledge from customers, suppliers, competitors, research institutions and the role of foreign organisations. *Knowledge from research institutions* gives the organisation updates on the latest technology and best

practices for specific industry. Collaborating with *external organisations* can improve the organisation's understanding of opportunities and industries, cultures and strategies to innovation creation that might improve the organisation's innovativeness and performance. Also, external stakeholders networking through consistent communication determines the success of innovation implementation (Saidi et al., 2019).

Also, collaborating with universities enhance the value of the organisation but the university cannot guarantee the benefit of the technology if it is in its middle phase (Buganza & Verganti, 2011). This finding implies that the benefit derived from collaborating with universities depends on the time of the existence of the technology or knowledge. Earlier Chesbrough (2003) had suggested that an organisation could benefit from collaborating with external partners through access to knowledge from the front-end and buying solutions (such as technology) to fit the organisation's business model. Interacting with *external partners* can empower the organisation to acquire fit for purpose technology. Knowledge that flows from *inter-organisation collaboration* can potentially improve output or processes (Mina et al., 2014).

Internal stakeholders such as employees also collaborate in OI based on how they are managed. For instance, the concentration of decision making power might influence the way they collaborate and lead to resistance, lack of commitment and motivation as well as challenges in implementation (Bigliardi & Galati, 2016). In all, collaborating with partners through broad and intensive searches in the IOI process positively affects the implementation of technology and organisation's performance (Ahn et al., 2015). Besides, collaborating with non-competing partners such as consumers, employees, suppliers, consultants, universities and research institutes also affects the organisation's performance positively (Ahn et al., 2015).

From the collaborative perspective of IOI, Sartori et al., (2017) define IOI as "the stage when organisations try to acquire knowledge from outside by establishing collaborations with external partners" (p.119). According to Sartori et al., (2017) the bedrock of successful IOI is trust and collaboration between partners. Partners need trust to access external resources and collaboration to enable people openly communicate, share ideas

and cooperate in the knowledge creation process. The lack of trust in partnerships in inbound OI may lead to failures of the relationship (Tate, 1996).

Above all, partners' open communications, unwavering commitment, understanding of partners concerns, flexibility in dealing with issues and fairness constitute the building-blocks and the foundation for trust, without which there can be no partnership (Tate, 1996). This also suggests that without trust there can be no OI practices. Collaborative IOI is like a marriage and the success depends on the partners. Thus "A successful partnership is like a marriage. Neither just happens: both relationships require constant hard work from the parties involved. Both parties must understand each other's needs, and must be compatible, with shared values ... requires open communications, mutual commitment to the partnership, fairness and flexibility" (Tate, 1996, p.7). Generally, collaboration in IOI benefits the organisation by way of improved flexibility of strategies, promotes in-flow of external knowledge and increases the rate of innovation (Buganza & Verganti, 2011).

Overall, the collaborative aspect of IOI seeks to answer the following questions among others (Huizingh, 2011):

- When is collaborative effort in the IOI process most effective?
- Which parties should the organisation collaborate with in the IOI process?
- How will the organisation find those parties to collaborate with?
- What is the best way to capture value from the IOI collaboration? Answers to these questions will help when and how to deploy collaborative IOI.

The IOI archetype also referred to as outside-in or in-flow is a *process* that enriches the organisation's knowledge base by integrating suppliers, universities, competitors, customers, research institutions and other external sources of knowledge to increase the organisation's knowledge base and innovativeness through in-licensing (inward technology transfer), acquisition agreements and external R&D (Gassmann & Enkel, 2004; Rondani et al., 2013). The OI paradigm depends on an innovation process that comprises many stakeholders outside an organisation's boundaries who are being managed from within these boundaries (Buganza & Verganti, 2011). The process perspective is underpinned by discussions and interactions between the functional heads such as IT and innovation management (Huizingh, 2011) leading to the inflow of the

external knowledge (Ahn et al., 2013). Thus, IOI as a process refers to those activities by which the concerned organisations source and exploit knowledge externally developed, owned and controlled by other organisations as well as suppliers, customers, research institutions, individuals and competitors (Enkel et al., 2009; (Huizingh, 2011; West & Bogers, 2014). That is an interaction between the source of the knowledge and the individuals in the organisation which may lead to the recipients learning and understanding the in-coming knowledge (Bellantuono et al., 2021).

Because IOI as a process encompasses both internal and external partners and their interactions and discussion, it is a strong and critical determinant for organisations adopting OI because it enables network partners for idea generation (Zynga et al., 2018). This requires cooperation among the stakeholders in the relationship. Buganza and Verganti (2011) suggest that the key issue in process IOI is to identify and reconfigure an organisational unit with the dual role of managing external relationships and selecting the knowledge source to invest and explore by considering the following:

- the number of people involved
- the level of work specialisation of the selected people;
- a clear understanding of the coordination process and level of formality
- the positioning of the selected organisational unit inside or outside the organisation's boundaries.

This perspective suggests that the process of IOI requires the identification of all relevant stakeholders and supporting them. These stakeholders must also understand the purpose of the partnership and work to achieve the objective.

Similarly, Chesbrough and Brunswicker (2013) describe IOI as *practices* that bring in outside ideas and technologies into an organisation's own innovation process. This is the "how to do it" aspect of IOI (Huizingh, 2011). Absorbing open innovation in this context implies that there are established practices and processes which enable knowledge absorption. These include practices of culture (collaborative and open culture) that handles issues of NIH, value ideas, that support networking; developing the capabilities (internal capabilities) through training, job rotation, promotion; motivation to achieve low resistance to external knowledge, involving employees and rewarding them appropriately

(Ades et al., 2013) and external participation, licensing-in, external networking, R&D outsourcing and involvement of customers (Rangus, 2017). Further, Sisodiya et al., (2013a) described OI (inbound) as the *sustained and systematic practice of engaging in* the search for and integration of new inputs or resources from external sources across organisational boundaries.

These IOI practices include in-licensing or technology acquisitions, corporate venturing, crowdsourcing and spin-ins, corporate venturing, using innovation intermediaries, dealing with unrequested ideas and using innovation tournaments (Wang et al., 2012; West & Bogers, 2014; Salter et al., 2014). A clear understanding of IOI practices require managers to understand: “when, how, with whom, with what purpose, and in what way should they cooperate with outside parties?” (Huizingh, 2011, p.6) Effectively responding to these *practices* much depend on the internal capability of organisations to leverage available inbound external knowledge and other relevant resources (Wang et al., 2012) and both internal and external partners playing various roles that can enhance the organisation’s innovation activities (Huizingh, 2011).

Mina et al. (2014) describe IOI as *a choice* between formal and informal governance processes and the type of partner to collaborate with. The *degree or choice* of formalization determines the nature of communication between the knowledge source and the recipients based on certain established protocols, standards and procedures (Bellantuono et al., 2021). This, to a large extent also determines the degree of engagement between employees in the organisation and the source of the technology. Organisations can choose to engage in formal processes through contractual agreements and cooperation or through an informal engagement of direct unstructured interaction with stakeholders, participate in innovation networks, or share knowledge that is not codified with other. This form of collaboration is not legally binding on the partners but based on mutual trust and moral obligations (De Wever et al., 2005). Organisations also choose the partner to collaborate for knowledge – partners based on science/technical (universities, research institutions), to gain access to basic knowledge or market (suppliers, customers) and knowledge to obtain requirements for innovation and costs reduction. The choice of partners or methods (formal or informal) and governance structure shows the level of

openness of the organisation (Felin & Zenger, 2014a). This implies that the choice of a governance mechanism and partner are geared towards achieving certain innovation objectives.

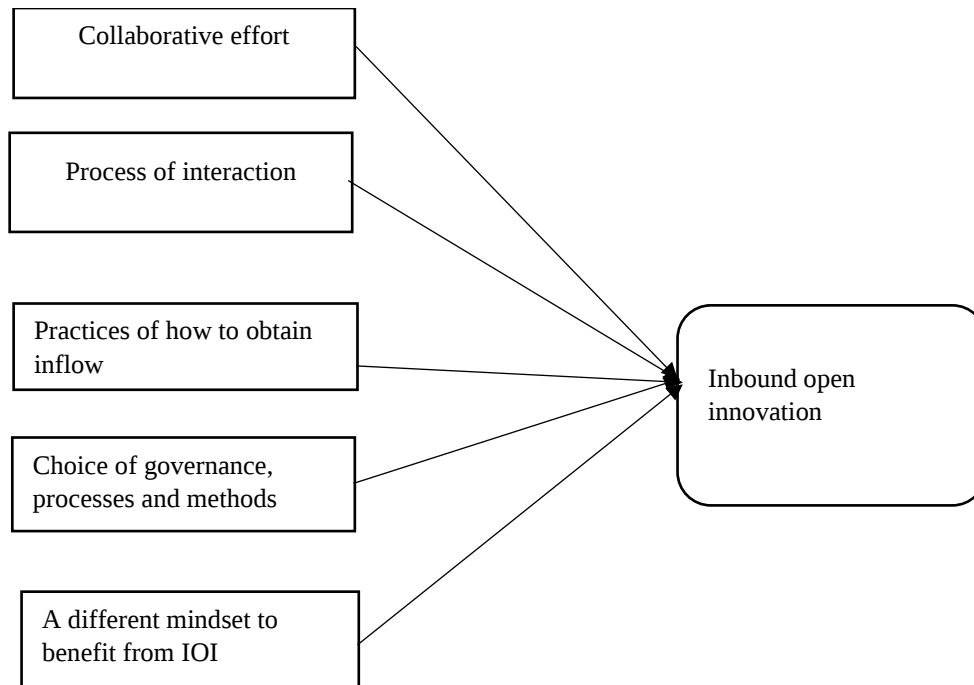
Beyond inbound OI being described as a process, practice or choice from available alternatives, Chesbrough (2017) and Engelsberger et al. (2019) describe it as *a different mindset* - an open distributed mindset that focuses on how organisations make use of or benefit from their internal resources (such as employees and technology scouts) and how they can also benefit from the resources (ideas, knowledge and technology) of others from the external environment.

Thus, the mindset represents both internal (inside) and external (outside) sources of knowledge. Indeed openness in the innovation process and the creation of an enabling work environment begin with a different mindsets (Gassman et al., 2010). This mindset represents the attitudes, values and beliefs of the individual employees and management which make OI possible (Engelsberger et al., 2019). The mindset of people involved in the OI is what they use to process, store and recollect some information concerning the organisation - the basis of a strong capable organisation (Ulrich & Lake, 1991). Ulrich and Lake (1991) suggest that the mindset of people in OI centres on ends (strategies or values) and means such as management activities, processes and work systems which the organisation uses to achieve competitive advantage. According to Nakagaki et al. (2012), the willingness of individual employees to accept external resources depends on the change in the individuals (employees) and the organisation's (senior management) mindset. In essence, OI is about the mind-set of members in the organisation, a mind-set that must be changed and nurtured to embrace and appreciate external knowledge (Santoro et al., 2019). In all the mindset of individuals is based on knowledge sharing, collaborative culture, managing diversity and ambidextrous thinking (Salampasis & Mention, 2015); a mindset of employees based on competence building – deciding on the best business model, changed leadership etc and not industry share-focused (Rufat-Latre et al., 2010)

As demonstrated above, many studies on OI have concentrated on different aspects of the OI phenomenon such as inbound, coupled and outbound (Natalicchio et al., 2017). Such studies have offered useful insights and suggested various conceptualisations of OI to

support decision-making. The studies also focused on various aspects of internal and external partnerships and processes. The review also suggests that these activities seek consensus building by identifying individual roles alongside the objective of the inflow. *What is however missing is a decent integrated conceptualisation of these IOI processes that will enable the organisation decide when and how to successfully embrace the inflow – technology readiness, ability and capacity to successfully implement external technologies.* Figure 2.3 shows the conceptualisation of IOI in this study.

Figure 2.3: Activities of knowledge in-flow



Source: Author's construction, 2020

Flowing from the above discussions on knowledge inflow and readiness, *the current study understands it is a collaborative effort, a process of interaction, a practice, a choice or decision making and a different mindset of individual employees and senior management to benefit from knowledge inflows where the organisation acquires, leverages and integrates external resources with internal capabilities to drive individual members to implement the technology successfully.* This definition applies both to the private and PS. It also makes individuals the centre of OI. Thus, the culture of OI can only be realised if

individuals adopt an OI mindset (Nakagaki et al., 2015) by recognising the potential of internal resources and the benefit of absorbing external inputs. As a form of collaboration and an interactive process in obtaining external technology, the organisation can assess the technology readiness of its employees who can assist it to make the right choice which eventually leads to individual members' willingness to implement the technology. This suggests that the notion of outside-in openness is innovation readiness

2.6 Redefining IOI according to technology readiness of the organisation

Technology readiness refers to “people’s propensity to embrace and use new technologies for accomplishing goals in home life and at work” (Parasuraman, 2000, p.308). It is an individual level construct that does not change within a short term or in response to external environmental changes (stimulus) (Parasuraman & Colby, 2014). This implies that individual inclination to use technology involves a series of activities over a period. It comprises four sub-categories: optimism, innovativeness, discomfort and insecurity which “can be viewed as an overall state of mind resulting from a gestalt of mental enablers and inhibitors that collectively determine a person’s predisposition to use new technologies” (Parasuraman, 2000, p.308). *Optimism* concerns the belief or the tendency to use technology because it gives people increased control, flexibility, and efficiency. *Innovativeness* relates to the desire of people to be the pioneer or (among) the first to use technologies. *Discomfort* concerns the perception of individuals lacking control over the technology and being overwhelmed by it. Finally *insecurity* relates to the lack of trust and skepticism about the ability of the technology to work properly. Optimism and innovativeness are drivers or motivators to technology readiness whereas discomfort and insecurity are inhibitors or detractors of technology readiness. The current study concentrates on innovativeness.

The OI phenomenon has basically focused on knowledge flows and the impact on performance, but inflows can also determine individual readiness to receive and implement the technology – the type of readiness involved in knowledge inflow. That is, the flow of technology from the external environment into the organisation leads to individuals either being motivated to implement the technology or inhibit its smooth

implementation. This means IOI is not a one-off transaction but involves a series of activities that may contribute to smooth implementation.

2.7 Empirical studies of IOI (knowledge inflow)

According to Wang et al. (2015) study in high-tech industries in Taiwan, external technology and knowledge facilitates internal knowledge innovation. Also, both VTC (customers) and HTC (competitors) improve organisational innovation process. To improve IOI strategies, an organisation must access abundant external knowledge resources through HTCs and VTCs. Thus, the first step to innovativeness is to understand the nature of HTCs and VTCs (Wang et al., 2015). Akinwale (2018), studied the impact of IOI in the oil and gas industry in developing countries and financial performance. The study used external sources of TS, VTC and HTC as sources of knowledge. The findings indicate that IOI is important to SME performance in the oil and gas industry and influences internal innovation capability significantly. Further, Hung and Chou (2013) examined the impact of OI on firm performance by moderating the relationship with internal R&D and environmental turbulence. The external source of knowledge in this study was technology acquisition. The study's finding was that technology acquisition was positively and significantly related to performance. Internal R&D also moderates the relationship between technology acquisition and performance positively. Their study suggests that organisations will gain more benefits from implementing external technologies by investing in internal R&D. In addition, Sisodiya et al., (2013) analysed the relationship between inbound open innovation and the impact on performance. The empirical analysis indicates a positive and significant relationship between the variables. However, this relationship is made possible through some indicators: the ability of the organisation to create that relationship through relational capability, available resources and boundary spanning. In that research, the IOI performance-relationship is analysed based on search strategies (Chiang & Hung, 2010). The search strategies include search breadth and search depth (Laursen & Salter, 2006; Chiang & Hung, 2010). Unlike Laursen and Salter (2006) who conceptualised performance as a proportion of turnover to innovative products, Chiang and Hung (2010), define performance to mean both

incremental and radical performance. The analysis showed that external source of knowledge positively impacts performance. Specifically, external search breadth is positively related to radical innovation while search depth is positively related to incremental innovation (Chiang & Hung, 2010).

While these observations are made in IOI studies, little attention is paid to the internal mechanisms of the phenomenon. For instance what happens to innovation when they are brought into the organisations (West & Bogers, 2014a). Also, research should examine the effect of IOI on innovativeness in different sectors and country apart from high-technology sectors in Taiwan (Wang et al., 2015). Research in this area should capture the contingency effect of ABCAP to understand how the relationship will be affected as outside knowledge integration may depend on ABCAP. Above all, future studies in this area should adopt social theory (social capital) to understand relationships and strategies (Wang et al., 2015). Also, there is no clear demonstration of the internal practices and capabilities that enable the absorption of external knowledge (Marco-lajara et al., 2018). Thus, the integrative aspect of the IOI phenomenon is not adequately researched, triggering the need to explore this aspect of IOI.

2.8 Inbound open innovation (knowledge in-flow) in the PS – a literature review

Open innovation is not only relevant and applicable in the private sector. It is equally relevant in the PS. Open innovation is necessary for the public sector because it encourages organisations to monitor the environment and look for solutions from external sources to address prevailing challenges (Mergel & Desouza, 2013; Mergel, 2018). The umbrella concept of OI in the PS is for inviting external participation to support government in finding antidotes to the challenges they find difficult solving internally or with support from grants and contracts (Mergel & Desouza, 2013 ; Mergel, 2018). Thus, successful PS innovation means creating and implementing “new processes, products, services and methods of delivery which result in significant improvements in outcomes efficiency, effectiveness or quality” (Mulgan & Albury, 2003, p.3). This description of PS innovation defines the boundaries and the focus of determining successful PS innovation.

The public sector in all respects is distinguished from the private sector. By definition, the PS refers to “the civil service and public administration as funded by public revenues (i.e.

taxes) as tasked with the coordination and delivery of policy mandates, a significant proportion of which are legacy policies” (Potts & Kastle, 2010, p.124). The basic mandate of the PS is to serve the people, which sometimes involves solving conflicts and challenges using little resources. The PS is multifunctional and usually have politically chosen leadership, do not operate in the market and not driven by profit motive (Christensen et al., 2007; Bloch & Bugge, 2013). Public sector innovation aims at improving service performance and adding value for the benefit of the public (Lee et al., 2012a); achieve efficiency (cost reduction), effectiveness (quality improvement), and satisfy the public (Demircioglu & Audretsch, 2017a). Kelly et al. (2002) suggest three forms of value creation in the PS: value created by *services for users* (increased efficiency, improved quality, user satisfaction), *social outcomes* (safety, education, healthcare, reduced crime) and *values of trust/legitimacy* (increased perception of PSOs and improved accountability). Another means of distinguishing the private sector from the public sector is the way they acquire technology or knowledge (sources) and their incentive systems (Marin & Bermejo, 2015). In the private sector, the incentive system is market-driven while that of the PS is determined by the political cycle and non-market. Further, the PS is seen as having a mechanistic structure, little or less empowering of employees, centralized decision making, bureaucratic, complex and resistant to change which affect the ability of the organisation to innovate (Damanpour et al., 2018).

Tan (2004) distinguished the PS from the private sector from four perspectives: customer and market focus; planning horizon; ownership and accountability; and process constraints. In the private sector, customers and markets are clearly identified and specific while the PS has stakeholders who are diverse and can force PSOs to make difficult decisions in the public interests. Because the private sector is market-driven, the planning horizon is short-term while the PS has a long-term planning strategy. The private sector usually has clear ownership and accountability and focuses on increasing the value of the shareholders. PSOs have employees who accept that they are public ‘servants’ and hence ‘owned’ by the public in principle. They are accountable to both elected executives and other bureaucratic administrations. Shareholders in private sector organisations take risks and tolerate failures whereas PSOs do not tolerate failures. The PS operates in an environment that is more scrutinized by the media and the public than the private sector.

Innovation in the PS does not only take a long time to diffuse, but is usually considered government property – lack of reward for successful innovation outcome and no shared ownership (Borins, 2001). Unsuccessful innovation in the PS also comes with grave consequence as opposition parties and the media are always eager to expose innovation failures and subject PS employees to public scorn which often has potential negative effects on their careers (Borins, 2001). Table 2.5 gives a summary of the differences between OI in the PS and the private sector.

Table 2.5: The difference between open innovation in the public and private sector

	Open innovation in the private sector	Open innovation in the public sector
Definitions	“The use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation” (Chesbrough et al., 2006, p.1)	The process by which governments leverage external resources and knowledge contributed by stakeholders or their citizens for purposes of innovation to assist in solving public challenges and create public value
Modes/strategies	Inbound, outbound and coupled OI	Crowdsourcing, challenges and contests and hackathons or app contests approaches
Aim	Aims at achieving competitive advantage	Improve service delivery and create value
Focus	Creates both new product and service development	Focuses on changes in the form and content of services
Value	Generates value and enhances higher revenues-serves the concerned organisation	Generates public value in terms of the benefits – not limited to the focal organisation

Table 2.5 continued: The difference between open innovation in the public and private sector

	Open innovation in the private sector	Open innovation in the public sector
Customer and market focus	Identified and targeted	Diverse stakeholders
Ownership and accountability	Clear-cut ownership	Public ownership
Planning horizon	Short term	Long term

Process constraints	Little media and public scrutiny	High media and public scrutiny
External stakeholders	Suppliers, customers, competitors, partners, research institutes etc	Citizens, online intermediary non- governmental agencies (including the private sector).
	Encourages organisations to acquire external technology	Implemented by government instructions (a political decision), to create, expand or abandon
	Context dependent and not transferrable	Interactions are governed by rules and regulations
	Uses crowdsourcing approaches	Needs greater freedom in acquiring external technology
Source of innovation and capacity	Uses both employees and external sources for ideas generation	Limited capacity to evaluate the innovativeness and appropriateness of solutions and the type of challenges that can be outsourced
		Unable able to reduce cost of service delivery to highest paid customer

Source: Tan, (2004); Mergel and Desouza (2013); Kankanhalli et al. (2017); Yuan and Gasco-Hernandez (2019)

Several reasons account for adopting IOI in the PS. Such reasons include: preparedness for future challenges, to remain competitive, to make work more exciting and interesting, reduce cost and increase efficiency, to attract the best pool of talents and increase new revenue sources (Tan, 2004).

2.8.1 Sources of IOI activities in the PS

Innovation in the public sector is harnessed from internal, external and combined sources, Marin and Bermejo (2015). Internal sources of PS innovation is from both management and staff (Bloch & Bugge, 2013). According to Bloch and Bugge (2013), about 80% of PS innovation ideas come from management while 20% are the ideas of staff. In the internal sources, employees look for information from within the organisation. The external aspect deals with knowledge acquired from outside sources such as private

organisations, citizens or third-party organisations. This means that the sources of innovation in the PS are different from the private sector. The combined sources of knowledge include both formal and non-formal agreements. Table 2.6 shows the various forms of internal, external and combined sources of OI in the PS.

Table 2.6: Indicators of internal, external and combined sources of knowledge in the PS

Source	Indicators	Author(s)/year
Internal	Managers, employees (non-managers) internal R&D activities; acquisitions; training; marketing; and commercial activities	
External	<i>market sources</i>: clients or consumers; suppliers, competitors; and consultants' <i>institutional sources</i>: universities, colleges, and federal and provincial governments. <i>Other sources</i>: business associations, and conferences and trade fairs. Enterprises, citizens and service users, professional organisations, and civil society. Others include clients, experts and early adopters	(Doloreux, 2015; Marin & Bermejo, 2015; Damanpour et al., 2018)
Combined internal and external	Public procurement and multi-agency networks	(Marin & Bermejo, 2015)

Source: Compiled by the Author, 2020

Thus, the PS possesses the ability to implement external innovations, except that the diffusion of innovation across the PS is largely slower or perhaps more difficult than in the private sector and takes a longer time (Albury, 2005). Also, ideas for adoption of innovation in the PS do not emerge bottom-up, or through the experimental process, rather, public servants (employees) are told (*instructed*) to align their procedures to be in line with the policy (government) requests. Thus, about 60% of PS innovation ideas emanate from political leadership (Bloch & Bugge, 2013) as it is mostly influenced by

government (politics and the political process), (Kim & Chang, 2009). The notion is that PS employees are not employed to continuously search for newness- new markets, new ideas for new products and services, or take an active interest in increasing returns to shareholders to ensure the organisation's survival (Mergel, 2018).

It is also concluded that using Social Media Monitoring (SMM) i.e., crowdsourcing serve as a source of external knowledge for improving government policies and addressing social problems (Loukis et al., 2017). Crowdsourcing particularly facilitates PSOs quest to extract useful external knowledge affecting society or the attitude of the citizens towards the government. Also, crowdsourcing enables governments to anticipate changes in the external environment and hence develop the appropriate innovation policies. To benefit from crowdsourcing, PSOs must select and monitor social media sources that are noted for reliability and quality. These sources should not only be sources that have “free and open” contents sources, but also subscribe to “paid and closed” sources as these sources contain high quality newspapers, magazines, expert opinions and websites with higher quality content (Loukis et al., 2017). Developing countries that use social media as a source to understand social problems and trends in technology are able to gather the necessary information and knowledge to observe the latest trends about social problems and new technologies that meet the organisation's demands, and thus support its innovation activities (Tajudeen et al., 2019). Using social media promotes interactions among citizens, knowledge sharing, collaborations, and networking outside the organisation with partners, suppliers, and customers and global firms such as Nike and Adobe have used social media successfully to develop several new products and development projects (Tajudeen et al., 2019). Other sources of external innovation in the PS are indicated in Table 2.7 shows various sources of IOI practices in the PS

Table 2.7: Sources of IOI practices in the PS

Practice	Author (s)
Customer involvement, consultants (external experts)	(van de Vrande et al., 2009; Niehaves, 2010; Rangus, 2017; Oltra, Flor, & Alfaro, 2018)
Technology transfer	(Atuahene-Gima, 1992; Tsai & Wang, 2008 Crema, Verbano, & Venturini, 2014)
Collaboration/cooperation	(Bommert, 2010; Lee et al., 2012; Deschamps, Macedo, & Evelevesque, 2013; Oltra et al., 2018)
Collective research centres (technology intermediaries)	(Gent & Knockaert, 2009; Deschamps et al., 2013)
Strategic alliances	(Feller et al., 2011)
Supplier involvement	(Oltra et al., 2018)

Source: Compiled by the Author, 2020

These sources of OI in the PS underscores the fact that using external sources of knowledge in the PS is beneficial and related to the introduction of new services (Marin & Bermejo, 2015).

The foregoing discussion indicates that innovation in the PS is championed by a top-down approach (political leadership) and internal sources (management and staff) as well as the social media (such as crowdsourcing). This structurally limits the involvement of employees at the conceptual and implementation phases of innovation projects. These PS employees may view the innovation proposal to align with government directives as alien and thus exhibit an NIH attitude. Consequently, this can lead to innovation failures. These challenges notwithstanding, the PS has embraced OI as an alternative to generating ideas, knowledge, technology and solutions to problems facing them with active participation by citizens (Mergel & Desouza, 2013).

To gain the full benefit from IOI activities, an organisation requires management capabilities to enable it align external inflows with the organisation's internal innovation processes (Brunswick & Vanhaverbeke, 2015). Whether in the private or public sector, OI is all about bridging both internal and external ideas and knowledge to make innovation

possible. The ability to do this is one of the major challenges of OI. Literature acknowledges that accessing external resources presupposes that the organisation has adequately prepared internally to adapt to external resource inflows. Principally, it is the organisation's internal mechanisms that must be prepared to meet outside ideas as both internal and external ideas and knowledge need to work together to make OI happen (Lindegaard, 2010 ; Barette et al., 2012).

The goal of the organisation coupled with pressure from the public for better service delivery, such as efficient trade clearance process at the borders, does not result in organisational adaptation and implementation. Adaptation and implementation are created by internal actors (employees) (Barette et al., 2012). Thus, the literature on PS innovation suggest that it leans towards intra-organisational process innovation (De Vries et al., 2015). Table 2.14 shows the drivers and barriers of OI in the PS at the intra-organisational level.

From the review, government (political) leaders generally determine innovativeness in the PS. Similarly, network management in the PS may not lead to innovativeness because government leaders may not like to change the status quo (Kim & Chang, 2009). However, performance based rewards, information sharing and learning culture that encourages education and training all increase innovativeness (Kim & Chang, 2009).

The findings show that innovativeness in the PS focuses on internal factors such as employees, culture and leadership incentives and reward management systems among others (Mergel, 2018). Therefore, there is the need to understand how innovativeness is achieved in the public sector in other countries and sectors apart from Korea (Kim & Chang, 2009) and Australia (Demircioglu & Audretsch, 2017b). Table 2.8 shows various factors and barriers of OI in the PS.

Table 2.8: Driving factors and barriers of OI in the PS

Category	Driving factors	Barriers
Intra-organisational	• Internal employee experimentation • Culture and leadership • Incentives and reward • Users and employee's engagement • Top-down decision (government or management) • Strategic alignment with the mission of the organisation • The need to change current innovations and meet modern demands • The need to solve difficult problems created internally by management • The need to link with external sources of knowledge	• Speed of adopting innovation • Regulatory barriers • Longer time to implement an innovation from acceptance to adoption. • Organisational barriers • Bureaucracy • Cultural barriers of NIH syndrome, organisational inertia (fear of the unknown) • Weak Ties • The difference in expectations between professionals and general members of the organisation • Power and cultural distance between the external source of knowledge and receiving organisation

Source: Albury (2011); Bekkers et al. (2013); De Vries et al. (2015; Mergel (2018)

Internal and external factors combine to enhance PS innovations. The internal factors border on the role of employees in bringing about innovation and this may be termed as ‘the people factors. These factors have higher effect on innovation adoption than external sources and enable the organisation to identify problems as well as search for solutions (Damanpour et al., 2018). However, the external factors together with the role of government may be described as ‘influencing factors’ as they serve to determine the direction and goal of the innovation. External sources of information is facilitated by ABCAP and involves accessing information from external sources to help the organisation identify available technologies and determine opportunities (Damanpour et al., 2018). This external source of knowledge is highly important as it enables the PS to introduce services that are new to the whole sector (Marin & Bermejo, 2015).

The above discussions show that IOI which involves the acquisition/sourcing of external knowledge for use in organisations to meet their goals involves both internal and external mechanisms as well as environmental factors.

Acquiring external knowledge requires the organisation to know more about the implications of using the external resource and how it may affect its innovation capabilities (Marin & Bermejo, 2015), hence there is the need to conduct research in this area in different industries and countries which requires a larger empirical testing to provide good understanding of the phenomenon (Venturini & Verbano, 2017). Thus, this study intends to investigate the practice of IOI in the PS in a revenue administration - Ghana Revenue Authority (GRA): The Customs Division (CD) and the Domestic Tax Revenue Division (DTRD). This study, also extends research on outside sources of knowledge in PSOs by empirically testing for external-internal knowledge sources of OI (Marin & Bermejo, 2015) to achieve OGI.

2.9 Individual level IOI factors

“It is hard to deny that knowledge creation, transformation, and sharing in intra-organisational networks is more conducive to innovation when it is supported by organisational mechanisms and practices operating at the individual level and aimed at boosting the interactions and exchanges among firm staff. Individuals are undoubtedly the main characters of innovation processes, the networks that they form are the real engine of such processes” (Colombo et al., 2011, p.536).

To date, the literature on OI has basically addressed three key factors at the individual level: *the motivation to adopt OI practices*, *the processes of acquiring knowledge*, idea or technology by brokers and boundary spanners such as technology scouts (Rohrbeck, 2006) and *absorptive capacity* (Lowik et al., 2017; Tian & Soo, 2018). Apart from organisational level capabilities (acquisitive, operational, adaptive and innovative capabilities), the processes of organisational innovation may be influenced by individual employee’s attitudes (Lichtenthaler, 2011) and employee innovativeness (Tang et al., 2013) which has been discussed in the OI literature. Indeed, individual differences influences the choices the organisation makes, the way it learns, the way it interacts and how it adapts (Schmeck, 1988; Cohen & Levinthal, 1990; Pandza & Thorpe, 2009; Ojo, Raman, Chong, & Chong, 2014) as the organisation learns through the aggregate of its members (Cohen & Levinthal, 1990).

The OI literature has addressed *individual motivation* factors through the NIH or neither-shared-here (NSH) syndromes which are very crucial for innovation at the exploratory phase (Katz & Allen, 1982; Burcharth et al., 2014). The NIH relates to employees’ negative attitude towards the outside-in knowledge acquisition while the NSH relates to the negative attitude of employees towards the exploitation of knowledge from inside the organisation to the outside world. Chesbrough (2003) suggests that employees may exhibit an NIH attitude because of past negative experience from externally acquired technology and inappropriate reward system. These two negative attitudes- NIH and NSH attitudes are the most significant attitudes towards external knowledge exploration (NIH syndrome) against an external knowledge exploitation asset (NSH syndrome) (Katz & Allen, 1982; Burcharth et al., 2014). However, Lichtenthaler (2011) extended these two

motivational attitudes by a third one - the Not-Connected-Here (NCH) attitude. The NCH attitude refers to a situation where an organisation's "employees have negative attitudes toward externally retaining knowledge" (Lichtenthaler, 2011, p. 83). These negative attitudes may come as a result of lack of trust in the inter-organisational relationship among potential partners and putting more emphasis on managerial problems in the collaboration. These three individual employees' attitudes (NIH, NSH and NCH) are linked to the open innovation process (Lichtenthaler, 2011).

Another individual level discussion of OI centres on *organisational inertia*. This relates to resistance to organisational change by various interest groups which emanates from both internal and external environments (Kwun & Cho, 2001; Godkin & Allcorn, 2010; Huang et al., 2013). Resistance to external sources of knowledge in the form of organisational inertia comes from three sources: *insight*, *action* and *psychological inertia* (Huang et al., 2013). *Insight inertia* refers to the failure by management to observe and interpret happenings within the environment in a timely manner so as to adjust and meet demands for change and may lead to the interruption in the learning process of the organisation. *Action inertia* describes a situation where the management response to environmental activities is too slow or they have insufficient data to enable them take informed beneficial decision. Lastly, *psychological inertia* means resistance to change by employees irrespective of the need for the change (Godkin & Allcorn, 2010).

The third individual level factor in the OI literature relates to *the roles of brokers and boundary-spanners*. *Knowledge brokers* are those individuals and organisations that facilitate and promote the sharing of public - scientific knowledge, industry-specific knowledge and firm-specific knowledge between the sources of the knowledge and the needing organisation (Sousa, 2008). They possess knowledge that may be termed as "relational knowledge or knowledge about knowledge, which allows them to know what others know, while providing the managerial and physical tools to access that knowledge" (Sousa, 2008, p. 19). They provide knowledge links, sources and sometimes technical knowledge that enable organisations to accelerate and increase the effectiveness of their innovation processes.

Boundary spanners are members of the organisation who connect their organisations with the external environment (Williams, 2002). They have the ability to engage with other members and apply effective relational and interpersonal competencies influenced by the need to gain an understanding of people and organisations in the external environment. According to Williams (2013) boundary spanners are considered to be

“individuals who have a dedicated job role or responsibility to work in collaborative environments such as partnership coordinators, crime and community safety officers, anti-poverty coordinators and health promotion managers who co-ordinate, facilitate and service the processes of collaboration between a diverse set of interests and agencies” (p.19).

The primary concern of boundary spanning basically “concerns the sharing and exchange of information... the fundamental task of boundary spanners is to make decisions concerning information gathered” (Kapucu, 2006, p.210). Boundary spanners generally identify and acquire outside knowledge and transmit it into their organisation, to enable others gain its value (Cohen & Levinthal, 1990). Knowledge brokers and boundary-spanners might seem very similar, but they are different. Whereas a boundary-spanner links external parties to the internal organisation, a broker connects various external parties to one another. Thus, “brokers can span boundaries, but not all boundary spanners broker” (Fleming & Waguespack, 2007, p.166).

The fourth individual level factor is *absorptive capacity*. Individual ABCAP refers to the ability of the individual to identify external resource, assimilate and utilise it to enhance performance (Tian & Soo, 2018). The OI literature has discussed individual ABCAP from various perspectives. For example, Lowik et al. (2017) discuss the individual attribute that enable them to recognise and assimilate external knowledge and integrate this external knowledge with internal knowledge through the process of transformation and knowledge exploitation to enhance outcome. Tian and Soo (2018) study individual level ABCAP by examining two employees’ antecedent factors of *intrinsic motivation and the level of perceived organisational commitment*. The rationale was to understand better the antecedents and outcomes of individual ABCAP. The study concluded that employee’s perception of organisational commitment and their inherent interest in doing something

(intrinsic motivation) such as learning make a significant and positive contribution to potential ABCAP. The finding suggests that these two variables are key in external resource acquisition since potential ABCAP represents resource recognition and acquisition (Zahra & George, 2002). Ojo et al. (2014) discuss individual level ABCAP (micro-level antecedents) as the ability to *recognise* valuable external knowledge, *assimilate* and *utilise* it. Similarly, Ter Wal et al., (2011) and Enkel et al., (2017) discussed individual ABCAP as the *identification* of external valuable resource, *assimilation* and *utilisation*. Zahra and George (2002) also conceptualised individual ABCAP as the ability to *identify*, *acquire* and *assimilate* valuable external resource (potential ABCAP), *transform* and *exploit* the resource (realized ABCAP). Thus, studies at the individual dimension of ABCAP predominantly focus on the effort and ability of the individual employees to identify external resource, acquire, assimilate and utilise it; transform and exploit. The ability of the individual to identify and assimilate etc external knowledge depends on individual characteristics of creativity, confidence, self-efficacy (the belief that the individual has the relevant capabilities to perform an activity); prior knowledge of the work; the external source of the knowledge and the policy of the organisation (Ter Wal et al., 2011). These factors facilitate individual ABCAP.

In conclusion, the literature on IOI has established the relevance of the individual dimensions with respect to the organisation's innovativeness and performance. These individual human dimensions include individual attitudes (NIH, NCH, NSH), TS (boundary spanning), organisational inertia (insight, action and psychological inertia), EI and individual ABCAP.

While previous literature has considered and explained the implication of these factors on the innovation performance at the intra-organisational level, research attention on this dimension (individual level) remain limited (Tian & Soo, 2018) and relatively silent on the processes by which organisations successfully implement these dimensions (Randhawa et al., 2016).

In this regard, this study focuses on the individual dimension of IOI to gain a better understanding of the consequences and interplay of individual dimensions of EI, TS and ABCAP on innovativeness of PSOs.

2.10 Employee involvement in organisational innovativeness

Employee involvement (EI) is a concept that is broad and varied and include a large scope of practices to economic, social and political issues (Morgan & Zeffane, 2003). As human capital, EI is the primary source of internal innovation as they are responsible for generating new ideas (Chen et al., 2011). This reflects the active participation of employees in the innovation creation process that results in employee willingness to innovate (Johnson et al., 2001). Empirical studies show that successful EI enhances organisational innovativeness (Johnson et al., 2001; Riordan et al., 2005 Konrad, 2006) Felstead et al., 2010; Wallace et al., 2013).

The literature on IOI recognises the involvement of employees as the most critical factor in determining the success of innovation adoption, implementation and survival of organisations (Bakotić & Rogošić, 2017). Scholars have argued that the responsibility for innovation should be for all employees and not a select few like R&D staff. For instance, front line employees are considered as source of innovation for the organisations (Chen et al., 2011; Karlsson & Skålen, 2015). For instance, at Wal-Mart, front line employees are considered as its key resource (Chen et al., 2011). Also, front-line employees contribute diverse knowledge such as customer, product and practice knowledge towards the innovation process (Karlsson & Skålen, 2015). Even in the midst of advancement in modern high technology, complex management systems, and spread in the use of computers, the most important element in any organisation is their employees (Owusu, 1999). Therefore, involving them in the organisation's activities becomes imperative. Notwithstanding these contributions of employees to innovativeness, literature on how all employees are involved in OGI is under explored (Bogers et al., 2017).

The recognition of employees as the most important and valuable assets organisations possess to deliver desired performance is recognised by both academics and practitioners (Mendes, 2012; Tchapchet et al., 2014). In recognition of this, many studies have investigated the diverse role that employees play in the life of the organisation. Employees are the sources of an organisation's innovativeness, survival, know-how, goal achievement, competitive advantage and innovation creation (Steenkamp & Kashyap, 2010; Bakotić & Rogošić, 2017).

In the OI literature, organisations benefit from internal knowledge by making use of employees' initiatives from both non-R&D and the R&D (Scouts) departments as activities have become more knowledge-centred (van de Vrande et al., 2009). Employees are also recognised as the mechanism for mobilizing both internal and external knowledge to increase innovation process and ensure successful outcomes (Breunig et al., 2014). Getting employees who are committed, loyal, and competent to work for organisations becomes an imperative as they are responsible for organisational innovativeness through resource scanning, searching, acquisition, assimilation, integration and transformation. In this regard, the involvement of employees in PS organisations becomes highly relevant in its innovation creation process.

The term EI is a broad concept that embraces a large scope of organisational practices instrumental in organisational success (Morgan & Zeffane, 2003). The concept is associated with organisational change strategy and trust between management and employees. The reason is that a change in the status quo brings suspicion and distrust between management and employees and this can be mitigated by involving employees in the transformation process (Morgan & Zeffane, 2003). The concept of EI includes practices and terms such as, empowerment, participation, training (Kaynak, 2003; Sofijanova & Zabijakin-Chatleska, 2013); participative decision making, training, information sharing, motivation and rewards (Riordan et al., 2005; Wallace et al., 2013); training and provision of adequate resource (Felstead et al., 2010); team-orientation and capacity development (Amah & Ahiauzu, 2013); use of ideas and suggestions from employees (Andries & Czarnitzki, 2014); participation, engagement and productivity (Tchapchet et al., 2014). These conceptualisations of the EI concept shows that it has a long history and different definitions; that could be summarised as empowering and giving voice to the employee in organisational processes.

There are various definitions of EI which focus on the degree of participation in the decision- making process, capacity building, ownership and responsibility (Amah & Ahiauzu, 2013); work practices that emphasise decision-making authority (Benson & Lawler, 2013); the opportunity for employee to make input and their opinions known in the decision-making process (Bosak et al., 2017).

The OI literature defines EI as “leveraging the knowledge and initiatives of employees who are not involved in R&D, for example by taking up suggestions, expecting them to implement ideas, or creating autonomous teams to realize innovations” (van de Vrande et al., 2009a, p.428). This aspect of EI suggests involvement at two levels – both internal and external as well as R&D and non-R&D staff aimed at getting contributions from all workers.

This means that EI is not a singular act but consists of various dimensions: training (power), participative decision-making power, information sharing and reward (Richardson & Vandenberg, 2005; Riordan et al., 2005; Konrad, 2006; Felstead et al., 2010; Phipps et al., 2013) involving both R&D (scheduled) and non-R&D staff. According to Macduffie (1995), all these four dimensions must be met to achieve high EI.

Empirically, a survey of employees in the United Kingdom (UK) suggests *that participative decision making* only increases the probability of continuous learning on the job (Felstead et al., 2010). Similarly, Riordan et al. (2005) in a survey of insurance companies in the US and Canada concludes that, studied in isolation, EI in decision making does not significantly influence their willingness to innovate or boost their morale. With regards to the reasons for employee driven innovation in OI, Hansen et al. (2017) outline four main reasons why employee participation is important in the PS. First, employee participation in decision making improves productivity, job satisfaction and means of innovation creativity. Second, it is a means by which employees influence the decisions relating to their activities. Third, it is a form of resolving conflict because of cooperation between employees and management in reaching consensus. Finally, it is a form of democracy in the organisation for effective decentralisation. Thus, for active participation, management is required to provide employees with all the necessary tools and abilities by investing in the necessary human capital development programmes, as evidence of their willingness for EI (Felstead et al., 2010). When this happens, employees can actively take part in decision making and then perceive that they have control over the decisions that affect them (Riordan et al., 2005). Participative decision making may have a strong effect on innovativeness when combined with other organisational activities such as training.

Training is the “systematic acquisition and development of the knowledge, skills, and attitudes required by employees to adequately perform a task or job or to improve performance in the job environment” (Tharenou et al., 2007, p.252) and quality decision making. Training enhances OGI, positively relates to employee outcomes and weakly related to financial performance (Tharenou et al., 2007). Ultimately, training and development of employees increases both employees’ productivity and organisational outcome (Nda & Fard, 2013). Training also improves initiatives of employees, increases quality of work, commits them more to achieving the organisational goals and enhancing employees’ effectiveness (Felstead et al., 2010; Nda & Fard, 2013). Employee training has become very important not only in enhancing organisation effectiveness, employee resourcefulness, but also give the opportunity to learn their jobs and deliver competently. Generally, training facilitates innovativeness. But how is this applied to OI practice?

According to Chatenier et al., (2010) the two most important competencies to be derived from training employees to implement OI are the competencies of *brokering* solutions (relational) and *social competence* (interactional). Thus, it is necessary to give employees the required training to develop the right knowledge for innovation creation. While employee participation and training are needed, there is the need to share information. Distributing power requires employees to share strategic information so that they can direct their efforts towards operations (Sun et al., 2000).

Information sharing refers to “the willingness to provide others with information in an appropriate and collaborative way” (Popović et al., 2014). This presupposes that the information required by employees to perform their jobs are in the hands of other persons or group –probably management or fellow employees. This makes the information held unique. According to Mesmer-Magnus and Dechurch (2009) information sharing is “sharing information not commonly held by all team members” (p.541) to enhance innovativeness. Therefore, information sharing is said to be a key process by which employees collectively make use of their available informational resources which seek to promote a positive environment of trust, cohesion, and improve employee socio-emotional outcomes (Mesmer-Magnus & Dechurch, 2009). Sharing information effectively, enables the transfer of both tacit and explicit knowledge (information) from

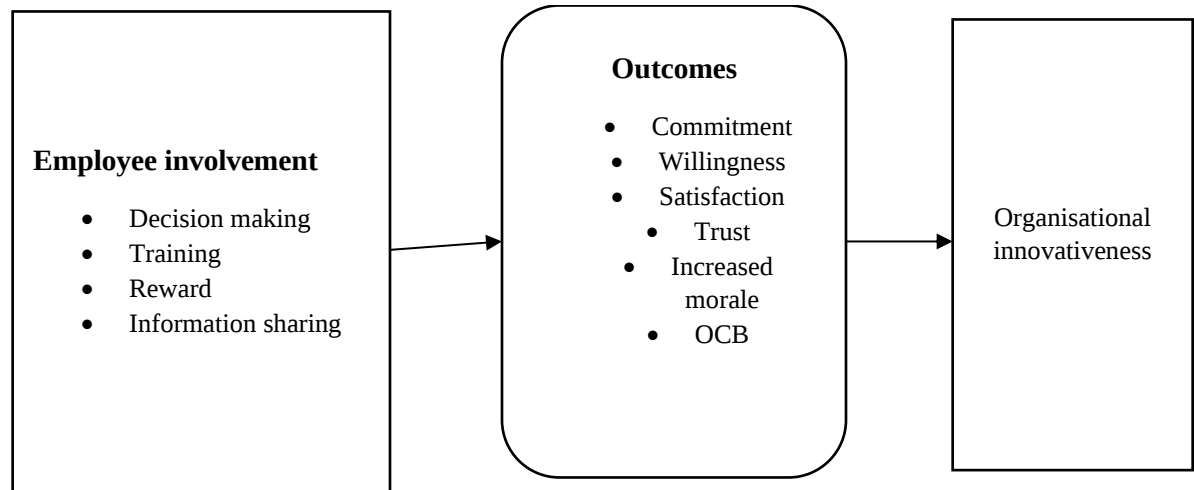
individuals within the organisation to other members, which may result in greater competency and strategic competitive advantage (Grant, 1996). This is needed to enable employees work enthusiastically and effectively. Information shared enables employees to carry out their work in a responsive and efficient manner, and motivated to deliver effective results (Bontis et al., 2011). Information sharing is thus recognised as an important part of the organisation that gives employees information about challenges in the industry, the workplace situation, organisation's plans, strategic goals, objectives, mission, and culture (Riordan et al., 2005; Bakotić & Rogošić, 2017); give employees self-efficacy technical knowledge to perform effectively (Bontis et al., 2011). In the PS, information sharing is seen as a competitive advantage as it enables employees to know about what is happening, know where to find knowledge, know if the knowledge will be profitable, know when to use the knowledge and understand the knowledge (know why) (Sandhu et al., 2011). This set of knowledge cannot be found in a single employee and the organisation can only benefit from individual embedded knowledge when it is shared. However, key individual barriers such as the lack of time, interpersonal skills problems and lack of interactions as well as organisational barriers of lack of information technology (IT) and rewards and motivation or recognition are seen as impediments to information sharing (Sandhu et al., 2011). Clearly, information sharing drives employee involvement and enhances innovativeness.

Another approach to improve EI and enhance innovativeness is through *reward, motivation and recognition of employees*. Rewards and motivation systems are ways by which management communicate to employees about what is expected of them (Bakotić & Rogošić, 2017). These rewards link the behaviour of employees to outcomes. Among the four dimensions of EI, rewards and motivations are the most critical factors to enhance performance (Pun et al., 2001; Karami et al., 2013). This includes both intrinsic and extrinsic rewards. Similarly, motivated employees work in the best interest of the organisation, increases their enthusiasms in fulfilling tasks, dedicated to duty, ensures growth, increased productivity effectiveness and overall development of the organisation (Manzoor, 2011) to ensure goal achievement. That is, employees add value to the organisation as far as they are working efficiently (possess dynamic capabilities) (Riordan et al., 2005).

Past studies in EI suggest that it leads to commitment, job satisfaction in the banking sector (Amah & Ahiauzu, 2013); increases the front-line employees willingness to implement their ideas and leads to innovativeness, increases the speed of work, improves quality of service delivery and leads to overall organisational effectiveness and higher performance in the health sector (Bosak et al., 2017; Mu et al., 2018); enhances innovativeness, fosters higher performance, releases knowledge and skills, develops better alternatives to solving problems, increases decision acceptance, reduces change resistance, and increases organisational commitment in the manufacturing sector (Pun et al., 2001; Rangus & Slavec, 2017). Using the variables power (decision-making), knowledge/skills, rewards and information sharing to determine EI influence on organisational productivity and moderated by organisational commitment, Phipps et al., (2013) found that both EI and commitment have impact on productivity. Further, employee commitment in the organisation influences behaviours that positively impacts productivity. Specifically, Amundsen et al. (2014) examined the attributes of employees that drive open innovation. The assumption about employee-driven innovation (EDI) is that all employees in the organisation have the potential to think in a creative way and willing to contribute to innovation and change (innovativeness). The basic idea is that by encouraging cooperation between employees and management, the organisation's performance would greatly improve (Hansen et al., 2017). Particularly, EDI generally improves employees interest in innovation activities, improves innovation process, reduces resistance to change, and increases the ability of organisations to exploit OI principles (Amundsen et al., 2014).

In all, EI has a positive impact on the organisation's objectives regardless of the sector that is adopting the EI practice. However, the notion is that EI is typically applicable when integrating external ideas with internal knowledge. But, Williamson (2008) extends this to mean also providing employees the chance to determine the type of external knowledge to bring into the organisation; involving them in the technology scouting or searching process as well. Figure 2.4 illustrates the relationship between EI and OGI. That is, the positive outcome if EI enables OGI.

Figure 2.4: The relationship between EI and OGI



Source: Developed by author, 2020

Little attention is dedicated in the extant literature to understanding the process by which EI translates to higher innovativeness in IOI. Thus, in recent times, researchers have been implored to study the impact of EI on firm innovativeness in OI (Bogers & Horst, 2014; Bogers et al., 2017) especially empirical research to understand its true merit in the small and medium sized enterprises (Felstead et al., 2010; Bakotić & Rogošić, 2017) including PSOs. Also, while EI in the health sector (Netherland) leads to innovativeness, the findings are not generalizable beyond the context of the research. This study bridges the gap in the EI – OGI literature (Mu et al., 2018) by investigating the relationship between them in Ghana. Apart from Slovenia, this current study also enhances the generalisability of the relationship between EI and innovativeness by investigating the organisation’s internal mechanisms of achieving innovativeness (Rangus & Slavec, 2017). Sanneh and Taj (2015) conducted a case study approach to establish the outcome of employee engagement in the PS of Gambia and advocated for an extension of the study to add depth and detail in another country using a quantitative or mixed method since employee engagement in the PS is beneficial. The current study contributes to enhancing EI mechanisms in the PS in Ghana. Again, Phipps et al., (2013) examined the relationship between EI and organisational productivity moderated by commitment, this current study addresses the impact of EI on OGI using ABCAP as a moderator to determine the impact. This study attempts to fill these gaps by exploring the PS in a developing country.

However, this study examines the stage at which a PSO is ready to implement an external technology.

2.11 Technology scouting (TS) and organisational innovativeness

With the increasing need for innovation creation, TS now represents an important factor in OI; which is increasingly becoming a key part of an organisation's strategy to collaborate (Sakamoto et al., 2017). Technology scouting enhances innovation creation success and hence contributes to the innovation management literature (Wang & Quan, 2019). Indeed, successful OI requires collaboration within the organisation, its practices and structure to support both internal (Zynga et al. 2018a) and external collaboration. Organisational innovativeness is recognised as an outcome of collaborative effort between the organisation and its external partners through an OI search strategy. One key strategy of systematically searching for external resources is through technology scouting.

An understanding of the TS space beyond the organisation's boundaries creates opportunities to acquire external solutions for current innovation programmes and also provides a systematic view of the current trend of development in the relevant technology industry (Spitsberg et al., 2013b). In the OI literature, there is active interaction between the internal and external innovations which is a demonstration of the fact that TS in the OI phenomenon does not only suggest external technology acquisition and innovations, but integrating external innovations with internal competencies (Yan & Cai, 2011) to enhance innovativeness. To achieve this, organisations conduct search for technologies on the external environment to discover trends and technologies to enhance their innovative efforts (Wang et al., 2018).

Technology scouting refers to an organised strategy of externally sourcing for technology that can be reconfigured to meet either tactical or strategic organisational needs by providing a linkage between the organisation (internal) and the environment (external) (Alves & Trabasso, 2015). Technology sourcing refers to an IOI strategy of acquiring external technology through intellectual property agreements (acquisitions) activities and strategic alliances (Vanhaverbeke et al., 2002). Organisations achieve this by

systematically assigning part of their employees or engaging external consultants to gather information relating to technology which enhances technology sourcing (Rohrbeck, 2010). On the basis of these definitions (Rohrbeck, 2007; Aloini et al., 2017; Tajudeen et al., 2019) suggest that TS is executed through two dimensions: internal and external dimensions.

The *internal perspective* of TS involves searching and scanning for information within the organisation related to the systematic assessment and observation of technology trends to detect opportunities and address challenges and threats in a timely manner (Parida et al., 2012). Technology scouting should start with the internal resources in a formal or informal manner because they know about the organisation, its strategy, and its processes (Sakamoto et al., 2017) as internal scouting is the main route that organisations search for technology (Yan & Cai, 2011). This typically involves the use of internal employees on full time basis or internal experts (Rohrbeck, 2007). Indeed, Wolff (1992) contends that the use of full time internal employees as scouts is ideal for the organisation. Further, the position of the technology scout could be in a corporate level position so that they could “get cross-divisional fertilisation that multiplies the value of whatever is found by technology scouting” (Wolff, 1992, p.11). The *external dimensions* of TS involve searching for information and scanning the external environment to discover emerging trends in technology that involve the use of external partners or consultants to gain ideas, new technologies, knowledge and opportunities to enhance innovation activities. This means searching for a new technology beyond the organisation’s boundary that can assist its innovative efforts (Akinwale, 2018). The use of external consultants as scouts enables the organisation to discover information relating to new technologies in spaces unknown to the organisation (Rene Rohrbeck, 2007). Organisations scouting around external technology identify, monitor and observe cutting-edge technology and their applicability (Wang & Quan, 2019). Scouting for external technology can be considered as the first step toward technology exploration and an important factor of IOI practice where organisations need to create scanning channels for recognizing valuable external knowledge sources (Cohen & Levinthal, 1990). Technology scouting thus aims to help organisations build and identify potential search opportunities from outside sources (Rohrbeck, 2012).

Identifying opportunities outside the organisation emanates from two mechanisms of technology scouting: *technology scanning* and *monitoring*. *Technology scanning* means an undirected process of broadly searching the technological environment to discover current or potentially relevant technologies while technology monitoring refers to a directed process emphasizing the depth of focusing on some specific types of technologies that are closely related to what the organisation needs (Rohrbeck, 2007; Yan & Cai, 2011). Technology scanning is a powerful process to encourage organisations to be both externally focused and forward looking; encourages foresight; enhances corporate learning; and helps organisations formulate technology strategy (Van Wyk, 1997).

The purpose of TS is not only limited to gathering large volumes of data but involves gathering ideas, gathering information, gaining awareness about current relevant technologies, accessing current technologies to support the organisation's internal innovation system that can be used to build innovation capability and readiness (Akinwale, 2018; Tajudeen et al., 2019). According to Parida et al. (2012) the aim of TS is "to create insights or awareness regarding significant patterns of change in the external environment" (p.290). In the same vein, TS can potentially allow the identification and prioritisation of a several relevant technologies on time and reduces both technology implantation and human resources costs (Bianchi et al., 2010).

TS in this study means *the process by which public service organisations scan and monitor the technological environment to discover relevant technologies through internal or external mechanisms to meet their unmet needs*.

Spitsberg et al., (2013) conclude that TS affects three areas of OI: helps identify external sources of knowledge to fill organisational gaps; facilitates the development of organisational strategy that gives equal attention to internal technology innovations and external acquisition of technology; and provides relevant information that enhances the generation of new ideas. Similarly, OI through various collaboration mechanisms can facilitate innovativeness (Wang et al., 2015). As a collaborative mechanism, TS comprises, *four groups of collaborators*: the internal stakeholders (sponsors and employees); the technology foresight team (interface between the organisation and the

scouts); the scouts that can be internal employees or external consultants, and the external experts (the source of information and potential technologies) (Rohrbeck, 2012).

Drawing from Monteiro and Birkinshaw (2016) and examined through the lens of SC, three dimensions of technology scouting activities (translating, transforming matchmaking) are linked to organisational innovativeness. These are value added processes depicting the role of the scouts.

Translating process (initiated by scouts) describes a situation where technology sourced externally by scouts needs to be reconfigured to fit the purpose of sourcing. The search for the technology is guided by the area of interest of the scout and problems identified by the organisation. These are technologies that are unfamiliar and do not map onto the organisation's business process. This involves the scouts performing two activities of filtering and framing. Filtering involves discussing how to make the business units understand and apply the technology by making it clear and simple; framing on the other hand means changing the language to "catch the eye" and win the heart of management. Scouts add value here by basically decoding information to fit the context (Monteiro & Birkinshaw, 2016).

Matchmaking process refers to situation where an internal unit proactively requests for specific technology providers. This request triggers a search process by the scouts. The process requires a stronger relationship between the scouts and the internal business unit. Here the scouts act as middle persons and connect the internal business unit and the provider. What the scouts do in this situation is that they add value by identifying the appropriate technology provider and facilitating their linkages (Monteiro & Birkinshaw, 2016).

Transforming process – unlike the above two processes, scouts spent time with the business units to understand the problem instead of accepting what they articulated. This involves scouts giving their own advice and engaging the unit in interactive search process to understand the problem. This may lead to the transformation of the problem after interacting with both internal and external partners and involves more follow ups and risks (Monteiro & Birkinshaw, 2016).

These three processes of resource acquisition led by scouts facilitate innovativeness in the sense that they make innovation possible by getting both internal and external partners to cooperate in the process.

Empirical studies in TS reveal that the phenomenon facilitates innovation. For instance, Wang et al. (2015) and Akinwale (2018) conclude that TS affects organisation's different acquisition mechanisms and at the same time facilitates internal innovation capabilities. Wang and Quan (2019) also found that TS is positively related to IOI generation (innovativeness). Inbound open innovation generation is defined as “the extent to which the active and systematic implementation of the strategies is encouraged and implemented resulting from the inflow external technologies for the in-house innovation” (Wang & Quan, 2019, p.6). In the SME sector, Brunswicker and Vanhaverbeke., (2015a) conclude that TS enhances innovativeness. Monteiro and Birkinshaw (2016) also find that success of technology scouting is dependent on absorptive capacity and network perspectives. For instance, the ability of the scouting unit to recognise and absorb external knowledge is made possible by internal capabilities such as technological capabilities. Also, TS is made of processes: the lack of a common ground between the internal and external partners leads to a *translating process*; a high level of uncertainty as to who connects to whom, leads to a *matchmaking process*; and a lack of common ground and a high level of uncertainty, results in *transforming process*. Establishing the relationship between technology scouting and innovativeness, Wang et al. (2018) conclude that TS enables OI generation in in high-tech-sector and in certain environments with high absorptive capacity.

Successful scouting depends on both internal attributes and external conditions (Monteiro & Birkinshaw, 2016). The external conditions discuss the level of common ground between the internal and external partners – that is the knowledge that is known and shared between the actors. This facilitates knowledge transfer. The other external factor is the uncertainty of outcome in the mediation process. Internal attributes of the scout refer to the stock of social capital possessed by the scouts (*structured dimension, cognitive and relational or connective*) (Nahapiet & Ghoshal, 1998). The *structural* component of social capital describes the set of relationships the scouting department has with both internal

and external actors. That is where the scouting department sits within a network of relationships. This (structural social capital) enables the unit to facilitate external knowledge sourcing and gives access to both internal and external partners for knowledge exchange (Nahapiet & Ghoshal, 1998; Monteiro & Birkinshaw, 2016). Obviously, the unit needs structural capital to execute its work of transforming, matchmaking and translating, but it is not enough to successfully execute that. They also require cognitive and relational capital. This dimension of capital is especially important in the matchmaking category where actors are introduced to each other (Monteiro & Birkinshaw, 2016). The *cognitive component* describes the resources that the scouting unit has accumulated over time to enable it provide shared representations, interpretations, and systems of meaning across organisational boundaries, a dimension of social capital that is important in the translating process (Monteiro & Birkinshaw, 2016). This dimension of social capital allows two parties to exchange ideas or knowledge through the availability and use of shared knowledge and vocabulary (Nahapiet & Ghoshal, 1998).

To conclude, TS depends on internal attributes (social capital possessed by the scouts) and external conditions (knowledge gap and outcome uncertainty). It also depends on the collaboration between stakeholders and employees. It facilitates and focuses on the adoption of external knowledge to solve organisational challenge (Wolff, 1992; Spitsberg et al., 2013). In the OI practices, TS has at least three effects namely the identification of external sources of knowledge, technology, solutions or ideas for identified challenges; making input towards developing a technology strategy and providing critical information that enables the organisation generate new product, services and ideas (Spitsberg et al., 2013). Technology scouting also enables organisations to detect in advance relevant technologies emerging from the industry and has therefore become a critical part of OI.

While the extant literature discusses the relevance of TS in IOI, most studies have focused on SMEs (Nigeria) and high-tech sectors (Taiwan and Europe). Also, the role of TS in IOI in the PS is barely investigated. Thus, several calls have been made by scholars (Wang et al., 2015; Tajudeen et al., 2019; Wang & Quan, 2019) to investigate the impact of TS in different sectors (apart from high-tech sectors) and countries using social network theory and moderating it with absorption capability to account for other contingent effects. This

study contributes to the TS literature in both theoretical and practical terms from a developing country perspective within the context of the PS.

2.12 Organisational innovativeness as an organisational practice - setting the context

Innovativeness is a precondition for innovation and success in complex and dynamic environments (Crossan & Apaydin, 2010; Kessler et al., 2015; Facó et al., 2020). Organisational innovativeness has increased in contemporary organisational life as firms need both innovativeness and creative employees to enable them innovate new products, new services and new processes to survive (Riivari et al., 2012). The literature on OGI has identified four key research dimensions: *structure-oriented dimensions* derived from the structural setup of the organisation and how it facilitates innovation creation; *person-oriented perspective* – individual members assumed to be the source of creativity and assertiveness; *process-oriented perspective* that uses organisational innovation processes to derive innovativeness and *culture oriented perspective* that assumes that organisational culture and climate enhances innovative capabilities and innovativeness (Binder et al., 2016). This study employs the culture dimension and integrates part of the structure, process and person perspectives.

The cultural perspective “captures innovativeness at a deeper level within an organisation, is more persistently compared to the other streams and acts more as a fundamental condition for a company’s innovative behaviour” (Pallas et al., 2013, p.3). Hence, OGI is the primary ingredient for innovation that requires employee collaboration, integration capability, and creativity (Riivari et al., 2012). In the OI literature, culture supports innovation by creating an enabling climate and valuing outside knowledge and competence as critical in OI practice (Naqshbandi et al., 2014). Pallas et al. (2013) align OGI to innovative culture and describe it “as deeply held beliefs or values that are manifested in managers’ or employees’ behaviour and may be a source of sustainable competitive advantage” (p.13). Similarly, Kessler et al. (2015) and Binder et al. (2016) from the cultural perspective, distinguished OGI into three dimensions of *willingness to take risk or innovate*, *the ability to innovate (resources slack)* and *the possibility to*

innovate (rewards and freedom to act innovatively). These dimensions of OGI may serve as barriers or facilitators of IOI. Tsai and Yang (2013) also define innovativeness as a form of Organisational Culture (OC) that is open to new ideas, technology and innovation from internal and external sources. It (OGI) also refers to the technological capacity/superiority, behavioural willingness and capability of the organisation to engage in innovation (Avlonitis et al., 1994; Hurley & Hult, 1998; Salavou, 2004; Hult et al., 2004; Rhee et al., 2010); the organisation's receptivity and inclination to initiate and implement new ideas (Rubera & Kirca, 2012); the proclivity for OI (the organisation's inclination to integrate external technology to complement internal capabilities (Rangus et al., 2016). Other definitions underscore OGI as climate to support innovation, engage employees and capability to innovate (Lumpkin & Dess, 1996; Shoham et al., 2012; Ruvio et al., 2014).

Organisational innovativeness (also known as innovation culture, process innovation or innovation behaviour) is a multidimensional construct (Wang & Ahmed, 2004; Dobni, 2008; Lynch et al., 2010; Shoham et al., 2012; Riivari et al., 2012; Pallas et al., 2013; Ruvio et al., 2014; Kessler et al., 2015; Binder et al., 2016) and an important cultural antecedent of innovation (outcome) (Crossan & Apaydin, 2010; Tsai & Yang, 2013) which reflects differences in the possibility of the organisation to innovate (Shoham et al., 2012; Klimas & Czakon, 2018).

This study defines innovativeness from the perspectives of both Kessler and Binder:

The willingness, ability and capacity to innovate. That is, the innovativeness of the GRA refers to its employee's (management and staff) willingness, ability and capacity to implement externally acquired technology effectively.

The *willingness to innovate* describes the inclination of employees to engage in innovative behaviours and the acceptance of the innovation (Kessler et al., 2015). The acceptance of innovation by employees is driven by their individual goals, intentions, ownership, rewards/motivations and level of involvement in the innovation (Chrisman et al., 2015) which are key in the change process (Binder et al., 2016). The *ability to innovate* describes resource availability in the organisation (resource slack) (Kessler et al., 2015; de Vries et al., 2016) and technological capability (ability to master and use the acquired technology)

(Liao et al., 2020) including competence in knowledge management, IT skills, collaboration, engagement and effective communication (Gordon & Tarafdar, 2007). The *organisation's capacity to innovate* describes the ability of its employees to adopt and implement new technologies, build and deploy resources as well as possess the requisite technological and managerial capabilities (Lynch et al., 2010). Table 2.9 gives a summary of the various elements of organisational innovativeness.

Table 2.9: Dimensions of organisational innovativeness

Organisational innovativeness		
<i>Ability to innovate</i>	<i>Capacity/possibility to innovate</i>	<i>Willingness to innovate</i>
Resource availability	Error tolerance	Readiness for change
Employees and management	Rewards	Problems handling
<i>Innovation capabilities of:</i>	Integrative capacity	Monitoring the external environment
Employees and management	Creativity	Cooperating with other stakeholders
Knowledge management	Technological capacity	Managing resistance
Information technology skills		Generating new ideas
Organisational climate		Positive attitude towards external knowledge
Employee engagement		

Source: Compiled from the literature (2020)

The above three dimensions suggest that OGI is best achieved by combining these factors. They constitute the readiness of an organisation to performance in IOI activities.

Specifically, OGI in the PS (government agency) refers to “the capacity of a government agency to generate new ideas, processes, practices, or programmes that change the way the organisation provides services for customers or constituents” (Kim & Chang, 2009, p.294). This means effective service delivery and performance of a government agency depend on its innovativeness. The *capacity to innovate* also includes the capacity to

stimulate or reward innovation; focus on idea generation and selection; and capacity to implement and use the novel ideas (Facó et al., 2020). This capacity to innovate thus represents a pre-condition for innovation (Ruvio et al., 2014). Thus, OGI in the PS is the basis for solving challenges and a precondition for PSOs as they implement and develop new processes and structures to achieve efficiency, effectiveness and service quality (Kobylnska & Vila-Biglieri, 2015). Achieving this goal requires the organisation to invest in shaping and developing OC necessary for innovation (Riivari et al., 2012; Kobylnska & Vila-Biglieri, 2015).

Organisational innovativeness requires employees to interact among themselves and create a shared understanding and a positive behaviour which involves risk-taking, power sharing, reputation and financial resources (Quandt & De Castilho, 2017). Innovativeness in the PS, can be categorised into behavioural (internal environment) and technological factors (external) (Lopes & de Carvalho, 2018).

Behavioural innovativeness refers to the internal interest of the organisation in new ideas and innovation (Riivari et al., 2012). It shows the extent of change in behaviour, attitude and commitment towards innovation (Avlonitis et al., 1994; Salavou, 2004) by employees and management. *Technological innovativeness* refers to the degree of technology adoption by an organisation (Antoncic et al., 2007) through knowledge inflow activities. It demonstrates the willingness and ability of employees and management to change from existing technologies and adopt the current state of the art (Salavou, 2004) and the capabilities, opportunities as well as the constraints of the organisation to exploit innovations (Avlonitis et al., 1994). Thus, both technological and behavioural innovativeness demonstrates the capacity and commitment of both employees and management to innovate. Table 2.10 shows the various elements of behavioural and technological innovativeness

Table 2.10: Behavioural and technological innovativeness

Behavioural innovativeness	Technological innovativeness
• Readiness and appreciation • Culture of openness • Willingness (tension)/tendency to innovate • Risk taking • Receptivity, inclination and proclivity • Organisational climate • Possibility to innovate • Management support • Networking • Rewards • Effective communication	• Capacity to innovate • Ability/capability/superiority

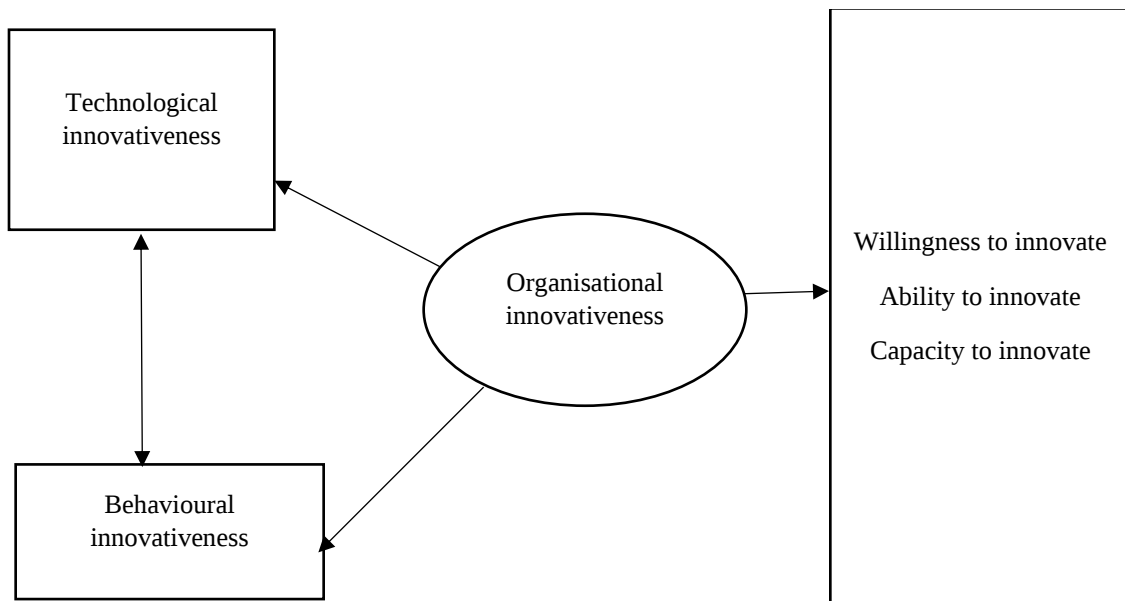
Source: Developed by author, 2020.

Studies on OGI have led to varying outcomes. According to Su et al. (2009), both internal capabilities and external partnership contribute to innovativeness but the examination of one alone may not give a complete picture. This study (Taiwanese biotechnology firm) used R&D, marketing and manufacturing capabilities to represent internal capabilities while external capabilities represented partnerships with suppliers, customers, horizontal competitors and universities and research institutes. A study in a high-tech Taiwan manufacturing firm (Tsai & Yang, 2013) operationalise OGI as openness to new ideas (management and employee acceptance or rejection) and find that it impacts positively on firm performance when market turbulence and competitive intensity are both high. Another empirical study on OGI (Chen et al., 2010) by Taiwanese firms concludes that knowledge management (knowledge creation and sharing) positively impacts innovativeness but this relationship is stronger under a supportive organisational climate. Further, Antoncic et al. (2007), in their study in transition economies, find that technological innovativeness significantly predicts organisational growth, profitability and new resource creation. But this occurs with organisational support and partnerships with other organisations. Another empirical operationalisation of OGI (Kessler et al., 2015) in the Austrian hospitality industry concludes that OGI is determined by five factors of cooperation as a means to change, acceptance of change, available resource (time, money, ability) for change, pluralism as a means for change and tolerance for errors.

Empirically, Shin & Choi (2019) operationalised OGI (non-profit organisations in South Korea) as success in achieving organisational goals facilitated by three factors: organisational attributes (decentralized decision making, top management practice, and rules and procedures); internal and environmental characteristics (the role of government-policies, rules and regulations); and leadership (motivation, skills, empathy, teamwork, conflict management, capacity building of staff).

The above brief review shows that OGI in the PS is an underdeveloped area of research and requires further exploration (Kim & Chang, 2009) in developing economies (such as Ghana) (Lin et al., 2019) by determining its impact on employees innovation creation (Kessler et al., 2015). This study contributes to the literature on innovativeness by focusing on the PS of a developing African economy (Ghana).

Figure 2.5: Dimensions of organisational innovativeness and outcomes



Source: Author, 2020

2.13 Theoretical perspective

This research is guided by three relevant theories: the social capital theory (SCT) (Burt, 1997; Nahapiet & Goshal, 1998; Batjargal, 2003; Luk et al., 2008; Casanueva & Gallego,

2010), the dynamic capabilities theory (DCT) (Teece et al., 1997; Eisenhardt & Martin, 2000; Helfat et al., 2007; Teece, 2007: 2014 ; (Lin et al., 2016; Bogers et al., 2019) and absorptive capacity theory (Cohen & Levinthal, 1990; Fabrizio, 2009; Zahra & George, 2002; Robertson et al., 2012). These theories have been used to study OGI from various perspectives (Pihkala et al., 2007; Alguezaui & Filieri, 2010; Yu et al., 2013; Eklinderfrick et al., 2014; Ou et al., 2015).

2.13.1 Social capital theory

Social capital is a broad concept that facilitates innovation and explains the various management phenomena (Tura & Harmaakorpi, 2005; Casanueva & Gallego, 2010; Camps & Marques, 2014). According to Lin et al. (2001), the notion of SC is “investment in social relations with expected returns” (p.7). In other words, the assumption of the importance of returns from investments in the social networks. Thus, the fundamental proposition of SC theory is that network ties give actors access to resources (Nahapiet & Goshal, 1998). In this case, SC may be defined as the resources or returns obtained from the relational network that an individual or organisation keeps for some time (Casanueva & Gallego, 2010). There are two perspectives of the SC concept - the individual (personal) level and the group or organisational level (Lin et al., 2001). Further, the influence of SC on innovativeness is analysed from the individual, organisational, inter-organisational, intra-organisational, societal levels and departmental or various research units (Tsai & Ghosal, 1998; Casanueva & Gallego, 2010).

Adler and Kwon (2002) define SC as “the goodwill available to individuals or groups ... its source lies in the structure and content of the actor’s social relations ... its effects flow from the information, influence, and solidarity it makes available to the actor” (p.2002). This definition describes SC as having both internal/ intra-organisational and external/ inter-organisational relations and attributes SC to both individual and groups. That is, the

the sum of the actual and potential resources embedded within, available through, and derived from the network of relationships possessed by an individual or social unit ... comprises both the network and the assets that may be mobilised through that network (Nahapiet & Goshal, 1998, p.243).

In terms of dimensions, the SC theory is conceptualised and measured from various perspectives (Tsai & Ghosal, 1998; Nahapiet & Ghoshal, 1998; Lin et al., 2001) . Based on Nahapiet and Ghoshal (1998) and Tsai and Ghosal., (1998) SC is conceptualised in this study as *structural (network arrangements)*, *cognitive (shared language, beliefs, codes and understanding)* and *relational dimension (trust, norms)*.

Social capital is suitable for OGI for several reasons. *First*, it facilitates the flow of information among employees about opportunities and other activities from networks. Such information reduces transaction costs. For instance, seeking information on available technology. *Second*, social networks may influence the actions of the actors involved in the network because of positions (authority or capacity), strategic locations such as structural hole in decision making. *Third*, the social-tie builds trust among the actors. *Fourth*, social relations enhance identity and recognition as members may be willing to share and access resources for innovation (Lin et al., 2001). *Fifth*, SC facilitates access to external knowledge and ideas within innovation processes including sustainable benefits within general operations (Rass et al., 2013). Thus, information sharing, influence, social credentials and reinforcements may explain how IOI, TS and EI lead to OGI.

2.13.2 The structural dimension of social capital – network configurations

The structural dimension of SC gives the foundations for understanding the combination of linkages, connectedness and “social interactions among actors within a specific network” (Pinho, 2011, p.409). This dimension of SC capital denotes the form of relationships between network actors and the degree to which the actors are connected (Inkpen & Tsang, 2005) through interactions. Structural SC represents the impersonal configuration of ties between actors in a network (the hardware of social capital) (Adam & Roncevic, 2003) which is defined by network ties and quality of interactions between the actors in accessing resources and information (Liao & Welsch, 2005) in OI processes. Essentially, structural SC concerns the ability of actors in the OI process to access relevant information, resources (technology, knowledge and ideas), and other key support needed for successful innovation creation (Liao & Welsch, 2005). In knowledge generation, informal networking among employees through social capital shows that an employee with a larger size of networks obtains quality ideas needed for innovation performance.

But the presence of a higher number of structural holes reduces the quality of ideas the employee generates (Colombo et al., 2011). Structural holes – the dark side of networks – isolates networks and has a negative influence on the behaviour of employees to generate innovation (Colombo et al., 2011)

The structural perspective of *internal social capital* refers to the connections among individual employees or groups within the organisation (Cuevas-Rodríguez et al., 2014); the network structure and the network content of linkages among employees within the organisation (Adler & Kwon, 2002; Rodan & Galunic, 2004). Network linkages among employees enhance the transfer of knowledge, serves as mechanisms for information exchange and knowledge flows, hence “facilitate the mobilisation of existing knowledge resources” (Maurer et al., 2011, p.161). Casanueva and Gallego (2010) demonstrate empirically that intra-organisational SC directly affects employee innovativeness while Nahapiet and Ghoshal, (1998) argue that information flow among employees within the organisation gives competitive advantage and enhances the capacity of the organisation to absorb and assimilate knowledge, improve quality of information, importance and timely communication. Sharing of internal information by employees with each other and TMT acts as a multiplier because it impacts both employee efficiency and customer focus (Bontis et al., 2011) and the possibility to innovate.

2.13.3 Relational perspective of innovation creation – trust and norms

This dimension of SC discusses the type of personal relationships that individual actors within their network have developed through intensive interactions which influences their behaviour and motive fulfilment (Nahapiet & Ghoshal, 1998; Adam & Roncevic, 2003; Liao & Welsch, 2005). It focuses on relationships such as trust and trustworthiness, norms, obligations and expectations, respect, commitment to perform a future activity and identification (sense of belongingness to a group of people). Most scholars agree that discussions on relational SC in innovation creation is dominated by trust and norms (Tsai & Ghosal, 1998; Zheng, 2010) which is considered a precondition for many types of relationships (Moran, 2005) and the level of familiarity (Moran, 2005). Trust and trustworthiness have a positive correlation with resource exchange and combination, which in turn have a positive impact and generally contributes to innovation (Zheng, 2010;

Sanchez-Famoso et al., 2014). Because trust has overwhelming impact on innovation creation, this study limits the discussion on relational SC to trust and trustworthiness - *internal trust* (trust between employees and management) and *external trust* (trust between partners in a network of resource acquisition).

The *internal dimension of relational SC* refers to the types of relationship people develop throughout the history of interactions within the organisation which influences behaviour and focuses on the quality of the relationships between individuals (Liao & Welsch, 2005). This dimension of SC focuses on the quality of the relationship among employees that facilitate the transfer of information or knowledge (Maurer et al., 2011; Cuevas-Rodríguez et al., 2014) based on trust. Leana and van Buren (1999) describe trust as the capacity of individual actors to put group interest above individual desires while Mishra (1996) explains trust as the willingness of one party to be vulnerable to another party on condition and the belief that the other party is (a) competent in decision making (b) open and honest (c) concerned about the welfare of others (d) reliable-consistency between words and action. Trust also influences employees willingness and intention to share knowledge (Akhavan & Hosseini, 2016); facilitates innovation outcomes (Moran, 2005) and necessary for employees to work together (Leana & van Buren, 1999).

2.13.4 Cognitive dimension of SC-shared understanding

This dimension of SC captures “the common context and language in the structure” (Sanchez-Famoso et al., 2014, p.3); those resources providing “shared representations, interpretations and systems of meaning among parties.” (Nahapiet & Goshal, 1998, p.253). In this regard, Inkpen and Tsang (2005) describe cognitive SC as the degree to which group or network members share a common understanding and strategy in achieving outcomes. Common context and language serves as a bonding mechanism that enables the partners to integrate and reconfigure resource which reduces conflict, facilitates negotiations and achievement of common goals (Tsai & Ghosal, 1998); enables knowledge transfer and exchange (Inkpen & Tsang, 2005); encourages mutual understanding and inspires employees as to how they should behave (Sanchez-Famoso et al., 2014) and explains innovation creation processes (Zheng, 2010). Employees can interact better among themselves if they understand the context and the language within

which they interact and the rules that guide the interaction. Shared language facilitates the ability of employees, TMT and TS unit to gain access to each other and share information (Nahapiet & Goshal, 1998).

Two key benefits of SC emerge in the cognitive literature: solidarity (Adler & Kwon, 2002) and strategic consensus (Atuahene-Gima & Murray, 2007). Solidarity refers to the extent to which actors in the relationship subdue their individual needs to that of the organisation by complying with local rules and customs. Strategic consensus describes the extent to which actors (internal and external) “agree with or have a shared understanding of the strategic goals and processes of the task” (Atuahene-Gima & Murray, 2007, p.7). Cognitive social capital facilitates communication between parties (employees, TMT and TS unit), opens discussions, questioning, enables actors to gain access to each other and their resources, enables capability and combination of information through shared language and codes (Nahapiet & Goshal, 1998).

2.13.5 External social capital and organisational innovativeness

This section examines the relationship between IOI activities and external stakeholders in resource identification and acquisition. *Intra-organisational/internal* SC may not lead to organisational performance (Leana & Pil, 2006), as a result, organisations establish inter-organisational linkages during the innovation process to “enable them exchange a variety of information and complementary knowledge to scan their environment for new technologies” (Cuevas-Rodríguez et al., 2014, p.5). In this case, scouts are able to scan and monitor the environment for technology through quality information exchange with external stakeholders. Strong internal relations may lead to organisational inertia, prevent organisations from pursuing growth opportunities from the environment, sensing outside weak signals and seizing new opportunities for innovation (Kianto & Waajakoski, 2010). Strong and established inter-organisational ties reverse this “dark side” of strong intra-organisational connectedness and result in external information access through network collaborations (Kianto & Waajakoski, 2010).

Inter-organisational SC may benefit the organisation in several ways. This relationship may provide the organisation access to important outside resources, alliance partners and contacts networks to innovate (Leana & Pil, 2006; Huggins et al., 2012). Through alliance

partnerships, organisations are able to collaborate and interact which leads to knowledge access between the partners. Burt (1997) and Adler and Kwon (2002) identify informational benefits, control benefits and solidarity as benefits of external SC. Through inter-organisational interactions, partners obtain wider sources of information that would have been difficult to obtain alone, timely access to information and referral of information or resource by other actors needed by the scout at the right time and place. The willingness to cooperate and exchange resources at the inter-organisational level depend on two characteristics of relational embeddedness – *relational closeness* (the degree of familiarity of the partners in the relationship) and *relational trust* (Moran, 2005). Relational SC with external stakeholders enhances cooperation and commitment among partners which results in innovativeness (Cuevas-Rodríguez et al., 2014). Ortiz et al. (2018) find that inter-organisational SC facilitates knowledge identification and acquisition, which is necessary to sustain the flow of information and other resources in the dynamic business environment (Blyler & Coff, 2003). The review of the external SC literature reveals that it facilitates the effective accessibility, exchange and acquisition of valuable resources from partners. In this current study, the TS unit can access, exchange and externally acquire strategic resources such as technology on the external network.

2.14 Dynamic capabilities theory

“The key implication of dynamic capabilities is that firms not only are competing on their ability to activate and exploit their existing resources and organisational capabilities, but are also competing on their ability to renew and develop these” (Nielsen, 2006, p.61). This implies that the ability of organisations to enhance performance does not necessarily depend on the availability of resources that they can exploit. Rather, enhance performance depends on the organisation’s ability to combine, renew, integrate and develop its resources.

The emphasis of DCs is on the ability of management to imitate and combine resources from internal and external sources as well as across all functional units and also including human resources and organisational processes that give the organisation the opportunity to respond to the changing external environment (Lawson & Samson, 2001). The DCs concept evolved from the resource-based view of the firm (RBV) (Ambrosini & Bowman,

2009) where proponents of the RBV (Wernerfelt, 1984; Barney, 1991) argue that valuable, rare, inimitable and non-substitutable (VRIN) resources can be a source of higher performance, and may enable the organisation to achieve sustained competitive advantage. Dynamic capabilities have added value to the RBV debate by transforming VRIN static resource into one that can lead to competitive advantage in a dynamic perspective and the ability to rapidly react to changes in technology (Zaidi & Othman, 2012). Dynamic capabilities help to better understand and explain the successes and challenges in managing OI activities as it requires a combination of external and internal sources of knowledge (Bogers et al., 2019) to achieve innovativeness. Therefore, the competitive advantage of an organisation does not come from VRIN resources but “lies in the resource configuration that managers build using dynamic capabilities” (Eisenhardt & Martin, 2000, p.1117).

Eisenhardt and Martin (2000) relate DCs to routines and processes and define it as “*the firm’s processes that use resources to integrate, reconfigure, gain and release resources - to match and even create market change*” (p.1107). This view of DCs suggests that resources include both material and people based. These resources are critical in implementing IOI as management innovation alone is not sufficient without DCs (Lin et al., 2016). For instance, while internal resources (people) are the key elements in value creation, the organisation must also possess valuable resources from the external environment by following well established processes and routines based on the skills and capacities of their employees (Zaidi & Othman, 2012). Table 2.11 shows the constituent elements of DCs from the process and routine perspective.

Table 2.11: Constituent elements of DCs

Element of DCs	Brief description
Resource integration routines	Developing routines where managers combine their various skills, knowledge, and functional experiences to produce quality service and achieve competitive advantage
Strategic decision making	Pooling resources from various departments and individual experiences to enhance strategic choice and shape the organisation
Resource reconfiguration routines	Routines that enable managers to recreate, transfer, imitate and recombine knowledge in the organisation
Resource allocation routines	Routines to guide the allocation of scarce but valuable resources
Patching processes	Routines that enable the organisation to add, combine, split or realign strategic resources
Knowledge creation routines	Routines for building new knowledge and capability in the organisation by managers and employees
Alliance and acquisition routines	Processes for acquiring valuable external knowledge
Resource jettison process	Processes for disposing resources that no longer gives an advantage

Source: Eisenhardt and Martin (2000)

This perspective of DCs is necessary in IOI. For instance, acquisition process enables the organisation to acquire external technology. Also, routines such as resource integration facilitates resource combination in IOI while alliance and acquisition routine enable resource identification and acquisition. Following processes established in IOI activities may enhance resource integration and hence employee's commitment, willingness and readiness to innovate.

While Eisenhardt and Martin (2000) relate DCs to routines and processes, Teece et al. (1997) define DCs as in terms of latent action – organisational ability “*the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments*” (p.516). This perspective means:

- the ability of management to coordinate and deploy both internal and external capabilities in response to environmental changes in an effective manner;
- the capacity to renew competences; and

- emphasises the key role of management in effectively adapting, integrating, and reconfiguring both internal and external organisational skills, resources, and departmental competences to meet the demands of the changing environment

Similarly, Pavlou & ElSawy (2011) define DCs by relating it to four capabilities as the *ability to sense and seize opportunities* (sensing capability), *modify existing resources* (learning capabilities), *integrate external resources* (integrating capability) and *ability to coordinate activities and deploy resources* (coordinating capability). Also, Bogers et al. (2019) relate OI to DCs by discussing three distinct capabilities: *sensing, seizing and transforming* (Teece, 2007) which “help companies to reap the full benefits of open innovation” (p.84). Further, Lin et al. (2016) identify four components of DCs (internal and external) that can be used to create innovation: *ability to sense and pursue opportunities, relational capability, absorptive capability and integrative capability*. From the capability perspective DCs consists of:

- *sensing capabilities,*
- *seizing capabilities*
- *integrative capabilities,*
- *transforming capabilities,*
- *relational capabilities*
- *absorptive capacity*

Some of these forms of capabilities relate to some components of ABCAP which is discussed in this study as a theory. Such capabilities will not be discussed in detail under DCs but rather discussed under ABCAP. For instance, sensing capabilities relates to recognition ability while seizing capability relates to acquisition capacity. Briefly, the following are discussed and related to the study.

2.14.1 Transforming capability

This requires the organisation to realign their systems, promote cultural change that facilitates collaboration, overcome NIH and NSH syndromes, make adjustments to both internal innovations and externally technologies to fit for purpose. It involves implementing the required infrastructure, structures, processes and routines and ensuring

that employees have the needed skills and capabilities among others (Kump et al., 2019). This form of DCs is needed to understand IOI strategies. This capability is needed both within the organisation and across its boundaries in TS activities, knowledge in-flow and EI.

2.14.2 Relational capability

This as an external element of DC refers to the ability of the organisation to build relationships with partners and acquire resources through social capital building and interaction (Lin et al., 2016). This type of capability comprises external and internal capabilities. The *external aspect* occurs when the organisation widens its sources of technology search by building social and economic relationships with other partners or individuals while *internal relational* capital promotes interaction, communication, collaboration, knowledge sharing, teamwork and value creation within the organisation (Lin et al., 2016). Both *external and internal relational* capabilities play different roles in the innovation process. For instance, external search for technology depends on relational capability to gain understanding and information on changes in the external environment and internal relational capital to realise information on internal challenges. Empirically, relational capability affects innovation activities positively as it facilitates the ability of partners or individuals to interact, share valuable knowledge and other resources (Lin et al., 2016). This form of DC affects OI activities both internally and externally. Internally, it enables employees to interact, communicate and work as a team to achieve innovativeness. It may lead to understanding, cooperation and team collaboration. Externally it enhances collaboration between external partners. Such processes are useful in inbound open innovation, technology scouting as well employee engagement processes which can lead to OGI.

2.14.3 Integrative capabilities

Jiang, Mavondo and Matanda (2015) define *integrative capability* (IC) as “a firm’s competence to strategically acquire, combine and deploy resources that are available in business partnerships to achieve managerial vision” (p.1186). For Verona (1999), ICs act as “an adhesive by absorbing critical knowledge from external sources and blending the

different technical competencies developed in various company departments” (p. 134). Synthesising the various definitions of ICs Mitchell (2006) conceptualised it as “knowledge transfer with two dimension: the ability to import external knowledge and the ability to synthesise internal knowledge” (p.923). Integration is essential for effective performance and the basis for the capability building process (Iansiti & Clark, 1994); a dynamic capability that impacts organisational innovativeness and an important element for value creation driven by top management participation (Hu et al., 2012). Its (IC) role in technology adoption (innovativeness) is particularly relevant in high-uncertainty environments, (especially the public sector) but has received less attention in the literature (Woiceshyn & Daellenbach, 2005). They (ICs) provide the capacity for reliable, repeatable communication and coordination activities aimed at introducing and modifying products, resources and capabilities and business models (Helfat & Raubitschek, 2018).

Externally, ICs refer to the ability of an organisation to access and import external technology from its external environment (Mitchell, 2006). Typically, external integration activities include two dimensions of integrating market and customer knowledge and integrating knowledge of emerging technologies (Iansiti & Clark, 1994). This capability requires the organisation to develop new knowledge, skills, training, new approaches and combine with experience to match the new dimension of technology. Following Dangelico et al. (2013) this study conceptualises EICs as *collaborative networks, external knowledge links, and access and acquisition of technology* in organisational innovativeness. These three EICs have positive and significant effect on product design innovation. From a network perspective, *collaborative network* refers to

a distinct mode of organisation in which participant organisations work together in equity, commitment and trust exchanging information, sharing activities and resources and complimenting and enhancing one another’s capacity for mutual benefit and a common purpose by sharing risks, responsibilities and rewards (Bititci et al., 2004, p.23).

For example, Dangelico et al. (2013) in their study found that formal network collaborations through external knowledge sources benefit the organisation from the acquisition of novel technical knowledge and other resources as they share ideas, search,

make comparisons and acquire resources from a network of collaborators. This may result in acquiring resources at lower costs and on time. Similarly, collaborations with customers in product development enables access to information, mutual understanding and meeting expectations and improved quality (Koufteros & Vonderembse, 2005)..

External knowledge links in the form of external communication channels is an important IC in innovativeness (Verona, 1999) and a mechanism of importing novel technology (Mitchell, 2006). For instance, Kapucu (2006) emphasises the importance of external communication and coordination between partners during emergencies through information sharing and activities coordination. Also, external knowledge links with regard to the extent of openness towards collaborators such as suppliers and universities enhance manufacturing innovativeness and a means of accessing external technical-know-how (Dangelico et al., 2013). Further, external knowledge links facilitate knowledge flows which have the potential to improve the organisation's current processes by making knowledge available to partners, users or suppliers or make use of underutilised resources (Mina et al., 2014). These activities suggest that external knowledge links facilitate innovativeness. Acquisition of novel external resources directly affects innovativeness and creates opportunities (Dangelico et al., 2013) and depends on the ability to merge the new knowledge with accumulated knowledge (Verona, 1999) into the decisions and choices and actions of employees (Mitchell, 2006). This shows the importance of recruiting employees with the right skills and knowledge, training and involvement in decision making (Mitchell, 2006b ; Dangelico et al., 2013).

Studies in external integration suggest that external resource such as technology is strongly associated with performance or innovativeness. Su et al. (2009) study of how external partnerships contributes to process innovativeness in the biotechnology industry in Taiwan showed that external partnerships contribute to innovativeness.. Jiang et al. (2015) demonstrate that external integrative capabilities help in transforming operational capabilities in business partnerships. Helfat & Raubitschek, (2018) show that external networks (alliances) in business ecosystems help platform leaders attract broader resource providers and capture value. Further, Harianto (1992) shows that stronger external technology networks in the banking sector lead to higher innovativeness.

Generally, external technology acquisition has a positive impact on innovativeness (Tsai et al., 2011). But this impact on innovativeness is significant when internal capabilities are enhanced (Tsai & Wang, 2008a). Similarly, organisational innovativeness is a complementarity between the integration of external activities (acquisitions) and internal capabilities (Cassiman & Veugelers, 2006). Further, the acquisition of technological know-how and resources affect the innovativeness of the organisation (Dangelico et al., 2013).

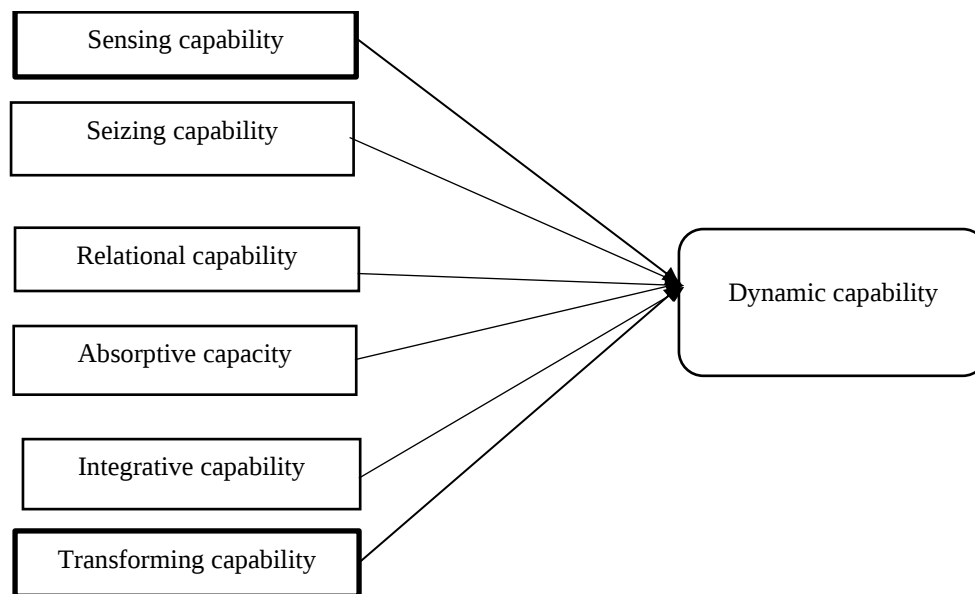
Finally, integrative capability (IC) as an *internal dynamic capability* concerns the ability of the organisation in resource reconfiguration, coordination, relocation and readjusting its functional capabilities to gain cooperation in implementing innovation activities (Lin et al., 2016) and the capacity to integrate external resources (Zhou et al., 2017). This dimension of ICs focus on integrative competence, or the ability to exchange information effectively across the units within the organisation (Henderson, 1994); coordinate activities to ensure successful innovativeness (Iansiti & Clark, 1994); inter-unit knowledge transfer competence and the “ability to synthesize the internal knowledge” (Mitchell, 2006, p. 923). These forms of capabilities are needed to successfully implement new concepts, ideas or technologies through inter-unit co-ordination, leadership, organisational routines by enhancing communication and, sharing novel information on time (Iansiti & Clark, 1994). Inter-unit coordination is particularly important for effective communication in risky and uncertain endeavour (Atuahene-Gima, 2005) which involves the integration of existing specialized skills, knowledge bases, technical and managerial systems (Iansiti & Clark, 1994). So, inter-unit co-ordination identifies the needed skills, knowledge and other resources needed for successful innovation.

Empirically, IC has positive and significant effect in the innovation process, especially during implementation (Lin et al., 2016). Internal capabilities also affect organisations that seek to adopt technology (Woiceshyn & Daellenbach, 2005), affect organisational innovativeness (Su et al., 2009), enable firms to benefit from digital innovations (Helfat & Raubitschek, 2018), facilitate system engineering (Yu, 2012), facilitate organisational performance (Hu et al., 2012) and enhance technology scouting (Yoon et al., 2018). However, the internal integrative capabilities of the organisation serve as “a foundation

for identifying and exploring external opportunities from partnerships, which in turn lead to the exploitation of internal capabilities” (Su et al., 2009, p.311).

This capability may also depend on the degree to which employees are involved in the innovation process and the attitude they exhibit towards the innovation as well as their willingness to embrace the innovation. Figure 2.6 illustrates the components of DCs as adapted for this study.

Figure 2.6: Internal and external components of dynamic capabilities



Source: Teece, (2007); Lin et al. (2016); Kump et al. (2019)

2.15 Absorptive capacity in the relationship between IOI activities and OGI – the theory

Since the evolution of the OI paradigm, knowledge flows (skills and absorptive capacity) has been identified and established as key moderating factors in openness research (Lopes & de Carvalho, 2018). In fact, Escribano et al. (2009) suggest that the best way to study absorptive capacity is to examine its moderating effect on out-side in knowledge flows on

innovation activities because organisations that possess higher ABCAP benefit more from external sources of knowledge. Similarly, Liao et al. (2010) conclude that ABACP is an intermediary between external knowledge and innovation capability. Absorptive capacity thus enhances OI in knowledge management (Wilden & Gudergan, 2014).

The concepts of OI and ABCAP are based on the premise that organisations can make use of externally generated technology to improve their innovation activities (Flor et al., 2018) and innovativeness. By defining the concept and emphasizing its influence on the organisation's capabilities on innovation, Cohen and Levinthal, (1989) started a research agenda on absorptive capacity (Escribano et al., 2009a), a concept which is one of the relevant learning processes in organisations and the most important organisational construct that has emerged in studies in recent times (Lane et al., 2006). Zahra and George (2002) defined ABCAP as a four-dimensional concept of “organisational routines and processes by which firms *acquire, assimilate, transform and exploit* knowledge to produce a dynamic organisational capability” (p.186). ABCAP is perceived as a dynamic capability because the processes are routine and follow a learned and stable pattern which facilitate the absorption of new knowledge (Filippini et al., 2010). These dimensions of ABCAP enable the organisation to reconfigure its resources and also adapt to its environment in order to achieve organisational innovativeness (Spithoven et al., 2011a). The foundation and rationale of these four dimensions are embedded in social interactions and hence affected by the interaction processes of social and environmental integration (Todorova & Durisin, 2007). These interactions may be intra or inter-organisational. This implores the use of SC and DCs theories. Cohen and Levinthal (1990) relate the concept of ABCAP to *innovation capabilities*, among others (Kostopoulos et al., 2007). Similarly, Cepeda-Carrion et al., (2012) relate ABCAP to *innovativeness*. Camisón and Forés (2010) also define absorptive capacity as “the systematic, dynamic capacity that exists as two subsets of potential and realised absorptive capacities” (p.709).

Absorptive capacity is thus defined here as: *the systematic and dynamic processes and routines that enable an individual to recognise, search, acquire, assimilate, capture and integrate knowledge to achieve a desired goal*. This definition underscores the relevance of ABCAP when individuals integrate both internal and external resources by following

their routines and processes. Thus, it is relevant in the study of OI. This definition also meets the two critical requirements of a construct domain – testability and operationalisation of the construct and it must have global relevance (all-inclusive) i.e., ability to incorporate other proposed dimensions (Shankar et al., 1995; Camisón & Forés, 2010). Besides, the definition also captures the two sub-types of ABCAP – PACAP and RACAP (Zahra & George, 2002). The rationale for this conceptualisation is that external knowledge is not freely sourced and absorbed without effort even if it is free in the public sphere, and not equally exploited by all organisations (Fabrizio, 2009). Rather, the organisation needs effort, expertise and strategy to access and identify, assimilate and exploit outside knowledge (Cohen & Levinthal, 1990) as a means of achieving superior innovation (Kostopoulos et al., 2007). In this case, collaboration between the individuals in the organisation and external sources help in identifying and accessing the resource to integrate with internal capabilities. This provides the organisation an efficient search mechanism and absorb the outside knowledge more quickly (Fabrizio, 2009).

PACAP includes recognition, acquisition, search and assimilation capacities which represent the organisation's efforts and activities to recognise, search, acquire and assimilate relevant and new external knowledge (Sun & Anderson, 2010) which are critically important for organisation innovation activities (Wang et al., 2018). PACAP makes the organisation ready to receive external knowledge and acts as the barrier between the organisation and its environment (Fosfuri & Tribó, 2008). Studies in innovation activities reveal that PACAP have significant influence on organisation's innovation performance (Yaseen, 2019). On this basis, the main input of ABCAP is inflows of knowledge from outside the boundaries of the organisation that is identified, processed and exploited to produce tangible benefits (Cohen & Levinthal, 1990; Zahra & George, 2002). Therefore, an organisation's ABCAP is not an outcome or a goal but can help obtain other important results (Fosfuri & Tribó, 2008).

RACAP on the other hand, is reflected in knowledge capture and integration capacity, which shows the ability of individuals in the organisation to capture, integrate and reconfigure the newly assimilated knowledge with the existing internal knowledge to produce new operations and competences (Sjödin et al., 2019). Combining these

dimensions make ABCAP complete as it does not only influence employee's behaviours (Zahra & George, 2002) but also the overall organisation (Liao et al., 2009). At the intra-organisational level, ABCAP facilitates the speed, frequency and volume of innovativeness (Kostopoulos et al., 2007). For example, scholars such as (Filippini et al., 2010; Camisón & Forés, 2011; Li, 2011; Ter Wal et al., 2011; Cepeda-Carrion et al., 2012; Ahn et al., 2016) identify ABCAP at the intra-organisational to include *knowledge capture, integrative capacity, in-house R&D, training, transformation and exploitation*. These capabilities help with the transformation of the external knowledge. Through RACAP, the organisation is able to sustain competitive advantage by being able to use the available resources; this demonstrates not only the effort of employees but also top management support. RACAP is an indication of how efficient external resources obtained through PACAP are absorbed (Fosfuri & Tribó, 2008). This type of capability (RACAP) allows the organisation to develop and refine its routines which facilitates the combination of existing and newly assimilated knowledge as well as transformed knowledge into its activities (Zahra & George, 2002). In line with the RACAP dimension, Cepeda-Carrion et al. (2012) conceptualised ABCAP as “a set of organisational abilities for managing and assimilating knowledge and applying it to commercial ends” (p.111). They argue that ABCAP depends on the individuals who prepare the ground for creating and applying the new knowledge and requires them to learn new methods of behaving to absorb the new knowledge. This is accomplished by adopting new practices and developing and applying new knowledge structures (Cepeda-Carrion et al., 2012). This reflects the RACAP dimension of ABCAP.

Thus, a discussion about ABCAP may focus on one dimension of these, a combination or even incorporate all the streams. This study considers all the dimensions.

Past studies have analysed the moderating effect of ABCAP at the aggregate level (Escribano et al., 2009; Guo & Wang, 2014; Hernandez-Perlines, 2018). These studies found the moderating effect of ABCAP as positive. However, this approach limits the possible insights and a clear understanding of the possible fine-grained interaction effects between IOI practices and OGI. Failure to examine the interaction effect of ABCAP at the micro or disaggregated level may induce a capability gap and a lack of appreciation of the influence ABCAP exerts in IOI practices on OGI. As such, this study conceptualises

ABCAP as a six-dimensional individual-level construct of knowledge *recognition, search capacity, acquisition capacity, knowledge assimilation, knowledge capture and integrative capacity* which can exert various effects on an organisation that undertakes innovation activities.

Similarly, Al-jabri and Al-busaidi (2018) identify two categories of factors that influences IOI activities: External, donor, partner or inter-organisational and Internal, recipient or intra-organisational factors. These factors influence the in-flow of knowledge from both the internal and external perspectives of the stakeholders – absorptive capacity, intra-organisational transfer capability, motivation to learn and leadership. This study discusses only the ABCAP attribute from both angles. From the partner perspective, the ability of the organisations to transfer knowledge adds value to their partners which also creates business opportunities and publicity for their products. From the recipient organisation's point, partnering external partners enhances their performance.

Also, intra-organisational knowledge capacity relates to the ability of the receiving organisation to effectively communicate and spread the externally acquired knowledge internally through formal or informal teams, e-mails and other organisation specific communication tools.

Overall, the ABCAP theory relates to the existing internal resources of the organisation such as knowledge and human capital; the outside environment including government policies and rules; industrial interactions and risks, increased expenditure on training, education, R&D; learning intensity; organisational strategies; increased innovation capability and competitive advantage (Liao et al., 2010).

Hence, there is the need to operationalise these concepts and processes of ABCAP; and OI provides an excellent context for operationalising these processes and concepts (Zobel, 2017). The various dimensions of ABCAP are explained below.

2.15.1 Knowledge acquisition capacity

Acquisition refers to the organisation's ability to locate, identify, value, recognise, understand the relevance of technology, and acquire externally generated knowledge or information that is crucial to its internal operations (Zahra & George, 2002; Fosfuri &

Tribó, 2008; Camisón & Forés, 2010; Noblet, Simon, & Parent, 2011). This means the gathering of information from both internal and external sources (Newey, 2010) through selection, identification and reconfiguration (Helfat et al., 2007) relating to knowledge gaps to meet organisational needs. Knowledge acquisition is the first practical step among a broad range of activities of accepting external knowledge from the external environment and converting it into a suitable form that can be internalized and used (Liao et al., 2010). This involves extracting the knowledge from external sources, interpreting it and disseminating it to the various parts of the organisation. Hence, the amount of effort used in knowledge acquisition processes that can impact ABCAP depend on three processes of intensity and speed of the organisation's effort to identify and gather knowledge and the direction the organisation takes (Zara & George, 2002). For instance, technology ABCAP – the capability an organisation possesses to seek, acquire and exploit external technological knowledge enables organisational receptiveness to external technological knowledge processes (García-Morales et al., 2007). Acquisition of external knowledge, technology or information occurs through prior investment in knowledge acquisition activities, R&D, intensity, direction and speed (Zara & George, 2002; Noblet et al., 2011). The literature also discusses this capability as seizing capabilities. Seizing requires efficient investment (building internal capabilities) and commitment to strategies in 'sensed' opportunities for internalisation of external technologies (Matysiak et al., 2018). This requires integrating, adapting and reshaping external technology to fit internal capabilities, setting good governance systems and establishing network collaborations. Thus, seizing capabilities is required for successful IOI (Bogers et al., 2019). Seizing thus bridges the gap between external and internal information and knowledge (technology) (Kump et al., 2019). The capacity to seize begins with the ability to recognise valuable knowledge; this capacity is high within the organisation if it is "able to decide whether some information is of potential value, to transform valuable information into concrete business opportunities" (Kump et al., 2019, p.10)

2.15.2 Knowledge assimilation capacity

Knowledge assimilation or assimilation refers to the organisation's capacity, processes, and routines that enables it to analyse, process, interpret, understand, absorb and integrate

external information with internal knowledge (Zara & George, 2002; Todorova & Durisin, 2007; Camisón & Forés, 2010; Zobel, 2017). Hence, knowledge assimilation concerns the organisation's ability to absorb external knowledge and integrate with its internal capabilities or existing knowledge base. The capacity for assimilation is acquired by coordination through gatekeepers, incentivising and motivating employees to use external knowledge resources, and knowledge management mechanisms through the use of processes that articulate the knowledge, codify knowledge, and disseminate external knowledge resources (Zobel, 2017).

2.15.3 Knowledge recognition capacity

Knowledge recognition relates to the capability of the individual or organisation in exploring, identifying, and valuing external knowledge resources (Todorova & Durisin, 2007) and “the ability to adequately assess technological feasibility” (Sjödin et al., 2019, p.374). It is the first element of ABCAP in the resource absorption process (Cohen & Levinthal, 1990; Todorova & Durisin, 2007) and involves two main processes of externally scanning and monitoring the environment for new and emerging relevant partners, technologies, and markets as well as assessing the strategic fit of external partners or knowledge with organisation's goal (Zobel, 2017). *Recognition and understanding describe* the organisation's ability to identify gaps in knowledge, identify necessary and valuable knowledge and identify external suppliers with know-how. Recognition capacity thus is positively related with accessing external technological resources (Zobel, 2017). According to Schweisfurth and Raasch (2018), knowledge recognition is a core innovation capability which involves the ability of the organisation to identify and evaluate novel external resources as well as crucial organisational needs that may impact its future survival. Similarly, Glavas et al. (2017), describe knowledge recognition as a critical element for exploiting and leveraging the external environment for knowledge acquisition process. Knowledge recognition depends on the ability of the individual to evaluate the feasibility of the technology (the relevance of the technology to the organisation) and the individual employee's motivation (value of the evaluated technology to the individual) – usefulness of the technology, motivation to assimilate, sufficient novelty, value, and feasibility in the midst of the organisation's innovation set

up (Sjödin et al., 2019). Further, knowledge recognition is contingent on prior knowledge of the organisations and the source of the knowledge (Todorova & Durisin, 2007). Knowledge recognition capacity is similar to opportunity sensing dynamic capabilities.

2.15.4 Search capacity

Search capacity refers to the general attitude of individual employees in searching for potential and valuable sources of knowledge (Ahn et al., 2016). This is the ability of the organisation to scan the external environment for potentially valuable new sources of knowledge (Arbussà & Coenders, 2007; Ahn et al., 2016) critical to its innovation activities. Organisations may set up units (such as scouting units) to purposefully search the environment. The ability to search for knowledge from various sources constitute an important aspect of the innovation process, which enables the organisation to benefit from several opportunities in acquiring relevant and accurate external knowledge (Guo & Wang, 2014).

2.15.5 Knowledge capturing

Knowledge capturing refers to established routines and processes of the organisation that enable employees to absorb external knowledge through internal workshops (discuss ideas, make suggestions and consider proposed observations); data interpretation, cooperation with consultants, subunits and academics; research groups/teams, project evaluation etc. (Filippini et al., 2010). Knowledge as used here refers to

the boundaries encompassing job-related entities (such as operational thoughts, behaviours, standard operational procedures, organisational routines, information and strategies about competitors, and customer knowledge), and individuals' insights and their past working experience which is relevant to the current job (Yang, 2004, p.423).

That is the level of the individual knowledge related to the systems in operation and experiences which is key in understanding current innovations.

Knowledge capturing is thus both quantitative and qualitative means by which employees gain knowledge through the identification, collection, recording and application of

relevant and important information relating to a phenomenon (such as customer interest) to facilitate decision making and enhanced organisational innovation activities (Yang, 2004). Accordingly, Chen and Huang (2009) relate it to gaining knowledge from partners, competitors, customers and sharing that knowledge with others as well as managing it effectively and putting it into practical use. These processes help leverage the received information and filter out knowledge that is not needed. Prajogo and Ahmed (2006) relate knowledge capturing processes to innovation stimulation (managing people) to achieve innovation performance which involves four key processes of training, effective communication, employee satisfaction and multi-skilling. These processes lead the organisation to turn the external knowledge into the required form for its intended purpose (Filippini et al., 2010).

2.15.6 Integrative capacity

This refers to the ability to incorporate the relevant valuable outside knowledge into the organisation's innovation process (Robertson et al., 2012; Ahn et al., 2016) which helps in digesting and transforming external knowledge and has direct influence on an organisation's performance (Ahn et al., 2016). Thus, integrative capacity influences innovation activities which is achieved through an interaction among the *social* (knowledge sharing, conflict management, team identification), *psychological* (shared understanding), and *cognitive* (knowledge consideration, assimilation and accommodation) processes which enables employees to develop effective communication practices, a shared identity, and a shared conceptualisation of a challenge that enables them to recognise how their unique knowledge resources can combine to create an integrated knowledge necessary for innovativeness (Salazar et al., 2012). An organisation's integrative capacity therefore denotes its competence in integrating knowledge from various sources (internal and external) needed for innovation creation (Yoon et al., 2018).

This definition suggests that integrative capacity is not an individual employee's effort, but the interplay of the social, psychological, and cognitive systems within the organisation which facilitates innovativeness. Thus, the ability to adapt, integrate, and reconfigure technology from external sources can help generate new and cutting-edge

knowledge (Salazar et al., 2012). Organisations that possess higher ABCAP demonstrate stronger ability of learning from partners, integrating external technology and transforming it into organisation-specific capability (Wang & Ahmed, 2007). Hence, integrative capacity relates to the ability of individual employees to embed external knowledge into the internal innovation process and the capability to successfully generate/create knowledge. This capacity also enables system reconfiguration and compatibility.

A close look at the literature on ABCAP clearly associates some of the variables with some of independent variables than others. For example, *recognition* and *acquisition* capacities are closely related to *in-flow of external knowledge* while *search* and *integrative* capacities are closely associated with *technology scouting*. Further, *knowledge capture* and *assimilation* are also related to *employee involvement*.

Drawing on the SCT and the DCT, the researcher proposes that IOI, EI and TS may impact OGI. But this relationship may also be moderated by ABCAP - a dynamic capability. The rationale is that PSOs innovativeness is determined by both EI and TS and moderated by ABCAP. That is, employee participation in decision making and the systematic scanning and monitoring of the business environment enables innovativeness. That is, certain actions of employees and scouts contribute to enhancing PSOs innovativeness. Specifically, EI in decision making shapes their beliefs and influences their actions towards achieving three goals of OGI (1) political goals where employees have greater influence over work decisions that affect them –exercising the principle of democracy (2) social goals of improving service delivery, job satisfaction, organisational commitment and cordial labour relations (3) economic benefit of greater commitment, improved performance and source of motivation that results in greater productivity (Tchapchet et al., 2014). Employee involvement in the PS also creates synergies for organisations and increases performance (Sanneh & A.Taj, 2015). Additionally, Parida et al. (2012), Wang et al. (2015) and Akinwale (2018) found that TS enhances OGI.

However, Tchapchet et al. (2014) observe that EI may not necessarily be the only factor that enhances organisational innovativeness. Similarly, TS, may not also be the only factor that is responsible for innovativeness. Certain aspects of intra-organisational activities

may also influence OGI. For instance, individual employee's ABCAP may influence the innovativeness of organisations (Lowik et al., 2017; Tian & Soo, 2018). Based on the extant literature, individual ABCAP of search capacity, knowledge recognition capacity, knowledge capture capacity, knowledge acquisition capacity, knowledge assimilation capacity and integrative capacity may influence the relationship between IOI, EI and TS on one hand and OGI on the other.

2.16 Hypotheses development

2.16.1 Direct link between inbound open innovation and organisational innovativeness

Although the association between IOI and OGI has not been specifically investigated, there are indications in the OI extant literature that the two are closely related. There are suggestions that organisations that engage in accessing external resources to complement internal knowledge and capabilities increases OGI (Enkel et al., 2009; Natalicchio et al., 2017). In line with literature, (Chesbrough, 2003; Chesbrough et al., 2006 ; Lichtenhaler, 2011; Dahlander & Gann, 2010), IOI relates to the process by which organisations explore the external environment for knowledge, skills, ideas and technology by collaborating with partners such as suppliers, customers, competitors, research institutes, universities to enhance internal innovations.

Collaborating with external partners gives the organisation easy and quick access to resources, builds relationships, a source of creativity and motivation and a greater source of knowledge to complement internal knowledge and capabilities (Barney, 1991; Lakemond et al., 2016; Hochleitner et al., 2017). Internal knowledge in IOI processes improves organisational innovation activities, complements the organisation's resources and capabilities, enhances the outside-in innovation process, creates strategic and social opportunities (Eisenhardt & Schoonhoven, 1996; Bagherzadeh et al., 2020). Besides, IOI practices also create opportunities to learn, boost innovation and make OI possible (Sisodiya et al., 2013). This enables the organisation to pursue and access abundant innovative opportunities (Wang et al., 2015), resources from external partners using various channels such as crowdsourcing, living lab, alliances, research centres and

intermediaries (Spithoven et al., 2011; Gasco-Hernandez et al., 2017; Gascó, 2017; Brunswicker & Chesbrough, 2018).

This discovery and use of knowledge and novel ideas from external sources is made possible by individuals (employees, consultants, boundary spanners etc.) playing various roles such as scouting and functions such as translators, matchmakers and transformers of ideas, knowledge or technology (Dahlander et al., 2016 ; Monteiro & Birkinshaw, 2016). Thus, an organisation that is open to external sources of knowledge is able to access knowledge, adapt it, exploit, value and create innovative opportunities (Laursen & Salter, 2006; Helfat et al., 2007). It thus accentuates the proclivity of organisations to work toward innovativeness.

Further, IOI helps increase the organisation's innovativeness by monitoring the external environment and sourcing technology from collaborative partners (Spithoven et al., 2009; Bucic & Ngo, 2012). Organisations are able to create innovation in IOI from the external environment when they have the ability to integrate it, especially relational capability to effectively interact with boundary spanners (Sisodiya et al., 2013). This ability to obtain external technology through relational capital facilitates innovativeness. Innovativeness is also enhanced by resource slack, resource network and other capabilities (Sisodiya et al., 2013). Aside these factors, organisation's innovativeness is also enhanced when it invests heavily in internal R&D (Hung & Chou, 2013). Investing in internal R&D enables the sourcing and integration of external technology for innovativeness (Tsai & Wang, 2009; Tsai et al., 2011; West & Bogers, 2013).

Inbound open innovation as a mindset of individual employees enables those collaborating in the knowledge in-flow process to overcome negative attitudes, cultural impediments , beliefs and thus benefit from the new technology (Engelsberger et al., 2019). Inbound open collaborative effort therefore enable employees to focus on the benefit of the technology, build integrative capabilities, a change in management thinking from market-share to benefit focused and mindset of competence building (Rufat-Latre et al., 2010). Collaboration in the IOI process builds trust which stems from change in the mindset of employees and partners towards openness, knowledge sharing, management of diverse cultures, building collaborative efforts (synergy) and ability to generate ideas and manage

knowledge (ambidextrous thinking) (Salampasis & Mention, 2015). This then builds an atmosphere of trust between the external partners and internal employees on one hand and internal employees and management on the other when leads to the willingness of employees to accept external technology and management preparedness to provide the necessary resources and build the capacity of individual members (Nakagaki et al., 2012).

Thus, IOI influence on OGI depends on various factors which come from the organisation pursuing the strategy. These factors determine the willingness, ability and possibility to innovate. Hence, the activities involved in obtaining external knowledge determines the propensity of the organisation to successfully combine external technology with internal capabilities (Chen et al., 2010).

In the public sector, IOI contributes to generating ideas where governments use various sources of knowledge, creativity, and expertise to facilitate learning and better understanding of societal problems (Sorensen & Torfing, 2015). Open innovation in the PS also contributes to generating innovative ideas to solve problems, an avenue to engage citizens and identify actors that have particular interest in a sector, a forum where government agencies learn about each other, engage employees, a means of engaging employees to solicit for support government projects creates public value by enhancing problem-solving capacity of citizens and employees (Yuan & Gasco-Hernandez, 2019); a means of obtaining knowledge, ideas and solutions, a platform for citizen participation, increases awareness of government challenges and a trust building process between the government and its stakeholders (Mergel & Desouza, 2013). In addition, IOI can facilitate innovation practices in the PS as it involves various stakeholders in understanding the problem, takes users and citizens need into consideration and builds consensus as well as joint ownership of the new policy, programme, product or solution (Hartley et al., 2013; Sorensen & Torfing, 2015). For example, implementing IOI in the PS involves the coordination of activities, exchange and pooling of resources, broader participation and understanding by users, employees and managers, which seeks to avoid negative attitude and resistance (Sorensen & Torfing, 2015).

This process facilitates the willingness of employees to accept the external knowledge as well as their ability to implement it and thus support organisational innovativeness.

Further, collaborating with external stakeholders in the IOI process to acquire knowledge may improve the technological capabilities of the organisation (the ability to acquire and utilise various technologies relevant to the goal of the organisation and integrating) by integrating the external knowledge into the internal innovation process which increases the possibility of innovation (innovativeness) (Helfat & Raubitschek, 2018; Liao et al., 2019; Bagherzadeh et al., 2020).

In the qualitative interview conducted, employees and managers of the organisation (the GRA) described how external technology is obtained and utilised. The respondents all agreed that external technology is selected and acquired by political leadership without internal analysis for implementation by management. One respondent remarked “the way customs acquire external technology has been externally driven ... and started by external stakeholders’ “politicians”. Another respondent said “more often than not, it comes from political leadership” referring to external technology acquisition.

In the public sector, the acquisition of external knowledge is normally influenced by the political environment, bureaucracy, “politics and the political process” (Kim & Chang, 2009, p.296). The literature suggests the importance of political leaders as agents of innovativeness. Activities of government leaders that possess the ability to explore new ideas, conduct environmental scanning and problem solving skills impact positively on OGI (Kim & Chang, 2009). Also, ethical leadership role of PS leaders in acquiring external resources motivates employees to take risks, openly share knowledge and hence contribute to the capability of the organisation to innovate. This leadership role and its influence on employees to innovate is also facilitated by trust (Pučetaité, 2014). Generally, political relationship enables political leaders to access wide range of suppliers because of their enhanced ability to pay legitimate transactions (Luo et al., 2020) which makes available the much needed technology by PSOs to innovate and thus enhance their capacity to innovate (resource availability). By collaborating with external partners to absorb external technologies from sources such as universities, other organisations, research groups suppliers etc may enhance the readiness of individual employees (R&D, non-R&D and technology scout staff) to implement such technologies, identify the

required capabilities and skills as well as the resources needed to achieve innovation creation.

The present study raises the possibility that external resource acquisition processes affect the ability, willingness and capacity to innovate. The study therefore hypothesises that:

H1: There is a positive relationship between inbound open innovation and organisational innovativeness

2.16.2 The moderating role of knowledge recognition in the relationship between inbound open innovation and organisational innovativeness

Knowledge recognition capacity refers to the ability of the organisation to identify (discover), evaluate and exploit potentially novel external knowledge (Todorova & Durisin, 2007; Zobel, 2017; Sjödin et al., 2019) and underpins the core concept of innovation capability (Sjödin et al., 2019). It represents the individual members capacity to identify gaps in knowledge, value outside knowledge needed for innovation, understand the know-how of suppliers and the organisation's know-what (Cohen & Levinthal, 1990; Filippini et al., 2010; Zobel, 2017).

Knowledge recognition capacity is critical in determining individual innovativeness and capabilities in external knowledge sourcing processes irrespective of the organisational level of the innovation (Cohen & Levinthal, 1990). Knowledge recognition capacity include broadly scanning and monitoring the external environment for emerging partners, technologies and markets which increases the speed and intensity of organisation's search efforts, allows access to a broader set of external knowledge, technology, partners, markets or ideas (Zobel, 2017). Organisations can recognise and access new external resources by developing new routines, organisational knowledge, processes, internal capabilities and change in mindset of employees, organisational structure and culture (Vanhaverbeke et al., 2008; Vega-Jurado et al., 2008; (Lewin et al., 2011; Felin et al., 2012; Kratzer et al., 2017a). Individuals with knowledge recognition capacity also possess internal capabilities that enable them to recognise and monitor valuable external developed technologies (Vanhaverbeke et al., 2008). These internal capability includes the organisation's internal knowledge or innovation source such as internal (intramural)

R&D, production, marketing and technology monitoring departments, clients, and management (Kratzer et al., 2017).

Externally, individual employees with recognition capacity are able to strategically assess and evaluate the external technology and determine their fit with the organisation's business model, the process, the scope and the direction of external technological resource access (Zobel, 2017). Such individuals have the ability to evaluate and focus on smaller and selected few sources of technology that are valuable (Arora & Gambardella, 1994).

Similarly, Filippini et al. (2010), identify two strategies or processes for knowledge recognition: establishing access to external resources and the process of absorption. In the first instance, individuals recognise the providers of the knowledge and establish relationships or ties with them while the second aspect deals with the individual deliberately observing the potential knowledge provider in regular, conscious and spontaneous manner. Knowing the source of the knowledge enables participating employees to concentrate effort on accessing the knowledge for defined purpose. For one thing, it also enables individuals to properly assess the knowledge before acquisition. This form of knowledge may come from various sources. Experts provide cutting-edge knowledge and customers provide important market-based knowledge, such as expectations, the nature of the competition and ideas. Also, employee involvement is another strategy by which the external knowledge could be sourced and recognised (Andries & Czarnitzki, 2014). Specifically, organisations that explore the external environment for knowledge to produce innovative products should involve and use ideas from chief executive officers (CEOs) and R&D managers while organisations that seek process innovation recognition should engage and use ideas from employees (Andries & Czarnitzki, 2014).

Emphasizing the relevance of recognition capacity in external resource acquisition, Sjödin et al. (2019), acknowledge that knowledge recognition activities inside the organisation (i.e. among employees and managers) is also important as it intrinsically motivates the individual, develop a positive attitude towards the technology absorption, discovers deficient ideas, high interest in locating critical solutions, strong technical capabilities and

understanding of internal processes and a form of idea filtration through interacting with colleagues.

Empirical research on recognition capacity demonstrates that the process enhances the quantity of technology, quality of the technology, and various forms of external resources that can be accessed for organisational innovativeness and competitive advantage (Zobel, 2017). Further, recognition capacity enables employees to understand the innovation process through external linkages or intensity of knowledge flows from the external environment (Fosfuri & Tribó, 2008). This capacity to recognise external resources emphasises external search and scanning efforts as important ingredients in OI (Laursen & Salter, 2006). The capacity to recognise the value of external technology forms part of the organisation's PACAP (Zahra & George, 2002), that enables it to acquire potential valuable external knowledge but does not assure the organisation beneficial returns and ownership. Thus, recognition capacity enhances individuals involved in the IOI process to fully appreciate the need for the resource and determine the appropriate technology for the organisation.

Flowing from the above, individuals' employees who possess recognition capacity may strengthen the collaborative relationship between external partners and internal employees to achieve organisational innovativeness. That is, the ability of individual members to search, identify and exploit knowledge from external sources and understand internal knowledge gap facilitates IOI processes which increase the individual employees' readiness to innovate, identify the resources required for innovation (capacity) and the capability to innovate.

Thus, when accessing external knowledge, knowledge recognition is an important component of PACAP that individuals in an organisation must possess in order to build a stronger organisational innovativeness. Following the above arguments, it can therefore be suggested that:

H1a: The positive relationship between inbound open innovation and organisational innovativeness will be stronger as the recognition capacity becomes greater

2.16.3 The moderating role of knowledge acquisition in the relationship between inbound open innovation and organisational innovativeness

The search for external knowledge using various innovation processes does not immediately result in innovative performance but helps the organisation make a decision and act on it. Acquisition is one of two processes of obtaining innovation from external knowledge sources (West & Bogers, 2014a); the other process being the search process. Acquisition capability is the ability of an individual to identify/locate, value and obtain externally developed knowledge relevant to the organisation's development (Zahra & George, 2002; Fosfuri & Tribó, 2008; Camisón & Forés, 2010). The ability of individuals to obtain knowledge from external sources may be achieved through knowledge or technology acquisitions or through the use of technology suppliers (West & Bogers, 2014).

Individual acquisition capacity activities include their ability to interact with other partners, gather information from external sources through formal and informal means, interpret the extracted knowledge, establish cross functional engagement with employees, and the ability to transfer the interpreted knowledge (Liao et al., 2003; Fernhaber & Patel, 2012). These processes may motivate employees, especially those in the PS to willingly innovate, enhance their capacity and provide the necessary resources for the innovation. This ability to regularly interact, identify, understand, motivate employees, and gather data may reduce the negative influence of IOI on organisational innovativeness.

Individuals with knowledge acquisition capacity are able to coordinate, capture information, evaluate and make decisions by identifying technology solution (improve competitiveness/functionality), classifying technology solution through prioritization, identify the source of the technology and choosing the appropriate technology to acquire (technology acquisition decision making) (Durrani et al., 1998).

These activities indicate that knowledge acquisition is both an inter and intra-organisational activity (Liao et al., 2003) as the capacity of individuals to acquire knowledge aims at gaining knowledge from both internal and external sources (Aming'a, 2015).

Thus, the capacity of individuals to acquire knowledge from both internal and external sources increase the organisation's ability to innovate (Liao et al., 2003).

The intra-organisational dimension of knowledge acquisition is the dissemination (effectively communicating about the generated knowledge to all relevant departments and individuals) of the gathered knowledge to the various departments and individuals through effective communication. This can be achieved through effective knowledge flows and sharing of information to ensure that the knowledge reaches all the relevant departments and people. Knowledge dissemination and response from internal stakeholders ensures a smooth implementation of externally acquired knowledge (Liao et al., 2003). Thus, investing in the internal R&D resources in IOI is critical in external knowledge acquisition and utilization (Zahra & George, 2002).

The literature suggests that the individual members' capacity to select, identify and reconfigure knowledge is enabled by certain individual antecedents. For instance, individual prior knowledge enables them to search broadly and identify new opportunities, especially when the acquisition is linked to knowledge already possessed by the individual (Cohen & Levinthal, 1990; Lowik et al., 2017a).

External identification and internal dissemination of knowledge information are two capabilities that are inseparable and interdependent. Both are positive and significant predictors to actions taken by organisations to acquire external knowledge (Liao et al., 2003). Similarly, knowledge acquisition is significantly and positively related to absorptive capacity and innovation capability (Fernhaber & Patel, 2012). However, this relationship is moderated by the structure of the industry. Also, knowledge acquisition (ability to scan the environment for new knowledge) is positive and significant in innovation activities. Finally, knowledge acquisition from various sources such as customers, suppliers, competitors, government agencies and consultants has a positive and significant effect on creativity and problem solving (Soo et al., 2007).

Overall, the capacity of the individual members to interact with internal members and external partners to acquire new knowledge, engage in cross-functional consultation, gather information through informal means, stay in touch with stakeholders and interact with customers, suppliers and other third parties may enhance the inbound open

innovation process and hence increase individual readiness, capacity and ability to innovate.

In sum, the capacity to acquire knowledge goes beyond identification, to include the involvement of the individual employee members in the organisation as well as the ability to absorb external knowledge from various sources to achieve organisational innovativeness (Fernhaber & Patel, 2012). This suggest that the individual acquisition capacity will enhance external technology acquisition processes and thus influence OGI. Therefore, it could conceivably be hypothesised that:

H1b: The positive relationship between inbound open innovation and organisational innovativeness will be stronger as the acquisition capacity becomes stronger

2.16.4 Direct link employee involvement and organisational innovativeness

Employee involvement (collaboration, engagement, employee driven innovation) in general terms reflects the desire in improvement among employees, enhanced collaboration in innovation processes, willingness to accept change and the ability of the organisation to exploit OI principles (Amundsen et al., 2014) and a way of effectively improving employees motivation (Jeung, 2011). This acceptance by employees to exploit OI principles demonstrate their willingness to be physically, emotionally and cognitively committed to their work (Kahn, 1990). Similarly, Konrad (2006) relates employee involvement to three components of cognitive (employee's beliefs about the organisation, leadership, climate and conditions); emotional (positive or negative attitude towards the organisation) and behavioural (effort exerted by employees on their tasks in terms of time, energy and creativity) tendencies towards innovativeness. It also requires empowering employees with greater freedom, flexibility in work processes and encouragement to participate in idea generation and implementation (Rangus & Slavec, 2017) to achieve innovativeness. So, to successfully implement an OI strategy, organisations should pursue EI practices (Amundsen et al., 2014).

For instance, empowering employees in decision making and participation gives them the autonomy or control in decisions that affect their work (Riordan et al., 2005), and a clear

understanding of management's expectations of their contributions (Hansen et al., 2017). This leads to employee loyalty or commitment (Riordan et al., 2005), development of positive attitude towards innovation activities and use of their expertise, skills and capabilities to solve organisational challenges (Konrad, 2006). This enhances employee's willingness to implement the organisation's innovation strategy. Also, information sharing builds trust among employees (Yang & Maxwell, 2011) drives employees performance (Mesmer-Magnus & Dechurch, 2009) and gives them access to data that is relevant and timely (Konrad, 2006). Through this process, employees will be able to gather innovative ways to do their work in an efficient manner. Also, rewarding employees as a dimension of involvement, enables them to achieve targets (meeting quality standards, efficiency, cost reductions increasing revenues and meeting work schedules), make meaningful suggestions and put in extra effort to achieve innovative activities (Konrad, 2006). Finally, training received by employees enables them to improve their work processes, increases employees skills, improves work ethics and practices and gives employees the confidence to execute their activities (Felstead et al., 2010) especially through skill development training in open innovation implementation (Sartori et al., 2017). This aspect of EI enables them to overcome challenges at work place.

In sum, employee involvement practices empower them to make decisions, build their knowledge and competence through training, share information about work processes and rewards them for successful implementation resulting in a win-win case for both employees and leadership. Thus, it is an integrated initiative and organisational strategy to achieve innovativeness from employees initiatives and management support (Hansen et al., 2017).

Employee involvement is necessary in bringing about organisational change as it addresses the challenges and frustrations of employees and equally works by involving them as change agents (Sims, 2002). Thus, without involving employees in the organisation's activities, the opportunity to survive, prosper and meet targets, especially in modern times is minimised. For this reason, the OI concept is all about people and their interactions (Rangus, 2017) in the innovation process to create value. Dynamic capabilities theory (Helfat et al., 2007), shows the important role of individuals in the

innovation process as they enable the creation of resources through search and selection processes, acquisition of resources as well as engaging in entrepreneurial and innovative activities. The DCT also highlights the important role of individual as Ferreira et al.,(2018) suggest that the relationship between DCs and organisation's performance is indirect. This relationship occurs via individual creativity and innovative competencies which enables organisations to perform better. Value creation and improvements in service delivery (innovation) are propelled by employee involvement and driven by their ideas, expertise, creativity, competence, experience, skills and problem-solving capabilities captured as part of the employees everyday work activities (Høyrup, 2010).

Employee involvement as suggested by the above leads to innovativeness by tapping into employees' experiences, expertise among others. Additionally, empirical evidence on the relationship between employee engagement (involvement) and performance of the PS of developing countries , shows a strong relationship. Sanneh andTaj (2015), demonstrate that employee engagement makes them obliged to perform better than their excluded colleagues and exceed set targets leading to increased organisational performance. Similarly, Tchapchet et al. (2014) conclude in their study that EI on decision making positively impacts the effectiveness, efficiency and productivity of higher educational institutions such as universities in delivering good quality service.

Particularly, involvement prepares employees for the challenge ahead and underscores the maxim that people are more important than ideas in the innovation process (Lindegaard, 2010). Increasing the EI in OI promotes knowledge-based activities such as sourcing, acquiring, diffusing, utilising and networking (Naqshbandi, 2018).

In terms of outcomes of EI, organisations experience various forms of outcomes. For example, Fenton-O'Creevy (1998), reports various outcomes of EI. According to Fenton O'Creevy (1998), the most important outcome of EI is an improvement in the quality of service or product, followed by reductions in costs of service delivery, improved response to customers. The rest in descending order include improved responsiveness to change, improvement in productivity, increased job satisfaction or employee's commitment to the job and finally a greater sense of success for the organisation among employees. This

shows that improvement in quality service delivery is the major outcome of EI in organisational decision making.

Accordingly, individual employees' participation in decision making concerning OI activities and the organisation's objectives relates positively to their readiness, capacity and ability to implement innovations. Such individuals are also enthusiastic about their work, solve challenges, find innovative ways to work, valued, inspired and recognised by the organisation and enjoys their work. These individual measures facilitates OGI.

Generally, successful EI to achieve organisational innovativeness leads to commitment, cooperation, pride in working for the organisation, trust, tolerance, openness in communication both internally and externally, and feeling of security – education, training and equal opportunities (Amundsen et al., 2014; Hansen et al., 2017). To successfully implement EI, management should assume that individual employees are willing and able to contribute towards achieving the goal of the organisation and be able to contribute towards that (Sun et al., 2000).

In general, EI is the strongest link to the organisation's innovation activities (Rangus, 2017). Based on these arguments, it is possible therefore that:

H2: Employee involvement is positively related to organisational innovativeness.

2.16.5 The moderating role of knowledge assimilation in the relationship between employee involvement and organisational innovativeness

Employee innovativeness relates to the ability of the employees to understand the needs of the organisation by assimilating information from external environment (identification process) and internal innovation system (dissemination process) (Schweisfurth & Raasch, 2018). Assimilation capacity reflects the capacity of employees to absorb the acquired knowledge as well as understand the internal routines and processes that enable the knowledge to be analysed, interpreted, understood, processed, shared, transformed, classified, diffused and internalised (Zahra & George, 2002; Camisón & Forés, 2010; Ter Wal et al., 2011). This capacity relates to the ability of the individual to connect the identified and acquired knowledge to fit the context of the entire organisation through organisational learning and effectively communicating for others to understand (Sjödín et al., 2019). It is thus referred to as “middle phase of absorptive capacity” where external knowledge is turned into internal knowledge (Ter Wal et al., 2011, p.21). Assimilation capacity may also be called the bridge between the external environment and the internal innovation system. Individuals who possess knowledge assimilation capacity overcome barriers related to interpretation and integration of knowledge. This could be achieved through shared goals, language and culture – cognitive dimension of social capital theory, where individual members understand the activities involved in achieving innovation outcomes guided by the rules, norms, codes, narratives and visions of the network (Inkpen & Tsang, 2005; Casanueva & Gallego, 2010). Through knowledge assimilation, individuals can enhance their innovation activities and create unique capabilities as well as core competencies needed for the organisation to survive and strongly compete in turbulent competitive business environment (Elbashir et al., 2013). The ability of employees to assimilate is a pre-condition for innovative activities because externally developed knowledge is coded in the developer’s language which needs to be processed and translated (Schweisfurth & Raasch, 2018). Such externally accessed knowledge may come into the organisation in different form and shape and thus needs re-calibration to make it more meaningful and valuable.

Particularly, knowledge assimilation enables the diffusion of externally accessed knowledge and in turn make the knowledge available to individual employees in the

organisation (Foss et al., 2013). Thus, the capacity to assimilate external knowledge is expected because assimilation capacity determines whether or not organisations gain benefits from technological resource accessed which they translate to fit the organisation's required technology-related capabilities (Zobel, 2017). Employees ability to analyse and process knowledge from outside is important for their innovative behaviour and enables them to apply the knowledge in their innovative activities in the organisation (Schweisfurth & Raasch, 2018).

The ability of employees to assimilate external knowledge can fast track the rate of solving problems and reduce the cycle of producing products (Xie et al., 2018); introduce new knowledge to innovation activities (Zahra & George, 2002); avoid repeating works and updates an organisation's knowledge reserves (Atuahene-Gima, 2003) which improve the innovativeness and competitiveness of the organisation (Hoarau, 2014; Ince et al., 2016). Similarly, the capacity to assimilate also enables employees to renew their stock of knowledge on continuous basis (Volberda et al., 2009) which is relevant in building their competence and aiding decision making processes.

Knowledge assimilation capacity requires individual employees to overcome individual interest and demonstrate a shared understanding and commitment to internalise externally accessed knowledge by appreciating both technological and business value as well as accepting the legitimacy of those proposing the external knowledge (Sjödin et al., 2019). This implies that the capacity to assimilate external knowledge requires that employees demonstrate and appreciate the value of the knowledge as well as accept the proposal because of the legitimacy (status, respect and experience) of the individual behind the proposed external knowledge. This ensures assimilation of the outside-in knowledge.

Knowledge assimilation capacity is determined by three factors of coordination, integration and knowledge management (Zobel, 2017). Coordination describes both formal and informal means of connecting external knowledge with internal innovation systems that enables the organisation to capture, broker and implement knowledge. Knowledge integration deals with rewards and incentives processes. Knowledge management, as the third component, deals with establishing "formal infrastructure for

articulating, codifying and disseminating external knowledge resources” (Zobel, 2017, p.272).

Through these processes, externally searched, recognised and acquired knowledge is adapted to suit the organisation’s business model and context in a manner that is understood and transferable by individual employees (Zollo & Winter, 2002). These processes suggest that while employees involvement in technology acquisition is necessary to incite organisational innovativeness, the capacity to integrate the external technology using routines, processes that enable employees to understand, analyse and interpret that knowledge (Zahra & George, 2002) is key in determining their level of involvement. Basically, adding technology or knowledge to the organisation’s resources that emanate from internal or external sources require assimilation capacity to combine it with existing expertise, skills and competencies (Ter Wal et al., 2011).

Assimilation capacity affects employees and their ability to innovate in the organisation from two processes. First, employees need to transform the external knowledge, ideas or technology to fit local requirement and culture (Ter Wal et al., 2011) such as determining appropriate reward for employees, the authority to participate in decision making, information sharing processes and appropriate training to enhance capacity. This role needs employees with deep knowledge and understanding of the organisation’s routines, expectations and capabilities to achieve innovation creation. Second, assimilation capacity also enables external knowledge to be shared among employees by repackaging and translating the external knowledge (Ter Wal et al., 2011). This requires cooperation and enthusiasm from employees about the prospects of the potential knowledge. Besides, knowledge assimilation enhances the organisation’s innovation performance (Xie et al., 2018).

Given the role of knowledge assimilation capacity in EI and its probable effect in OGI, the study argues that employees with greater assimilation capacity will be more successful in determining organisational innovativeness than those employees who make lower levels of effort to assimilate external knowledge. Thus, it can be suggested that:

H2a: The positive relationship between employee involvement and organisational innovativeness will be stronger as assimilation capacity becomes greater.

2.16.6 The moderating role of knowledge capture in the relationship between employee involvement in inbound open innovation and organisational innovativeness

It is also reasonable to expect an interaction between EI and knowledge capture as knowledge capture capabilities enable employees to process acquired technology by establishing routines (Filippini et al., 2010). Knowledge capture reflects the articulation and codification of new knowledge to realise its potential as well as the inclusion of the new knowledge into the organisation's stock of knowledge (Nielsen, 2006) and the capacity to retain the knowledge in various ways for future reference and use by members of the organisation (Cepeda & Vera, 2007; Aming'a, 2015). It also involves the use of templates (actual working examples of processes and routines located in one organisation) in the articulation, codification, transfer and absorption of knowledge by employees (Szulanski & Jensen, 2004). Knowledge capture also includes various activities that enable the organisation to identify and describe knowledge resources. The articulation and codification of potential knowledge makes its transfer to the potential users and other parts of the organisation easier.

Capturing knowledge to realise the individual potential and sharing is critical to develop the capabilities of employees and enhance their innovativeness. This to a large extent involves the interplay between human capital (skills and capabilities employees in the organisation) and structural capital (knowledge in the form of databases and processes that enable employees to work effectively) (Dawson, 2000). Knowledge capture is therefore necessary for employees to overcome challenges of knowledge stickiness (Szulanski & Jensen, 2004), increase the organisation's knowledge stock (Nielsen, 2006) and enhance competitiveness (Dawson, 2000).

Knowledge capture involves several strategies such as:

- the use of internal workshops to discuss ideas and observations
- gather suggestions, interprets client's preference data, defining formal procedures as how to address external information,
- using established routines to acquire information from both internal and external source and cooperating with experts (Filippini et al., 2010).

These strategies help individuals capture knowledge from internal or external sources.

Further, Aming'a, (2015) suggests other mechanisms of capturing knowledge as experts interviewing, records of proceedings, public seminars, process tracking and case analysis which enables employees and managers to improve knowledge retention, improve efficiency and effectiveness, reduce staff turnover and knowledge loss as well as increase knowledge accessibility.

Thus, the ability of the organisation to understand the individual behaviour, organisational processes and interaction structure could impact the level of employee involvement. That is an understanding of the organisation's routines in capturing knowledge enhances the level of involvement of employees. So, the capacity to capture knowledge through organisational training, effective communication, use of consultants, partners, employees, customers may improve EI.

In sum, individuals' employees have good knowledge about the organisation's processes such as career planning, the communication systems and have their jobs regularly and formally measured behave positively in the employee involvement process and hence exhibit higher OGI. Similarly, individual employees that possess that capacity to contribute to a good working climate, health, safety and the well-being of their colleagues increases their readiness to innovate. Further, when the organisation uses experienced employees who possess certain capabilities and skills to support the organisation's performance, employees in the organisation demonstrate their willingness to implement technologies and other policies as they participate in the organisation's activities. Finally, individual members who are capable of capturing knowledge from customers, partners, employees; effectively share knowledge between supervisors and subordinates, among

colleagues and functional units; and utilize and put such knowledge into practical use are likely to effectively participate in decision making and hence increase their OGI.

Overall, the capacity to capture external knowledge involves establishing organisational routines (internal and external) that includes the role of the individual (behaviours), processes, structures and capabilities; the articulation, codification and realisation of potential new knowledge as well as the ability to retain and reuse the realised knowledge. Also, to achieve greater innovation performance, organisations have to first develop behavioural context and innovation practices that serve as motivation and empowerment of the individual employees (Prajogo & Ahmed, 2006). Accordingly, the ability to capture knowledge (internal and external) is likely to result in successful effective employee involvement in generating organisational innovativeness. According to these arguments, the study infers that:

H2b: The positive relationship between employee involvement and organisational innovativeness will be stronger as capture capacity becomes greater

2.16.7 Direct link between technology scouting and organisational innovativeness

The principal function of IOI is to determine the level and sources of outside knowledge with which it can acquire, create wealth and deliver services. Thus, it is imperative for the organisation to create a channel or system to access valuable technological knowledge. One of such systems is technology scouting. Technology scouting and innovativeness are two important factors that determine the performance outcome of any innovation implementation (Tsai & Yang, 2013; Gloet & Samson, 2016; Xinchun Wang et al., 2016; Tajudeen et al., 2019). It is therefore necessary for organisations to systematically observe and assess current technological trends in order to identify the new technologies that could facilitate the organisation's innovativeness.

Technology scouting is an OI process which refers to both an internal or external boundary spanning function of scanning and monitoring that enables organisations to systematically assess and observe technology trends, which enables it to detect technological opportunities, and to timely resolve anticipated threats (Spitsberg et al.,

2013; Klueter & Monteiro, 2017; Aloini et al., 2017; Tajudeen et al., 2019). In other words, TS reflects the organisation's resource scanning and acquisition process where individuals search for technology acquisition mechanisms and support the innovation scanning and acquisition efforts (Wang et al., 2015). Thus, TS is a reflection of the relevance of the organisation's ability to monitor its external environment for new technologies (Laursen et al., 2010) to enable it to build, seek, sustain, exchange, and collaborate with external partners in the innovation process (Wang et al., 2015). The key argument is that the decisions by organisations to externally acquire technology and capability involves pooling resources with external partners to develop innovations which may seem impossible internally.

The internal function of TS involves searching and scanning for information within the organisation's boundaries – activities that involve other actors such as employees and functional heads; while the external function involves searching for information and monitoring the technological environment across the organisation's boundaries – between organisations or span national boundaries (Aloini et al., 2017; Klueter & Monteiro, 2017).

Technology scouting as an internal function helps the organisation discover opportunities and identify challenges as employees are better able to understand the importance of monitoring and assessing external trends, and hence the likelihood of cooperating and collaborating with the external parties (Tajudeen et al., 2019). When employees understand the reason for searching and scanning for information, it reduces interpersonal uncertainties, enhances trust, and minimises the potential for opportunistic behaviour – internal conflict reduction (Floyd & Lane, 2000), improves productivity and facilitates team work among employees as well as with suppliers and customers (Tajudeen et al., 2019). In addition, internal TS processes guide the organisation in selecting quality and relevant technology and increases the likelihood of the acceptance of the technology by all stakeholders (Oertl et al., 2014). Besides, TS also involves various processes of translation, match making and transforming (Monteiro & Birkinshaw, 2016). These activities involve constant interaction with partners both internal and external which shape understanding and cooperation in achieving innovation.

External TS involves the use of external actors to source for ideas, new and relevant knowledge, technical solutions and acquisitions, or even the detection of emerging opportunities (Spitsberg et al., 2013; Wang et al., 2015). Organisations engage in IOI processes such as external TS strategies to inquire about relevant sources knowledge that is available in the external environment (Tajudeen et al., 2019). Wang et al. (2015) suggest that organisations that scout for valuable outside technology can play a crucial role in developing innovation capability. This allows the organisation to discover and acquire valuable technological resources quickly. Organisations that gather ideas from actors in the external environment help support internal innovation capabilities and improve performance (Akinwale, 2018). Further, the externally sourced ideas complements the strengths of the organisation's internal effort and maintain a strong internal capability function to fully benefit from its collaborative activities of licensing and alliances (Chatterji & Manuel, 1996). Moreover, external TS enables organisations to discover technological trends that are relevant in the development of the new innovations (Wang & Quan, 2019).

According to Wang et al. (2015) TS can be achieved through horizontal and vertical collaborations. Technology scouting through horizontal technology collaboration (HTC) requires individuals to collaborate and link with external partners such as competitors and other industries that aim to share risks, reduce cost of development, increase its innovation activities, discover new external opportunities and acquire valuable ideas (Parida et al., 2012; Wang et al., 2015) to enable organisational innovativeness. Similarly, competitor collaboration enables individuals to imitate technology and improve their processes (Ardito et al., 2018). Horizontal technology collaboration influences incremental innovation (Parida et al., 2012).

Technology scouting through VTC relates to collaborating with customers or suppliers to obtain novel ideas, identify customer needs and market trends, monitor technological trends, and improve core capabilities (Parida et al., 2012; Wang et al., 2015). Vertical technology scouting is characterised by regular interactions between the organisation and its partners (suppliers and customers) and voluntary sharing of information and experiences. So, to achieve innovativeness in the IOI processes, organisations need to use

VTC approaches as the main scouting vehicle (Wang et al., 2015). This type of innovation influences radical innovation with sourcing as an important activity (Parida et al., 2012). Generally, technology scouting through HTC and VTC “enhance the innovation deployment” (Wang et al., 2015, p.28).

Individual members have a wider source of advanced scouting channels may search for new ideas, knowledge and technology from the external environment that it finds appropriate for its internal innovation (Laursen & Salter, 2006; Laursen et al., 2010; Parida et al., 2012). Ardito et al. (2018) also find that sourcing external technology by collaborating with competitors, suppliers and customers (HTC and VTC) in IOI enables organisations to achieve innovation.

Empirical research on TS indicates that it has a positive and significant effect on innovation activities. For example, Akinwale (2018), established this pattern of positive and significant relationship. Further, this relationship is made possible by establishing a TS unit with adequate staff who possess both theoretical and practical knowledge and are committed to the organisation as well as prioritised funding (Akinwale, 2018). With adequate funding and proper staffing, TS units can acquire the requisite external resources by searching wide for external ideas and knowledge and collecting detailed information about the industry (Akinwale, 2018). Wang et al. (2018) found that when firm in the high-tech sector in a highly turbulent and competitive environment engage in external TS, this improves innovation generation by improving the ABCAP in an uncertain technological environment. Similarly, Tajudeen et al. (2019) showed that when PSOs (government-based or government-supported institutions) engage in external technology acquisition and exploitation through the use of social media, it impacts positively on firm innovation through innovation performance. In addition, Wang and Quan (2019), found that TS in high-tech industries was positively related to innovation generation and increased innovation success. Further, Wang et al. (2016) found that firms that engage in external acquisition – joint sense-making (understanding actors involved in the process), tacit and explicit knowledge exchange through ABCAP increases organisational innovativeness. Finally, Stute et al. (2021), suggest that TS enables organisations to implement critical and relevant technologies, especially in the manufacturing, processing and supply chain

industries. These findings are consistent with Wang et al. (2015) who found external TS as an antecedent factor that enhances organisation's innovation activities through various mechanisms.

According to Laursen and Salter (2006), organisations that do not open their boundaries may suffer from organisational myopia. Hence, searching widely across various mechanisms gives the organisation ideas as well as resources that enable it obtain and exploit opportunities for innovation. Thus, the study proposes that TS is an important OI activity; capable of driving organisational innovativeness in the PS. It is thus a process that involves collaboration between partners (internal and external), information gathering, observing technology trends and searching for new technology which will lead to employee's willingness and ability to innovate. The findings reported here suggest that:

H3: Technology scouting is positively related to organisational innovativeness.

2.16.8 The moderating role of search capacity in the relationship between technology scouting and organisational innovativeness

Search capacity refers to the general attitude of individual employees scouting for potential and valuable sources of knowledge (Ahn et al., 2016) to solve organisational challenges; describes the capacity of the individual employee to systematically scan the external environment using a range of various channels that include the network of employees (both internal and external), partners, competitors, customers and suppliers (Ebersberger et al., 2013), collective research centres (knowledge intelligence repository) (Spithoven et al., 2009); living labs (Leminen et al., 2012; Gascó, 2017) and open search strategies (which may be market-driven, science-driven, intermediary driven and generic knowledge-driven) (Henttonen et al., 2011). Search capacity thus describes the willingness of employees to gather innovation related information and implement search strategies (Laursen & Salter, 2006) and scan for external knowledge (Fontana et al., 2006). This type of capacity enables the organisation to understand the dynamics of business change in the market (and in public institutions), opportunities, threats and solve organisational challenges (Ebersberger et al., 2013).

Individuals employees conduct search for knowledge for two reasons: to enhance the understanding of the market and the trend for information from customers, clients, and competitors (Ebersberger et al., 2013). Organisations that properly identify, collect and use information about the condition of customers and competitors are considered knowledgeable about the industry or market; where market knowledge refers to knowledge about customers behaviours and needs and also the behaviour of competitors (Luca & Atuahene-Gima, 2007). Secondly, individuals conduct a search for possible solutions to challenges or for “new directions to explore” by searching from universities, research institutions, suppliers and competitors (Ebersberger et al., 2013, p.4). This enables the organisation to acquire various inputs and combine them with their internal processes to create value.

Searching for external knowledge in particular, is motivated by the individual desire to improve efficiency and access to innovations in the external environment by performing two processes of identifying the knowledge source and obtaining the knowledge (West & Bogers, 2014b). Scanning the external environment demonstrates the degree to which individuals search broadly and deeply for external knowledge and depends on the willingness of the individual employees to extensively gather information through various mechanisms (Zobel, 2017). The willingness of employees to search for external knowledge reduces organisational inertia, increases the speed and rigor of the search effort, and makes the individual employee more proficient which leads to quality knowledge access (Zara & George, 2002; West & Bogers, 2014; Zobel, 2017).

The empirical literature on search strategies has indicated various effects on performance. Studies on search capabilities examine in detail the problem-solving processes of the organisation or the search process which expands the work on DCs and hence contributes to understanding organisational search processes (Katila & Ahuja, 2002). Search capabilities directly or indirectly affect the organisation’s performance and form essential components of the performance (Ahn et al., 2016). Also, search breadth improves innovation performance and this is better than narrow or close search (Chiang & Hung, 2010). Similarly, search breadth involving a range of channels with external sources has a positive effect on an organisation’s performance (Ebersberger et al., 2013).

Searching wide and deep across many search paths helps the organisation gain ideas, knowledge and exploit innovative opportunities (Laursen & Salter, 2006). Also, external search strategy is an important factor that influences and determines collaboration between universities and industries in knowledge use (Laursen & Salter, 2004). In contrast, Fontana et al. (2006), suggest that external search strategies do not influences collaborations between organisations and public research institutions.

The ability to scan the external environment for knowledge and information through scientific or business journals is beneficial to the organisation (Caloghirou et al., 2004). Lee et al. (2010) suggest that search capacity increases the performance of firms engaged in OI, especially when they simultaneously undertake market search and TS. The capacity to search for market information (information related to customers activities and technologies) enables an organisation understand the dynamics of the market as well as acquire knowledge and information necessary for managing the relationships with customers, monitoring competitors' activities and emerging trends as well as managing other stakeholders (Liao et al., 2019). In other words, the ability to monitor the external environment for emerging opportunities and subsequent acquisition relies on strong search capacity (Kokshagina et al., 2017).

Without the capacity to search or scan, the organisation will die because it cannot obtain the available opportunities and resources (knowledgeable personnel and novel technologies) as this capacity creates awareness of an existing opportunity (Yu, 2012).

This study argues that the search capacity of a public sector organisation is likely to influence the ability of that organisation to scout for technology and hence increase OGI. Overall, the study expects search capacity to influence the relationship between TS and OGI. Following this argument, it is hypothesised that:

H3a: The positive relationship between technology scouting and organisational innovativeness will be stronger as search capacity becomes greater

2.16.9 The moderating role of integrative capacity in the relationship between technology scouting and organisational innovativeness

Inbound open innovation dictates the acquisition of external resources into the organisation's internal innovation system. This mere acquisition of external resource and assimilation is not enough to create competitive organisational value. External acquisition of resources requires the organisation to integrate its internal innovation systems to create greater levels of knowledge needed to create value (Ahn et al., 2016) and ensure systems compatibility (Robertson et al., 2012). To achieve benefits from external resource, it must be integrated into the organisation's internal innovation and R&D system (West & Bogers, 2014) to realize the value of the resource (Zahra & George, 2002). Hence, knowledge integration is defined here as

structures and processes, the use of documentation, information-sharing meetings, analysis of successful and failed projects, project reviews and briefings by general experts and consultants, that ensure the capture, analysis, interpretation and combination of knowledge within the firm (De Luca & Atuahene-Gima, 2007, p.97).

Integrative capacity thus relates to processes that enable the individual to build, accumulate, deploy, and exploit resources, the capability to combine those resources, the capacities to support organisational innovativeness, transformation and renewal (Hu et al., 2012). That is the organisation's capacity to strategically acquire, combine and recombine, deploy and redeploy resources in order to capture and exploit opportunities and achieve innovativeness (Liao et al., 2009; Jiang et al., 2015).

As a capability, integrative capacity is sustained through an interactive system connecting social, psychological, and cognitive processes that allow the individuals to build effective communication practices, share a common identity and combine resources to create an integrated knowledge (Salazar et al., 2012). In other words, an individual integrative capacity is a "dynamic interaction between knowledge systems and adoption processes" (Woiceshyn & Daellenbach, 2005, p.325). Accordingly, individual integrative capacity depends on four knowledge base systems of: knowledge about *the organisation's*

technical systems such as equipment, software, tools where employee skills and knowledge are embedded; an understanding of *the organisation's managerial systems* such as routines, procedures, incentives that directs knowledge creation and control; *employee skills and knowledge* (both firm-specific and technological); and *values and norms* associated with knowledge creation and control (Woiceshyn & Daellenbach, 2005).

Integrative capacity thus involves scanning the external environment to recognise and detect opportunities as well as understand the organisation's internal resource or knowledge potential and limitations by aligning and matching the resources with opportunities (Liao et al., 2009). In this case, integrative capacity is dichotomised into internal and external orientation (Woiceshyn & Daellenbach, 2005; Liao et al., 2009; Dangelico et al., 2013; Lin et al., 2016; Ferraris et al., 2019). The capacity of the organisation to integrate knowledge from various sources involves using “existing knowledge from internal sources, absorb knowledge from external sources, and blend the different technical competencies required for innovation” (Yoon, Kim, Vonortas, & Han, 2018, p.363). This is the point from which the organisation benefits from the innovation activities (West & Bogers, 2013).

External integrative capacity relates to the capacity to sense, detect, identify, filter, and calibrate opportunities from the external environment (partners) – sensing and relational capabilities (Lin et al., 2016). This capacity enables the organisation to obtain and evaluate external information in relation to the organisation's capability (Woiceshyn & Daellenbach, 2005) and supports value capture (Helfat & Raubitschek, 2018). It also relates to collaborations between networks to share resources and competencies, innovate, provide new solutions; external knowledge links for effective communication; and acquisition of know-how through recruitment, training, and purchase of software and equipment (Dangelico et al., 2013).

As such, organisations that lack relevant resources and competencies to innovate on their own, depend on external integrative capabilities (Dangelico et al., 2013) to scan the external environment for critical knowledge and suitable partners (Ferraris et al., 2019). As a sensing or scanning capability, integrative capacity enables the organisation to

discover new strategic opportunities and threats, identify unexploited needs, reduce uncertainty and changes in customer demands which may affect the organisation's innovation adoption process (Lin et al., 2016; Helfat & Raubitschek, 2018). External relational integrative capability refers to the ability of the organisation to broaden its social and economic network of relationships with other organisations and individuals to enhance competitiveness (Lin et al., 2016) as well as manage those relationships (Sisodiya et al., 2013) to facilitate the interaction and sharing of critical knowledge (Lorenzoni & Lipparini, 1999) to achieve innovativeness.

Empirically, external integrative capacity in the oil and gas industry enables access to externally developed technologies and the detection of relevant emerging technologies through constant interaction (Woiceshyn & Daellenbach, 2005). Helfat and Raubitschek (2018) suggest that platform-based ecosystems firms can discover opportunities and respond to threats through external scanning or sensing. In establishing relationships with global partners, Ferraris et al. (2019) found that external integrative capacity permits organisations to identify important sources of knowledge and suitable partners. According to Lin et al. (2016), sensing capability has a positive effect on innovation implementation and thus help management to evaluate and make decision as well as well as sense the attitude of employees towards implemented innovation thereby avoid NIH attitudes. Further, external integrative capacity enhances the acquisition of knowledge from various sources, creation of new opportunities and sharing of new ideas. However, the capacity to integrate from external sources is only one aspect of the innovation challenge (Bogers & Horst, 2014; Ferraris et al., 2019) because external integration alone is not enough for new technology adoption as the acquired knowledge has to be integrated with the existing knowledge and skills – internal integrative capacity (Woiceshyn & Daellenbach, 2005).

Internal integrative capacity refers to the organisation's ability to integrate or how to integrate various external resources (such as customer or technological knowledge), capabilities or activities within the innovation system and the ability to effectively communicate and coordinate those resources, activities and capabilities (Zhou et al., 2017; Helfat & Raubitschek, 2018). This type of capability facilitates the sharing of knowledge internally (Zhou et al., 2017). Basically, internal integrative capabilities concern the

organisation's capacity to seize, capitalise, and exploit opportunities using intra-organisational structures, procedures, designs, and incentive systems to redeploy and reconfigure resources to achieve organisation innovation (Liao et al., 2009). Specifically, internal relational capability enables the organisation to understand internal challenges by sourcing information from internal stakeholders (Lin et al., 2016).

Besides, individual integrative capacity represents the organisation's ABCAP to learn about resource acquisition, assimilation, transformation and exploitation as well as the ability to relate and interact with internal networks of employees managers (Lin et al., 2016). This type of capacity is important because the organisation depends on its employees and managers in order to execute its activities. In this case, the organisation need internal relational capability to start interaction, communication, share values, information and knowledge across all units with organisation (Lin et al., 2016). Internal integrative capacity is therefore needed in order to successfully implement external resources and concepts because technologies acquired from outside need to be reconfigured to fit for purpose (Woiceshyn & Daellenbach, 2005).

Accordingly, internal integrative capacity enhances employees commitment and motivation as it involves many individuals with various skills in the technology adoption process by oil firms in uncertain times (Woiceshyn & Daellenbach, 2005). Ferraris et al. (2019) found that by cooperating with external partners to increase innovation performance, integrative capacity is critical in integrating the external unfamiliar technology to achieve enhanced performance. Liao et al. (2009) also found that internet firms that possess internal integrative capacity are able to create new values, skills, and adopt other technological or organisational practices – innovation. Similarly, Lin et al. (2016) suggest that internal integrative capacity increases understanding among employees and managers and thus enhances successful adoption and implementation of knowledge.

Integrative capacity therefore focuses on how external technology is formally adopted and used in the organisation by performing two critical functions: gaining support from stakeholders and securing scarce resources (Sjödín et al., 2019). To successfully integrate external technology in OI practices, management should be able to gain the support of

individual members, understand and respect stakeholders' interest as well as organisational politics and the use of both formal and informal means to gain support. Successful integration of external knowledge also means the ability to secure competent and committed staff and available budget.

Put together, integrative capacity has a positive and significant effect in innovation adoption and implementation (Lin et al., 2016). Integrative capacity also enables organisations to organise (mobilise) resources and capabilities as well as apply them (Liao et al., 2009). This means that organisations do not only depend on resource availability but also the ability to deploy and utilise those resource and capabilities. Yoon et al. (2018) found that technology foresight (TS) and OGI both depend on integrative capacity as the capacity to combine and reconfigure might help the organisation solve challenges. Integrative capacity is therefore needed to increase the positive effect of TS on innovativeness and establish good relations with both internal and external stakeholders.

Emphasising the importance of integrative capabilities, Yu (2012) remarked that “of all capabilities in the firm, the most important is the integrative capability because it is the integrative capability that changes the resources into other capabilities” (p.395). This underscores the critical role that integrative capabilities play in resource acquisition and implementation to achieve innovativeness.

The discussions show that individual integrative capacity integrative enables the integration of external knowledge which increases the readiness, ability and capacity to innovate. As a result individual integrative capacity can determine whether out-side in technologies can be successful or not given the present capabilities level and the organisation's culture (Naqshbandi et al., 2014).

The above arguments suggest that integrative capacity plays a critical role in TS activities of PSOs which leads to employees and management willingness to implement desired technologies, knowledge or practices. It also builds the capacity of individuals and creates awareness of relevant emerging technologies. It is thus guided by the theories of both DCs and SC. For instance, from the DCT, the ability of organisations to learn to sense new opportunities and threats, seize new opportunities and reconfigure internal and external competences to respond to the fast changing environments provides it the ability to

enhance innovativeness (Teece, 2014). This theory thus suggests that, the essence of the organisation is its ability to create, transfer, assemble, integrate and exploit external resources including technology (Teece & Pisano, 2003).

Following the above arguments, the study hypothesises that:

H3b: The positive relationship between technology scouting and organisational innovativeness will be stronger as integrative capacity becomes greater.

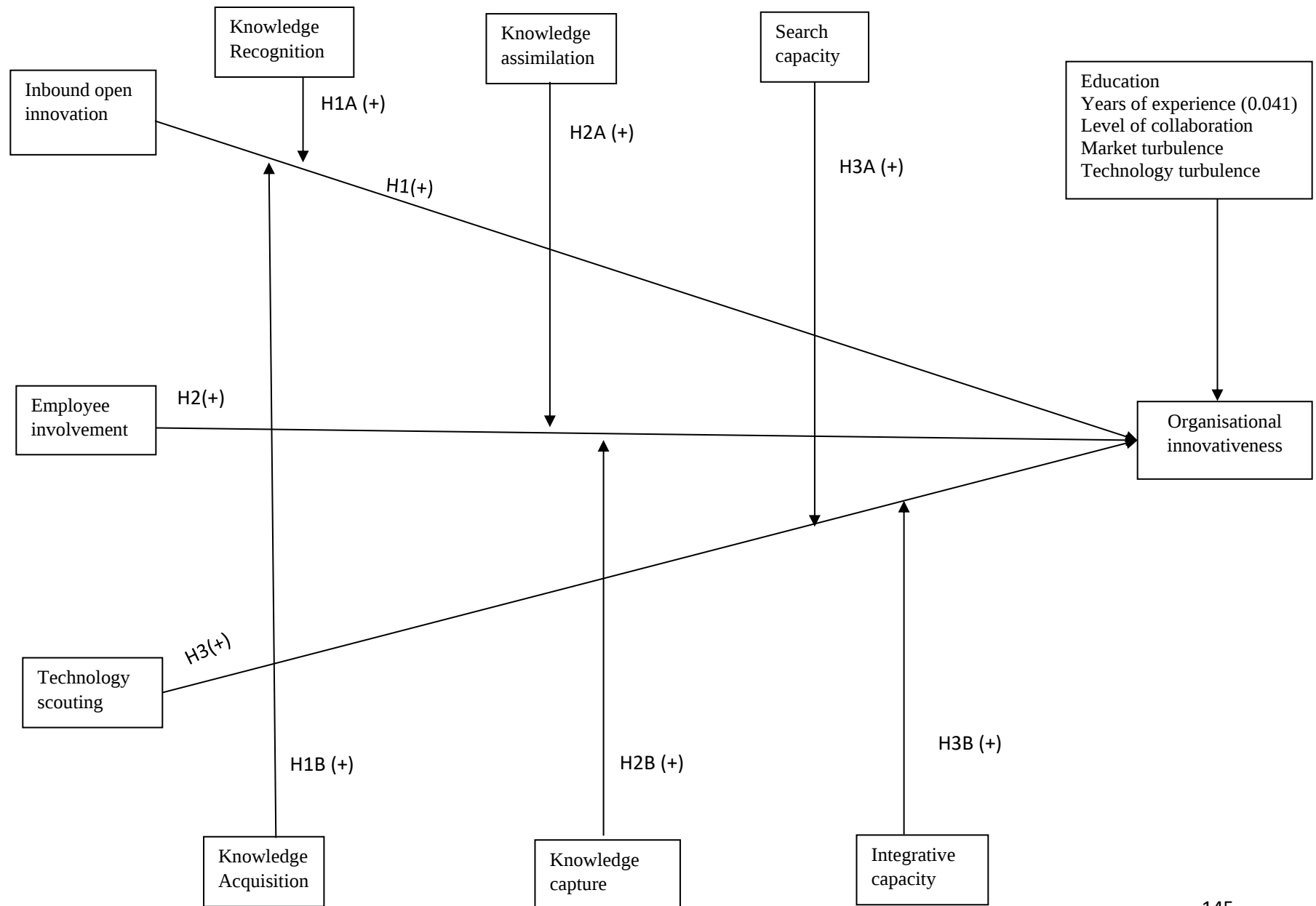
2.17 The study's conceptual framework

From the literature review to the hypothesis's development, the following conceptual framework was developed. Figure 2.7 shows the conceptual framework. The conceptual framework explains that the role of employees in the OI environment represents three critical activities of collaboration between internal employees and external partners to absorb knowledge (IOI), the involvement of employees in the OI process and the role of the technology scouts. All these three key activities are hypothesised to positively and significantly impact the willingness, capacity and ability of the individual employees to innovate. Also, individual employees' capabilities in the relationship are expected to increase the strength of the relationship. Also, the study controls for individual characteristics of employee's level of education, experience and level of collaboration; technology turbulence and market turbulence, all of which may influence organisational innovativeness.

All these interactions require the individual employees to possess professional skills to enhance knowledge combination and expansion; social skills to cooperate in complex social relationships; personal skills to exercise self-reflection – social capital (Soderquist et al., 2016) and dynamic capabilities (Teece et al., 1997; Eisenhardt & Martin, 2000). Both the social capital and the dynamic capabilities are at the individual level of the organisation. As a “dynamic capability”, the “dynamic” perspective of the individual in the framework represents individual employees ability to change their attitudes, competencies and values in order to fit the out-side in technology with the organisations

internal innovations (willingness) while the “capabilities” aspect concerns assessing individual capability, modifying individual internal and external skills and competencies, and the availability of resources and appropriate rewards to better match the individual expectations (Taylor & Rindova, 2002) to achieve organisational innovativeness. This the conceptual framework suggests that IOI activities will build the ability of employees (such as technology specific knowledge, cognitive and technical capabilities); incite their willingness (such as participation, intrinsic, motivation and collaboration) (Tang et al., 2013) and the capacity (such provision of resources and rewards by management) to enable individual employees successfully implement external technologies.

Figure 2.7: The study's conceptual framework



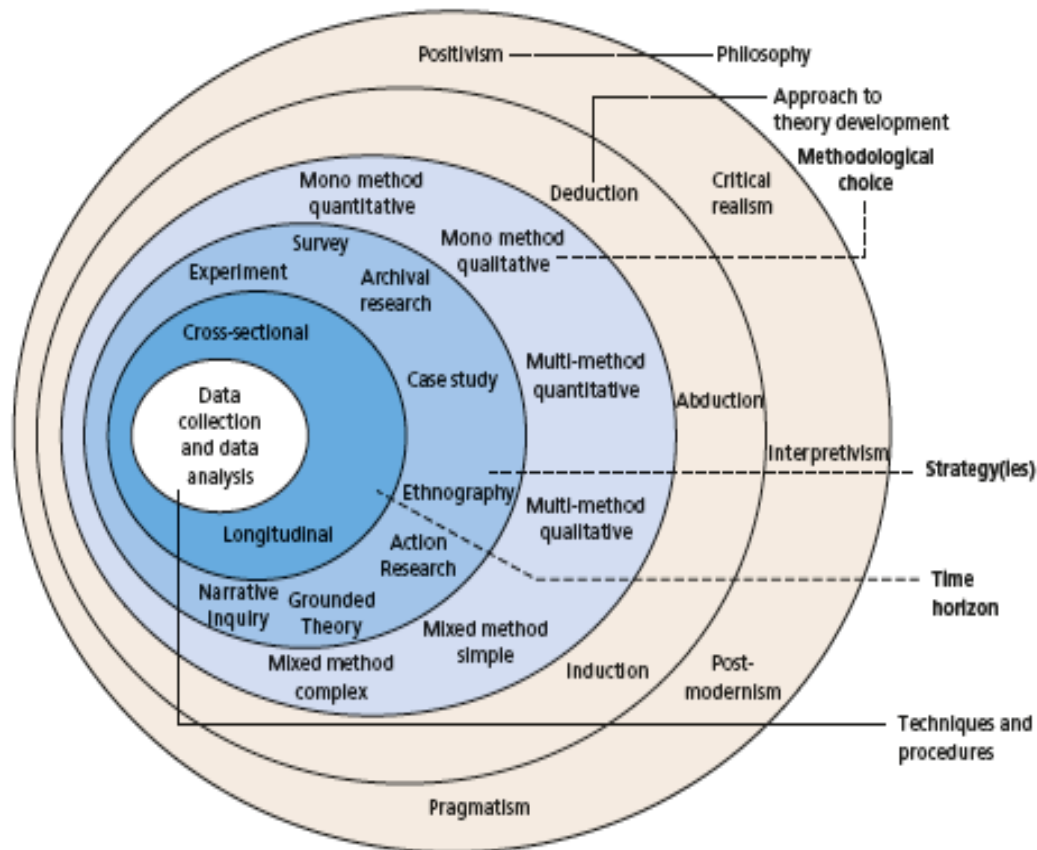
Chapter Three: Research Methodology

3.1 Introduction

The previous chapter discussed and presented the theoretical framework that showed the relationship between intra-organisational practices of IOI, EI, TS and OGI with ABCAP as a contingency factor. The current chapter discusses the research philosophy, paradigms and approaches, sample selection criteria, common method bias procedure, informant's response rate determination, questionnaire development and statistical methods employed in analysing the data obtained through survey strategy.

The chapter is divided into two sections: section I focuses on methodological decisions and processes related to the quantitative component while section II focuses on the qualitative aspect.

This study justifies the research, manages the processes to answer the research questions by using the research onion model (Saunders et al., 2016) as a guide. The research onion gives a comprehensive description of the key stages that should be accomplished for effective methodology formulation and also “enables the researcher to choose most suitable theories or practices within existing layers in order to answer the research questions” (Melnikovas, 2018, p.41). The outer layers of the research onion serve as the foundation or the roots of the research, while the middle layers serve as the building blocks, which together provides the research context within which data collection techniques, analysis and processing should be selected (Sahay, 2009). The research onion model was also adopted for this study because it adequately addresses the issue of lack of clarity in research methodology, conceptualises research methodology as a multistage approach, gives an integrative understanding to the various layers in the onion and how they are connected and deals with the general phenomenon of research (Asher & Popper, 2019) in innovation. Finally, the research onion model “can add rigor, richness and relevance to results” (Orth & Maçada, 2020, p.3). Figure 3.1 depicts the research onion.

Figure 3.1: The research ‘onion’

Source: Saunders et al. (2016)

3.2 Research paradigms and philosophies

A research paradigm can be referred to as a research approach or research design (Atieno, 2009) or the researcher's world view (Creswell, 2014) that guides the study; addresses the philosophical basis of research (Wahyuni, 2012) and establishes the context within which the study is investigated (Ponterotto, 2005). In this regard, "a paradigm is a basic belief system and theoretical framework with assumptions about 1) ontology, 2) epistemology, 3) methodology and 4) methods" (Rehman & Alharthi, 2016, p.51). As a paradigm consist of ontology, epistemology, methodology, and methods, it helps define a study's philosophy (Žukauskas et al., 2018). This means that every research philosophy (positivist/post-positivism; interpretivist/constructivist; transforming; pragmatist is underpinned by a paradigm. That is each philosophy has its own ontology, epistemology, methods and data collection techniques. Thus, the most fundamental factor in asking and

answering research questions is the philosophical position or worldview of the researcher (Bisman, 2010; Saunders et al., 2016).

Research philosophy refers to “a system of beliefs and assumptions about the development of knowledge ... in a particular field” (Saunders et al., 2016, p.124). These assumptions include *ontological assumptions* (the nature of reality), *epistemological assumption* (assumptions about knowledge) and *axiological assumptions* (influence of the researcher’s values on the research). These research philosophies are the ways of knowing what knowledge is or what it should be in a certain area of study or the epistemological considerations of knowledge. Research philosophies influence the study, and thus requires researchers to make clear their philosophical ideas that will help explain the choices related to the designs (quantitative, qualitative or mixed) and methods (data collection, analysis, interpretation and validation) (Creswell, 2014). Thus, *the ability of the researcher to identify and articulate the philosophical position of the research is considered the most important job for the researcher as it determines how the research is undertaken* (Baldwin, 2015).

Research philosophy may be divided into several streams such as positivism, interpretivism, critical theory (critical realism), post modernism, pragmatism and post-positivism (Ryan, 2006; Saunders et al., 2016; Panhwar et al., 2017).

This study is underpinned by post-positivism. However, each of the designs is guided by different sub-philosophies. The quantitative design is guided by positivism while the qualitative design is guided by interpretivism. Thus, the study research philosophies and paradigms are discussed below.

3.2.1 The positivist stance of the research

The *positivist* stance of the research reflects the philosophical view of the natural Scientist (Melnikovas, 2018) and the assumption that objectivity/reality exists independent of humans (Rehman & Alharthi, 2016). From the positivist perspective, the study strives to understand the social world and its independent existence by establishing and predicting a cause-effect relationship between the variables under investigation without considering the role and behaviour of individuals in the social reality. Therefore, with positivism, the relationship between the variables could be controlled and predicted (Melnikovas, 2018). The research is further underpinned by positivism because of the believe that social phenomena are governed by laws, and by applying scientific methods, the study is able to formulate these laws and present them through factual statements in law-like generalisations (Rehman & Alharthi, 2016). Thus, positivism is appropriate for investigating natural objects and not so successful when studying a social phenomenon. The researcher thus prefers precise quantitative data, surveys, and statistics. The work is grounded on theoretical framework and test causal hypotheses by following a systematic process to carefully analyse and interpret the data and all relevant factors involved in the measures. With the positivist view, the study developed hypotheses about the causal relation between phenomena; gather empirical evidence; analyse and explain the effect of the IVs on the DV (Rehman & Alharthi, 2016). The purpose is either to prove or disprove a hypothesis (Mack, 2010), predict, control, gain scientific explanation, measure, construct laws and establish causal relations in natural or social phenomena (Peca, 2000; Neuman, 2014a; Rehman & Alharthi, 2016). Positivism therefore was considered because quantitative data was available which made calculating, predicting and explaining the relationships possible.

3.2.2 Interpretivism as a second philosophical position of the research

Interpretivism on the other hand, assumes that truth and reality are socially constructed, and not discovered (Rehman & Alharthi, 2016) because humans are not physical objects and hence create meanings through social interactions (Saunders et al., 2016). It emphasises social interaction and social construction of values and meanings – that is, it concerns itself with the way people interact with one another (Neuman, 2014). The goal

of the researcher in adopting the interpretivist stance was “to understand the interpretations of individuals about the social phenomena they interact with” (Rehman & Alharthi, 2016, p.55) and “provide an insight and not a prediction” (Melnikovas, 2018, p.37). That is to understand the perspective of the participants about their own interpretations of IOI activities in their organisation. That is the truth and reality of IOI activities in an organisation is not created but discovered through humans. External and internal activities happen through the worldview of the observers, their values, culture, concepts, norms etc. Thus, the emphasis of this philosophy is to help the researcher understand or explore a phenomenon rather than explain it. In summary, interpretivism enabled the researcher to understand the contextual meaning of IOI activities resulting from their interactions with the government, management and external partners. This philosophical stance enabled the researcher to collect qualitative data from participants and analysed the data through inductive processes to find patterns in the gathered data under various themes to gain an insight about the phenomenon of IOI activities. Thus, the data collected was verbal which was audio recorded by using an open-ended interview method (semi-structured).

3.2.3 The post-positivist philosophy – the general philosophy of the study

Post-positivism assumes that reality exists independent of the researcher and also recognises the possibility that the researcher as beliefs and values affect what is observed (Rehman & Alharthi, 2016). This means that the view of the participants, their values and beliefs also affect what is being investigated. This study uses qualitative results to complement and explain the quantitative outcome. The current study recognises that reality is not from a single method but from multiple sources, subjective in nature and created by individuals participating in the research (Crossan, 2015). The rationale is that individuals’ participants in the study are not objects and their views regarding the study ought to be considered. Their views may therefore enhance the understanding of the quantitative findings in details. Hence, the ontological position of post-positivist stance of the researcher is that of critical realism – a focus “on explaining what we see and experience, in terms of the underlying structures of reality that shape the observable events” (Saunders et al., 2016, p.138). That is a focus on explaining in details the findings

of the quantitative findings. As the name suggests, it “represents the thinking after positivism” (Creswell & Creswell, 2018, p.44). That is after the quantitative findings, the study solicits the views of participants about the subject under study to understand the phenomenon in depth and interpret the quantitative outcomes.

Based on the research questions, the purpose of the study and the research design, the post-positivist philosophy is deemed appropriate and useful for this inquiry. Guided by the post-positivist stance, this study uses sequential explanatory mixed methods design to facilitate the investigation.

As the study that embraces the post-positivist philosophy, it is underpinned by more than one methodology and hence “advocates methodological pluralism” (Wildemuth, 1993, p.450). The type of mixed method design underpinning this study is sequential explanatory – that is the research process is dominated by quantitative data (i.e. quantitative dominant) – QUAN + qual research because “qualitative data are collected to explain the quantitative findings” (Halcomb & Hickman, 2015, p.8). As this study is dominated by quantitative data the dominant philosophy is post-positivism (Teddlie & Tashakkori, 2009). This means that the study focuses more on quantitative data with more emphasis on the results with the support of qualitative data (Wildemuth, 1993; Leavy, 2017).

As a philosophy, post-positivism is a balance between both the positivists and interpretivists philosophies (Philips & Burbules, 2000).

The current study views post-positivism as a critical epistemological assumption for several reasons.

First, post-positivism legitimises the use of the study’s mixed methods which provides accuracy, completeness of understanding of the study phenomenon and avoid biases (Henderson, 2011). This reduces the biases and prejudices of both the researcher and the participants because data was collected from various sources using different methods. This approach challenges the status quo in OI studies which is primarily quantitative, case study and conceptual. In this case, new methods and approaches are integrated or unified in a single study.

Second, post-positivism provides a practical guideline to collecting data by using both quantitative and qualitative methods.

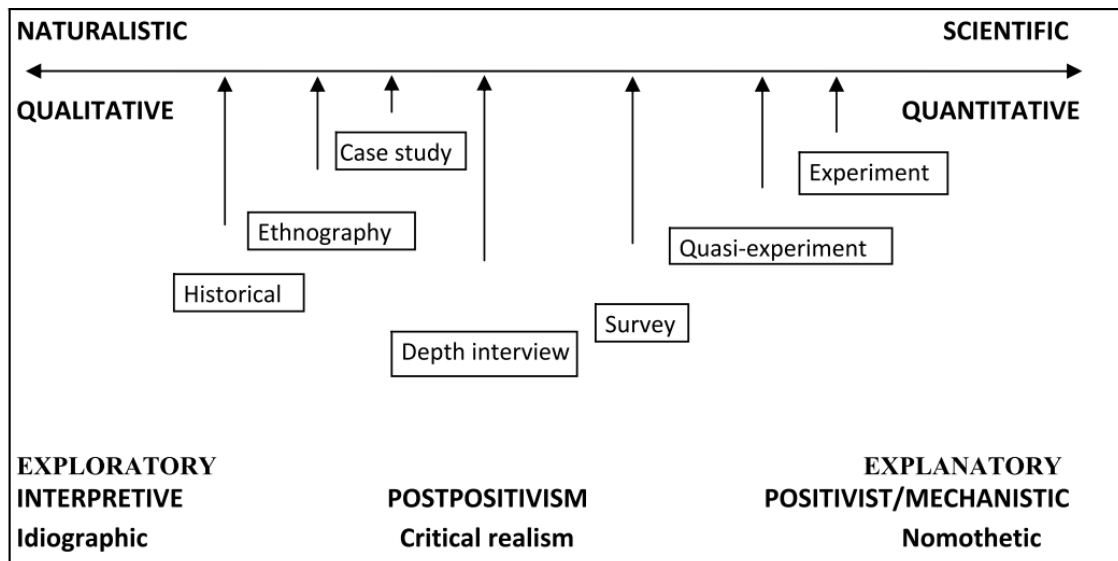
Third, using this philosophy enabled the study to uncover meanings from participants about their various understanding and interpretations of IOI activities (reality) from their natural settings and context.

Fourth, post-positivism enabled the study to turn empirical findings into knowledge by comparing with other participants views and interpreting the results. This was achieved by using different frameworks to generate new and enhanced understanding of the phenomenon than just one methodology such empirical justifications.

Fifth, using diverse methods enabled the interaction with participants to understand the existence of biases, challenge the result of the absolute truth and investigate causes that affect findings (Panhwar et al., 2017).

Sixth, post-positivism enriches both theory and practice by “improving probability that designs and occurrences are recognised through the course of studying research questions from various different perspectives” (Panhwar et al., 2017, p.257).

Figure 3.2 shows the continuum between quantitative and qualitative research and post-positivism. Mixed methods research is in the middle of the continuum because it combines elements of both qualitative and quantitative designs (Creswell & Creswell, 2018)

Figure 3.2: Attributes of qualitative-quantitative continuum

Source: Bisman (2010).

3.3 The ontological, epistemological, axiological and methodological assumptions of the study - Research philosophical assumptions

Apart from Saunders et al. (2016), Guba and Lincoln (1994) suggest three philosophical assumptions that underpin research: ontological, epistemological and methodological. These assumptions are also referred to as research paradigms (Rehman & Alharthi, 2016). This study thus recognised and applied four philosophical assumptions to the study.

3.3.1 The ontological assumption

Ontology as a philosophy concerns itself with “assumptions about the nature of reality” (Saunders et al., 2016, p.127) and existence (Easterby-Smith et al., 2015). The researcher’s view about reality and being – claims about the existence of knowledge, what the knowledge looks like, what it comprises of and how these components interact with each other (Mack, 2010).

Objectivism/realism and subjectivism/relativism are the two key ontological position of reality (Saunders et al., 2016). This study embraces both positions. Objectivism takes the position of the natural sciences and argues that social reality is external to the researcher and other social actors. That is, as a positivist, the ontological position is that of

objectivism or realism. There is emphasis on investigating the nature of relationships among the elements in their constituents (Bahari, 2010). This study thus investigates the relationship between IOI activities and OGI. This enables the researcher to discover knowledge about the world of IOI by facts that are observable, replicable and measurable.

Subjectivism/relativism makes assumptions of the arts and humanities, by “asserting that social reality is made from the perceptions and consequent actions of social actors (people)” (Saunders et al., 2016, p.130). Unlike objectivism, *subjectivism deals with the internal aspect of the organisations where understanding, truth and meaning are contextualised, relative to the cultural and physical environment of the people including their understanding of how the social world functions* (Huizing, 2007). The study also embraces subjectivism in order to understand how participants perceive and construct IOI activities in OGI within the GRA. Here, what constitutes IOI activities is understood through the interaction of the employees (managers, non-managers and scouts). The position of subjectivism in this study gives more and perhaps superior insights to the findings based on objectivism by demonstrating the understanding of the people involved in IOI activities and providing further and deeper understanding of the organisational dynamics. This view enables the study to understand how IOI activities are handled in the organisation by soliciting the opinions of participants – their motives, involvement and the effect on innovativeness. Subjectivism is related to qualitative research design and uses inductive approach.

As the study combines both interpretivism and positivism, Table 3.1 shows the ontological assumptions of both.

Table 3.1: The study ontological assumptions of both positivism and interpretivism

Positivists ontological assumptions	Interpretivist ontological assumptions
• Reality is independent of the research and represented by objects • Objects have meanings regardless of human thinking • Reality can be predicted, explained, measured and controlled	• Reality is subjective and constructed based on individual interpretation • Individuals interpret and make meaning out of their own understanding of social phenomenon • There are various perspectives on a single event • Events are unique and should not be generalized • Causes in social sciences determined by various meanings, texts and symbols

Sources: Teddlie andTashakkori,(2009; Mack (2010); Saunders et al. (2016)

3.3.2 The epistemological assumption of the study

Epistemology concerns how we know the world in which we live in and include “what we need to do to produce knowledge and what scientific knowledge looks like once we have produced it” (Neuman, 2014, p.95). In other words, epistemology is an “area of philosophy concerned with the most valid ways to reach truth” (Neuman, 2014, p.95). Epistemology is relevant to serious research as it is the tool researchers use to establish the validity and legitimacy of their work (Thiétart, 2012); concerns the beliefs on how the researcher is able to generate, understand and use the knowledge that are considered to be acceptable and valid (Wahyuni, 2012). In effect, it is “the view of how one acquires knowledge” (Mack, 2010, p.5). Thus, epistemology is the process by which the researcher justifies the knowledge and belief embedded in the research. Hence, the interpretive epistemology of the study justifies knowledge within the constructivist ontology. Here the researcher uses qualitative designs as a means of understanding IOI activities effects on OGI at the GRA. Similarly, the study uses quantitative research design to establish knowledge within the positivist ontology. Table 3.2 indicates the assumptions of both the positivists and the interpretivists epistemology.

Table 3.2: Assumptions of both the positivists and the interpretivists epistemology

Positivists epistemological assumptions	Interpretivist epistemological assumptions
• Used natural sciences methodology to study the nature of reality • Truth about IOI activities at the GRA can be discovered • Knowledge about IOI activities is objective • Knowledge is generated deductively from a theory or hypothesis.	• Knowledge is gained through social interactions between people and the objects of natural sciences • Knowledge is generated through personal experience. • Inductive generation of knowledge to create a theory

Sources: Teddlie and Tashakkori (2009); Mac, (2010); Saunders et al. (2016)

3.3.3 Axiological assumptions of the study

These are assumptions that concern issues of ethics and values held by the researcher; the role of values, ethics and the stance of the researcher in relation to the study being conducted (Wahyuni, 2012; Saunders et al., 2016); give direction as to how the research is conducted and thus give a criteria for judging the research work (Biesta, 2015). The study's value is summarised as follows:

As a post-positivist the researcher, the study is not entirely value-free but value-laden and subjective. There is a place for the voice and role of the participants in the study. Humans (participants/respondents) are seen as central to the research process, rather than isolated from it. They are not controlled and studied but are participants in the research.

The current study was guided by the values espoused by post-positivists scholars suggesting that research is value-laden and biased by environmental conditions such as worldviews, opinions, the context (public or private sector) etc. On this score, the current study values human interactions in data collection and thus gathered data through face-to-face interviews (constructivism i.e., ontological relativism). Similarly, the current study also values the views of participants expressed anonymously through questionnaire and therefore gathered quantitative data.

3.3.4 *The study's methodological assumptions of the study*

A methodology refers to the process to conduct a research within the context of a certain paradigm that “comprises the underlying sets of beliefs that guide a researcher to choose one set of research methods over another” (Wahyuni, 2012, p.72). It is a *philosophy or a branch of knowledge* or axioms which deal with the way *new knowledge is generated* (McGregor & Murnane, 2010). That is, the justification and the philosophical assumptions that underpin any research – how the approach (logic), reality, values and what constitutes knowledge inform a study. Hence, methodology is concerned with “*why*” a research is conducted, “*how*” the research problem was defined, in “*what*” ways and “*why*” the research hypothesis was developed, the data collected and the method used, *the reason for using a particular technique* for data collection and analysis and *the source of the data (where)* (Scotland, 2012; Kothari, 2004). From the above, research methodology refers to “the theoretical assumptions and principles that underpin a particular research approach” (Giddings & Grant, 2006, p.5) or the “general approach the researcher takes in carrying out the research project” (Leed & Ormrod, 2021, p. 32). The methodology thus informs the method to use. The key question about methodology is:

“How can the inquirer (would-be knower) go about finding out whatever he or she believes can be known”? (Guba & Lincoln, 1994, p.108). The answer to this question is constrained by the study's ontology, epistemology and axiology. **Appendix 3.1** shows the study's research methodology, method and techniques.

3.4.5 Research methods and techniques

Research methods consist of the particular procedures, mechanisms, tools and techniques used to collect, analyse and interpret (Wahyuni, 2012; Leed & Ormrod, 2021). The research techniques are those methods or the processes that the researcher uses in performing the research operations (Kothari, 2004, p.7).

This study used both quantitative and qualitative methods to collect data. The study used survey method to collect quantitative data from the selected sites of the GRA and analysed quantitatively using both descriptive and inferential statistical techniques. The data collected using the survey method made it possible to establish correlational relationships between the constructs and also develop models from the relationships. The challenge encountered in using the survey strategy was that several reminders had to be sent to the contact person to ensure timely response from participants. While survey method may involve several techniques such as structured observation, questionnaire and structured interviews (standardised questions asked of every participant) (Saunders et al., 2016), this study used questionnaire as the data collection technique.

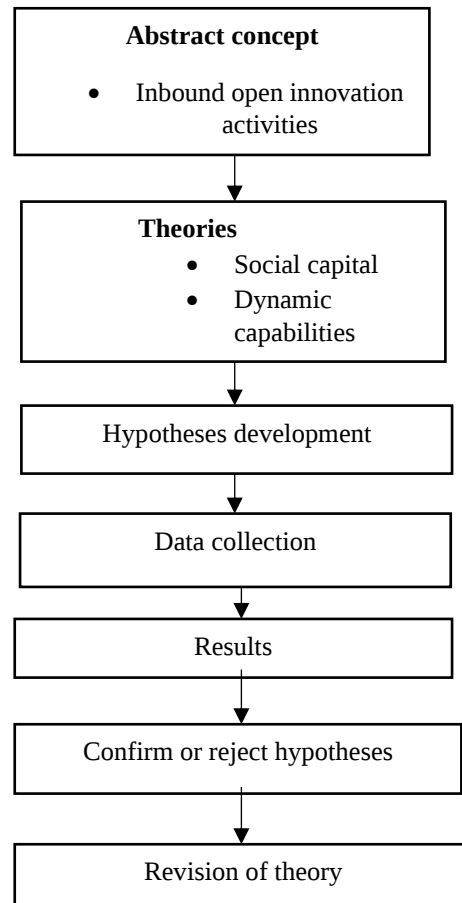
The data collected using survey method restricted the participants to a set of validated questions. The findings from the survey method was complemented by in depth semi-structured interviews to explore and enhance understanding of the quantitative findings. Hence, semi-structured interview method was used to collect qualitative data. The semi-structured interview contained a list of key questions and themes which served as a guide. The interview was preceded by comments. While semi-structured interview can use either note taking or audio-recording technique (Saunders et al., 2016), this study chose the latter.

3.4 Research approach

There are three approaches to research which dictate how the research is conducted: *deductive approach, inductive and abductive* (Saunders et al., 2016).

The *deductive approach* to research is also referred to as the scientific research or logic involves the development of a theory that is rigorously tested through a number of propositions. The research starts from a general rule and a theory expressed in the form of hypotheses to a specific law-like generalisation (Bryman, 2012; Melnikovas, 2018). This approach enabled the researcher *to explain the causal relationship between the research concepts and the variables*. By moving from the general to the specific, the study developed a logical structure to facilitate the achievement of the objectives based on the definitions and assumptions. The approach starts with identifying the objectives; clarifying the definitions and assumptions and developing a logical structure based on the definitions and assumptions (Zalaghi & Khazaei, 2016). Thus, the conclusion is derived from the logical structure or the premise which is normally formal. This form of reasoning is related to quantitative design. Figure 3.3 shows the study's deductive approach.

Figure 3.3: A diagrammatic representation of the study's deductive approach



Source: Adapted from Bryman (2008)

However, the limitation of this approach is that it only enables the testing of the hypothesised relationships and does not help in identifying if other unexpected factors may exist. Further, data that could not be provided by participants during the interaction are lost. But the inductive logic could help reverse these disadvantages.

Inductive logic starts with an observation or data collection to explore a phenomenon and build a theory upon which a general rule is articulated (Melnikovas, 2018). This logic emphasises observation of a phenomenon by moving from specific to general (Zalaghi & Khazaei, 2016). In this study, the inductive reasoning starts by collecting data on IOI activities of the GRA. The focus of this approach is the participants whose reflections and opinions shape and guide the research process (Ali & Birley, 1999). Using this approach

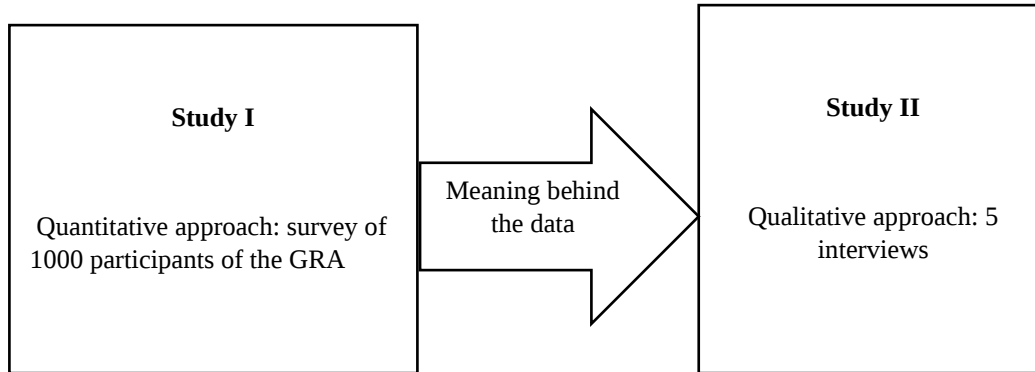
suggests that participants are able to identify and focus on variables that are relevant and discuss them. It is a theory building process that starts with observations of specific phenomenon, and seeking to establish generalisations about the instance under investigation (Hyde, 2000).

While deductive moves from theory to data and inductive from data to theory, abductive combines deductive and inductive by moving “back and forth” (Saunders et al., 2016).

Appendix 3.2 shows the study’s research approach

Practically, the current study operationalised the approach by designating *the quantitative-deductive design as the principal instrument* to collecting data because it has the strengths that are suitable for the study’s goal and the *qualitative-inductive design as the complementary* tool because it has other advantages that complement the principal method in achieving the research goal. This approach is in recognition of the fact that various research designs have different strengths. Second, data gathered from the principal design was analysed first. And to maximise the data analysed using the principal method, a follow-up data using the complementary design was gathered and analysed to add new strengths to the principal data. Using qualitative design as a complementary follow-up method to gather data involve the use of smaller groups that help in evaluating and interpreting the outcome as well as provide meaning for poorly understood and extreme outcomes of the principal method – it adds more meaning to the principal method (Morgan, 1998).

To this end, the current study was conducted in two stages. Study I focused on the quantitative aspect involving a deductive approach while study II discussed the qualitative aspect using the inductive logic. Figure 3.4 illustrates the interplay between quantitative-deductive and the qualitative-inductive designs - MMR design.

Figure 3.4: The mixed method research approach

Source: Author's construction, 2020

3.5 Research strategy

A research strategy refers to “a general way which helps the researcher to choose main data collection methods or sets of methods in order to answer the research question and meet the research objectives” (Melnikovas, 2018, p.39). Saunders et al. (2016) suggest nine strategies which are associated with research work: narrative inquiry, ethnography, action research, grounded theory, case study, survey, experiment and archival research.

This study uses the *survey strategy* as the main tool to collect data and answer the research questions. The survey strategy is associated with a deductive research approach and used to answer questions of “what” ‘who’, ‘where’, ‘how much’ and ‘how many’. The strategy facilitated the collection of standardised quantitative data from a sampled population and making it possible to compare, easy to understand and explain the relationships between variables. The strategy therefore gives the researcher control over the process and generates findings that are statistically representative.

3.6 Methodological choice

In terms of methodological choice, Saunders et al. (2016) suggest quantitative and qualitative research choices including simple or complex mix of both as well as the use of mono methods. The research choices include: quantitative mono method, qualitative mono method, multi-method quantitative (solely multiple quantitative approaches), multi-method qualitative (solely multiple qualitative approaches), mixed method simple and

mixed-methods complex. This study uses *a mixed method research design* (QUANT +qual)

3.7 Research design

Research design is the plan or blue print that the researcher uses to satisfy the objectives of the research by examining and answering the questions (Marcyk et al., 2004; Cooper & Schindler, 2010). That is a logical plan for moving from research questions to the conclusion by organising the tasks of the research, giving justification with regards to the data to be collected, how it is collected and source (where), how the data is analysed and how it will satisfy the research objectives and answer the questions (Easterby-Smith et al., 2015).

Using the current study as an example, dealing with the involvement of employees and organisational innovativeness requires the researcher to collect data from both employees and management of the organisation to draw unbiased conclusion.

There are three types of research designs within an inquiry: quantitative, qualitative, and mixed methods research designs (Bryman, 2012; Creswell, 2014; Saunders et al., 2016).

The current study used the mixed methods research design to combine quantitative and qualitative methods. Specifically, the current study used the *sequential explanatory research design* (Creswell & Creswell, 2018) to answer the research questions.

This study was motivated to use the mixed methods research design:

- 1) because of the existing gap of using mixed methods research designs in the OI literature (Santos, 2015; Hossain et al., 2016; Usman et al., 2018)
- 2) to understand the motivations of individual members in the OI environment to engage or not engage in IOI activities as observed by Bogers et al. (2017), particularly the PS of Ghana and
- 3) to empirically test the correlational relationship between IOI actions and OGI.

This study is however dominated by quantitative orientation as it began with quantitative research. Hence quantitative data was collected first, followed by the qualitative research the in order to understand the views of the employees about IOI activities, deepening

understanding about the phenomenon, corroborate the findings of the quantitative strategy and complement or enhance the understanding of the quantitative outcome. Hence quantitative data was first collected and analysed. The findings were then explained in-depth by conducting qualitative explorations to elaborate more on the outcomes. In this case, the qualitative strategy is being used to add more information to the quantitative data. This type of mixed method is called sequential explanatory because the initial quantitative stage is followed by the qualitative stage. Using a smaller component of qualitative design helped in evaluating and interpreting findings from the main quantitative study.

A quantitative design comprising a series of validated and pretested self-complete questionnaires were used in the survey over the period September to October 2019. Also, a qualitative design of semi-structured interviews of participants over a one-day period was used. **Appendix 3.3** shows the attributes of various research designs.

3.7.1 The study mixed method research design (MMR).

Mixed methods research (MMR) is defined as

the type of research in which a researcher or team of researchers combines elements of qualitative and quantitative research approaches (e.g., use of qualitative and quantitative viewpoints, data collection, analysis, inference techniques) for the broad purposes of breadth and depth of understanding and corroboration (Johnson & Onwuegbuzie, 2007, p.123).

As a research plan, MMR design is “driven by the inductive or deductive theoretical drive, and comprising of a qualitative or quantitative core component with qualitative or quantitative supplementary component(s)” (Morse et al., 2006, p.281). MMR therefore involves the collection, analyses and integration of both quantitative (statistical) and qualitative (thematic) data (Teddle & Tashakkori, 2009; Leavy, 2017; Creswell & Creswell, 2018) which promises rich and deep insights into less explored areas (such as OI) (Johnson & Onwuegbuzie, 2004). The core assumption underlying the MMR is that “the integration of qualitative and quantitative data yields additional insight beyond the

information provided by either the quantitative or qualitative data alone” (Creswell & Creswell, 2018, pp. 41-42). This phenomenon may result in a comprehensive understanding of the subject being investigated because of the data integration. Therefore, the goal of the MMR design is to

- 1) “draw from the strengths and minimise the weaknesses of both in single research studies and across studies” (Johnson & Onwuegbuzie, 2004, pp.14&15)
- 2) answer the research questions, increase knowledge and strengthen the conclusion of the study, contribute to the extant literature as well as gain fuller and richer understanding of a phenomenon (Schoonenboom & Johnson, 2017).
- 3) considerably enhance the value in examining and combining both quantitative and qualitative research designs (Bryman, 2006)

The current study uses the MMR because

- 1) it increases the confidence in establishing causal relationships (higher confidence in hypotheses test), enhances data reliability and validity, increases the probability of making meaningful contribution to literature and higher confidence in making conclusions (Abowitz & Toole, 2010).
- 2) it enables access to, and understanding of the behaviour of certain qualified respondents not captured by the survey. Respondents are therefore able to explain their motivations for embracing or not embracing IOI activities.
- 3) using the qualitative approach gives the researcher a deeper and better understanding into individual employee motivations certain behaviours not captured in the literature.
- 4) the MMR outcome enables the integration of the results, enhanced analysis and conclusion; provided deeper and rich insight rich within the context and understanding of the human behaviour, role and experience (Polit & Tatano, 2010).
- 5) MMR design therefore provides “the most informative, complete, balanced, and useful research results” (Johnson & Onwuegbuzie, 2007, p.129) in a study on an underexplored topic such as OI (Hossain & Kauranen, 2016).

Overall, MMR approach was adopted for the following reasons (Johnson & Onwuegbuzie, 2007; Halcomb & Hickman, 2015)

- breadth or depth purposes – provide a complete picture, deeper, better understanding and enhanced description
- corroboration – using the outcome of the quantitative method to corroborate the findings of the qualitative processes
- provide the study outcome with greater confidence
- meet the aim of the study and
- complement quantitative results with qualitative processes

3.8 The purpose and statement of the current research – explanatory sequential design

Following Creswell and Creswell (2018), the study presents its *purpose statement* which is considered “the most important statement in the entire study” (p.177). The purpose statement establishes the intent of the study (why the study is conducted) and its intended accomplishments (its outcome). This is *different from the problem statement (problems that led to the study) and the research questions (questions that data will be collected on)*. Each research design has its own purpose statement. Hence this study’s design (sequential explanatory) purpose statement is stated below:

This study addresses the effects of IOI activities on organisational innovativeness. That is, a focus on the role of individuals operating in the open innovation environment at the Ghana Revenue Authority. An explanatory sequential mixed method research design was used to collect quantitative data first, and then explaining the quantitative findings with in-depth qualitative data. First, the quantitative data was collected using the survey method and collected data from 1000 participants from the purposively selected data collection sites underpinned by the dynamic capabilities and social capital theories to determine whether inbound open innovation activities relate to organisational innovativeness. The second qualitative stage was conducted following the quantitative findings to further explain the quantitative findings. In the qualitative exploratory stage, the study explored the role of employees in the technology in-flow process with five (5) individual members at the Ghana Revenue Authority head office.

3.9 Selecting the time horizon and justification – cross sectional

A research study either uses cross-sectional (a snapshot) or longitudinal (diary recording) methodological design at a point in time (Saunders et al., 2016; Leavy, 2017).

The current study used a cross-sectional time horizon to study the IOI activities in the GRA between September to October 2019 using mixed methods research design. The study thus gathered data within the period using a questionnaire and followed by a semi-structure interview. This study horizon thus measured the outcomes as and the exposures in the study respondents at the same time. This time horizon was selected for the following reasons:

First, the data required for the study was available for collection at a particular time.

Second, the data gathered led to several outcome and further investigations.

Third, the data collected could be used to estimate the occurrence of a phenomenon in a population because the sample is obtained from the population. It therefore provided information about IOI activities, understanding, monitoring and the evaluation of a technology acquisition processes within a period.

Fourth, cross-sectional study was particularly important because it enabled the study to determine the influence of IOI, EI and TS (IVs), predict OGI and infer causations between IOI activities and OGI. Hence, “cross sectional studies are the best way to determine prevalence and are useful at identifying associations that can then be more rigorously studied using a cohort study or randomised controlled study” (Mann, 2003, p.57).

However, cross-sectional methodological design may have the disadvantage of threats to internal validity. For instance, differences in age, experience and practice (instructional or technology) of sampled participants might affect the outcome of a study such as critical thinking (Leed & Ormrod, 2021).

3.10 Research techniques and procedures

This is the final layer of the research onion which moves towards data collection and analysis. The study adopted two research techniques in the data collection process. Using the survey method to collect quantitative data, the study used questionnaires while audio-recording technique was used to collect the qualitative data using the semi-structured method.

3.11 Summary of the study's methodology

The study's research design follows the concept of the research onion suggested by (Saunders et al., 2016) – a system of an integrated theoretical knowledge developed for IOI activities research. Table 3.3 shows the summary of the methodology.

Table 3.3: The current study's methodology based on the research onion

Layer	This study
Philosophy	Post-positivism
Theory development approach	Abductive
Methodological choice	Mixed method simple
	Sequential explanatory research design
	Quantitative research – core
	Qualitative research-supplementary
Research strategy	Survey research
Time horizon	Cross sectional
	September to October 2019 (60 days)
Data collection method:	Survey (quantitative) and semi-structured interview (qualitative)
Data collection techniques and analysis	Techniques for quantitative - self reported and audio recorded for qualitative
	Data analysis: (quantitative) – SEM using AMOS software
	Qualitative – Word cloud, thematic analysis

Source: Adapted from Saunders et al. (2016)

3.12 The study's MMR theoretical drive

Besides the purpose of MMR, another key attribute that must be stated in a research is the theoretical drive (Schoonenboom & Johnson, 2017). This is the overall inductive or deductive direction of the study “that guides the use of the appropriate qualitative and/or quantitative methodological core” (Morse et al., 2006, p.281). The core component of the theoretical drive of the research overrides the drive(s) of the supplemental component(s). Thus MMR design is underpinned by two theoretical drives – inductive or qualitative /induction characterised by theory building process (exploration and description) and deductive or quantitative/deduction characterised by theory testing and prediction (Morse et al., 2006; Schoonenboom & Johnson, 2017). The core component is written in capital while the supplemental is in lowercases.

The current study's theoretical drive is deductive /quantitative. That is, the quantitative aspect dominates the qualitative. In this regard, the

Quantitative dominant mixed methods research is the type of mixed research in which one relies on a quantitative, post positivist view of the research process, while concurrently recognising that the addition of qualitative data and approaches are likely to benefit most research projects (Johnson & Onwuegbuzie, 2007, p.124).

This is written as QUAN (core) and qual (supplementary).

3.13. Brief description of the study area

The Ghana Revenue Authority (GRA) is a semi-autonomous PS institution clothed with the responsibility of assessing, collecting and accounting for the nation's tax revenue (GRA Act, 2009, Act 791). Thus, the core mandate of the GRA is to “ensure maximum compliance with all the relevant tax and customs related laws in order to ensure sustainable revenue mobilization for government” (GRA 3rd Strategic Plan, 2019, p.9).

The GRA integrates customs and domestic tax administrations and operates under the Ministry of Finance (MoF). Just like other Semi-Autonomous Revenue Administration (SARAs) (von Haldenwang et al., 2014; Shpak et al., 2020), the GRA has independent legal identity, enjoy some level of operational and financial independence from the MoF

in terms of staffing, payments, budget allocation and internal administration and operates on a commission (retention) basis, where a percentage of the funds collected are used to run the administration.

The GRA is ideal for this study for several reasons:

First, the customs division of the GRA has implemented several technologies since 1985 to improve its revenue performance and promote trade (Addo & Avgerou, 2020). In 1985, customs implemented the Automated Systems for Customs Data (ASYCUDA) developed by the United Nations, TradeNet implemented by GCNet in 2003, several destination inspections companies between 2005 to 2015, West Blue's classification and valuation system and Ghana Link-UNIPASS national single window in 2019 (De Wulf, 2005; Addo & Avgerou, 2020). However several challenges such as street-level corruption and the implemented technology's failure to internalise the anti-corruption measures (Addo & Avgerou, 2020) and high level of informal practices such as bribery, extortion and pilfering (Addo, 2016). Therefore, individual employees in the GRA have accumulated lived experiences to help the study achieve its goal.

Second, given the role that effective revenue administrations play in the growth of developing countries and the reliance on revenue administrations by governments to develop their countries, studies in such revenue administrations such as the GRA will help improve resource mobilisation for national development.

Another reason why, the GRA is ideal for the research is that studies in IOI activities have focused in the high-tech sectors in Europe and the USA (Santos, 2015) and in SMEs (Hossain & Kauranen, 2016). The phenomenon is however, less explored in South America, Africa, and South-Asia as well as the context of the PS (Santos, 2015; Hossain & Kauranen, 2016). Also, studies that investigate the impact of SARAs in developing countries is scarce (von Haldenwang et al., 2014). Researching OI in this area will help improve its performance as politicians, citizens and experts expect the GRA to effectively mobilise tax revenue.

According to von Haldenwang et al. (2014), findings on the revenue collection impact of SARAs are inconclusive even though they can "contribute to achieving a more stable and

predictable revenue” (p.552). Also, a recent empirical study about the revenue performance of SARAs in Sub-Saharan Africa (including Ghana) suggests that it is inconclusive and fails to consider the dynamics in revenue collection (Dom, 2017) such as intra-organisational behaviour and innovativeness. These findings suggest that performance of SARAs may not necessarily be as a result of reforms but the ability, willingness and the capacity of employees to embrace the reforms – organisational innovativeness.

Apart from the revenue considerations, new technologies deployed by the GRA cover all the internal operations of these selected areas. Hence, all staff in these areas use the deployed technology for their work. Another rationale for selecting the sample areas includes the high rate of economic operations and heavy use of the deployed technology (i.e., high frequency of contacts between traders and GRA staff) which makes the use of the deployed technology meaningful. A further justification for the selected areas is the availability and access to staff members. The staff members operating in these areas are all located in one building and work from their desks.

3.14 Data collection sites within the organisation and justification

Data for the study was gathered from Accra, Tema, Kotoka International Airport (KIA), Jamestown and the national head-quarters. The areas were purposively selected because they provided relevant information and characteristics to the study. For customs, Tema harbour (the largest sea port in the country located in Tema, near Accra) was selected because it contributes the highest revenue – about 75% of the annual targeted revenue. Tema harbour is located at the eastern part of the capital city, Accra. Tema Harbour was also selected because 80% of goods imported into the country are cleared from the Tema harbour (Addo & Avgerou, 2020). Kotoka International Airport (KIA) was selected because it is the biggest and busiest international airport in Ghana. Also, all goods imported by air into the country are cleared from the KIA. KIA is located in the capital city of Ghana, Accra. On the other hand, Aflao (a land border bordering Ghana and Togo) operations area contributes significant amount of revenue from inbound inland operations. It is the busiest land border in terms of Customs operations. Kumasi (the second biggest city in Ghana with the second biggest airport) as customs revenue point was selected

because it serves as a meeting point of goods imported moving from the southern part of Ghana (i.e., from Accra, the Aflao operational areas and other land borders) to the northern part of Ghana (imports from Tamale, Bolga and Wa) that have a lot of land borders bordering Burkina Faso and Togo and vice versa. The customs in Kumasi also supervise a many warehouse. Jamestown is Customs operational area located in the capital, Accra which is mainly in charge of customs warehousing and other manufacturing operations. For the DTRD, these selected areas contribute the greatest revenue to their annual revenue targets.

In all, selecting these operational areas reflected the *fiscal function* (controlling payments of taxes and levies based on set rates and tariffs, determining the mode of tax verification and collection as well as accounting for the collected tax); *control function* (implementing a range of customs and domestic tax regulatory procedures to ensure compliance with the law when importing or exporting goods and vehicles) and the *security functions* (a key function of customs to ensure national security and protect society from dangerous and substandard goods, prevent and counteract smuggling, protect intellectual property rights, determine the level of responsibility for violation of customs rules, prosecute offenders, conduct cases of violation of customs legislation etc.) among others (Shpak et al., 2020).

3.15 The study's unit of analysis and justification

The unit of analysis is the element or case about which data are gathered i.e. the unit whose attributes are being described, measured and information obtained (de Vaus, 2002) – that is the ‘who’ or ‘what’ that is the focus of the study (Leed & Ormrod, 2021). The focus of the unit of analysis may come in the form of a group, individuals, buildings, income and education. This is normally determined in the study questions and purpose (Saunders et al., 2016).

The current study's unit of analysis was the individual senior employees of the GRA. Whereas employees consist of both junior and senior staff members, the study specifically focused on the senior staff members. The reasons for using senior staff members only as participants was to be assured of informed and in-depth knowledge about innovation and management practices in the organisation combined with managerial and rich leadership experiences. Respondents in this category are informed constituents that occupy positions

which enable them to monitor and report potential effects of organisation-wide innovation activities needed for innovation creation (Simpson et al., 2006). Within the context of the study, almost all senior officers have access to using implemented technologies (they are provided usernames). Junior officers in most cases are not provided with usernames and access to the implemented technologies within the GRA, especially Customs. They are thus, able to use their experiences to identify both positive and negative practices that may arise from innovation activities. The rationale is that senior staff members are already involved in managing the activities of the organisation, hence the focus.

3.16 Study I – Quantitative design

The goal of this phase was to collect data using survey questionnaire to provide empirical evidence (test hypotheses) on the effect of IOI activities on OGI under the influence of ABCAP, learn about the sources of technology acquisition in the organisation, the processes of acquiring the technology, using internal capabilities to obtain external technology among others from the sampled employees. This was done by distributing questionnaires to respondents and subsequent collection.

3.17 Target population

In this study, the population is all staff of the Ghana Revenue Authority (GRA) - Customs Division (CD), Domestic Tax Revenue Division (DTRD) and the Support Services Division (SSD) taken from the selected areas. Specifically, all senior officers from the rank (position) of Assistant Revenue officers (AROs) to Deputy Commissioners (DCs). This list of all the staff members was obtained from the GRA in 2019. The sample for the study was taken from this population. This group contain the desired information that can answer the measurement questions. The population for the study was 2,611 employees of the GRA. Table 3.4 shows the breakdown of the population obtained from the GRA.

Table 3.4: Target population determination table

No	Unit	Population
Customs Division		
1	KIA	148
2	Tema	300
3	Aflao	89
4	Kumasi	95
5	Jamestown	117
6	Head office	617
	Total (A)	1366
Domestic		
1	Accra	108
2	Kumasi	300
3	Tema	169
4	Head office	668
	Total (B)	1245
	TOAL (A+B)	2611

Source: The Ghana Revenue Authority, June 2019.

3.18 Sampling size determination procedure

The sample for the study was drawn from the population of the purposively selected areas in a proportionate manner. The purpose of determining and collecting data from the sample was to enable the author make inferences about the larger population that the sample was drawn from (Easterby-Smith et al., 2015). To select a probability sample for a study, the sample frame was first determined. This is, the complete list of all the elements in the target population from which the sample for the research is taken (Saunders et al., 2016). Thus, the sampling frame for the current study comprised the complete list of all the individual staff members of the target population.

According to Leed and Ormrod (2021), a study that has a population of about 1,500, 20% (300) should be sampled while a population of more than 5,000 should use 400 as the sample. Also, Krejcie and Morgan (1970), Israel (1992), Bartlett, Kotrlik and Higgins (2001) and Saunders et al. (2016), suggest that at 95% certainty a target population of 2,000 should use a sample of 322. In Saunders et al. (2016), a population beyond 5,000 should use a sample of 357. Hair et al. (2012) and Kock and Hadaya (2018) suggest that to obtain samples that are safe and appropriate using both normal and non-normal data in structural equation modelling (SEM), a study should consider the number of IVs or maximum number of arrows pointing to the DV. This will give the minimum number of observations needed for a study. Kock and Hadaya (2018) call this the inverse square root method – a simple and precise method with little estimation. The population in this study is 2,611, which is more than 1,500 but less than 5,000.

Using the inverse square root method of precision (Kock & Haday, 2018) -number of IVs pointing to DV, the study has a maximum number of 3 IVs pointing to the DV. At a significance level of 5%, the study needs a minimum of 124 observations to make precise and appropriate generalisations. Also, going by the recommendations of Saunders et al., (2016), the sample required is 322. This means the current research needs a minimum of 124 and a maximum of 322 observations. Therefore, any sample that fall between 124 and 322 is accepted as safe and appropriate for analysis. As a rule of thumb, the bigger the size of the sample, the better it is for analysis (Leed & Ormrod, 2021). So, if the sample turns out to be more than 322, the better it is.

The current study population of 2,611 is too large to administer questionnaires because of constraints of time, human resources and finance. To overcome these challenges, and keeping the required samples or observations in mind, the study administered 1,000 questionnaires which was appropriate and could be collected and analysed within the constraints. The 1,000 questionnaires administered was guided by the results of the pilot study which yielded an effective response rate of 32%. Given that the maximum sample required for this study was 322 effective responses, using the 1,000 participants was appropriate. Other empirical studies in OI also informed the selection of the 1,000 participants. For instance, Sisodiya et al. (2013) distributed 532 questionnaires to managers and obtained a final useable sample of 204 representing 38.3%. Using a sample of 1,500 firms, Parida et al. (2012) received 252 responses representing 16% useable samples. Also, Wang (2018) distributed 500 questionnaires and received 122 useable samples representing 24.4%. Similarly, Wang et al. (2015) used stratified random sampling method to administer 650 questionnaires to high-tech CEOs and obtained 118 usable responses representing 18.15%. Following the above, the expected usable questionnaires (samples) for this current study should have a minimum of 12.4% and a maximum of 32.2 % of the administered questionnaires.

This study adopted stratified random sampling technique to distribute the questionnaire. This sampling strategy is used where the elements in the study population are divided into two or more groups based on a shared attribute (these groups are called *strata*) (Leavy, 2017) and the researcher requires equal samples from each strata in the target population (Leed & Ormrod, 2021). Stratification was done based on the divisions of the GRA - DTRD and CD. The rationale was to ensure that each stratum or division was adequately represented. The strata were the CD which comprised staff members of Customs from the selected areas; the DTRD which consisted of staff involved in internal tax operations including the SSD which comprised all staff members not engaged in customs operations or internal tax collections but offering technical support such as the Information Technology (IT) department, the Human Resource (HR) department, the procurement department, etc. Thus, the current study applied proportional stratified sampling technique to obtain appropriate samples from the stratum because the various strata are different in size.

So, using proportions, the sample for the study was derived as follows:

Customs division

KIA: $148/2611 \times 1000 = 57$

Tema: $300/2611 \times 1000 = 115$

Aflao: $89/2611 \times 1000 = 34$

Kumasi: $95/2611 \times 1000 = 36$

Jamestown: $117/2611 \times 1000 = 45$

Head office: $617/2611 \times 1000 = 236$

Domestic tax revenue division

Accra: $108/2611 \times 1000 = 41$

Kumasi: $300/2611 \times 1000 = 115$

Tema: $169/2611 \times 1000 = 65$

Head office: $668/2611 \times 1000 = 256$

Thus, the number of participants to be sampled from each data collection site is indicated in Table 3.5

Table 3.5: Number of participants determination table

No	Unit	Number of respondents
Customs Division		Customs
1	KIA	57
2	Tema	115
3	Aflao	34
4	Kumasi	36
5	Jamestown	45
6	Head office	236
	Total (A)	523
Domestic		
1	Accra	41
2	Kumasi	115
3	Tema	65
4	Head office	256
	Total (B)	477
	TOAL (A+B)	1000

Source: Field research, 2020

3.19 Data collection strategy

To test the study hypotheses and investigate whether IOI activities influences OGI, survey data was collected from a sample of the staff members. Before administering the questionnaire, a pre-test of the items was conducted to establish the validity and enhance integrity.

3.19.1 Pre-testing and pilot study

The essence of pre-testing and pilot studying the research questionnaires was to examine the validity and reliability of the study instruments and assist the researcher to gain full understanding of the study (Nordin & Muhammad, 2015).

Pre-test involves the evaluation of the questionnaire (by the study supervisor) and the use of experts who are experienced and knowledgeable in the study area (Hair et al., 2014) to establish content or face validity – appropriateness of the measures to be included in the study (Nordin & Muhammad, 2015). The experts matched the measures with the constructs without any difficulty which further demonstrated the establishment of face validity. Pre-testing was conducted to achieve two objectives of checking individual questions and the general design (Reynolds et al., 1993). Specifically, pre-testing was conducted in July 2019.

Even though the questionnaires were from validated sources, pre-testing was done to check misunderstandings, incomplete concept coverage, inconsistent interpretations, satisficing (respondents answering questions just to satisfy the process), context effects among others (Collins, 2003); check the content, wording and appropriateness of the questions (Hair et al., 2014); a means of judging the success or otherwise of the questionnaire (Saunders et al., 2016) and increase respondents interest, discover sequencing challenges of questions, and devise ways of improving the general quality of survey data (Cooper & Schindler, 2012). Besides, pre-testing was conducted to understand the culture of the organisation – in terms of access and other protocols. Pre-testing the questionnaire is important because it is difficult to predict how respondents will react and interpret the questions as well as allow any challenge to be identified and corrected, and also point out any potential source of interviewer bias (Gill & Johnson, 2002).

Feedback received from the pre-testing contained some important suggestions:

First, the questionnaire used the term firm which was not synonymous with the PS. The term firm was therefore replaced with organisation. But to preserve scale integrity, the firm was maintained where appropriate but still referring to the organisation under study.

Second, some typographical errors were identified and corrected.

Third, some questions were too long. Such questions were shortened but without losing their original meaning.

After revising the questionnaire and incorporating meaningful suggestions, a pilot study was conducted to confirm the appropriateness of the measures, understand respondents and determine reliability of the measures prior to the actual study (Nordin & Muhammad, 2015). Because of the importance of pilot-testing, this study follows the advice of Bryman (2012): “it is always desirable, if at all possible, to conduct a pilot study before administering a self-completion questionnaire or structured interview schedule to your sample” (p.263). Viechtbauer et al. (2015) suggest that to achieve 95% level of confidence in a study, a sample of 29 participants is adequate for a pilot study. This current study used fifty (50) participants in the pilot study from the port of Tema and Head Office of the GRA excluding those who took part in the pre-test exercise. The pilot study was conducted in August 2019 immediately after the pre-test. In all 16 useable questionnaires were returned after a period of 21 days. This marks an effective response rate of 32% ($16/50 \times 100$). After analysing the responses of the participants involved in the pilot-study, the results showed that all the IVs and the DV's Cronbach's alpha were more than 0.70. This demonstrates instrument reliability and also an indication of the number of questionnaires to be distributed as well as the likely response from the actual study.

3.19.2 Questionnaire design

Following the receipt of meaningful input from participants and experts in the pre-test the researcher redesigned the questions to elicit those responses. After some remarks from the introduction to establish some clarity about the questions, two important issues were also considered: keeping the respondent's perspective in mind and avoiding confusion so as to obtain valid and reliable measure (Neuman, 2014). These two principles serve as the rule of thumb in questionnaire development. This was to ensure that each respondent completely and honestly understood each question as it was intended.

To obtain valid responses from participants, the following points were considered in designing the questionnaire:

- the use of jargons, abbreviations or slang were avoided
- ambiguity, vagueness and confusing questions were avoided. Simple and short questions were used instead
- emotional language was not used. For instance, what should happen to corrupt GRA officials who loot the nation? Emotional words here include corruption, loot.
- as much as possible, double-barrelled questions were avoided. For example, does the organisation involve employees in decision making and technology acquisition? This may lead the respondent to answer yes or no depending on their understanding of the questions
- leading or loaded questions were not used. e.g., management do not involve you in decision making, do they?
- questions beyond the capabilities of respondents were not asked. For example, five years ago, management refused to involve you in decision making
- questions that involve future distant intentions were avoided. e.g, will you encourage your children to work in your organisation?
- double negatives questions are confusing and were avoided. e.g., do you agree or disagree that employees should not be involved in decision making?
- overlapping or unbalanced responses were avoided. e.g., Is the performance of GRA management outstanding, excellent, very good or good?

Details about instruments and measures and their sources are found in Sub-section 3.20.

The questionnaire was divided into two separate parts. The first part contained questions on the IVs and the moderating variables including the demographic and control variables while the second part also contained questions on the DV including the demographic and control variables. Both were accompanied by a cover letter that indicated the study's purpose and requested participants to answer the questions. Also, the letter assured respondents about their anonymity and confidentiality. In the questionnaires, participants were promised summaries of the results of the study provided they gave requested details (telephone numbers or emails). To demonstrate this, participants were asked not to indicate their names but rather provide their emails or telephone numbers where a summary of the final results of the study could be shared with them if they were interested. This served as a motivation and reward for them to participate in the research.

Data were gathered on a 5-point Likert scale for all the constructs ranging from 1 (strongly disagree) to 5 (strongly agree). In between the negative and positive answers, were intermediate options.

Generally, the 5-point Likert scale is simple for the participants to read the entire descriptors and produces a slightly higher scores than the 7-point Likert scale (Dawes, 2008); increases response rate and simple to use (Taherdoost, 2019). However, because the 5-point Likert scale has a midpoint of "neutral" participants may use the mid-point as a dumping ground when in their opinion the study items are undesirable, their answers to the study depends on other factors, they have no interest in the topic and they have little knowledge about the topic under study (Chyung et al., 2017).

3.19.3 Main survey data collection approach

Data for the study was gathered between September and October 2019 (a 60-day period) using survey questionnaire. The collection of the data was made possible with the help of a research assistant and contact persons at the GRA.

The researcher first wrote a letter to the managers of the purposively selected areas asking for permission to collect data. The purpose of the data collection was stated as academic purpose only. The telephone number of the researcher was indicated on the letter. Two days after receipt of the letter, the managers (officers-in-charge-OIC) of the customs areas called to inform the researcher that the letters should be directed to their Commissioner who could then advise them. A letter was immediately dispatched to the Commissioner of Customs who subsequently requested them to permit the exercise.

Upon receipt of approval from the Commissioner of Customs, the researcher was informed. A date for site-entry meeting was agreed: first, by the sector commander of Tema Customs. The OIC then invited another officer who was later introduced as the contact person to coordinate the collection of the data. After briefings from the researcher emphasizing anonymity and assuring confidentiality, the OIC then educated the researcher including the research assistant about the rules of behaviour. For instance, the OIC indicated that gifts were not to be accepted by officers in the course of working for someone except in certain circumstance. The value of the gift must not be more than fifty Ghana Cedis (GHS50.00). Where the value of a gift is more than GHS50.00, it must be reported immediately. The OIC then asked the contact person to give the researcher all the necessary assistance during the exercise.

The researcher, together with the research assistant and the contact person then had a separate meeting where the procedure for administering the questionnaires was explained and the questionnaires delivered. The contact person was educated that the questionnaires were to be distributed based on convenience or happenstance to only senior officers. It was agreed that the research assistant was to communicate with the contact person and collect questionnaires that were completed. Communication was to be done every Monday in the afternoon through WhatsApp and instant text messaging (IMS) first before a voice call where no responses were received after two (2) hours. The contact person could however call the researcher or the assistant anytime in connection with the work. To

motivate the contact person and also facilitate uninterrupted communication, a mobile phone credit valued GHS50.00 was given to him through the OIC. This procedure was replicated in the other customs areas.

The DTRD had no protocols like the CD. Upon receipt of the letter for data collection, approval was given by the various managers and the researcher duly informed through a telephone call. To ensure consistency, the procedure for collecting the data in the Customs areas was suggested to the managers of the DTRD who readily agreed.

For ethical reasons, the researcher who is also a Customs officer did not contact respondents directly but allowed the research assistant to constantly communicate with the contact persons and hence could not influence the responses.

3.19.4 Data screening and response rates

Data collected from participants was screened. This was done by checking for missing/incomplete data, suspicious response patterns (straight lining or inconsistent answers), identifying outliers and checking for normality in the data, and conducting a preliminary test for some of the statistical assumptions (Hair et al., 2010; 2014; 2019). Conducting data screening is important because the accuracy of the results of the main analysis is influenced by the accuracy of the data (Saunders et al., 2016). Data screening was initially done to detect and correct certain errors in the multivariate analysis and thus reduce their effect on the outcome of the study (McQuitty, 2018). Data screening therefore ensures that there are no breaches of the basic assumptions of multivariate analysis before performing the final analyses for the research. Failure to conduct data screening would affect the value as well as the appropriateness of the type of analysis required (Gorondutse & Hilman, 2014). The basic assumptions underlying multivariate analysis of variance (MANOVA) – a test for two or more multidimensional observations (George, 2001; French et al., 2008) include:

- there is homogeneity in the variance or co-variance matrices i.e., the variance or covariance matrices are equal. The assumption is that the DV demonstrates equal levels of variance across the range of predictor variables.

- the variables are all normally distributed within the group. This means that tests for outliers should be done before running a MANOVA, and subsequently transformed or removed.
- the assumption of linear relationships among all pairs of DVs, covariates, and all DV-covariate pairs in each cell. Thus, when the relationship deviates from linearity, the power of the analysis will be compromised.

In all, a total of 382 questionnaires were returned representing 38.20% of the total questionnaires. This constitutes the number of participants who agreed and took part in the study. After physically screening the returned questionnaires, 73 of them were eliminated because part of their pages was missing, straight-lined, incomplete responses among others and hence not fit for analysis. This constituted 18.96% of the returned questionnaires. The remaining 309 questionnaires were entered into SPSS 24 file for further screening. Table 3.6 summarises the questionnaires returned.

Table 3.6: Summary of responses to the survey questionnaire

Returned questionnaires	382
Missing demographics pages	16
Missing dependent variables pages	16
Incomplete responses	15
Inconsistent answers	17
Straight-lining	9
Useable questionnaires	309
Missing data	12
Outliers	12
Final usable data for analysis	285

Source: Filed data, 2020

The next step after entering the 309 questionnaires into the SPSS 24 file was to identify missing data.

Missing data refers to a situation where valid values of data on one or more variables are not available for analysis (Hair et al., 2010). This occurs when a participant either knowingly or unknowingly fails to answer one or more question(s) (Hair et al., 2012) or related external factors such as data collection problems or entry mistakes (Hair et al., 2019). The total identified missing data was 12 (3.88%) of the useable questionnaires. This falls within the 15% threshold for missing data deletion (Hair et al., 2012). It is necessary to identify and evaluate missing data because it impacts the size of the sample available for analysis and affects the accuracy and worthiness of the outcome (Hair et al., 2019)

According to Hair et al. (2012) an outlier is “an extreme response to a particular question, or extreme responses to all questions” (p.53). Outliers values are distant from the centre of the data, with distance measured in terms of the dispersion (Hellerstein, 2008). This means that outliers are suspicious and problematic responses/measures because they appear smaller or much bigger than the greater majority of the measures (Cousineau & Chartier, 2010). From these explanations, outliers refer to the measurements that do not conform with the majority of the data and may either be much smaller or larger in comparison to the majority. Outliers have effects on empirical data analysis in practical terms and may influence the data analysis to a large extent as well as lead to non-normal distribution of the data. Thus, the first step in dealing with outliers is to identify them. The study used three approaches in detecting outliers: Mahalanobis Distance (MD), Cooks’ Distance (CD) and Leverage Point (LP). These three methods are commonly used to detect outliers in multivariate statistics/quantitative studies (Kannan & Manoj, 2015; Leys et al., 2018)

Alternatively, in the Statistical Package for Social Sciences (SPSS) file, the “Explore” option was used to develop box plots and stem-and-leaf plots to enable the identification of outliers by respondents (Sarstedt & Mooi, 2019). This led to the identification of 12 outliers. Given that the remaining sample was 297 (309-12), removing the 12 respondents was not going to affect the sample substantially. All the 285 (297-12) were retained for further statistical analysis after the screening. After going through the data screening process, the effective response rate was 28.5% ($285/1000 \times 100$). This effective response

rate of 28.5% was comparable to other survey-based studies in IOI studies such as Parida et al. (2012), 16%; Hung & Chou (2013), 22.3%; Wang et al. (2015), 22.56%; Wang (2018), 24.4%; Sisodiya et al. (2013), 38.3%.

Beyond identifying outliers and missing data, the study also determined fraudulent responses by contacting some respondents using the phone numbers provided. Suspicious responses were assessed by looking for straight-lining answers while inconsistent answers. These included questionnaires such as those completed by National Service Persons (persons on a compulsory one-year national service programme for all universities, technical universities and other graduated students from various educational institutions). Questionnaires completed by Nation Builders Corp (NABCO) (a government initiative to give temporary employment to some graduates after their one-year compulsory national service while waiting for permanent job openings). To determine the inconsistencies here, the rank of the respondents was used because these categories of persons have no staff numbers nor are identified by their ranks.

According to Saunders et al. (2016) participants refusal to answer questions, ineligibility, failure to locate and contact eligible participants all constitute non-response and should be reported for questionnaires and structured interviews.

Several steps were taken to improve the response rate as shown in **Appendix 3.4**

3.20 Instruments and measures

To measure the five constructs of interest in the study, existing scales were adopted and or adapted from the literature to fit the purpose. The early versions of these questions were pre-tested to determine the level of understanding, flow and clarity of the questionnaire. Feedback from the pre-test facilitated the refinement of the measures which was used to gather the data.

Inbound open innovation: The study adopted IOI measures from Sisodiya et al. (2013) because these measures were specifically developed for IOI by following recommended prescriptions and taking into consideration the conceptual definition of OI, DCs theory (relational capability, inter-firm spill over) and resource perspectives (knowledge) of the organisation. The scales were used to measure the effect of IOI on performance in a

business-to-business high-tech firm. The relationship was moderated by relational capabilities. **Appendix 3.5** shows a summary of the adapted measures.

Employee involvement: Measurement scales for EI were adapted from three sources. Fenton-O’Creevy (2001), Chen and Huang (2009) and Ababneh et al., (2019). All these measures focused specifically on EI. For instance, Fenton-O’Creevy measures assessed how employees participate in organisational activities. Participants were members of a UK based professional organisation – the Institute of Management. Chen and Huang examined the role of EI in performance in the top 5,000 Taiwanese companies by using the survey strategy to distribute the questionnaires. Ababneh et al. (2019), specifically developed measures to assess EI in organisations. These measures were validated for construct validity and reliability. **Appendix 3.5** shows the measures used.

Technology scouting: Measures for TS were adapted from Wang et al. (2015). These measures were empirically tested. Wang et al used these scales to measure the effect of TS on firm performance in the high-tech sector. Earlier, Parida et al.(2012) used similar scales to measure the impact of TS in high- tech sectors. The measures are shown in **Appendix 3.5**.

Absorptive capacity: ABCAP is conceptualised as six variables and measured as follows: search capacity, integrative capacity, knowledge recognition, knowledge acquisition, knowledge capture and knowledge assimilation. All under **Appendix 3.5**

Control variables: This study recognises the influence of certain factors in the relationship of interest; hence, control variables are included to take care of likely extraneous influences. Specifically, market and technological turbulence (environmental turbulence) (Wang, 2007; Chiang & Hung, 2010; Sisodiya et al., 2013; Tsai & Yang, 2013; Hilmersson, 2014) were identified as having influence on OGI and performance (Ngamkroekjoti & Speece, 2008 ; Atuahene-Gima & Wei, 2011; Tsai & Yang, 2013; Lopes & de Carvalho, 2018) and IOI practices (Ishikawa, 2019).

Since the evolution of the OI paradigm, market and technology turbulence have been identified as having influence on innovation activities (Lopes & de Carvalho, 2018). Technological turbulence refers to the degree of change in technology, product or services

in an industry of the organisation used to enhance performance, whereas market turbulence refers to the extent to which consumer preferences and demands for products and services change (Jaworski & Kohli, 1993; Ngamkroeckjoti & Speece, 2008; Tsai & Yang, 2013; Sisodiya et al., 2013). Thus, technological turbulence in this context describes the rate of change in technologies used by revenue administrations to enhance performance. Market turbulence relates to the demand and preference for service quality by stakeholders such as importers, freight forwarders, tax payers, traders, other government agencies etc. Measures for the control variables in the study are thus given in **Appendix 3.5**.

Organisational innovativeness: Organisational innovativeness as the DV was measured using the scale developed by Tsai & Yang (2013) which was robustly tested and found to be valid and reliable. Measures of OGI used in the study are found in **Appendix 3.5**

The survey questionnaire used to measure all the constructs including the control variables are found in **Appendix 3.5**.

3.21 Measurement validity and reliability

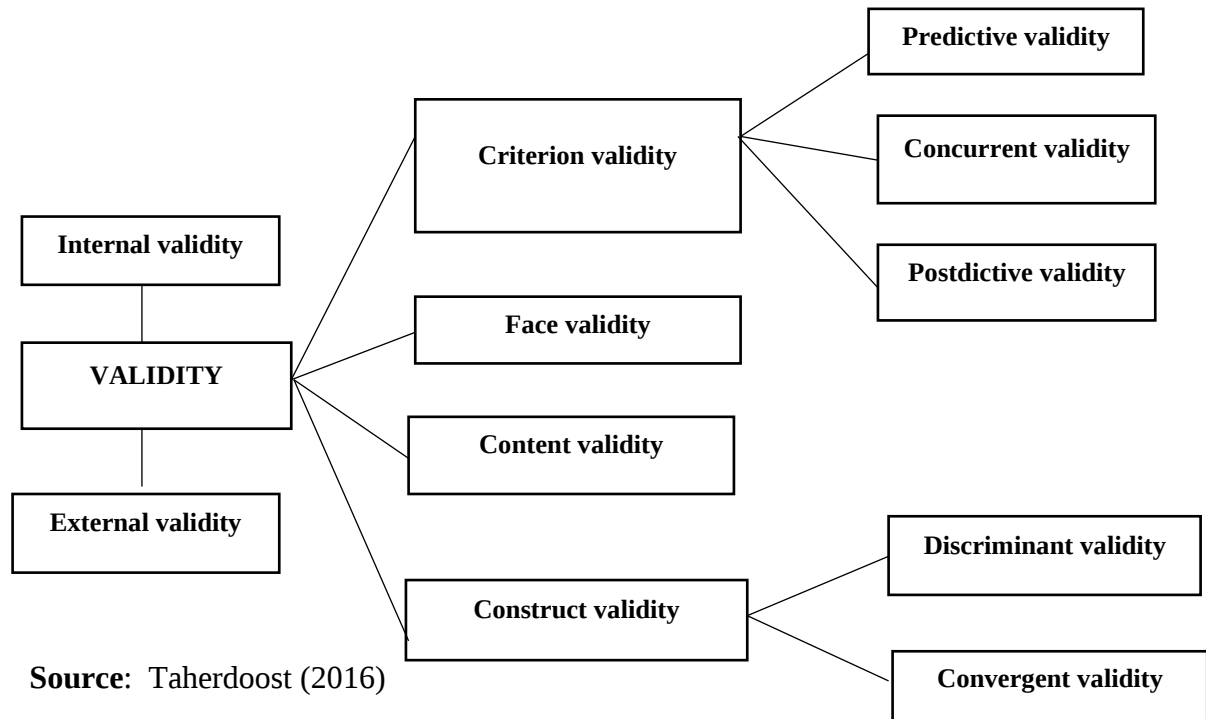
Validity and reliability are key in determining the quality of research in both the natural sciences and social sciences. They make the research stand up to scrutiny and establish the basis for assessing the quality of research.

Validity concerns itself with the appropriateness of measures used, analysing the results accurately and being able to generalise the findings/conclusions generated from a research project (Bryman, 2012; Saunders et al., 2016) “...by eliminating or controlling as many confounding variables as possible, which allows for greater confidence in the findings of a given study” (Marcyk et al., 2004, p.66). Thus, the primary aim of validity is to improve the research usefulness, credibility and accuracy. There are various forms of validity, but two major ones are often discussed: internal validity and external validity (Cooper & Schindler, 2010; Bryman, 2012; Saunders et al., 2016; Yin, 2017).

Internal validity (causality) concerns the ability of the research design to show that the IV was directly responsible for the effect on the DV, and hence the results of the research (Marcyk et al., 2004; Neuman, 2014). The current study achieved internal validity by making sure that the design properly measured the causal effect of the IV on the DV without bias. Thus, the study identified the unit of analysis, the population, the sample, established the correct procedure for collecting the data, identified the control variables (artefacts), pretested the questionnaire, adopted/adapted the measures from existing literature and correctly followed the methodological design. This was to establish that the IV was at least partly responsible for outcomes and exposures in the DV.

External validity on the other hand concerns whether a study’s conclusion can be generalised to other settings, conditions, persons or groups beyond the focal study context (Easterby-Smith et al., 2015; Saunders et al., 2016). The current study can be generalised to similar settings (revenue administrations) by taking into consideration the context of the study, the sample procedure and characteristics and past or future dynamics of the revenue administration.

Further, the quality of research design is assessed by face validity, content validity, criterion validity, convergent validity, statistical conclusion validity, and discriminant validity. Figure 3.6 shows the various types of validity.

Figure 3.5: Various subtypes of validity

Generally, the researchers normally use construct, content, criterion and face validity to assess scholarly work (Neuman, 2014; Creswell & Creswell, 2018; Leed & Ormrod, 2021). The current study follows this recommended way of assessing validity.

Construct validity refers to the degree to which a set of questions actually measure the theoretical construct it's meant to measure (Neuman, 2014); whether a research instrument correctly measures the construct (Heale & Twycross, 2015). In this current study, IOI, EI, TS, ABCAP and OGI are all constructs because none of them can be observed and assessed directly even though they are assumed to exist based on established patterns. That is whether the study can make inferences about the measures related to the latent constructs. To establish construct validity, the current study deduced hypotheses from theories that are relevant to the concept by examining the relationship between IOI activities and OGI. This study also established construct validity by aligning measures of the variables to other previous studies.

To verify construct validity, items that load on a minimum of 0.40 is considered for further analysis. That is, the correlation between the items and the various constructs. Also, items cross loading more than 0.40 were deleted (Taherdoost, 2016). This was achieved by using principal component analysis (PCA) with varimax rotation method (Wee & Quazi, 2005). The PCA aims to (a) extract the most relevant information from the data set (b) reduce the size of the data set by keeping only this relevant information, (c) make the description of the data set simple and (d) analyse the structure of the observations and the variable (Abdi & Williams, 2010). Construct validity is assessed by convergent and discriminant validity as well as the use of CFA techniques.

Convergent validity refers to the extent to which scores on one scale correlate with scores on other scales designed to assess the same construct (Neuman, 2014). That is, the extent to which various independent assessment methods of the same factors are correlated (Byrne, 2017). In the current study convergent validity was assessed by evaluating Cronbach's α (0.7), AVE (0.5 or higher), factor loadings (0.5 or higher) and composite reliability (0.7 or higher) (Wilden & Gudergan, 2014; Hair et al., 2019). In this case, various alternative measures of the concept correlate with the summated scale where high correlations indicate that the scale is measuring its intended concept.

Discriminant validity is the opposite of convergent validity. This means the measures of one latent construct is negatively or distinctively related with other opposing constructs (Neuman, 2014). An assessment among traits is achieved when the correlations among traits (latent variables) differ significantly from 1.00 at 0.05 level (Bagozzi & Yi, 1991). That is, validity is determined when the variance in the measure reflects only the variance related to the intended latent variable and not to other latent variables (O'Leary-Kelly & Vokurka, 1998). In any case, convergent validity is established first before discriminant validity (Bagozzi & Yi, 1991). Using Fornell and Larcker (1981) and Hair et al. (2019) criteria the current study assessed discriminant validity. That is, construct's AVE should be larger than the squared of its greatest correlation estimate with any construct. Meeting this requirement demonstrates good evidence of discriminant validity (Hair et al., 2019).

Confirmatory Factor Analysis (CFA) techniques were used to assess construct validity (Kock, 2015; Taherdoost, 2016) in validating the findings of a research. This technique gives “the most comprehensive method for assessing construct validity ... the only method that provides statistical tests for the assessment of construct validity” (O’Leary-Kelly & Vokurka, 1998, p.403). The CFA also provide measures of the general degree of fit and useful information as to how and if construct validity is achieved (Bagozzi et al., 1991).

Content validity concerns whether the items, questions, procedure or tasks adequately represent all the content it intends to with regards to the construct (Heale & Twycross, 2015) and the appropriate behaviour and skills needed (Leed & Ormrod, 2021). In other words, it refers to whether the items used in the study adequately cover the entire content with regards to the constructs it was intended to measure? The current study assessed content validity by asking several questions about the instrument and using a panel of experts in content assessment and quality of measures in the study domain. Suggestions from the experts provided more clarity on the representativeness of the items.

Criterion validity relates to any other instrument that measures the same variables (Heale & Twycross, 2015) and is considered the gold standard. This is achieved by finding the relationship between a measure and an established criterion. The current study assesses criterion validity by using correlation and CFA to establish the statistical relationships. Criterion validity is made of both concurrent and predictive validity (Dost, 2011). *Concurrent validity* refers to the ability of a study to use a measure with a pre-existing measure (criterion) that is considered in the face as the established standard to predict an event in the present while *predictive validity* refers to the ability of an indicator to measure some future event that are logically related to a construct (Neuman, 2014). An example of predictive validity involves the use of EI to predict their level of willingness in an organisation. The current study use correlations to determine the strength of the association between the IVs and the DV in concurrent validity. Predictive validity is assessed using path analysis and regression.

Face validity concerns whether the questionnaire or measures appear to make sense to the participant in terms of readability, legibility, appearance, clarity of words, formatting and style consistency and feasibility. It is an intuitive process that indicates whether the

measures represents the content of the concept in focus (Bryman, 2012). A subjective judgement by the participants whether the items really measure the latent constructs (Neuman, 2014). To assess face validity, two experienced researchers and my supervisor reviewed the contents of the questionnaire to determine whether the items measured the intended purpose. After making comments, rephrasing and eliminating some of the questions to suit the concept, the questionnaires were then pilot-tested. This further clarified some of the terms as respondents asked for clarity.

Literature suggests ways by which validity could be determined. Table 3.19 indicates ways by which validity is determined.

Table 3.7: Techniques for determining validity and reliability

Validity	Level recommendation	Measurement techniques
Content validity	Highly recommended	Literature review; use of experts
Face validity	Recommended	Expert assessment of measurement items
Discriminant validity	Compulsory	PCA, CFA, PLS, AVE, Multi-trait, multi method analysis (MTMM), correlational and partial correlational analysis
Convergent validity	Compulsory	PCA, CFA, PLS, AVE, MTMM, correlational and partial correlational analysis
Predictive validity	Compulsory	Regression analysis and path analysis
Concurrent validity	Compulsory	Correlation analysis
Internal consistency (reliability)	Compulsory	Cronbach's correlation; SEM

Source: Taherdoost (2016)

Reliability (internal consistency or test of homogeneity) on the other hand concerns dependability, consistency and repeatability of measures or results (Bryman, 2012; Neuman, 2014; Saunders et al., 2016) under similar situation or condition. Reliability is heavily connected to quantitative research where the concern of the researcher is about the stability of the measure or results. There are three types of tests used to examine the reliability of measures in a study: internal consistency tests, test of stability and equivalence of measures test (Salmond, 2008; Heale & Twycross, 2015). This study examined reliability by testing for the internal consistency of measures. Internal consistency describes how all the measures are consistent and examines one construct. This is assessed in four ways: item-to-total correlation, split-half, Kuder-Richardson coefficient and Cronbach's α (Salmond, 2008; Heale & Twycross, 2015). The current study assessed reliability using the Cronbach's α statistical technique where instruments that have questions above two responses are used. The Cronbach's α result is a number ranging between 0 and 1 with an *acceptable reliability score of 0.7* and higher (Heale & Twycross, 2015; Mohamad et al., 2015). The other two methods (stability and equivalence) of measures were not used.

3.22 Common method bias (CMB) and common method variance (CMV)

The CMV phenomenon may be the main source of trouble in conducting survey research as it accounts for a large part of variance and leads to systematic measurement error i.e. errors that inflate or deflate the measured relationships and also threatens measurements validity (Siemens et al., 2010; Craighead et al., 2011). Measurement error is defined as "the degree to which the observed values are not representative of the true values" (Hair et al., 2010, p.7). Common method variance occurs when, systematically, responses differ on account of a common scaling techniques on measures obtained from one source of data (Fuller et al., 2016a).

A common method variance, is "the amount of spurious correlation between variables that is created by using the same method - often a survey to measure each variable" (Craighead et al., 2011, p.1). CMV thus, arises from generally using a survey method or using the same respondent which can inflate or attenuate (deflate) the estimates and causes Type I and Type II errors (Siemens et al., 2010). According to Bagozzi and Yi (1991). CMV

relates to “variance that is attributable to the measurement method rather than to the construct of interest” (p.426). CMV inflates estimates and causes it “to converge toward a higher value than their true population value...it can lead researchers to erroneously conclude that an effect exists (Type I error)” (Siemsen et al., 2010, p.457). CMV deflates or attenuates estimates and leads to estimates that “converge to a lower value than their true population value...makes it more difficult to detect an effect if it exists, increasing the odds of erroneously concluding that no effect exists (Type II error)” (Siemsen et al., 2010, p.457).

So, common method bias (CMB), refers to a “phenomenon that is caused by the measurement method ... and not by the network of causes and effects in the model being studied” (Kock, 2015, p.2). In this case, efforts to control for CMV should reflect its effects at the item level and not the construct level (Podsakoff et al., 2003).

This study adopted two strategies to decrease the potential effect of CMV—procedural and statistical remedies (Podsakoff et al., 2003; Craighead et al., 2011; Podsakoff et al., 2012; Min et al., 2016).

Procedural techniques were applied in the response process “to identify what the measures of the predictor and criterion variables have in common and eliminate or minimise it through the design of the study” (Podsakoff et al., 2003, p.887). Procedural control techniques reduce the possibility of CMV by prudently designing the study procedures. The current study identified the following as potential sources of biases and their remedies discussed.

Table 3.8: Sources of CMB and remedies applied in the study.

Source of method bias	Brief description	Remedies
Common rater or source effects/ escalate the unit of analysis	A situation where data for both the IVs and the DV are collected from the same participant	Data for both IVs and DV obtained from different participants/obtain matched pairs
Social desirability	Participants response to data because of their social acceptability rather than their genuine feelings; editing items to suit their social desirability which may result in spurious relationships	Data was distributed and collected by a research assistant that has no connection with the organisation
Scale length/response style	Scales with fewer items are likely to generate more responses	Adopted the 5-point Likert over the 7 and 10-points
Methodological separation	Capturing the IVs and the DV in various formats	Separated IVs from the DV and administered to different participants; quantitative-qualitative strategies applied
Proximal separation between IV and DV	Collecting data from various locations in terms of physical distance	Collected data across three regions of Ghana
Temporal separation	Time delay between data administration and collections	Questionnaires were distributed and collected at different times
Psychological separation	Reducing the connection between the IV and the DV	Used different introductory letters to introduce both the IV and the DV
Protecting respondent's identity	Allowing respondents to participate anonymously	Entreated participants to answer questions honesty; assured participants that there are no wrong or correct answers; reward for participation. Guaranteed anonymity of participants in the cover letter so as to avoid evaluation anxiety

Source: Adapted from Podsakoff et al. (2003); Craighead et al. (2011); Podsakoff et al. (2012); Min et al. (2016).

Notwithstanding the procedural remedies undertaken to ensure valid and reliable conclusion of the study's findings, the study also tested for possible CMV using statistical techniques. Statistical remedies refer to measures aimed at reducing the likelihood of CMV effects on the results of the study by using statistical techniques. While the literature proposes several statistical remedies to control CMB, this study uses the Harman's single factor test (Podsakoff et al., 2003) and the confirmatory factor analysis (CFA) (Fuller et al., 2016; Bagherzadeh et al., 2020).

The Harman's single factor test is the most widely used statistical technique in post-hoc test by researchers to detect and control CMV (Fuller et al., 2016b). This approach uses exploratory factor analysis (EFA) where all the variables of the study are loaded onto a single factor (Eichhorn, 2014) and rotation of the factors restricted so that the number of factors necessary to account for the variance in the variables can be determined (Podsakoff et al., 2003). That is, all items in the constructs in the study are loaded onto a single factor to analyse and determine whether a greater part of the variance can be accounted for by one general factor. This technique detects problems in method variances if an EFA containing the research variables gives eigenvalues indicating that the first factor is responsible for more than 50% of the variables (Podsakoff et al., 2003; Fuller et al., 2016). This also means that post-hoc test may identify CMV that is not problematic. Generally, the assumption of the Harman's single factor test is that "if a substantial amount of common method variance is present, either (a) a single factor will emerge from the factor analysis or (b) one general factor will account for the majority of the covariance among the measures" (Podsakoff et al., 2003, p.889). Min et al. (2016) suggest that even though using the Harman's single-factor test is acceptable, it is questionable and not theoretically sound and may not be the best to use as the only statistical control remedy. The reason is that the probability of detecting one general factor diminishes when the constructs in the study are many (MacKenzie & Podsakoff, 2012a). Thus, the current study also used the CFA technique.

Another statistical technique adopted to check CMB is CFA (Williams et al., 2010; Williams & McGonagle, 2016). The CFA process indicates whether there is a relationship between the observed variables and the underlying latent constructs and also determines

whether the hypothesised structure gives a good fit to the data; verifies that all items are properly aligned with the correct dimensions within the general construct being measured (Holtzman & Vezzu, 2011). This technique (CFA) allows the study to estimate the true relationships that exist between the latent variables that are free from method biases. Given these expectations regarding the extent of construct validity acceptability, it is expected that CFA would enable the identification of CMB.

3.22.1 Confirmatory Factor Analysis (CFA) and fit indices

CFA is “a method for evaluating whether a prespecified factor model provides a good fit to the data ... relies heavily on ... the method of maximum likelihood” (Floyd & Widaman, 1995,p.293). It is the measurement of trait factors (latent variables) and used when “the indicators are well specified according to either related theories or prior knowledge” (Thakkar, 2013, p.19) and used to examine the multidimensionality of a theoretical construct (Byrne, 2017). Following these explanations, the main objective of the current study using CFA is to determine how well the proposed model fits the data. Then where there is a fit of the prespecified model and the data, the proposed model is said to be confirmed.

There are three main purposes of the CFA: evaluate construct validity (Cokley & Helm, 2001; McCoach, 2002), examine whether the response patterns or a measure of various groups, populations or time is unchanging or invariant (decision on instrument usage and findings inference) and make comparisons with competing models to enable the identification of the score interpretation that is most appropriate (e.g. Cokley et al., 2001; Sun, 2005). The main purpose of CFA in the current study is to evaluate convergent and discriminant validity in AMOS 25.0. Besides these three reasons, the study uses CFA to allow the researcher to impose a model of the study on a specific data set to determine how well that model explains the data and also used as tool for theory testing (Cokley & Helm, 2001). The use of CFA also gives the research the advantage being driven by theory or evidence based on past research, specifies the relationships among constructs in advance, ability to determine the relationship among the various variables, used as an antecedent to SEM, ability to examine all potential source of invariance in the factor

solution and evaluate the acceptability of the particular model by examining goodness of fit (Brown, 2015).

In running the CFA, the current study used various fit indices to determine the adequacy of the model and fit for the data. The RMSR, the chi-square indices, GFI, AGFI are sampled based absolutes while the RMSEA is population based absolute (Sun, 2005). Table 3.21 shows the various fit indices used in the study.

Table 3.9: CFA fit indices

Fit indices	Brief description	Goodness of fit values/conclusions
Model chi-square (χ^2)	This test shows the difference between the expected and manifest covariance matrices. Statistically, a non-significant chi-square value is desired because it indicates that the two estimated matrices are not different. That is a χ^2 of close to zero and a p-value of greater than 0.05 shows a good fit. This shows that a model that fits the data has a lower chi-square value. That means the desired χ^2 value should not be significant since it tests for difference	Insignificant result ($p > 0.05$)/good fit
RMSEA	The root mean square error approximation relates to residuals in the model. It compares the mean differences of each expected degree of freedom (df) that can take place in the population with each other. Values ranging from zero to one with a lower RMSEA value show a good model fit. RMSEA is typically indicated by values of not more than 0.06 or 0.08	Value between 0.08 and 0.1 (mediocre fit), <0.08 (good fit)
NFI	The normed fit index indicates the improvement of a model good. This must be accompanied by other indicators. It takes values between 0 and 1 with higher values indicating better fit. Values more than 0.90 are acceptable, while values higher 0.95 are good fit	Value of >0.90
GFI	Goodness of fit indices measures the amount of variance and covariance that is explained by the model. The indices of the GFI fit statistics increases as the sample size increases. Values range from 0 to 1. Values higher than 0.90 are acceptable and shows that covariance is calculated among the manifest variables.	Value >0.90 or >0.95 (use 0.95 if factor loading and number of samples are low)
CFI	Comparative fit index assesses the general improvement of a proposed model	Value of ≥ 0.90
RMSR	Root mean square residual	<0.06
AGFI	Adjusted goodness of fit statistics. This must be accompanied by other indices	Value of >0.80
TLI (NNFI)	Tucker-Lewis index (non-normed fit index). Used to measure model fit	Value of >0.80

Sources: Fornell & Lacker (1981); Cokley and Helm (2001); Sun, (2005); Thakkar (2013); Brown (2015); Civelek (2018)

Also, Holber and Stephenson (2002) suggest that the recommended fit indices for $\chi^2/d.f$ should be <3.00 .

3.23 Data analysis procedure and software - SEM with AMOS 25

The current study analysed data using Analysis of **MO**ment Structures (AMOS) structural equation modeling (AMOS-SEM) version 25 package also known as “the analysis of mean and covariance structures” (Harrington, 2009, p.12). This covariance-based SEM is commonly referred to as factor based SEM which may enable the prediction of outcomes but with the primary statistical goal of confirming theory underpinned by the assumption of normal distribution of data among others (Hair et al., 2019). SEM is a “statistical methodology that takes a confirmatory (i.e., hypothesis-testing) approach to the analysis of a structural theory bearing on some phenomenon” (Byrne, 2017, p.3). SEM was particularly used because it enables inferential data analysis and hypothesis testing as the relationship among the variables were specified and grounded in established theory (Hoe, 2008). It thus allows the relationship among the latent and observed variables to be described, tested and evaluated (Thakkar, 2013)

The SEM approach (Thakkar, 2013; Byrne, 2017; Hair et al., 2014; Civelek, 2018) was used because:

- it assumes a confirmatory approach to the analysis of data which requires the relationship among the variables to be specified.
- it enables the study to assess the relationships simultaneously
- it enables the assessment or correction of measurement errors.
- it analyses of data incorporates both observed and unobserved variables.
- it enables the modelling of multivariate relationships and indirect effects.
- it enables the evaluation of the hypotheses to connect both observed and latent variables.
- it is able to represent, estimate and test the theoretical linear framework among variables.
- it enables the testing of hypothesised forms of directional and non-directional relationship between measured and latent variables.

Generally, the approach to data analysis using SEM involves the use of theory, model construction, instrument construction, data collection, model testing, results and interpretation of the results (Thakkar, 2013).

There are several computer software programmes that are used to conduct CFA, SEM and other analysis. The current study chose AMOS-SEM because constructs for the study were adapted from previously developed and validated scales with emphasis on testing theory (Hair et al., 2014). Other reasons for using AMOS include its relative ease to use graphical interface (user friendly), its close usage with the SPSS package (does not require the calculation of covariance matrices), its ability to build complex and multiple relationships such as attitudinal and behavioural models in an accurate manner enables a multivariate Kurtosis measure to examine the “peakedness” of the multivariate distribution; it can be used to effect estimates, sample means, sample variances and covariances as well as correlations, model comparisons, comparisons of estimation methods and can accommodate models from various populations (Gallagher et al., 2008; Thakkar, 2013; Hair et al., 2014).

3.24 Study two – qualitative design (exploratory)

3.24.1 Brief overview of the qualitative methodology.

Qualitative methods demonstrate different strategies to investigating a phenomenon that mostly rely on text and image data, involves unique guidelines in data analysis, and uses various designs (Creswell & Creswell, 2018). Typically, qualitative research focuses on observing and studying a phenomenon occurring in the real world or natural setting.

The current study uses both case study and content analysis as the design. The case study design is used because it contains special qualities that can enhance the understanding or inform managerial practice of the OI phenomenon. Besides, it is suitable for learning a lot about a situation that is poorly known or understood as well as appropriate for studying how events change over time. Accordingly, it is “most useful for generating or providing preliminary support for tentative explanations regarding the phenomenon being studied” (Leed & Ormrod, 2021, p.261).

By choosing the case study design, the statement of purpose is stated below:

To understand how inbound open innovation activities contribute to OGI in the PS by focusing on a few senior staff members in their place of work (natural settings) using semi-structured interview method to collect data, using audio-taping technique and analysing the data by categorising and interpreting it in the form of common themes.

This study used purposeful sampling technique to select participants to provide the important information about the study being conducted. This method was used because it is sometimes impossible to interview every member because of the population size.

In terms of sample size selection, Saunders et al. (2016) add that depending on the nature of the sample – homogenous or heterogeneous the sample required to reach saturation may vary. For instance, a minimum of 4 samples may be enough to reach saturation in a homogenous group such as the GRA. Table 3.22 gives details of the various samples needed in qualitative research.

Table 3.10: Sample sizes in qualitative research

Nature of the study	Minimum sample size
Semi-structured/in-depth interviews	5-25
Ethnographic	35-36
Grounded theory	25-36
Studying a homogenous population	4-12
Studying a heterogenous population	12-30

Source: Saunders et al. (2016)

3.24.2 Sampling and data collection approach

To understand IOI activities the GRA practices, the current study collected qualitative data using purposive sampling techniques. The goal was to develop an in-depth understanding of the effect of IOI activities on OGI. The interview entertained a semi-structured style where initial set of questions were prepared to guide the interview (Appendix 3.7). Based on the responses from the individuals, there were specific follow-up questions. The interview took place at the Head Office of the GRA. This site was purposively selected because all *top-management* members are headquartered there. **Appendix 3.7** shows the interview guide.

The aim of the interview was to gain a better understanding of the processes involved in obtaining external technology, the role of employees as well as the TS unit (the information technology unit) in successfully implementing and using external technology. Responses were obtained using a non-probability purposive sampling technique involving selected participants who were experienced, willing, ready, knowledgeable in the topic under study and mostly took part in management activities.

In all, 5 interviews were conducted each lasting between 45 to 60 minutes in their offices. Before the actual interview, all the contacted persons were briefed on the topic via telephone at their own convenience.

On the day of the interview, all the respondents agreed to be audio recorded *but did not want their official designations (such as rank/position) to be captured on tape*. Thus, the interview was voice recorded using iPhone 11Pro Max. The interview ended with the fifth person because at that point there was no new or additional information or the discovery of new themes on the subject matter as responses were relatively consistent. At the fifth person, the interview had reached data saturation and therefore ended. The entire process ended in a day. The number of interviewees (5) selected and the saturation point reached is in line with Saunders et al. (2016) recommendation that a homogenous group such as the GRA needs a sample between 4-12 to reach saturation. All the recorded interviews were data transcribed.

The objective of the interview was to understand how the GRA obtains its external technology, the role of employees/internal capabilities and the role of the IT unit. Appendix 3.6 shows the interview guide.

This process will give more meaning and understanding to IOI process and innovativeness, especially in the PS.

Thus, this section used a qualitative methodology to explore the factors involved in IOI activities in the PS. Given this methodological approach, a data analysis technique involving the use of NVivo and the generation of Word Cloud (a word cloud generator tool) was used to give in-depth understanding and relevancy of the themes of the study (Kaptein, 2012a; 2012). Table 3.11 gives a summary of the phase methodology.

Table 3.11: Summary of the phase methodology

Ontology	Subjectivism
Epistemology	interpretivism (post-positivist)
Axiology	Value bound (interprets meanings)
Research type	Field research
Research approach	Inductive
Research design	Exploratory mixed methods design
Time horizon	Cross-sectional
Research strategy	Semi-structured interview
Method of data collection	Recorded face-to-face semi-structured interview

3.24.3 Criteria for establishing data quality in the inquiry– trustworthiness

Whereas quantitative design uses concepts of validity, reliability and generalisability to ensure valid conclusions, qualitative research is concerned with the concepts of credibility, dependability, confirmability and transferability to establish trustworthiness of the process (Choudhuri et al., 2004; Shenton, 2004; Rolfe, 2006; Lincoln & Guba, 2013; Patton, 2014; Saunders et al., 2016).

Trustworthiness refers to the quality of a naturalistic inquiry that seeks to establish that the findings and interpretations made are the result of a systematic process which can be trusted (Lincoln & Guba, 2013). While there are several ways of establishing the quality of a qualitative inquiry, the current study follows the above criteria to establish trustworthiness because it is comprehensive and a recommended guideline for assessing qualitative research (Choudhuri et al., 2004; Lincoln & Guba, 2013).

Credibility corresponds to internal validity and deals with the overall quality and confidence in the study with regards to the processes of addressing the study such as using appropriate methods and designs as judged by other scholars (Lincoln & Guba, 2013; Leed & Ormrod, 2021). It is often referred to as “doing member checks”(Guba, 1981, p.80), that is, testing the data with members of the relevant human data source groups. The current study established credibility by performing the following activities:

- selected respondents in management positions from both the CD and the DTRD who could shed light on key management decisions and used semi-structured approach to collect data until saturation
- questions covered all the key constructs of the study
- informed and briefed selected respondents in advance of the interview; visited respondents in their offices to familiarise with the environment and also understand their culture
- established rapport with respondents and encouraged them to be frank as their identities were not revealed
- debriefed my supervisor for alternative approaches, comments and suggestions
- allowed colleagues and academics who are familiar with the inquiry themes to scrutinise the work – peer validation
- respondents were given the opportunity to listen to their own recorded statements immediately after the interview to ascertain data accuracy. This was to establish whether respondents intended to say what they actually said.
- data coding was independently done.
- the final transcription and data analysis were taken back to respondents for further clarifications or suggestions before interpretation. This further step of member checking did not lead to new information.

Transferability relates to external validity in the positivist philosophy and refers to the “extent to which a research study’s findings might be similar or applicable to other individuals, settings, and contexts” (Leed & Ormrod, 2021, p.549). Because generalisability is not the aim of qualitative research, applying the current study findings to other contexts must be consistent with this study’s procedures – a vivid description of the context. To facilitate transferability, the current study:

- clearly and distinctively described the culture and context of the study.
- clearly demonstrated how participants were selected, the data collection and analysis process.
- presented the findings of the study together with appropriate quotations.
- clearly indicated the data collection period, and
- the location and number of the organisations involved in the study.

Dependability corresponds to reliability in positivism and refers to how the outcomes and interpretations of the inquiry could be said to be the result of a consistent and dependable process (Lincoln & Guba, 2013). In other words, dependability “accounts for the ever-changing contexts within which research studies take place and thus requires researchers to provide in-depth descriptions of their data collection methods” (Leed & Ormrod, 2021, p.451). The process must be well documented, logical and traceable. To achieve dependability and ensure consistency, the inquiry process was first reviewed by a research assistant and another academic as well as the supervisor. The process of the data collection, analysis and accuracy of interpretation was clearly documented.

Confirmability relates to objectivity and refers to “a researcher’s concerted effort to base conclusions on actual data as much as possible and to describe data-collection and data-analysis processes in enough detail that other researchers might reasonably replicate their study and draw similar conclusions” (Leedy & Ormrod, 2021,p.451). It concerns connecting the findings, analysis and interpretations to the data in a meaningful way which is the result of the dependable process (Lincoln & Guba, 2013). The current study achieved confirmability by:

- indicating a detailed description of the methodology used.
- making the researcher’s world view, history, interest, background and assumptions known – reflexivity.

- clearly establishing the data collection process – confirmability audit.
- demonstrating that the inquiry outcomes and interpretations are supported by the data.

3.24.4 Data analysis procedure and techniques

A qualitative data analysis using NVivo (a computer software technique) was used to analyse and organise the unstructured data in order to find insights. Word cloud was generated using NVivo to identify keywords that are relevant from the perspective of the current study and to determine how to explore further. The current study generated word cloud because it enables a quick overview (summary) and understanding of the data (Kaptein, 2012b). Using human observation techniques and skills, it is easy to focus on a group of relevant words or messages of interest from the wordcloud. Themes emerging from the qualitative research were analysed within the context of the study and between respondents to determine their interrelationships.

A word cloud is “a visual representation of word frequency derived from written text” (Atenstaedt, 2017, p.231), mostly used to show keyword or data that give more meaning about another word or data (metadata) on websites or a free form of text (Ahuja & Shakeel, 2017) and often “used within the public and private sector as a tool to identify the focus of written material” (Atenstaedt, 2017, p.231). Thus, using word cloud to analyse the interview in this study is appropriate.

A word that appears more often within the texts being analysed, appears in a larger form and gives viewers a clear view and understanding of the main themes contained within the text. That is, it provides a pictorial view of the frequency or prominence of usage of the word in the text. Word clouds effectively analyses texts (Heimerl et al., 2014) and shows the endorsed ideology (culture) of the data (in this case data of GRA employees); helps in exploratory analysis and assists in communicating the most important points or themes that help interpret the data (Ahuja & Shakeel, 2017).

Whereas word clouds are useful in text analysis, they have limitations. One of the limitations of word cloud is that they present only a purely statistical summary of isolated words without considering the context in which the words are used and the phrases they

are made up of; limitations in grouping words with similar meanings (e.g. Centre and centre) and little or no capabilities of interaction (Heimerl et al., 2014; Atenstaedt, 2017).

Wordcloud approach has been used to explore, understand and engage customers in their business. For instance, using data from twitter, Ahuja and Shakeel (2017) used word cloud to explore and engage customers in “brand management and visibility” (p.17). Similarly, Rosane et al. (2020) used word cloud approach to “analyse how corporate sustainability reports address socio-environmental issues and business development through bibliometric analysis” (p.3).

Chapter Four – Results and Findings

The purpose of this chapter is to present the findings of the study. The focus of the study was to evaluate the effect of IOI, EI, TS on OGI. Thus, the study also examined the influence of knowledge acquisition, knowledge recognition, knowledge assimilation, knowledge capture, search capacities and integrative capacities in the relationship between IOI activities and OGI. The results and findings are discussed as follows.

4.1 Checks for data quality

An assessment of the individual items used for each variable was done. The inferential nature of the study required a detailed analysis of the data to ensure that wrong entries, missing values and outliers do not affect the final results of the study. Table 4.1 reports the summary of individual items of the study. A clear description of the data shows that each item was intact, free from errors, wrong entries corrected and missing values anomalies resolved. Subsequently the individual constructs were used to assess normality of the data.

A test of normality was conducted on the data spread for all the measures in the questionnaire. The tests for skewness and kurtosis – the degree of deviation of the data from normality (Hair et al., 2014) are also shown in Table 4.1. *Skewness* describes the balance of the distribution; that is whether the responses are shifted to the right (indicating a negative skew) or to the left (indicating a positive skew) and hence unbalanced /skewed or centred and balanced with almost the same level of distribution or skewness (Hair et al., 2019). *Kurtosis* on the other hand refers to the height of the distribution and describes “the peakedness or flatness of the distribution compared with the normal distribution” (Hair et al., 2019, p.94). A positive value denotes peakedness in distribution (a narrow distribution with majority of the responses in the centre) while a negative value shows a relatively flat distribution (Hair et al., 2014; 2019).

According to Pallant (2013), the skewness value provides “an indication of the symmetry of the distribution” whilst the Kurtosis value provides “information about the ‘peakedness’ of the distribution” (p.59). A value very close to zero, in both instances, signifies that the data is almost perfectly a normal distribution (Pallant, 2013). Also, Byrne

(2010) suggest kurtosis value of 3 for a normal, while values exceeding 5 indicate data are non-normally distributed (Bentler, 2006). The data was normally distributed since the skewness and kurtosis was approximately between -3 and +3. The information in Table 4.1 showed that majority of the values was between 0.008 and 2.459 in absolute terms proving normality.

Table 4.1: Descriptive statistics

	N	Min	Max	Mean	SD	Skewness		Kurtosis	
	Stat	Statistic	Statistic	Stat	Statistic	Stat	SE	Stat	SE
IOI1	285	1.00	5.00	4.032	0.954	-1.556	0.144	2.817	0.288
IOI2	285	1.00	5.00	2.961	1.380	-0.019	0.144	-1.299	0.288
IOI3	285	1.00	5.00	3.733	1.097	-1.099	0.144	0.709	0.288
IOI4	285	1.00	5.00	2.867	1.263	-0.159	0.144	-1.248	0.288
IOI5	285	1.00	5.00	2.590	1.238	0.416	0.144	-0.946	0.288
EII	285	1.00	5.00	3.712	1.088	-0.926	0.144	0.278	0.288
EI2	285	1.00	5.00	4.067	0.907	-1.386	0.144	2.546	0.288
EI3	285	1.00	5.00	4.133	0.962	-1.440	0.144	2.157	0.288
EI4	285	1.00	5.00	4.147	0.930	-1.381	0.144	2.194	0.288
EI5	285	1.00	5.00	4.116	1.053	-1.343	0.144	1.403	0.288
EI6	285	1.00	5.00	3.884	1.050	-0.961	0.144	0.418	0.288
EI7	285	1.00	5.00	3.550	1.062	-0.640	0.144	0.045	0.288
EI8	285	1.00	5.00	3.726	0.954	-0.750	0.144	0.337	0.288
EI9	285	1.00	5.00	3.642	1.006	-0.718	0.144	0.194	0.288
EI10	285	1.00	5.00	3.498	1.070	-0.525	0.144	-0.258	0.288
EI11	285	1.00	5.00	3.674	1.053	-0.666	0.144	-0.012	0.288
EI12	285	1.00	5.00	3.604	1.123	-0.629	0.144	-0.193	0.288
TS1	285	1.00	5.00	3.881	0.904	-1.175	0.144	1.839	0.288
TS2	285	1.00	5.00	3.979	0.911	-1.476	0.144	2.812	0.288
TS3	285	1.00	5.00	4.032	0.824	-1.353	0.144	3.175	0.288
TS4	285	1.00	5.00	3.825	1.086	-0.874	0.144	0.220	0.288
TS5	285	1.00	5.00	2.751	1.337	0.304	0.144	-1.153	0.288
SC1	285	1.00	5.00	4.035	0.855	-1.497	0.144	3.288	0.288
SC2	285	1.00	5.00	4.021	0.872	-1.389	0.144	2.927	0.288
SC3	285	1.00	5.00	3.972	0.953	-1.371	0.144	2.325	0.288
SC4	285	1.00	5.00	3.972	1.038	-1.353	0.144	1.636	0.288
SC5	285	1.00	5.00	3.884	0.902	-1.160	0.144	1.707	0.288
SC6	285	1.00	5.00	3.677	1.085	-1.013	0.144	0.656	0.288
IC1	285	1.00	5.00	3.895	1.039	-0.981	0.144	0.599	0.288
IC2	285	1.00	5.00	3.856	1.016	-0.946	0.144	0.674	0.288
IC3	285	1.00	5.00	3.161	1.205	-0.204	0.144	-0.945	0.288
IC4	285	1.00	5.00	3.625	1.173	-0.764	0.144	-0.106	0.288
IC5	285	1.00	5.00	2.526	1.280	0.362	0.144	-1.140	0.288
IC6	285	1.00	5.00	2.540	1.237	0.502	0.144	-0.834	0.288
IC7	285	1.00	5.00	3.288	0.853	-0.555	0.144	0.298	0.288

Table 4.1 continued: Descriptive statistics

	N	Min	Max	Mean	SD	Skewness		Kurtosis	
	Stat	Statistic	Statistic	Stat	Statistic	Stat	SE	Stat	SE
IC8	285	1.00	5.00	3.526	0.837	-0.736	0.144	0.759	0.288
KR1	285	1.00	5.00	3.902	0.754	-0.681	0.144	0.876	0.288
KR2	285	1.00	5.00	3.933	0.782	-0.772	0.144	1.106	0.288
KR3	285	1.00	5.00	3.782	0.793	-0.573	0.144	0.560	0.288
KR4	285	1.00	5.00	3.951	0.744	-0.746	0.144	1.406	0.288
KA1	285	1.00	5.00	3.600	0.950	-0.662	0.144	0.288	0.288
KA2	285	1.00	5.00	3.709	0.921	-0.779	0.144	0.692	0.288
KA3	285	1.00	5.00	3.804	0.858	-0.790	0.144	0.957	0.288
KA4	285	1.00	5.00	3.828	0.797	-1.108	0.144	2.303	0.288
KA5	285	1.00	5.00	3.793	0.909	-1.107	0.144	1.471	0.288
KA6	285	1.00	5.00	3.667	0.879	-0.894	0.144	0.906	0.288
KC1	285	1.00	5.00	3.586	0.973	-0.797	0.144	0.433	0.288
KC2	285	1.00	5.00	3.604	0.986	-0.579	0.144	0.105	0.288
KC3	285	1.00	5.00	3.474	1.050	-0.766	0.144	0.008	0.288
KC4	285	1.00	5.00	3.614	1.013	-0.702	0.144	0.084	0.288
KC5	285	1.00	5.00	3.698	1.028	-0.916	0.144	0.451	0.288
KC6	285	1.00	5.00	3.639	0.880	-0.882	0.144	0.807	0.288
KC7	285	1.00	5.00	3.730	0.868	-0.908	0.144	1.181	0.288
KC8	285	1.00	5.00	3.698	0.856	-1.040	0.144	1.338	0.288
KC9	285	1.00	5.00	3.930	0.840	-0.942	0.144	1.176	0.288
KC10	285	1.00	5.00	3.944	0.772	-0.505	0.144	0.337	0.288
KC11	285	1.00	5.00	3.874	0.875	-0.863	0.144	1.156	0.288
KC12	285	1.00	5.00	3.860	0.797	-0.709	0.144	1.244	0.288
KC13	285	1.00	5.00	3.849	0.823	-0.781	0.144	1.307	0.288
ASS1	285	2.00	5.00	3.839	0.802	-0.649	0.144	0.243	0.288
ASS2	285	1.00	5.00	3.902	0.803	-0.846	0.144	0.862	0.288
ASS3	285	1.00	5.00	4.011	0.689	-0.858	0.144	2.036	0.288
ASS4	285	1.00	5.00	3.789	0.850	-0.724	0.144	0.744	0.288
ASS5	285	1.00	5.00	3.807	0.793	-0.753	0.144	1.081	0.288
ASS6	285	1.00	5.00	3.681	0.835	-0.659	0.144	0.439	0.288
ASS7	285	1.00	5.00	3.639	0.830	-0.875	0.144	1.073	0.288
MT1	285	1.00	5.00	3.825	0.842	-0.764	0.144	0.910	0.288
MT2	285	1.00	5.00	3.790	0.945	-1.032	0.144	1.159	0.288
MT3	285	1.00	5.00	3.853	0.892	-0.817	0.144	0.781	0.288
TT1	285	1.00	5.00	3.884	0.763	-0.953	0.144	1.863	0.288
TT2	285	1.00	5.00	3.814	0.803	-0.965	0.144	1.757	0.288
TT3	285	1.00	5.00	3.733	0.804	-0.542	0.144	0.192	0.288

Table 4.1 continued: Descriptive statistics

	N	Min	Max	Mean	SD	Skewness		Kurtosis	
	Stat	Statistic	Statistic	Stat	Statistic	Stat	SE	Stat	SE
FI1	285	1.00	5.00	3.302	1.141	-0.226	0.144	-.884	0.288
FI2	285	1.00	5.00	3.481	1.112	-0.292	0.144	-.858	0.288
FI3	285	1.00	5.00	3.909	0.899	-0.697	0.144	.403	0.288
FI4	285	1.00	5.00	3.783	0.901	-0.866	0.144	1.218	0.288
FI5	285	1.00	5.00	3.786	1.010	-0.674	0.144	.056	0.288

Source: Field work, 2020

Note: Explanations for the denotations are found in Appendix 3.6

4.2 Demographic characteristics of the sample

The study gathered background information about the respondents and their organisations with respect to gender, age, education, years of work, department, and rank and collaboration level. The results of respondents' demographic characteristics are shown in Table 4.2.

Table 4.2: Sample characteristics

Variable	Characteristics	Frequency	Percent
Gender	Male	136	47.72
	Female	149	52.28
Age	Below 25 years	1	0.35
	25-35 years	94	32.98
	36-46 years	141	49.48
	47-57 years	44	15.44
	Above 58 years	5	1.75
Education	Diploma/SHSC	20	7.01
	Degree	88	30.88
	Masters	121	42.46
	Post graduate	56	19.65
Years worked	Under 5 years	35	12.28
	6-15 years	89	31.23
	16-25 years	72	25.26
	26-35 years	88	30.88
	Above 36 years	1	0.35
Department	Custom Division (CD)	157	55.09
	Domestic tax revenue division (DTRD)	105	36.84
	Support Service division (SSD)	13	4.56
	Others	10	3.51
Rank	Assistant Revenue officer (ARO) to Principal Revenue Officer (PRO)	248	87.02
	Chief Revenue Officer (CRO) to Deputy Commissioner (DC)	33	11.58
	Other	4	1.4
Collaboration level	Low	33	11.58
	Medium	118	41.40
	High	93	32.64
	Have no idea	36	12.63
	Not applicable	5	1.75

Source: Fieldwork (2019); Post graduate means any qualification obtained after Master's degree; SHSC means Senior High School Certificate

Table 4.2 shows the distribution of sample characteristics of respondents. From the sample of 285 participants, slightly more than half of the respondents were females. This constituted 52.28% of the responses. Conversely, more than forty-seven percent (47.72%) of the respondents were males. This clearly shows that the number of females exceeded that of the males for this study. This also shows that more females showed interest and enthusiasm in the survey. Another possible reason for the female dominance was that more than half of the contact persons introduced to the researcher were females. In the CD four (4) out of the six (6) data collection sites had their contact persons being females. The DTRD also had three (3) females and one male as contact persons. The age distribution of the respondents showed that about fifty percent (49.98%) of the respondents were between 36-46 years. This was followed by those between the ages of 25-35 years (32.98%), 47-57 years (15.44%) and those above 58 years (1.75%). This may imply that majority of the respondents involved in this study were in their prime ages, between 36 and 46. In terms of the educational level, majority of respondents surveyed representing 42.46% were Master degree holders, thirty percent (30.88%) had their first degrees, and 19.65% had their post graduate training in one form or the other with about seven percent (7.01%) having a diploma certificate. From the above, majority of the participants who responded to the questionnaires were highly educated and young (36-46 years) who are enthusiastic to help the organisation succeed by acquiring higher qualifications and skills. This also implies that respondents were able to grasp the questions posed to them about the objectives of the study. Irrespective of the respondent's educational level, majority indicated that they have between 6-15 years of experience in the work they do. This represented a little over thirty percent (30.4%) of the responses. Thirty percent (30.0%) of the respondents indicated that they have worked for between 26-35 years. This was followed by those who have worked between 26-35 years (30.88%), under 5 years (12.28%) and above 36 years (0.35%). What this implies is that over sixty percent (60.4%) of the respondents worked between 6-35 years and would therefore have a good understanding about the culture and other dynamics of the organisation.

The distribution of the department of the participants of the study showed that majority of respondents were from the CD. This represented over fifty-three percent (55.09%) of the responses received. Other respondents were from the DTRD (36.84%), SSD (5.56%) and

other departments (3.4%) not indicated. The Customs Division had majority of the respondents answering the questionnaires. This may be the fact that the CD has had a lot of reforms in terms of technology and organisational leadership changes than the DTRD which made them ready to share their experiences with the research project. With all the respondents involved in the study, about eighty-five percent (87.02%) indicated that their rank was Assistant Revenue officer (ARO) to Principal Revenue Officer (PRO). This was followed by those with ranks of Chief Revenue Officer (CRO) to Deputy Commissioner (DC) (11.58%) and those with other ranks (1.75%) not mentioned. The question of the level of collaboration between the Policy and Programme (P&P) department and the rest of the organisation was asked. The outcome showed that, majority of the respondents agree that the level of collaboration between the Policy and Programme (P&P) department and the rest of the organisation was medium (41.40%) followed by high (32.64%) and low (11.58%). However, about thirteen percent (12.63%) mentioned that they have no idea as to how the collaboration is like among departments.

4.3 Diagnostics statistics

Diagnostics tests were performed to confirm the validity of the estimated models for analysis and policy recommendations. A Levene's test (univariate test) – the test “used to assess whether the variances of a single metric variable are equal across any number of groups” (Hair et al., 2019, p.98) for threat of unequal variance for all the variables was done. That is “one-way analysis of variance (ANOVA) on the absolute deviation from the sample mean” (Parra-Frutos, 2013, p.1270) was entertained. The results showed that all of the variables had equal variances except for three variables (inbound open innovation, knowledge assimilation and search capacity), indicating the presence of homoscedasticity (see Table 4.3). Homoscedasticity (Hair et al., 2019) refers to:

“the assumption that dependent variable(s) exhibit equal levels of variance across the range of predictor variable(s). Homoscedasticity is desirable because the variance of the dependent variable being explained in the dependence relationship should not be concentrated in only a limited range of the independent values” (p.97).

To assess the presence of homoscedasticity, “the variance of a metric variable is compared across levels of a nonmetric variable” (Hair et al., 2019, p108). Hence, a test of homogeneity between the factors of IOI activities and OGI was entertained (Table 4.3). On the basis of the standardised residuals and Cook’s D tests, 12 outlier cases were deleted. A visual inspection of the plots of the histogram and normal probability plots (see Appendices 4.1, 4.2 and 4.3) reaffirmed the multivariate normality of the data (Hair et al., 2010). The Normal P-P Plot was used to validate the normality of the residuals. In Appendices 4.1, 4.2 and 4.3 the points were observed to be lying within a reasonably straight diagonal line indicating no major deviations from normality. Also, the scatterplot on the standardised residuals, showed that all the residuals were roughly rectangular distributed with most of the scores concentrated in the centre (along the 0 point).

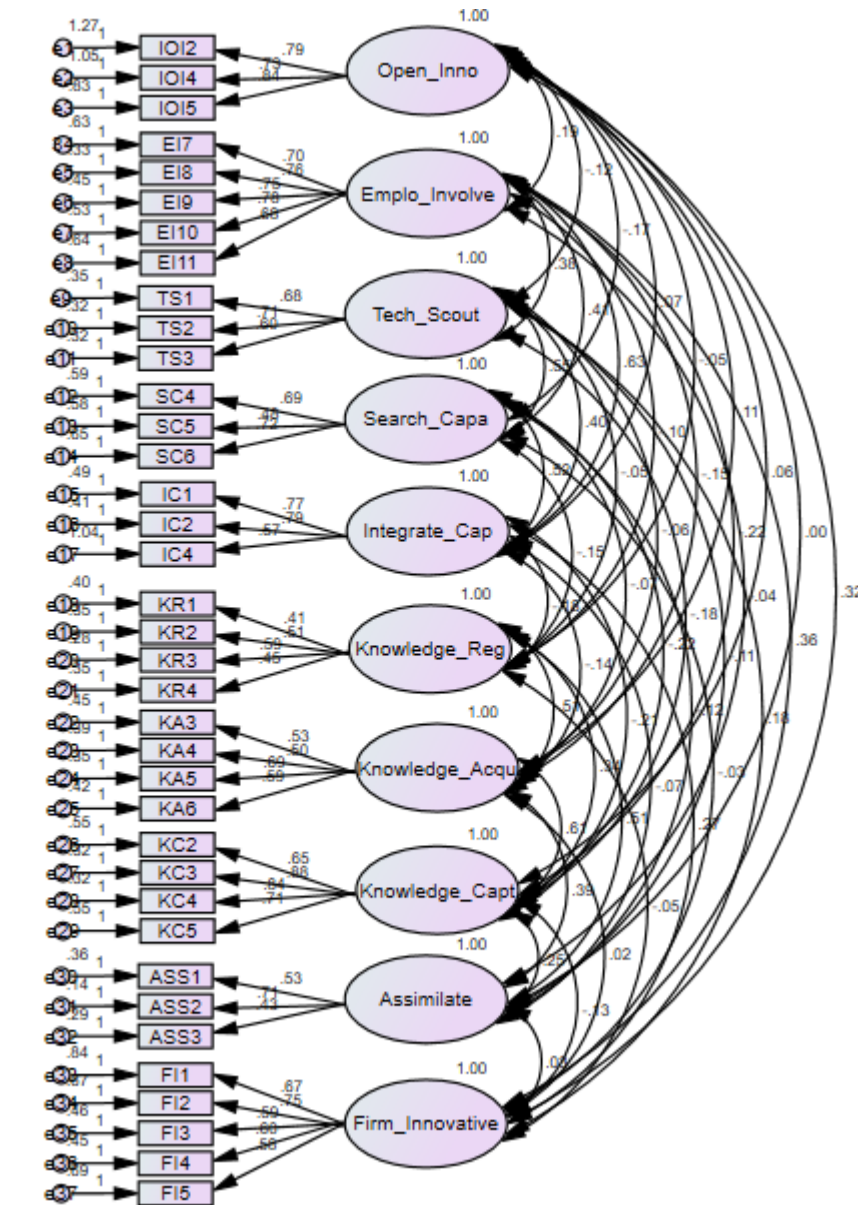
Table 4.3: A Levene’s test of homogeneity between the factors of IOI activities and OGI

Variables	Levene’s Statistic	
	<i>F</i>	<i>p-value</i>
1. Inbound open innovation	1.087	0.298
2. Employee involvement	0.000	0.992
3. Technology scouting	0.917	0.339
4. Knowledge capture	0.090	0.765
5. Knowledge acquisition	0.952	0.330
6. Knowledge recognition	0.548	0.460
7. Assimilation	1.509	0.220
8. Search capacity	2.718	0.100
9. Integrative capacity	0.153	0.696
10. Organisational innovativeness	0.274	0.601

4.4 Confirmed measures of key constructs

The details of the items confirmed as measures of the key constructs are shown in Figure 4.1 and Table 4.4. All the measures were subjected to CFA. The number of items retained, demonstrated reliability of each construct among others are all indicated in Table 4.4

Figure 4.1: Final confirmatory factor analysis measurement model of variables



4.5 Confirmatory Factor Analysis (CFA)

A confirmatory factor analysis using AMOS 25 was performed to test the measurement fit of the model. Eight model fit indices were used to assess the overall goodness of fit of the model: the ratio of χ^2 to the degrees-of-freedom (d.f.), Root Mean Square Error of Approximation (RMSEA), Normed Fit Index (NFI), Comparative Fit Index (CFI), Goodness-of-Fit Index (GFI), Tucker Lewis Index (TLI), Incremental Fit Index (IFI) and Standardised Root Mean Residual (SRMR). The recommended levels of the various fit indices are given in Table 4.4. Detailed description of the fit indices is found in Section 3.23.1 and Table 3.21

Table 4.4: Confirmatory Factor Analysis of measures

Operational measures of construct						
Item code	Model Fit Indexes: $\chi^2 = 672.572$; d.f. = 552; $\chi^2/\text{d.f.} = 1.218$; RMSEA = 0.028; GFI = 0.902; AGFI = .963; CFI = 0.965; NFI = 0.938; IFI = 0.966; TLI = 0.958	SFL	t-value	α	CR	
<i>Inbound open innovation</i>				0.700	0.770	
IOI2	I actively seek out external sources (e.g., research groups, universities, suppliers, customers, competitors, etc.) of knowledge and technologies when acquiring new technologies	0.793	8.198			
IOI4	I often bring in externally developed knowledge and technology to use in conjunction with our own internally developed capabilities	0.735	8.281			
IOI5	I seek out technologies and patents from other firms, research groups, or universities	0.836	9.360			
<i>Employee Involvement</i>				0.838	0.855	
EI7	I participate in activities that will influence my performance evaluation	0.702	11.816			
EI8	I fulfil the assigned responsibilities and duties defined in my job description	0.761	15.265			
EI9	I am enthusiastic about my work	0.749	13.865			
EI10	I am inspired to perform my job	0.783	13.528			
EI11	I am allowed to make decisions towards technology acquisition	0.683	11.559			
<i>Technology scouting</i>				0.798	0.845	
TS1	I regularly observe technology trends.	0.680	13.341			
TS2	I usually consider external sources for ideas and knowledge as important	0.714	13.987			
TS3	I usually collect deep information on our industry.	0.596	12.715			
<i>Search capacity</i>				0.704	0.747	
SC4	I use human networks, such as Chief Executive Officer/Chief Technology Officers' informal meeting, human network, newly employed workers as technology search source	0.694	10.437			
SC5	I use expert level information, such as patent or journal database as technology search source	0.500	8.139			
SC6	I use general information media, such as trade fairs, conferences, the internet as technology search source	0.721	10.377			
<i>Integrative capacity</i>				0.701	0.739	
IC1	I play important role in adapting the information/technology from outside to improve processes	0.767	12.530			
IC2	The adapted information/technology from outside has widely been used to improve service delivery.	0.786	13.203			
IC4	I play a formal role in my organisation that captures, interprets, and integrates knowledge and information about technology through information sharing meetings	0.573	7.806			
<i>Knowledge recognition</i>				0.735	0.799	
KR2	I intentionally search for knowledge in many different domains to look “outside the box”	0.506	10.723			
KR3	I am good at distinguishing between profitable opportunities and not-so-profitable information or opportunities	0.592	12.686			
KR4	I easily identify what new knowledge is most valuable to us	0.503	9.983			

Table 4.4 Continued

Operational measures of construct						
Item code	Model Fit Indexes: $\chi^2 = 672.572$; d.f. = 552; $\chi^2/\text{d.f.} = 1.218$; RMSEA = 0.028; GFI = 0.902; AGFI = .963; CFI = 0.965; NFI = 0.938; IFI = 0.966; TLI = 0.958	SFL	t-value	α	CR	
	Knowledge acquisition (source)			0.759	0.779	
KA3	I collect information through informal means (e.g. social gatherings with customers and suppliers, trade partners and other stakeholders	0.531	10.438			
KA4	I am in touch with other stakeholders in the industry	0.500	10.575			
KA5	I sometimes organize special meetings with customers, suppliers, or third parties to acquire new knowledge on process and distribution related innovation.	0.686	13.368			
KA6	I regularly approach third parties outside the industry (such as professional organisations) to gather information.	0.588	11.502			
	Knowledge capture			0.838	0.845	
KC2	I understand the organisation's 'top-down' and 'bottom-up' communication processes	0.647	11.756			
KC3	My performance satisfaction is formally and regularly measured	0.881	16.423			
KC4	My experience, knowledge and skills are actively used to support performance improvement.	0.839	16.112			
KC5	I always maintain a work environment that contributes to the health, safety and well-being of all employees	0.711	12.603			
	Assimilation			0.759	0.826	
ASS1	I frequently share my new knowledge with colleagues to establish a common understanding	0.530	11.208			
ASS2	I translate new knowledge in such a way that my colleagues understand what I mean	0.707	15.281			
ASS3	I communicate newly acquired knowledge that might be of interest for our unit	0.531	10.537			
	Firm innovativeness			0.763	0.824	
FI1	I readily accept technology implemented based on research results	0.675	9.710			
FI2	Management actively seeks innovative ideas	0.747	11.318			
FI3	Management readily accepts innovation based on ideas from employees	0.592	11.044			
FI4	I am encouraged and supported to undertake innovative activities	0.595	11.103			
FI5	My new ideas are quickly accepted in our organisation	0.576	9.300			

Note: KA= knowledge acquisition, KC= knowledge capture, ASS= assimilation, FI= firm innovativeness

All items were measured on five-point scales anchored by 1 = "strongly disagree" and 5 = "strongly agree". λ = Standardised Factor Loadings, CR = Composite Reliability

As shown in Table 4.5, all the model indices were within the accepted levels, confirming the measurement model as a good fit with the data collected. Therefore, the model fit indices obtained were: $\chi^2 = 672.572$; d.f. = 552; $\chi^2/\text{d.f.} = 1.218$; RMSEA = 0.028; GFI = 0.902, AGFI = 0.963; CFI = 0.965 and NFI = 0.938; IFI = 0.966; TLI = 0.958 thereby confirming the one-dimensionality of each construct in the model (Anderson & Gerbing, 1988). The fit indices presented in Table 4.4 indicate that the model fits the data well. All item standardised factor loadings for each construct were significant ($p < .001$), which supports the one-dimensionality of the constructs. Thus, the reliability and validity of the constructs in terms of Cronbach Alpha, composite reliability, convergent and discriminant validity are subsequently discussed.

4.6 Reliability and composite reliability

In SEM, reliability (test of homogeneity) is assessed using two strategies: the use of the Cronbach's Alpha and the composite reliability (Hair et al., 2019). To evaluate the measures of the constructs in the measurement model a reliability test analysis was performed. The Cronbach's Alpha is widely used to examine reliability of measures but it does not weight the individual measures or indicators in determining the results (Hair et al., 2019). The composite reliability was estimated using the square of the summation of the factor loadings/ {(square of the summation of the factor loadings) + (summation of error variables)}. The interpretation of the resultant coefficient is similar to that of Cronbach's alpha, except that it takes into account the actual factor loadings of the individual measures and thus overcomes the limitations of the Cronbach's Alpha. In SEM, composite reliability is thus considered a more appropriate measure of reliability but the Cronbach's alpha is "still considered a conservative measure of internal consistency reliability" (Hair et al., 2019, p.761). Hence, Cronbach's Alpha is an acceptable measure of reliability. Both Cronbach's Alpha and composite reliability has a minimum acceptable reliability value of 0.7 and not above 0.95 as a general rule in SEM but between 0.6 and 0.7 in exploratory studies (Hair et al., 2019).

The result in Table 4.5 show the composite reliability of the main constructs in the study was above 0.70 and the Cronbach Alpha value all above 0.70 (Nunnally, 1975; Hair et al., 2019).

4.7 Correlation

Correlation examines the statistical relationships between two or more variables by looking at the surface of the relationships without probing causal reasons or influence for the relationships (Leedy & Ormrod, 2021). That is, correlation does not necessarily mean causation. Hence, a correlation that may show statistical significance does not necessarily imply that the strength of the correlated relationship is strong, but rather the *p-value* indicates the probability that the strength of the relationship may occur by chance (Akoglu, 2018). Thus, the assumption of correlated IVs suggests that other variables not included in the specified model influence the DV (i.e., there may be other common causes) (Hair et al., 2019). This section reports the composite means, standard deviations, skewness, kurtosis and correlation of all the variables under the study. The means of all the constructs were computed to determine the variable that averaged the highest. Their respective standard deviations were also estimated to determine the closeness of the data points to the various means. Also, the correlation analysis was performed to determine the strength and direction of the relationship between the variables.

Table 4.5 presents the summary statistics of the relevant variables: firm innovativeness, inbound open innovation, employee involvement, technology scouting, knowledge capture, knowledge acquisition, knowledge recognition, assimilation, integrative capacity and search capacity.

Table 4.5: Correlation among variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. Education	-														
2. Years of experience	0.148*	-													
3. Level of collaboration	0.066	0.018	-												
4. Market Turbulence	0.011	0.115	-0.041	-											
5. Technology Turbulence	0.026	-0.007	-0.078	0.351**	-										
6. Inbound open innovation	0.028	0.042	-0.027	-0.018	-0.064	0.727									
7. Employee involvement	0.001	0.034	0.115	-0.054	-0.036	0.152*	0.737								
8. Technology scouting	0.050	0.018	0.064	-0.002	-0.084	-0.07	0.307**	0.803							
9. Search capacity	0.001	0.06	0.012	-0.093	-0.133*	-0.108	0.317	0.386**	0.707						
10. Integrative capacity	0.069	0.041	0.096	-0.003	-0.006	0.114	0.521**	0.327**	0.343**	0.699					
11. Knowledge recognition	0.010	0.115	-0.060	0.341**	0.217**	-0.031	-0.097	-0.028	-0.111	-0.163**	0.708				
12. Knowledge acquisition	0.024	0.005	-0.165**	0.311	0.236**	0.072	-0.113	-0.050	-0.041	-0.100	0.391**	0.722			
13. Knowledge capture	-0.035	0.102	-0.071	0.261**	0.185**	0.048	-0.213**	-0.162**	-0.184**	-0.180**	0.272**	0.513**	0.762		
14. Assimilation	0.070	0.092	-0.025	0.189**	0.182**	-0.005	-0.055	-0.073	-0.093	-0.068	0.397**	0.310**	0.224**	0.784	
15. Firm innovativeness	-0.004	0.077	0.056	0.068	-0.063	0.261**	0.287**	0.133*	-0.018	0.217**	-0.038	0.037	-0.099	0.019	0.731
Mean	-	-	-	-	-	2.8058	3.6182	3.9637	3.8444	3.7918	3.8921	3.7728	3.5974	3.9170	3.6519
Standard deviation	-	-	-	-	-	.98528	.80260	.74316	.77896	.84356	.57377	.65670	.83626	.62964	.72915
Skewness	-	-	-	-	-	-.137	-.577	-1.262	-1.151	-.940	-.927	-1.139	-.962	-.972	-.128
Kurtosis	-	-	-	-	-	-.807	.321	2.655	1.774	.971	2.635	2.081	.540	1.578	.020
AVE	-	-	-	-	-	0.528	0.543	0.645	0.500	0.488	0.501	0.521	0.5801	0.615	0.534

Note: † $p < 0.10$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ (two-tailed test)

Diagonal values in bold represent the square root of the AVEs ($\sqrt{\text{AVE}}$)

The correlation result found that firm innovativeness had a significant relationship with inbound open innovation ($r = 0.261, p < 0.01$), as well as a significant positive relationship with employee involvement ($r = 0.287, p < 0.01$), and a significant positive relationship with technology scouting ($r = 0.133, p < 0.05$). This implies that the r of 0.261 has weak to moderate correlation with very high statistical significance ($p < 0.01$) suggesting an important relationship. Technology scouting has a correlation coefficient of 0.133 meaning a weak to negligible correlation with a high level of significance ($p < 0.05$). Additionally, it was found that firm innovativeness had a negative insignificant relationship with search capacity ($r = -0.018, p > 0.10$), but a significant positive relationship with integrative capacity ($r = 0.217, p < 0.01$). This means that the r of 0.217 is weak correlation with a very high significance ($p < 0.01$). More so, it was found that, there is a negative insignificant relationship between knowledge recognition and firm innovativeness ($r = -0.038, p > 0.10$), and positive insignificant relationship between firm innovativeness and knowledge acquisition ($r = 0.037, p > 0.10$). Lastly, it was found that firm innovativeness has negative insignificant relationship with knowledge capture ($r = -0.099, p > 0.10$), and positive insignificant relationship with knowledge assimilation ($r = 0.019, p > 0.10$).

With regards to the relationship between the dependent variable with the control variables, it was found that there were no significant relationships between the control variables and the dependent variable. Specifically, it was found that firm innovativeness had a negative insignificant relationship with education ($r = -0.004, p > 0.10$), as well as with technology turbulence ($r = -0.063, p > 0.10$), but an insignificant positive relationship with years of experience ($r = -0.038, p > 0.10$) and level of collaboration ($r = 0.056, p > 0.10$) and market turbulence ($r = 0.068, p > 0.10$). As regards the correlation matrix, the least correlation coefficient was -0.004 and this was the correlation between education and firm innovativeness whereas the highest correlation coefficient was 0.287 which was the relationship between firm innovativeness and employee involvement. This means that the r of -0.004 is weak to negligible correlation with a low statistical significance ($p > 0.10$). Also, the r of 0.287 is weak to moderate correlation with a very high statistical significance ($p < 0.01$) suggesting an important relationship. This means the level of education among other causes has a weak and negligible correlation with OGI while EI among other causes

has weak moderate correlation with OGI. Table 4.5 shows the interpretations of the correlation coefficient (the r).

To interpret the correlation coefficients (the r), Schober and Schwarte (2018) suggest that values ranging from 0.00 – 0.10 is interpreted as negligible correlation; 0.10 – 0.39, weak correlation; 0.40 -0.69, moderate correlation; 0.70 – 0.89, strong correlation and 0.90 – 1.00 is very strong correlation. Table 4.6 shows the various interpretations of correlation coefficients used in this study.

Table 4.6: Interpretation of the Pearson's and Spearman's correlation coefficients

Correlation coefficient		Dancey & Reidy (Psychology)	Quinnipiac University (Politics)	Chan YH (Medicine)
+1	-1	Perfect	Perfect	Perfect
+0.9	-0.9	Strong	Very strong	Very strong
+0.8	-0.8	Strong	Very Strong	Very strong
+0.7	-0.7	Strong	Very Strong	Moderate
+0.6	-0.6	Moderate	Strong	Moderate
+0.5	-0.5	Moderate	Strong	Fair
+0.4	-0.4	Moderate	Strong	Fair
+0.3	-0.3	Weak	Moderate	Fair
+0.2	-0.2	Weak	Weak	Poor
+0.1	-0.1	Weak	Negligible	Poor
0	0	Zero	None	None

Source: Akoglu (2018)

4.8 Convergent and discriminant validity

To determine that the constructs used for this study were valid, the convergent validity and discriminant validity procedure was used. As shown in Table 4.7, the standardised factor loadings for the measures of each constructs from the CFA results were all relatively large and positive above 0.50. The squared of these standardised factor loadings, indicate the communality of the measure, or the variance that the measure has in common with the construct. When the communality measures are standardised, the average communality of a block of indicators is referred to as average variance extracted (AVE) (Fornell & Larcker, 1981).

The criterion for establishing convergent validity is that the AVE measures should be 0.50 or more to ensure that, on the average, the measures share at least half of their variation with the latent variable (Fornell & Larcker, 1981; Hjorth, 1994; Hair et al., 2019). This means that convergent validity is evaluated based on the AVE which should be more than 50 percent (0.5) as a rule of thumb to support the measurement model. Also the standardized factor loadings should not be less than 0.5, and preferably 0.7 to demonstrate adequate convergent validity (Hair et al., 2019). As shown in Table 4.7, the AVE criteria were met for all the latent variables. Thus, for the constructs with AVE 0.50 and above, the validity of their measures was supported.

Again, the correlation between latent constructs in the study was used as the main focus for discriminant validity – that is the degree to which an observed variable is really distinct, unique and different from other latent constructs and “captures some phenomena other measures do not” (Hair et al., 2019, p.788). That is “the variance-extracted estimates (AVEs) (shared variance within) should be greater than the squared inter-construct correlation estimate (shared variance between)” (Hair et al., 2019, p.788). The rationale for this is based on the understanding that an observed variable “should explain more of the variance in its item measures than it shares with another construct”(Hair et al., 2019, p.788). The discriminant validity of the constructs was obtained by comparing the squared root of the AVE with the correlations among construct. Examinations of Table 4.6 and Table 4.7 show that the squared root of the AVE was significantly greater than correlation among latent constructs which supports the discriminant validity of the construct.

As the AVE for all the items are above 0.70, it means that on average, more than 70% of the variations in the organisation's innovativeness is explained by these IOI activities. On the other hand, the study records a 30% measurement error on the items

Table 4.7: Validity of main constructs

Constructs	No. of items	AVE	$\sqrt{AVE}$
		(Convergent validity)	(Discriminant validity)
1. Inbound open innovation	3	0.528	0.727
2. Employee involvement	5	0.543	0.737
3. Technology scouting	3	0.645	0.803
4. Search capacity	3	0.500	0.707
5. Integrative capacity	3	0.500	0.700
6. Knowledge recognition	4	0.501	0.708
7. Knowledge acquisition	4	0.521	0.722
8. Knowledge capture	4	0.5801	0.762
9. Assimilation	3	0.615	0.784
10. Firm innovativeness	5	0.534	0.731

Note: AVE = Average Variance Extracted

4.9. Mathematical model

To address this study research questions, the following mathematical procedure was used. This study model includes the DV (OGI), the IVs as well as the control variables. In addition, the model also includes the moderating variables. This mathematical model was used to address issues of correlation between the IVs and the DV moderated by ABCAP. The model is empirically specified as follows:

$$\begin{aligned}
 OGI_I = & \beta_0 + \beta_1 \text{Education}_i + \beta_2 \text{Years of experience}_i + \beta_3 \text{Level of collaboration}_i \\
 & + \beta_4 \text{Technology turbulence}_i \\
 & + \beta_5 \text{Market turbulence}_i + \beta_6 \text{Inbound open innovation}_i \\
 & + \beta_7 \text{Employee involvement}_i + \beta_8 \text{Technology scouting}_i \\
 & + \beta_9 (\text{Inbound open innovation} \times \text{knowledge recognition capacity})_i \\
 & + \beta_{10} (\text{Inbound open innovation} \times \text{knowledge capture capacity})_i \\
 & + \beta_{11} (\text{Employee involvement} \times \text{knowledge assimilation capacity})_i \\
 & + \beta_{12} (\text{Employee involvement} \times \text{knowledge capture capacity})_i \\
 & + \beta_{13} (\text{Technology scouting} \times \text{search capacity})_i \\
 & + \beta_{14} (\text{Technology scouting} \times \text{integrative capacity})_i + \varepsilon_i
 \end{aligned}$$

Where ε_i is the error term and i is the predictor variable.

4.10 Common method variance and one-way ANOVA

In the study, both the independent and the dependent measures were obtained from the same source; common method variance could bias the findings. Common method bias was assessed using the recommendation by Podsakoff and Organ (1986) and Podsakoff et al (2003). According to Podsakoff and Organ (1986) procedure, Harman's one-factor test was performed where all of the items used in the study were subjected to exploratory factor analysis (EFA). Then, common method variance is assumed to exist if (1) a single factor emerges from unrotated factor solutions, or (2) a first factor explains the majority of the variance in the variables (Podsakoff & Organ, 1986, p. 536). The results showed

that first factor accounted for 13.426% of the total variance (see Appendix 4.4). This means that there was no problem of common method variance (Podsakoff et al., 2003; MacKenzie & Podsakoff, 2012)

Table 4.8 shows the one-way ANOVA test results of the mean differences between the working experience of the respondents and the main constructs of the study: IOI, EI, TS, search capacity, integrative capacity, knowledge recognition, knowledge acquisition, knowledge capture, knowledge assimilation and organisational innovativeness. That is, whether the level of working experience of individuals impact the various variables. From the result, there was no working experience difference (i.e., for those who have worked under 5 years, between 6-15 years, between 16-25 years, between 26-35 years and those above 36 years) with respect to all the main constructs of the study. The one-way ANOVA is interpreted using a critical t-test value of 1.645 at a p-value of 0.05 (Winship & Zhuo, 2018). This implies that constructs that have t-values of more than 1.645 are considered been significantly influenced by their work experiences. However, t-values lower than 1.645 means that respondents years of work have no significant influence on them.

For IOI, the means of all the year groups range between 2.333 to 3.009 with an average mean of 2.7116 and an insignificant *t-value* of 1.023 with a low level of significance ($p > 0.10$). This means the experiences of employees about IOI in the GRA is almost the same. Also, the difference between employees working experience and EI has means between 3.494 and 3.800 with an average of 3.640 across all year groups. It has a *t-value* of 0.403 and a low level of significance ($p > 0.10$) suggesting that the number of years worked has no influence over EI activities. Further, the means among all the year groups in TS range between 3.667 and 4.024 (average mean of 3.900) implying no difference. It has a *t-value* of 0.246 with a low level of significance ($p > 0.10$). With regards to the moderating variables all of them demonstrate no mean difference between respondents working experience with respect to ABCAP. With respect to the *t-values* all below fell below 1.645 except assimilation capacity that has *t-value* of 2.256, knowledge recognition 1.684 and knowledge capture of 1.881. This implies that employee's number of years worked has significant impact on their knowledge assimilation capacity. Also, knowledge recognition capacity has means ranging between 3.500 to 3.975 and averaging 3.800 with a significant *t-value* and a high level of significance ($p < 0.01$). Further, knowledge capture also shows

no difference in the mean values but has a significant t -value ($t=1.881$). Finally, OGI has means between 3.547 and 4.00 with an average of 3.7156 and an insignificant t -value of 0.437. The level of significance is low ($p > 0.10$). This means there is no mean difference between respondents working experience and OGI.

Generally, there is no mean difference between the respondents working experience and the main constructs. However, some of the moderating variables (knowledge recognition, capture and assimilation) capacities all have values more than the 1.645.

Table 4.8: One-way ANOVA test results of the mean differences between respondent's working experience and the main constructs of the study

Working experience	Under 5yrs		6-15yrs		16-25yrs		26-35yrs		Above 36yrs		t test	
Variables	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD	<i>t</i>	<i>p</i> -value
1. Inbound open innovation	2.657	1.003	2.771	1.062	3.009	0.985	2.788	0.882	2.333	0.103	1.023	0.396
2. Employee involvement	3.494	1.005	3.672	0.725	3.577	0.804	3.659	0.812	3.800	0.021	0.403	0.806
3. Technology scouting	3.941	0.901	3.915	0.837	4.024	0.607	3.953	0.711	3.667	0.742	0.246	0.912
4. Search capacity	3.726	0.814	3.806	0.820	3.895	0.756	3.862	0.774	4.333	0.614	0.419	0.795
5. Integrative capacity	3.608	1.013	3.849	0.849	3.781	0.808	3.792	0.808	5.000	1.346	1.005	0.405
6. Knowledge recognition	3.802	0.725	3.779	0.596	3.975	0.474	3.944	0.556	3.500	0.725	1.684	0.154
7. Knowledge acquisition	3.691	0.652	3.794	0.638	3.818	0.599	3.768	0.726	2.500	0.537	1.168	0.325
8. Knowledge capture	3.316	0.950	3.590	0.725	3.621	0.831	3.691	0.902	2.250	0.872	1.881	0.114
9. Assimilation	3.618	0.809	3.954	0.494	3.986	0.660	3.922	0.635	3.667	0.941	2.256	0.063
10. Firm innovativeness	3.547	0.869	3.635	0.785	3.674	0.625	3.722	0.712	4.000	0.533	0.437	0.782

4.11 Path analysis

Path analysis is an approach that studies direct and indirect effects/relationships in a SEM model which does not intend to discover causes in a model but to explain the relationships or pathways formulated by a researcher (Jeon, 2015) because “the relationships or pathways cannot be statistically tested for directionality and the models themselves cannot prove causation” (Lleras, 2005, p.25). It is an approach in SEM that comprises all the observed variables and not the latent variables i.e., it indicates the exogenous and the endogenous variables and their correlations (Jeon, 2015). The path analysis is thus a methodological tool that assists researchers using quantitative correlational data to explain the effect of the various exogenous variables on the endogenous variable or outcome as well as test the fit and strength between two or more hypothesised causal models (Lleras, 2005). Path analysis empirically estimates the strength of the various relationships as indicated in the path diagram (Hair et al., 2019).

Path analysis provides a graphical representation of a set of relationships and uses a bivariate correlation (a statistical technique used to estimate the relationships between two variables i.e., A and B to determine the strength of each relationship in a path diagram (Hair et al., 2019). This approach allows the research to determine the estimates for each specified relationship in the model, not only the direct impact of the predictor variable, but also estimates the moderating relationships. Path analysis thus enables the study to understand the level of change in the outcome variable when the predictor variable changes. In this case the aim of path analysis as an approach in SEM is “an explanation, not a prediction” (Jeon, 2015, p.1637).

After confirming the validity and reliability of the measurement model, the study analysed the structural model using path analysis after theoretically specifying the effects

The properties of the casual paths, including path coefficients and t-values are shown below. The rule of thumb for the critical *t-values* is 1.645 (Winship & Zhuo, 2018).

4.11.1 Inbound open innovation and organisational innovativeness

Table 4.9 shows the result of how inbound open innovation, moderated by knowledge acquisition and knowledge recognition contribute to organisational innovativeness.

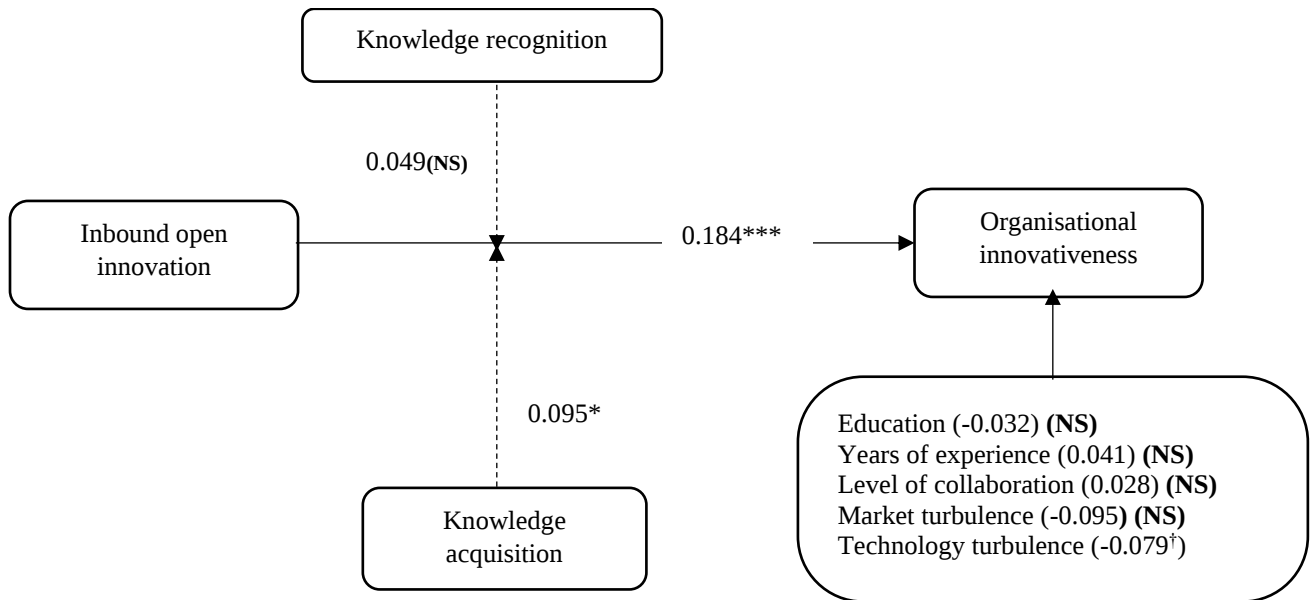
Table 4.9: Estimated coefficient of the relationship between inbound open innovation and OGI moderated by knowledge acquisition and knowledge recognition

Hypothesised path	Path coefficient	t- values	R ²	Hypothesis Decision
0.48				
Control Variables				
Education → organisational innovativeness	-0.032	-0.631		NA
Years of experience → organisational innovativeness	0.041	0.983		NA
Level of collaboration → organisational innovativeness	0.028	0.561		NA
Market turbulence → organisational innovativeness	0.095	1.410		NA
Technology turbulence → organisational innovativeness	-0.125	-1.687 [†]		NA
Independent Variable				
Inbound open innovation (IOI) → Organisational innovativeness	0.184	4.394***		Supported
Interaction Effect				
IOI × Knowledge acquisition → Organisational innovativeness	0.095	1.960*		Supported
IOI × Knowledge recognition → Organisational innovativeness	0.049	1.038		Not Supported

[†] $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$ (one-tailed)

NA = Not applicable

Figure 4.2: Estimated coefficient of the relationship between inbound IOI and OGI moderated by knowledge acquisition and knowledge recognition



† $p < .05$, * $p < .05$, ** $p < .01$, *** $p < .001$ (one-tailed), NS -Not Significant

—————► Direct effects

-----► Moderation effects

The path coefficients relate to each hypothesised relationship in the model, as well as the moderation effects. The entire model containing the control variables, IV and interaction terms, accounted for 48% of the variation in OGI ($R^2 = 0.48$). The result in Table 4.9 and Figure 4.2 show that IOI has a significant positive effect on OGI ($\gamma = 0.184$, $t = 4.394$, $p < 0.001$). This may imply that seeking out technologies and patents from other firms, research groups, or universities through an interactive process could enhance the innovative capabilities of the individual members. This result lend support to the first hypothesis (H1) of the study that states that, there is a positive relationship between IOI and OGI. The t-value of 4.394 exceeds the critical t-value of 1.645. Also, the t-value (4.394) has a very high level of significance ($p < 0.001$). Aside the direct relationship between IOI and OGI, the study also moderated this direct relationship with knowledge acquisition and knowledge recognition. Based on the result, as shown in Table 4.9, it was found that the relationship between IOI and OGI was significantly and positively moderated ($\gamma = 0.095$, $t = 1.960$, $p < 0.05$) by an organisation's knowledge acquisition, lending support to the other hypothesis (H1b). Here, the t-value of knowledge acquisition

capacity (1.960) exceeds the critical t-value of 1.645 at high level of significance ($p < 0.05$). However, the moderating role of knowledge recognition on the relationship between IOI and OGI was found positive ($\gamma = 0.049$, $t = 1.038$, $p > 0.10$) but not significant. Even though this moderating influence was found positive, the t-value of 1.038 was less than the critical t-value of 1.645. Therefore, the other hypothesis (H1a) was not supported.

4.11.2 Employee involvement and organisational innovativeness

Table 4.10 and Figure 4.3 show the result of how employee involvement, moderated by knowledge assimilation and knowledge capturing contribute to OGI.

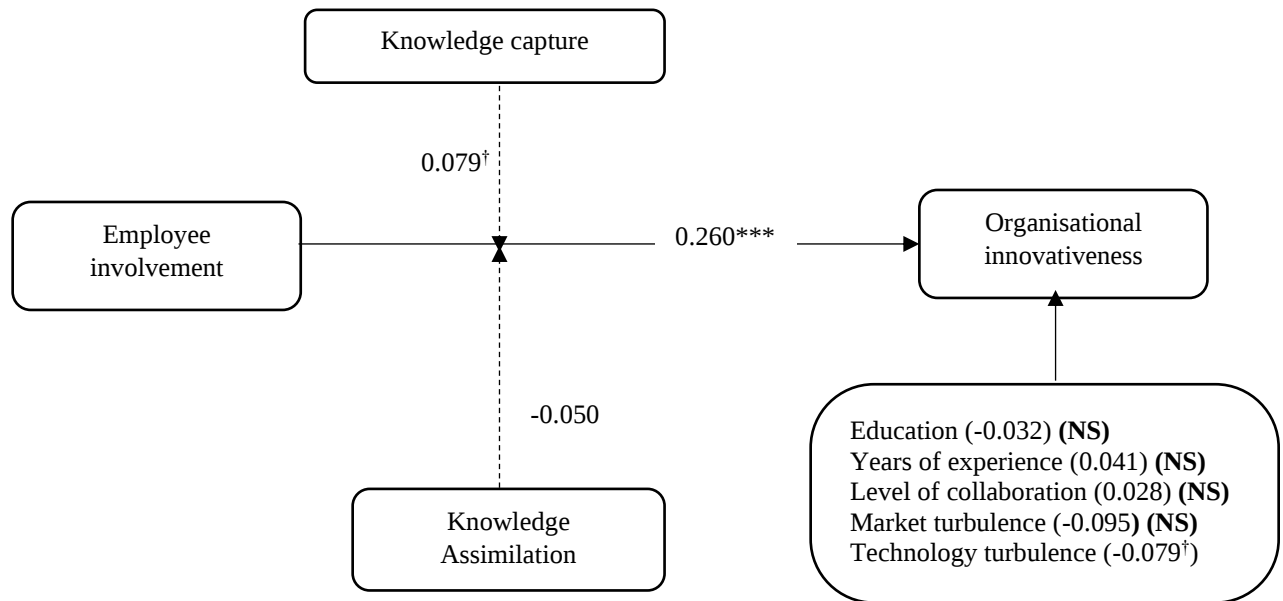
Table 4.10: Estimated coefficient of the relationship between EI and OGI moderated by knowledge assimilation and knowledge capture

Hypothesised path	Path coefficient	t- values	R ²	Hypothesis Decision
0.48				
Control Variables				
Education → Organisational innovativeness	-0.032	-0.631		NA
Years of experience → Organisational innovativeness	0.041	0.983		NA
Level of collaboration → Organisational innovativeness	0.028	0.561		NA
Market turbulence → Organisational innovativeness	0.095	1.140		NA
Technology turbulence → Organisational innovativeness	-0.125	-1.687 [†]		NA
Independent Variable				
Employee involvement → Organisational innovativeness	0.260	4.933***		Supported
Interaction Effect				
EI × Assimilation → Organisational innovativeness	-0.050	-1.140		Not Supported
EI × Knowledge capture → Organisational innovativeness	0.079	1.939 [†]		Supported

[†] $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$ (one-tailed)

NA = Not applicable

Figure 4.3: Estimated coefficient of the relationship between employee involvement and firm innovativeness moderated by assimilation and knowledge capture



† $p < .05$ * $p < .05$, ** $p < .01$, *** $p < .001$ (one-tailed), NS -Not Significant

—————▶ Direct effects

-----▶ Moderation effects

Presented in Table 4.10 and Figure 4.3 is the effect of EI on OGI while also considering the moderating role of knowledge assimilation and knowledge capture. With regards to the hypothesised relationships, it was found that EI has a direct and significant positive effect on OGI ($\gamma = 0.260$, $t = 4.933$, $p < 0.001$), implying that the innovative capacity of an organisation in terms of idea generations and creativity is enhanced when employees are involved through brainstorming towards the development of an organisational strategy. Thus, this finding implies that, hypothesis two (H2) of the study was supported. H2 was supported because it recorded a t-value of 4.933 which is higher than the threshold of 1.645 with a very high level of significance ($p < 0.001$). Aside the direct relationship between EI and OGI, the study also hypothesised that, knowledge assimilation and knowledge capture will moderate this direct relationship. From the interaction effect analysis, it was found that, knowledge assimilation had a negative ($\gamma = -0.050$, $t = -1.140$, $p > 0.10$) and insignificant effect on the relationship between EI and OGI. This therefore meant that the first part of hypothesis two (i.e., H2a) of the study was not supported. This result implies that, though an organisation may involve its employees in its internal

processes, with regards to knowledge sharing, EI will reduce if employees think that their views or suggestion are not incorporated into the activities of the organisation. When this situation prevails, it is likely that employee's motivation to be involved in the activities of the organisation may drop thereby having a reducing effect or negative effect on OGI. However, the result revealed that, the relationship between EI and the OGI was positively and significantly moderated by knowledge capture ($\gamma = 0.079$, $t = 1.939$, $p < 0.05$) thereby lending support to the second part of hypothesis two (i.e., H2b). This result implies that, in a situation where employees of an organisation are involved in the idea generation coupled with the organisation's high drive to capture knowledge, the organisation's level of innovativeness increases.

4.11.3 Technology scouting and organisational innovativeness

Table 4.11 and Figure 4.4 shows the result of how TS, moderated by search capacity and integrative capacity and how they contribute to OGI.

Table 4.11: Estimated coefficient of the relationship between TS and OGI moderated by search capacity and integrative capacity

Hypothesised path	Path coefficient	t- values	R ²	Hypothesis Decision
				0.48
Control Variables				
Education → Organisational innovativeness	0.032	-0.631		NA
Years of experience → Organisational innovativeness	0.041	0.983		NA
Level of collaboration → Organisational innovativeness	0.028	0.561		NA
Market turbulence → Organisational innovativeness	0.095	1.410		NA
Technology turbulence → Organisational innovativeness	-0.125	-1.687 [†]		NA
Independent Variables				
Technology scouting (TS) → Organisational innovativeness	0.070	1.007		Not Supported
Interaction Effect				
TS × Search capacity → Organisational innovativeness	-0.040	-1.441		Not Supported
TS × Integrative capacity → Organisational innovativeness	0.197	4.348 ^{***}		Supported

[†] $p < .10$, * $p < .05$, ** $p < .01$, *** $p < .001$ (one-tailed)

NA = Not applicable

Figure 4.4: Estimated coefficient of the relationship between TS and OGI moderated by search capacity and integrative capacity

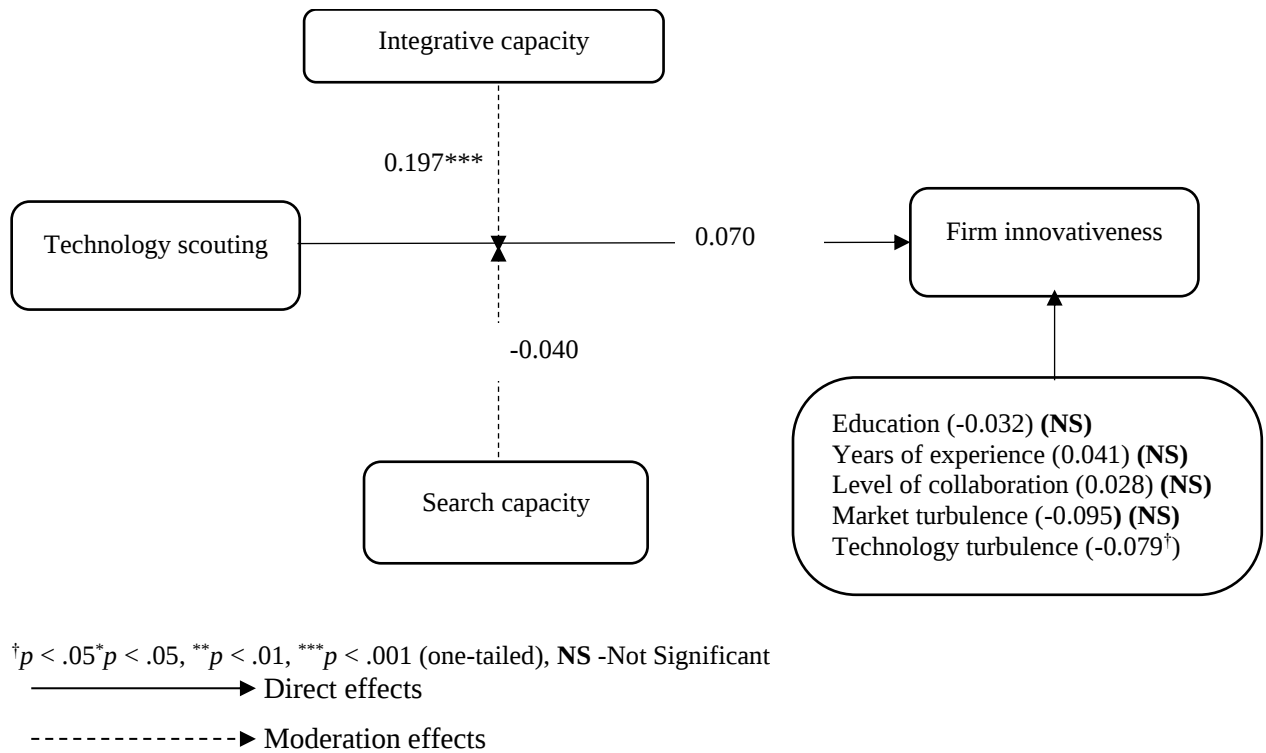


Table 4.11 and Figure 4.4 present results of how TS directly affect OGI as well as how this direct relationship is moderated by knowledge search capacity and knowledge integrative capacity of the firm.

In terms of the hypothesised relationships, per the result, it was found that TS had a positive ($\gamma = 0.070$, $t = 1.007$, $p > 0.10$) but insignificant effect on OGI. This result implies that though scouting for technology by an organisation adds to its level of innovativeness, it is imperative to note that per this result, it is not significant, therefore, hypothesis three (H3) is not supported. In terms of the moderation analysis, the result reveal that, search capacity had an insignificant negative effect ($\gamma = -0.040$, $t = -1.441$, $p > 0.10$) on the relationship between TS and OGI. This means that hypothesis H3a was also not supported. Lastly, the result revealed that, integrative capacity significantly positively ($\gamma = 0.197$, $t = 4.348$, $p < 0.001$) moderated the relationship between technology scouting and firm innovativeness. Thus, hypothesis H3b was supported. This result implies that, scouting for technologies in its own is not beneficial to the innovativeness of a firm unless

the firm has a high integrative capacity to integrate the technology into the internal processes of the organisation.

Generally, it was found that, the control variables, that is education, years of experience, level of collaboration, market turbulence and technology turbulence together with each independent variable, and the moderator variables accounted for 48% of the variation in the dependent variable. However, in terms of the effects of the variables on OGI, it was found that from the five control variables, only one had a significant effect on OGI. Specifically, it was found that, technology turbulence had a significant ($\gamma = -0.121$, $t = -1.687$, $p < 0.10$) positive effect on OGI while the other four control variables did not.

Overall, Table 4.12 shows the summary of the hypotheses test results. Figure 4.5 shows the interactive effect of the moderators and their effect on OGI. Figure 4.6 shows the various interaction effects of the moderating variables, the IVs and the DVs.

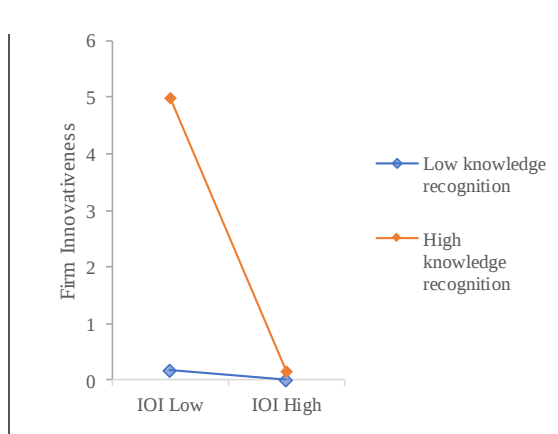
Table 4.12: Summary of hypotheses test results

Hypothesised Path	Empirical outcome
Hypothesis 1: There is a positive relationship between inbound open innovation and OGI	Supported
Hypothesis H1a: The positive relationship between inbound open innovation and organisational innovativeness will be stronger when recognition capacity is greater	Not Supported
Hypothesis H1b: The positive relationship between inbound open innovation and OGI will be stronger when acquisition capacity is high.	Supported
Hypothesis 2: Employee involvement (EI) is positively related to OGI	Supported
Hypothesis 2a: The positive relationship between EI and OGI will be stronger when assimilation capacity is greater	Not Supported
Hypothesis 2b: The positive relationship between EI and OGI will be stronger when knowledge capture is greater	Supported
Hypothesis 3: Technology scouting is positively related to OGI	Not Supported
Hypothesis 3a: The positive relationship between TS and OGI will be stronger when search capacity is greater	Not Supported
Hypothesis 3b: The positive relationship between TS and OGI will be stronger when integrative capacity is greater	Supported

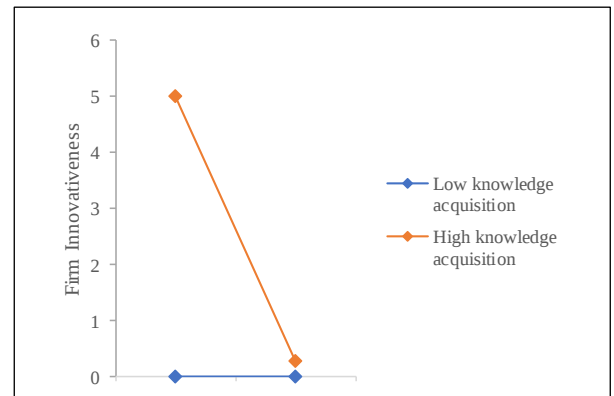
Bugbilla
Figure 4.5: Interaction plots

Inbound Open Innovation

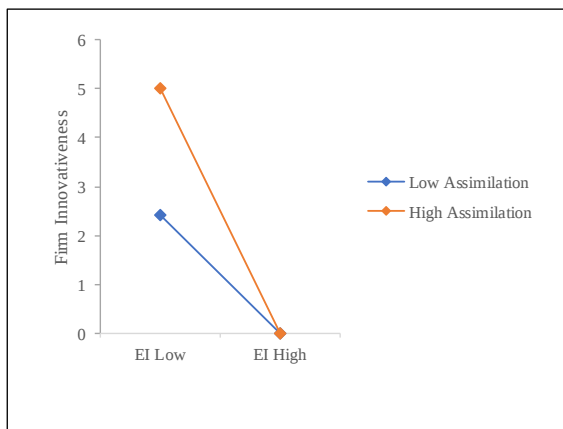
Interaction of IOI and knowledge recognition on OGI



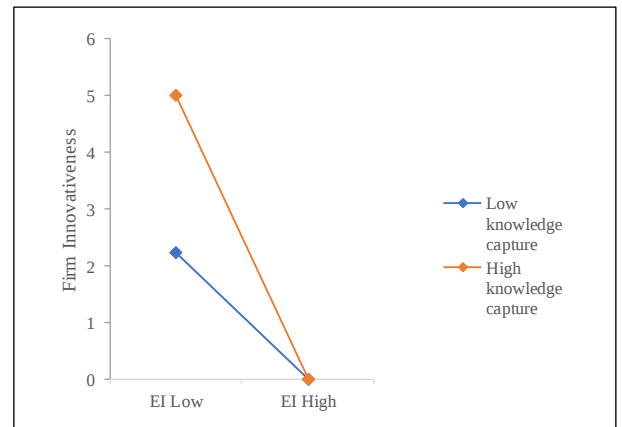
Interaction of IOI and knowledge acquisition on OGI



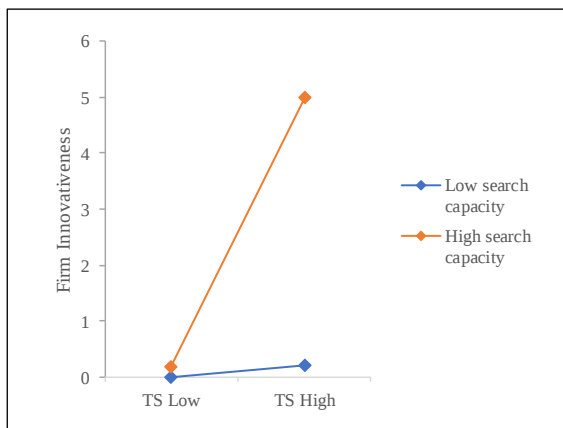
Interaction of EI and assimilation on OGI



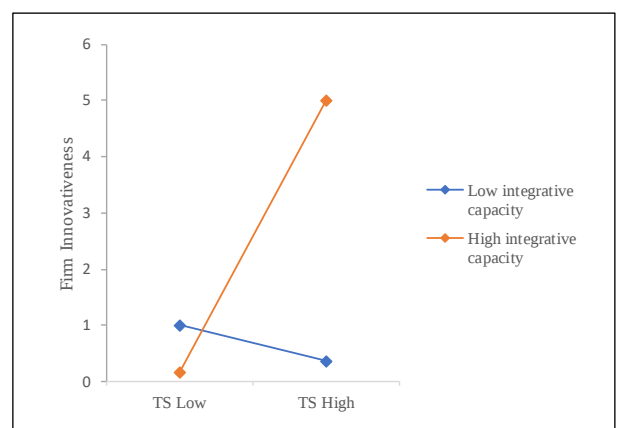
Interaction of EI and knowledge capture on OGI



Interaction of TS and search capacity on OGI

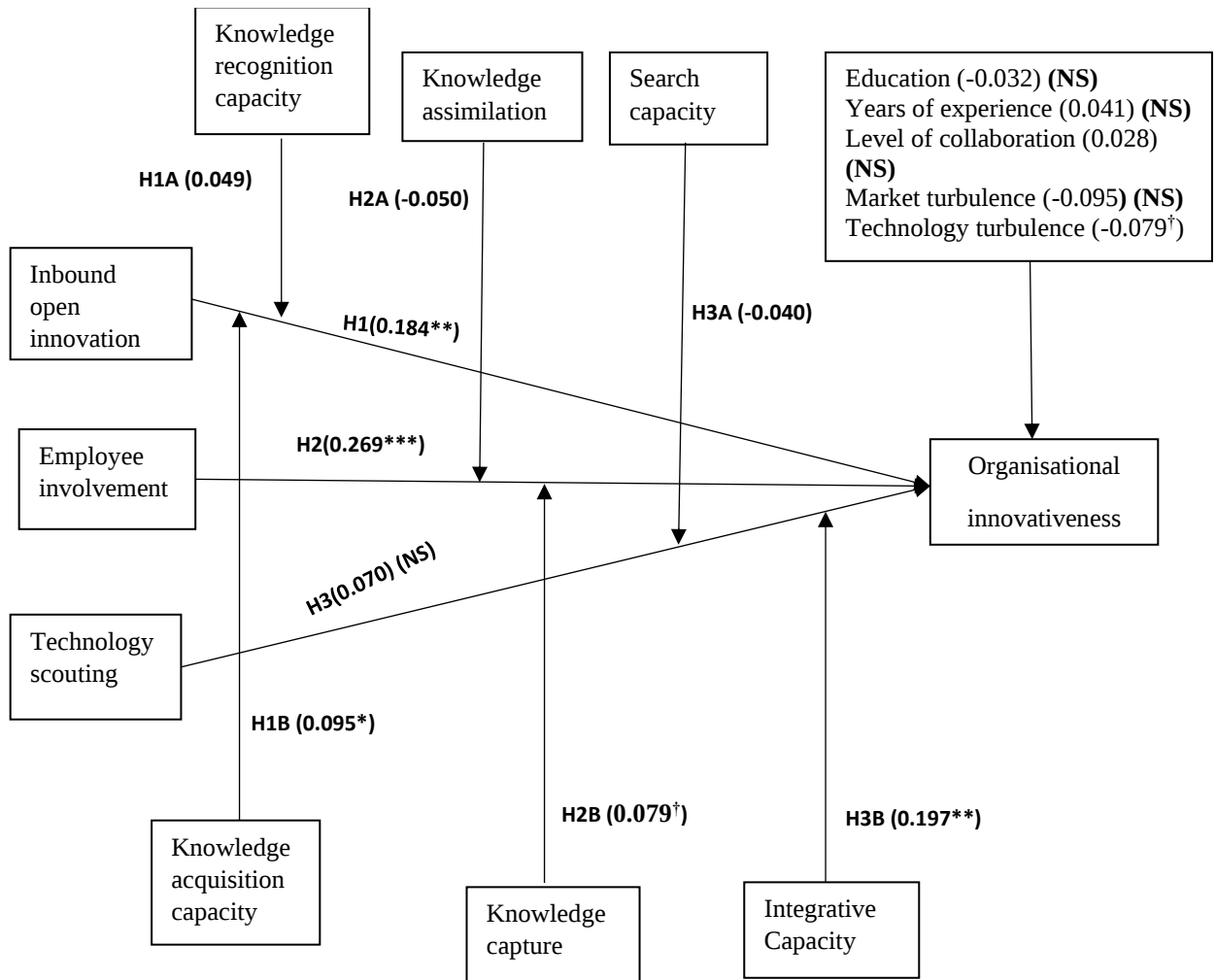


Interaction of TS and integrative capacity on OGI



This section presents the summary of hypotheses tested for the study. Details of the supported and not supported hypotheses for the study are presented in Table 4.12.

Figure 4.6: The effects of IOI activities on OGI



4.12 Part two – qualitative research

4.12.1 Analysis and interpretation

Using the recorded and transcribed scripts from the interviews, the following word cloud was generated (Figure 4.7). The most outstanding words shown in the word clouds are “activities, political, outside, change, act, technology, customs organisation”. This means that IOI *activities* (external technology acquisition and scouting) in the public sector are dominated by *political* leadership who take *decisions* for the organisation by imposing *outside technologies* for *customs organisations*. The staff are further *trained* to use these *technologies* to effect *change*. Interestingly, the word cloud (figure 4.7) reveals that, the acquisition of outside technology mostly takes place in the customs division of the GRA.

Figure 4.7: Word cloud panel of inbound open innovation in the GRA



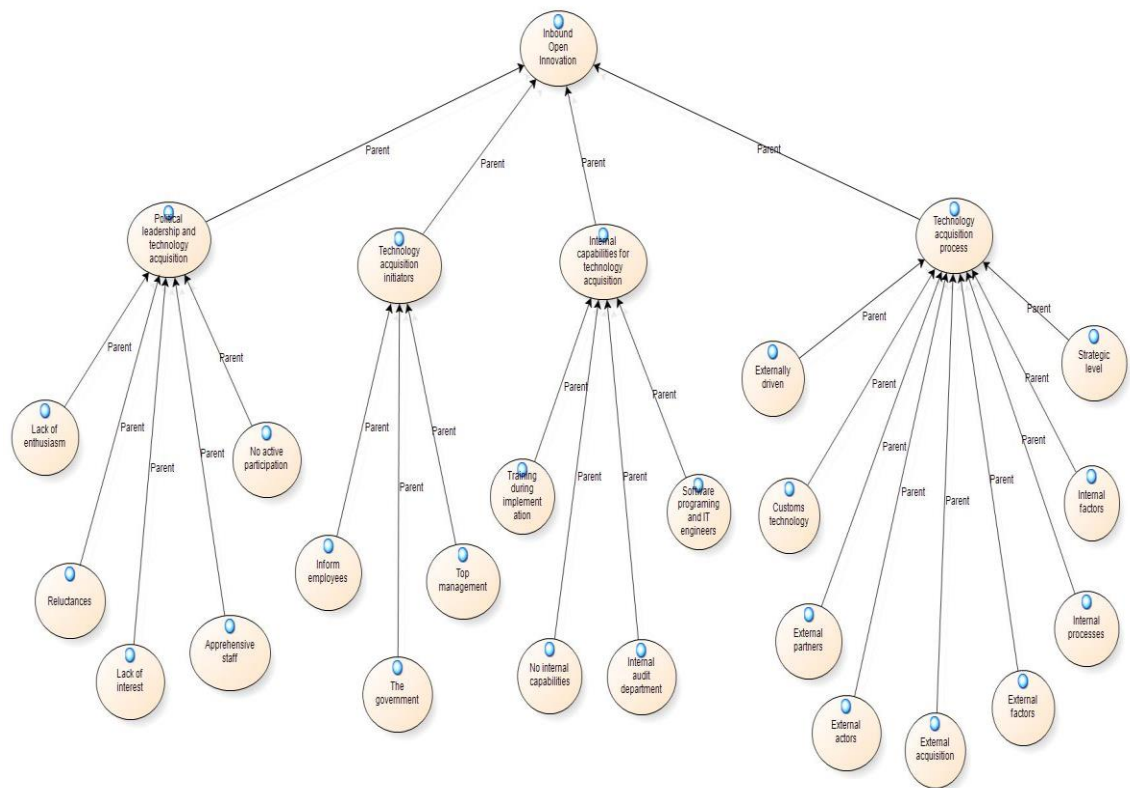
Guided by the objectives of the interview, four themes were generated as indicated in Figure 4.7. These themes are highlighted in Table 4.13.

Table 4.13: Inbound open innovation processes in the GRA

Approach to inbound OI	Brief description	Key quotes	Frequency of occurrence
Technology acquisition initiators	The group that recommends the need to acquire and implement new technology	“More often than not, it comes from political leadership”. “From the beginning decisions are taken from the top level, that is political leadership concerning certain technology they feel must be introduced”	5
Internal capabilities for technology acquisition	Internal ability to identify, access and integrate external technologies	“So basically, we don’t have experts in place but we train officers when new technologies are available” “IT department has a wing in the internal audit department... they can make some enquiries of the thing which we need to bring in”	5
Technology acquisition process	How technology is acquired for implementation and use	“the way customs acquire technology has been externally driven, it has not been a situation where there is an internal analysis before the acquisition of technology” “we mostly acquire technology from the outside”	5
Politics and technology acquisition - attitude of employees	Attitude of employees towards chosen technology	“most people will oppose it and some will just accept it because there is nothing they can do” “staff are mostly apprehensive ... but at the long run they accept it because they have no choice” “certain aloofness from the workers in terms of enthusiastic engagement, active participation in the process of internalising the technology	5

Source: Field interviews, 2020

Figure 4.8 shows that IOI in the GRA results from four main activities: political leadership, source of the technology (initiators/key stakeholders), internal capabilities and the role of employees. Depicting from the themes generated from the word cloud, technology acquisition involves external actors or partners, internal factors and processes, the strategy of the organisation among others. For instance, in response to a question on how technology is obtained from outside, a respondent replied “the way customs acquire technology has been externally driven”. Also, the main initiators of the technology is from the government (political leadership) followed by management. Employees are not involved in the process but only informed of the government’s decision through management. While internal capabilities are key in acquiring external technology, the GRA lacks key internal capabilities. Rather, they focus on internal audit of procurement processes. Again, employees are given the needed training (operational capabilities) to enable them work on the chosen technology during the implementation process. On the effect of the decision to exclude employees from the technology acquisition process, it was revealed that employees become apprehensive, do not take active part, lack interest /reluctance and enthusiasm. They however accept external technologies imposed on them by political leadership unwillingly because they have no choice.

Figure 4.8: Thematic map of the key themes

4.12.2 Reflexivity – strategies to overcome bias

As the main instrument in the data collection, analysis and interpretation, it is important to acknowledge biases that might affect the credibility and trustworthiness of the inquiry and suggest strategies to overcome these biases. Reflexivity refers to activities whereby undertaking the research really affects the process being studied and therefore cause bias (Austin & Sutton, 2014). Understanding reflexivity in qualitative inquiry is important because “good qualitative researchers actively try to identify personal, social, political, or philosophical biases that are likely to affect their ability to collect and interpret data” (Leedy & Ormrod, 2021, p.270) and take steps to remedy them.

In qualitative inquiry, two forms of researcher biases may occur – the effect of the researcher on key informants (Bias A) and the effects of the research participants on the researcher (Bias B) (Miles et al., 1994; Onwuegbuzie et al., 2010). Bias A tends to occur when the researcher is seen as a threat to the relationships of the study participants which

may be social or institutional. This type of bias (Bias A) can serve as a threat to participants where participants may view the researcher as a spy, voyeur, antagonist, or critic. Bias B (participant observer) tends to occur when the researcher becomes a study participant. These might compromise the interpretations of research results.

To deal with biases relating to Bias A, the researcher first clarified his role and the study from the conceptual design, the interviewing process, transcription, analysis, verification, theming and interpretation. The study also assured participants of their confidentiality and anonymity – a promise not to reveal their personal identities; sought the concern of participants (informed consent) by way of informing them ahead with regards to the nature of the research, the role of the participants, the identity of the researcher and the source of funding, the purpose of the research, and how the study results will be published and used (Orb et al., 2001) and the choice of the interviewing method (Austin & Sutton, 2014).

The study dealt with biases relating to Bias B by interviewing participants who were part of top management and were on top of the issues under investigation. Such participants could not be influenced by the researcher. Thus, their responses were authentic and not being influenced.

Chapter Five: Discussion, Conclusion, Implications and Limitations

5.1 Discussion of results

This chapter discusses the findings contained in chapter 4, draws conclusions, and examines the study implications. Discussions in this chapter are based on the conceptual framework and hypotheses, existing literature and research findings published in past studies and discussed in Chapter 2. The chapter then concludes with a limitation of the study and possible future research directions.

This section discusses the objective findings of the study. It juxtaposes them with previous findings to give a richer and theoretical nuanced meaning because the objective findings alone do not constitute an “exclusive source of valuable insight” (Geletkanycz & Tepper, 2012, p.257). This study is distinguished from other OI studies. The phenomenon is not analysed and measured based on organisational performance (the what of OI) but by determining the innovativeness of individual employees stemming from IOI activities (the how of OI). This section answers the research questions posed at the beginning, provides a logical explanation for the study findings and demonstrates the significance of the results by comparing them with other previous studies. The section thus bridges the gap between the study’s findings and the broader literature.

First, the current study focused on the effects of IOI activities on OGI and the moderating influence of the individual-level ABCAP. This question comprised three IVs of IOI activities (technology in-flow), EI and TS and the six individual-level ABCAP. The three key functions of employees in the OI environment is collaborating with external partners to absorb incoming knowledge, participation in the innovation adoption process and the TS unit role. These IVs were tested individually to determine the effect on OGI. These three IVs were also moderated by two individual-level ABCAP each.

This study found that collaborating and interacting with external stakeholders, establishing proper formal procedures, standards and protocols and changing individual beliefs (mindset), values and attitudes towards external technology acquisition processes positively and significantly influence the willingness to integrate and implement external technology. Hence, **H1**: There is a positive relationship between inbound open innovation

and organisational innovativeness, is supported. This finding is consistent with the importance of both the SC and DCs theories. The SC theory argues that individual employee innovativeness depends on their involvement in the innovation acquisition and creation process (Weerakoon et al., 2019). Also, the DCs theory (relational and transformative) argues that the ability of individuals to build relationships with stakeholders promotes interactions, collaboration, teamwork and knowledge sharing (Lin et al., 2016), which leads to understanding and innovation creation. Further, management's ability to understand the behaviour of stakeholders and realign their systems, facilitates collaborations, reduces NIH and promotes cultural change (Kump et al., 2019). This finding supports the argument (Bigliardi et al., 2020) that introducing technology's external flows into the organisation increases its innovativeness. Similarly, collaborating with partners increases the desire to implement new technologies in OI (Antikainen et al., 2010). This finding is consistent with Inauen and Schenker-Wicki (2011 and Sisodiya et al. (2013) who highlight the important role of external sources of knowledge to innovation creation. In line with this view, the current study emphasizes that IOI does not necessarily mean technology acquisition, that is the what of OI, but also the processes, mechanisms by which the technology is obtained and absorbed through human interactions. The findings also highlight that strong network ties among individual employees promote knowledge creation, interactions certainty, confidence building and the willingness to help the organisation succeed. Externally, the strength of the network enables stakeholders to identify technological opportunities and thus save time and effort (Nahapiet & Goshal, 1998). Another clear message from this finding is that being socially networked with a shared vision and trustworthy is not enough (SC). There is the need to complement this social capital with the ability to sense, seize, relate, transform and absorb (DCs). The results also demonstrate that IOI does not only lead to firm performance but also OGI. This finding is a novelty because most studies in OI have predominantly focused on performance (output) such as firm performance, innovation performance, economic innovation performance and sustainability innovation (Stefan & Bengtsson, 2017; Lopes & de Carvalho, 2018; Rauter et al., 2019)

Regarding the moderating role of knowledge recognition capacity, the findings suggest that influence on the IOI collaboration – OGI is positive but insignificant. Hence **H1a:**

The positive relationship between inbound open innovation and organisational innovativeness will be stronger as the recognition capacity becomes greater, is not supported. This finding is unexpected, though not surprising, because the determination of the appropriate technology or partners and the assessment of the same to fit the goal of a PS organisation is largely in the hands of political leadership. This result suggests that even though the ability of employees to explore, identify, assess and evaluate the external sources of technology and internal knowledge gaps are important (recognition capacity), individuals with such capacity do not get the opportunity to contribute towards the technology selection. As such, individual employees with recognition capacity do not enhance the collaborative process with their knowledge. Rather, they may exhibit negative attitudes towards the technology absorption process.

Individuals with recognition capacity in the GRA can distinguish between good and not-so-profitable sources of technology and other opportunities; quickly identify and recognise the relevance of new knowledge and intentionally search for new knowledge from various sources. They, therefore recognise the challenges of the organisation and the solution to the challenges. Such individuals may not show interest in the effective implementation of the external technology because of prior experience and early non-involvement. That is the recognition and understanding that such approaches within the organisation had failed to yield the desired results. Prior experience of individuals, leadership styles and ineffective intra-organisational communication can affect the recognition capacity of employees in OI arena (Lichtenthaler & Ernest, 2006; Zadeh & Darwishi, 2016; Ojo et al., 2017). The unexpected findings imply that investing in capacity building projects towards the external search and identification of technological opportunities might create knowledge redundancy when the choice of technology is determined by political leadership. Thus, any capacity to broadly monitor the external environment and assess the strategic fit of an emerging technology does not significantly influence the relationship between the processes of acquisition of external technology and the willingness and capability of employees. This finding is contrary to Zobel (2017) who found that knowledge recognition capacity is positively related to external technological access. Similarly, Minbaeva (2008) found that knowledge recognition activities significantly and positively affect knowledge transfer and facilitate its sharing. One

possible explanation for this conflicting finding is that the two studies were conducted in different fields and contexts. The current study was conducted in the PS in a developing country, whilst the other two were conducted in Europe in the private sector. The study by Zobel (2017) was also conducted in Europe, with chemical, electronics and manufacturing firms engaged in OI practices. Similarly, Minbaeva (2008) study was also conducted in Europe where data was gathered from 92 subsidiaries of Danish MNCs located in 11 countries.

Unlike knowledge recognition, knowledge acquisition positively and significantly moderates the relationship between IOI and OGI. Here, **H1b**: The positive relationship between inbound open innovation and organisational innovativeness will be stronger as the acquisition capacity becomes greater, is supported. This finding implies that an organisation may benefit from IOI processes and practices when its employees interact with other organisations within the industry, gather information from partners, engage stakeholders and effectively communicate the information to enhance understanding. Thus, the ability of management to effectively communicate the importance of the acquired technology to internal staff members will enhance their willingness to implement. This finding is consistent with the result that knowledge acquisition capacity increases an organisation's innovativeness and complements its knowledge portfolio (Spithoven et al., 2011). Similarly, knowledge acquisition capacity processes can also influence how complex decisions are made across the organisation's boundary (Fernhaber & Patel, 2012). Further, knowledge acquisition as a process of acquiring existing external knowledge through collaboration positively relates to an organisation's innovation capability (product, process and management) (Liao et al., 2009). Also, in the high-technology industries, knowledge acquisition through customer collaborations in acquiring relevant technology and internalising it may increase organisation performance (Wang et al., 2015). This finding means the organisation must establish processes and mechanisms necessary to acquiring technology and build an environment conducive to interacting and implementing the technology. In contrast, Kale et al. (2019) found that knowledge acquisition capacity in the service industry (hotel) has no direct effect on firm performance but indirectly through strategic agility. The authors explained that although knowledge acquisition capacity has no direct impact on firm performance, it is a necessary

step in obtaining external knowledge. A possible explanation for these differences might be attributed to the sector and the desired outcome.

Consistent with the study hypothesis two – **H2**: There is a positive relationship between employee involvement and organisational innovativeness. This relationship was positive and significant. This means employees are willing and ready to implement new technologies when they participate in technology acquisitions decisions and are motivated to do so. This does not only mean willingness to innovate but the capacity and the ability to implement.

Notably, employees in the GRA regard as involved in the organisation's activities when they participate in such activities that influence their performance evaluation. Participation also inspires them to perform their jobs, raises their enthusiasm; fulfil their job descriptions and make decisions towards technology acquisitions. Hence EI to individual members of the GRA means participation in decision making and intrinsic motivation. This means employees are interested in participating in matters affecting their well-being and are satisfied with the outcome of such activities. This finding is important because PS employees are attracted to intrinsic motivations more than sector's extrinsic rewards (Georgellis et al., 2011; Kolk et al., 2019). Also, intrinsic motivation and participation help sustain the focus of employees than extrinsic rewards as well as gain their desired behaviour (Kolk et al., 2019). This finding reflects the views of HR practitioners that EI is associated with OGI (Phipps et al., 2013; Karlsson & Skålen, 2015; Crowley & Bourke, 2017; Mu et al., 2018). The result is also consistent with previous researches which suggest that EI increases commitment to the organisation and encourages effective service delivery (Felstead et al., 2010; Tchapchet et al., 2014); increases performance (Bryson, 1999; Litwin, 2011; Luis Mendes, 2012; Phipps et al., 2013). Employee involvement also increases productivity in universities (Tchapchet et al., 2014); overcomes the NIH syndromes in external technology acquisition (Burcharth et al., 2014; Antons & Piller, 2015; Hannen et al., 2019) and facilitates organisational change processes (Hussain et al., 2018).

The study further gives empirical evidence that the e EI is not limited to improved performance and understanding employees' biases against out-side-in technology.

However, it positively impacts employee's willingness, ability and capacity to accept, adopt, adapt and implement external technology. This is consistent with both the SC and DCs arguments. The SC theory argues that strong internal ties enables effective communication, gives confidence, and improves the quality of information. Relational capital (trust) also enhances employees knowledge through members' interactions; cognitive capital (shared vision) allows employees to understand project goal and objectives and work in the interest of the organisation (Nahapiet & Goshal, 1998; Casanueva & Gallego, 2010; Weerakoon et al., 2019). Similarly, internal relational capabilities enable employees to interact and communicate effectively freely and also work as a team; internal integrative capabilities also provide employees with the capacity to integrate external resources and effectively exchange information (Iansiti & Clark, 1994; Henderson, 1994; Lin et al., 2016; Zhou et al., 2017). This implies that EI engenders organisational readiness, builds capacity, builds cooperation between management and staff, facilitates individual member interaction and builds teamwork to implement of technologies successfully.

This finding gives new insight into OI impact because most studies assumed that merely obtaining external technology enhances organisation innovation performance (Sisodiya et al., 2013; Wang et al., 2015; Xue, 2018; Wang et al., 2020; Moretti & Biancardi, 2020). As such, Wang et al. (2020) lament that extant literature has failed to explain how openness to external sources of knowledge affects firm innovation performance. This finding empirically demonstrates that one of the ways to achieve increased innovation performance is to involve employees in the technology selection and acquisition process. This finding is a novelty and a new dimension of the OI literature. It focuses on the individual level of OI, which has not been deeply examined (Salter et al., 2014).

Regarding the moderating role of knowledge assimilation capacity, the findings suggest contrary to the hypothesised. Hypothesis **H2a**: The positive relationship between employee involvement and organisational innovativeness will be stronger as the assimilation capacity becomes greater, is not supported. Instead, assimilation capacity has a negative but insignificant effect on the relationship between IOI activities and OGI. This result is complemented by the outcome of the qualitative studies (Study 2), which

demonstrated that employees are not usually involved in the search for external technology. When that happens, they become apprehensive and work reluctantly. They then act in negative ways towards the new technology. But as noted in study 2, they eventually implement the technology with some reservations. Hence, the insignificance of their resistance. Individual employees who possess assimilation capacity can share their new knowledge with other employees, and effectively communicate such knowledge to other individuals and units. Also, such individuals can translate such new knowledge to understand. This implies that employees who possess assimilation capacity use their communication and knowledge-sharing capabilities to negatively influence the EI-OGI relationship negatively. Individual employees with assimilation capacity may negatively influence the employee engage process because of prior experience and cognitive motivation (Lowik et al., 2017; Ojo et al., 2017). This means individual employees with past experience with external technology acquisitions and their performances may not be willing to accept another one based on their experiences, understanding, source and rewards. This may have other consequences. Another possible explanation for this outcome is that when individual members possess existing expertise, skills and competence but are ignored in the external knowledge identification and acquisition process, knowledge assimilation becomes a challenge (Ter Wal et al., 2011).

This finding is consistent with Phene and Almeida (2008) that knowledge assimilated from a multinational corporation's headquarters does not increase innovativeness because employees have little or no knowledge linkages with other departments as they perform strategic roles. This scenario is typical of the PS where employees' functions and roles are limited to their strategic departments. Employees may thus not have confidence in the new technology and trust in management and the partners (Lichtenthaler, 2011b). Employees develop a negative attitude towards understanding and communicating the new external knowledge into the organisation's internal innovation system (Lowik et al., 2017b).

Generally, assimilating valuable external knowledge becomes a challenge if it emanates from external sources (such as politicians) because it may not be compatible with its strategy, innovation systems and particular needs (Ter Wal et al., 2011).

On the contrary, Fernhaber and Patel (2012) found that the knowledge assimilation capacity positively influences the organisation's decision making processes in acquiring external knowledge. Similarly, Ter Wal et al. (2011) found that individual knowledge assimilation capacity (ability to transform, reshape and share knowledge) positively predicts individual innovativeness. Further, Elbashir et al. (2013) demonstrate that knowledge assimilation is a key condition that organisations need to increase the attainment of business value. The finding implies that finding is that individuals with assimilation capacity in the GRA may be unprepared to repackage or transform the external technology to fit the internal purpose of the organisation.

As expected, *knowledge capture* positively moderates the relationship between EI and OGI. Thus, **H2b**: The positive relationship between employee involvement and organisational innovativeness will be stronger as knowledge capture capacity becomes greater, is supported. The results emphasize that besides participation in decision making and intrinsic motivation, the ability of the organisation to maintain an organisational working climate (management support, mutual trust, friendliness, respect), pay attention to the health, safety and well-being of employees increases the confidence and the willingness to work. Thus, employees expect to have peace of mind and good health in order to enhance innovativeness. In addition, the ability of individual employees of the GRA to understand the regular and effective flow of information processes between management and employees also enhances EI. Further, employees understanding of their regular performance appraisal and job improvement systems within the GRA improves their participation and appreciation of rewards. Also, management use of internal employees' experiences, knowledge and skills improve the organisation's performance enhances OGI. Thus, the ability of management to organise internal workshops, gather suggestions, acquire information from employees and understand individual behaviour (knowledge capture) makes OGI stronger (Prajogo & Ahmed, 2006; Filippini et al., 2010)

This finding is consistent with Kazimoto (2016), who found that employee commitment to innovation activities, job satisfaction and availability of working tools lead to higher implementation of organisational objectives. The finding is also aligned to Taştan and Davoudi (2017), who found that organisational climate (an aspect of knowledge capture)

has no direct effect on OGI. Their study was conducted in innovative companies in Turkey. Interestingly, Filippini et al. (2010), also claim that knowledge capturing processes lead to trust between employees and management, which influences their willingness and ability to work. Ochurub et al. (2012) also found that knowledge capturing activities reduce resistance to the introducing external technologies, create awareness and understanding, encourage employees to make suggestions, and build a climate of trust between employees and management. Finally, Chen and Huang (2009) claim that knowledge capture capacity positively relate to innovation activities. The implication of this finding is that management's ability to understand the behaviour of employees, processes, procedures, practices and structures increase access to knowledge and greatly enhances OGI.

This study found no support for the direct, positive and significant effect of TS on OGI. Contrary to both theoretical (Rohrbeck, 2010; 2012; Spitsberg et al., 2013; Monteiro & Birkinshaw, 2016; Klueter & Monteiro, 2017) and empirical arguments (Frishammar & Hörte, 2005; Parida et al., 2012; Wang et al., 2015; Akinwale, 2018; Wang & Quan, 2019; Tajudeen et al., 2019), the findings indicate that TS activities have positive but insignificant influence on OGI. This means that regular monitoring of external technology trends for ideas, knowledge and deep sources of information on the industry has no significant effect on employees' readiness, capacity and ability in in the GRA. This finding was unexpected and suggests that the process of monitoring and assessing external technologies to detect early opportunities and resolve threats might not influence employee's willingness to accept the technology. This is a clear indication that technologies identified by internal sources to solve internal challenges are not considered by political leadership in acquiring external technologies. This outcome is particularly intriguing because both employees and scouts are great sources of internal ideas and have more insights about the organisation's objectives and strategy (Schneckenberg et al., 2015). They are therefore able to suggest the appropriate technologies and provide quality information towards it acquisition. They do so through interactions with management and the outside source of the technology. These interactions can be in the form of match-making, translating or transforming processes (Monteiro & Birkinshaw, 2016). This result confirms that the management of PSOs is aware of the availability of modern technologies

and the threats that the organisation faces from technological advancements. Nevertheless, PS managers may not be able to respond to the specific needs of the scouting unit. This scenario may occur because innovation activities in the PS are influenced mainly by government (Kim & Chang, 2009). This unexpected finding also demonstrates that investing resources in TS activities might be redundant when monitoring and scanning for external resources are low and insignificant and external political intervention is high.

Moreover, the result of this study is interesting because the finding is similar to previous studies (Oltra et al., 2018; Wang & Quan, 2019) who claim that there is no significant relationship between TS and ABCAP in IOI generation in the high-tech sector. Similarly, higher involvement of suppliers in OI has low significant effect on innovativeness, while customer involvement does not affect on the newness of innovation activities (Lassen & Laugen (2017). Similarly, the effect of broad internal involvement in OI activities is significantly and negatively associated with the newness of innovation (Lassen & Laugen, 2017).

This finding is contrary to previous studies which claimed that TS activities impact innovation performance. Kostopoulos et al. (2007) showed that can develop their knowledge base and the capacity to assimilate and apply the relevant external technology by collaborating with external partners to monitor external technologies. This allows the organisation to simultaneously obtain novel knowledge, skills, best practices and develop the capabilities to interpret, exploit and implement the acquired knowledge successfully. This differs from findings of the current study.

Although TS does not significantly influence OGI, it is possible that this thesis' finding was influenced by the lack of TS activities in the PSOs, investment in internal innovation activities and the frequent interference by political leadership and management. This current finding adds an insight into the effect of TS on innovation. While the previous findings determined the effect on performance, this current study has established a positive relationship with innovation capability, albeit insignificant, a shift from majority of the extant literature that focuses on innovation performance.

By accounting for the moderating effects, as demonstrated in the model, the study found empirical evidence that *search capacity* has an insignificant negative effect. In contrast

integrative capacity significantly and positively influenced the TS - OGI relationship. Thus, **H3a:** The positive relationship between technology scouting and organisational innovativeness will be stronger as search capacity becomes greater, is not supported. The unexpected findings imply that searching for knowledge from various sources such as chief technology officers, experts, networks, trade fairs and conferences do not influence the desire and commitment of individual employees, especially those in the scouting unit to be ready to innovate. Technology scouts or employees that possess the capability to search (scan and monitor) technology may not do so because their suggestions might be overlooked. They may therefore, develop a negative attitude towards monitoring and scanning for new technologies and detecting threats in the use of current technologies. Technology scouts negative attitude towards searching for external knowledge may be influenced by past negative experience and cognitive motivation (Lichtenthaler & Ernest, 2006; Lowik et al., 2017; Ojo et al., 2017). Individuals with search capacity exhibit negative attitudes towards searching for external technology because their efforts have not been used by the organisation as the basis of acquiring external technology. However, this attitude of unwillingness has insignificant negative effect on the government's resolve to obtain technology from their own sources. Suh individuals end up supporting the newly acquired technology for the organisation, although with some reservations.

This finding contrasts Ahn et al. (2016) who found that search capacity positively moderates the relationship between external knowledge search and OI performance in industrial firms. Similarly, the ability of the organisation to scan the environment for new relevant technologies significantly influence innovation activities in the manufacturing and service sectors (Arbussà & Coenders, 2007). The current study's findings is also inconsistent with Laursen and Salter (2006a) who argued that organisations that are more open to external sources of knowledge are more likely to achieve a higher level of innovative performance.

Similarly, Ferraris et al. (2019), found that an organisation's ability to engage external partners increases its innovation performance because it exposes it to novel knowledge. The current study finding is rather remarkable because it highlights the influence of search capacity in the PS, especially in developing countries.

As expected, *integrative capacity* (H3b) significantly and positively moderated the relationship between TS and OGI. Thus, **H3b**: The positive relationship between technology scouting and organisational innovativeness will be stronger as search capacity becomes greater, is supported. Individual employees possess the capacity to adapt external technology, play formal role in capturing the technology, interpret it, translate it, and integrate the technology through knowledge sharing processes such as meetings, significantly and positively increasing individuals' readiness, capacity and ability to innovate. This implies that, integrative capacity plays a key role in generating new knowledge regardless of the source of the knowledge (either through technology scouts or government). This finding is consistent with Yoon et al. (2018) who assert that integrative capacity significantly and positively influences the relationship between corporate foresight and innovativeness. Integrative capacity directly influences innovation performance (Ferraris et al., 2019). Moreover, it is also critical in dealing with the NIH syndrome when dealing with imported knowledge for effective internalisation (Lichtenthaler & Ernest, 2006). Integrative capacity facilitates the generation of new knowledge through common understanding and trust (psychological), knowledge consideration and assimilation (cognitive), knowledge sharing, conflict management and effective communication practices (social) (Salazar et al., 2012). This increases the willingness and acceptance of ideas and technology in the organisations and the appreciation of management support by employees (Tsai & Yang, 2013). This further underscores the importance of internal capabilities in the innovation process in organisations, particularly when knowledge comes from the external environment (Ferraris et al., 2019). These internal capabilities thus help the organisation adapt, absorb, and transform outside knowledge into a specific management need that enables innovation creation using various knowledge processes, skills and technical systems (Zawislak et al., 2013). The results also imply that imported knowledge needs to be interpreted, reprocessed, reconfigured, and integrated with internal knowledge to contribute to enhanced innovation performance (Salter et al., 2014). This also accords with Ahn et al. (2016) observation that integrative capacity directly influences technology performance and openness (collaboration, experience sharing and trust).

Second, the study sought to understand how IOI activities contribute to OGI in the PS, especially the GRA. The evidence from the sample comprising the 285 respondents in the quantitative study indicates that IOI is also practised in the PS as a form of external knowledge absorption. Also, the qualitative study involving five (5) management members gives a detailed account of how external technologies are acquired. The qualitative interview revealed that government or political leadership are the main source of external technology. Indeed most innovations in the PS are politically mandated, flows from the top to the bottom and without regard to internal factors (Bloch & Bugge, 2013). Thus, the type of technology to be acquired, the source of the technology, the technical capability and the purpose-fit is determined by political leadership. Political leadership acquire external technologies for the GRA to improve service delivery and create value to enhance revenue collection and improve security, health and safety at the borders. Thus, acquiring external technology in the PS aims to improve service delivery and create value for undefined customers (stakeholders) (Yuan & Gasco-Hernandez, 2019). Management then communicates to employees about the decision of government. Employees then have to respond to political “instructions or pressure” by implementing the acquired technology. The study found that employees who are supposed to implement the “imposed” technologies do so reluctantly. They do so because they are left out in the technology acquisition process. For instance, some of the respondents remarked that “more often than not, it comes from political leadership” ... “concerning certain technology they feel must be introduced”. With specific mention of how technologies are acquired for customs operations, the respondents indicated that the way customs acquire technology has been externally driven, it has not been a situation where there is an internal analysis before the acquisition of the technology. Because of this, employees’ attitude towards the technology is implementing it with reluctance. For instance, respondents remarked that most people will oppose it and some will just accept it because nothing they can do. Others indicate that staff are mostly apprehensive ... but at the long run they accept it because they have no choice. For some, government acquiring technologies without their input brings some certain aloofness from the workers in terms of enthusiastic engagement, active participation in the process of internalising the technology. These views expressed by the employees means that they want to be engaged in determining the

right technology for the organisation because they have specific experiences and capabilities. These concerns help explain the quantitative findings about the influence of employees' working experiences on identifying of external technology (knowledge recognition), knowledge capture and assimilation capacity. The One-way ANOVA test in chapter 4 indicates that work experiences significantly influence the way employees who possess knowledge recognition, capture and assimilation capacities behave towards IOI.

With regards to the role of the IT department in acquiring external technology (ideation), it was discovered that they had no input into the acquisition process but instead had to collaborate with the procurement department to conduct some audit about the selected technology. These findings in the qualitative interview are similar to what is established in the literature. For instance, innovation in the PS emerges from the influence of political leaders who only *instructs* public servants to align their activities in line with the request government's request (Kim & Chang, 2009; Bloch & Bugge, 2013). The rationale for political influence in external technology acquisition is that PS employees are not employed to search for newness (such as new technologies) to ensure the organisation's survival (Mergel, 2018).

Overall, PS employees (such as those in the GRA) may be unwilling to implement external technology because they term as "imposition" from political leadership. They may also demonstrate NIH tendencies because with their experiences, they think they can contribute meaningfully in the OI process but were not provided the opportunity.

The qualitative study provides evidence for the importance of internal readiness (attitude of employees towards external technology) and successful implementation. Specifically, individual employees develop negative attitudes towards the in-coming technology. This phenomenon is called the Not-invented-here (NIH) syndrome. The OI literature argues that employees who exhibit the NIH syndrome and reject the external technology, may be aware of the benefits of implementing such technology and its overall effect on innovation creation (Burcharth et al., 2014; Antons & Piller, 2015; Hannen et al., 2019) and yet reject it. This suggests that negative attitudes may hamper the adoption of external technology, project failures, and delays and influence how employees interact among themselves and define their relationship with management (Lichtenthaler & Ernest, 2006;

Antons & Piller, 2015). Thus, the extant literature cites several reasons why employees may exhibit negative attitude towards external knowledge absorption. Employees may not be willing to implement external technology from competitors because they do not want to be compared along similar parameters (such as performance outcomes and expertise) (Hussinger & Wastyn, 2015). The findings is also aligned to Antons and Piller (2015) who suggest that internal employees may reject external technology because they have no ownership of the technology, possible loss of expertise and the future impact of the imported technology on their positions and careers. Employees may also reject external technology when they focus on the failings of the new technology (knowledge function), the absence of an established formal procedure in acquiring the external technology, the organisational culture, top management commitment and lack of absorptive capacity (Antons & Piller, 2015)

Supported by previous literature, this study finds that the negative attitude of employees towards IOI practices affects the extent to which the technology is successfully implemented (Burcharth et al., 2014). The findings also imply that individual behaviour and attitudes towards outside technology and the mode of acquisition may hamper its successful implementation. Specifically, when political leadership chooses technologies for implementation without input from technology users, they may resist but implement it reluctantly. This attitude may lead to other consequences. This is a unique insight into the micro-foundations effect of IOI activities on OGI. However, the extant literature suggests NIH syndromes may be contained by rotating employees, engaging external experts, educating employees about the consequences of NIH, promoting innovation openness, training, perspective taking (putting oneself in another person's situation or shoes) among others (Burcharth et al., 2014; Antons & Piller, 2015; Hannen et al., 2019).

5.2 Conclusions of the study

This study concludes by assessing the theoretical/research contributions of the study, the practical/policy implications of the study, states some of the study's limitations and implications for further research.

The current study investigated the micro-foundations of innovative capabilities in a PSO in a developing country. This study integrates individual social capital and dynamic capabilities to examine the intra-organisational level (lower-level) behaviour of stakeholders engaged in IOI activities. This study thus addresses individual level innovative capabilities in IOI activities.

5.2.1 Theoretical implication of the study

Building on the SC and DCs theories, the study theorised and investigated the positive relationship between IOI activities and organisational innovativeness. Because IOI activities require social capital and dynamic capabilities to enable the organisation to address internal (choices, experiences, behaviour, attitude etc.) and external (collaborations) issue to ensure organisational readiness. Several theoretical implications can therefore be observed from this study. This study suggests that IOI studies involve three modes of IOI activities to understand the individual member readiness, capacity and ability to promote change. In this way, a contribution to the literature on innovativeness can be made. Given the correlation between the various IOI activities and OGI, investigating IOI activities individually may not lead to a comprehensive understanding of the role and behaviour of internal and external collaborators, employees and technology scouts. Given the impact of each of the IOI activities on OGI, it may lead to an incomplete understanding of their impact if one is used alone without controlling for the other.

This current study contributes to the role of employees in the OI literature in general and the role and behaviour of individual members in the OI environment in the PS in particular.

The study established that the innovativeness of individuals in an organisation is not merely the engagement of the R&D employees only to search for valuable knowledge from external sources and integrate it. Instead, this study suggests three critical roles of employees (comprising R&D, non-R&D and technology scouting employees) combined efforts and capabilities that enable individual employees to absorb external technology and effectively integrate external technology.

This finding has significant theoretical implications for public employees involvement and individual employees in the OI environment. The implication of this relates to one of the assumptions about employees role in the organisation: that individual employees are sources of knowledge and innovative work behaviour (Amundsen et al., 2014; Ter Wal et al., 2017; Hameed et al., 2018; Badir et al., 2019). Such studies did not indicate how individual specific actions, capabilities and motivations could lead to innovative performance. This assumption implies that engaged employees are motivated, possess the requisite capabilities and to a large extent automatically encouraged to implement new technologies. This study however, clarifies the mechanisms by which individual members in an organisation can achieve OGI.

Second, the study finding also indicates another important theoretical implication when considering the role of employees in the OI arena. The findings mean that when employees roles are considered in the OI environment, their capabilities should be considered alongside the specific role they are engaged in. For instance, not all employees engaged at the knowledge absorption (collaborative stage) are motivated to implement the technology successfully. Individual members participating at this stage possess different capabilities and are motivated by different things.

Third, at the employee level, the literature on OI focuses almost exclusively on R&D employees (Salter et al., 2015; Bianchi et al., 2016; Caputo et al., 2016; Ter Wal et al., 2017; Hameed et al., 2018), boundary spanners (Jespersen, 2010; Lundberg, 2013) Dahlander et al., 2016; Keszey, 2018), knowledge brokers (Hacievliyagil et al., 2007; Sousa, 2008; Abbate & Coppelino, 2011) with little focus on non-R&D employees and technology scouts. This study, therefore, addresses this gap by concentrating on all employees in general, including R&D, non-R&D and technology scouting employees. An understanding of the behaviour and role of employees from the broader context in the OI environment is important because successful innovation in the organisation is not only achieved by R&D employees, knowledge brokers and boundary spanners only (Salter et al., 2015; Dahlander et al., 2016; Badir et al., 2019).

Fourth, this study findings also show another important implication for OI when considering factors that may cause employees to embrace or resist OI. The literature on

employees resistance to inbound technology mainly focuses on NIH attitude (Lichtenthaler & Ernest, 2006; Hussinger & Wastyn, 2015; Hannen et al., 2019b) and organisational inertia (Kwun & Cho, 2001; Godkin & Allcorn, 2010; Huang et al., 2013). However, the role of employees in the identification, acquisition and implementation is less examined. This study shows that employees may resist a new technology acquired without their input. When technology scouts identify external technologies that may solve the organisation's internal challenges, but the government acquires different technologies, they may not embrace the new technology. Past experiences of individual employees involving the approaches by government and the success of the implemented technologies may affect their decision to embrace or resist the technology.

Fifth, the direct positive and significant effect of IOI on OGI ($\gamma = 0.184$, $t = 4.394$, $p < 0.001$) sheds another light on the relevance of the IOI concept and the importance of the SC and DCs theories. The finding also theoretically demonstrates that the IOI concept can mean external technology acquisition and an interactive process. The results of the IOI concept as an interactive process add a novel dimension to the OI literature. The current study establishes a precise mechanism by which PS employees can contribute to successful innovation implementation: collaboration between internal and external partners; a change in the mindset of employees; well-established governance mechanism; an interactive process; established practices of culture, and capabilities development. Particularly, the study empirically demonstrated with evidence the interactive effect of IOI on OGI. Similarly, collaborative effort leads to informal knowledge acquisition and an understanding of the culture of the collaborating organisations (Pouwels & Koster, 2017). Also, when collaborating, individuals keep records of their practices, suitable lessons learned, and records of quality interactive processes it improves OGI (Pouwels & Koster, 2017). Interactions between collaborating partners may also lead to a better understanding of the technology, the required skills and capability needed for the implementation and an appreciation of the individual challenges. Thus, collaborative efforts in the IOI process positively affects external technology implementation (Ahn et al., 2015; Saidi et al., 2019).

This study is among the few studies that have examined the concept from the “integrated process perspective”. This adds to the predominantly product or performance view of IOI (Lopes & de Carvalho, 2018). This implies that revenue administrations that effectively and broadly collaborate in OI activities show higher levels of individual innovativeness. The finding also means the existence of synergy between the collaborating partners. Specifically, when internal employees possess capabilities that can enhance absorption of the incoming technology, the readiness to absorb increases. Another implication of the finding is that effective collaboration between partners underpinned by SC can lead to innovativeness. Further, the findings also mean that the government, as the decider of the choice of technology and management can play a very important role in facilitating collaboration between internal employees and external partners.

In addition, the empirical finding clarifies the role of PACAP (recognition and acquisition) in terms of collaboration in external technology acquisition process. As such IOI is not just the acquisition of external technology to facilitate external resource identification, acquisition and increase competitive performance (Sisodiya et al., 2013a; Wang et al., 2015; Akinwale, 2018) but a process that determine the type of capabilities, the necessary mindset, the governance structure, and the capacity to innovate. This study finding also suggests that in the public sector context, particularly developing African countries’ revenue administrations, collaborations with other organisations, research groups or universities in implementing external technologies is more likely to improve individual members’ readiness, capacity and ability to innovate. Another implication of the collaborative impact of IOI on OGI is that it can increase technology implementation success and hence reduce uncertainties in technology implementation (Fanousse et al., 2021). The finding also contributes to the intra-organisational level literature on collaboration to reduce project uncertainties and improve innovation performance (Fanousse et al., 2021) and the collaborative role of employees in enhancing performance in OI (Hernandez-Espallardo et al., 2018). Collaboration between employees and external partners during technology in-flow process positively impacts employee innovation-related attitudes (Hernandez-Espallardo et al., 2018).

This finding implies that internal employees and collaborating partners must develop collaborative relationship that will enable technology integration, increase knowledge sharing, collective problem-solving processes, enhance organisational learning etc. They must also develop communication and knowledge sharing skills; build trust by effectively managing risk, transferring knowledge, cooperating with each other, jointly making decisions, building consensus, and effectively utilising of resources and expertise etc. (Fanousse et al., 2021).

Sixth, an observation of the influence of EI on OGI indicates a statistically significant positive effect ($\gamma = 0.260$, $t = 4.933$, $p < 0.001$) on individual innovativeness. This implies that PS revenue administrations that involve their employees in the implementation of new technologies show OGI. The current study contributes to internal capabilities literature in OI by arguing that involving employees in the IOI process lays a strong foundation and a determinant in the success of external technology implementation. This implies that interacting with employees during the innovation implementation may lead to individual willingness to promote change. It also means a win-win situation between employees and management. The finding also means SC and DCs are critical theories in managing human resources. They show the involvement process, the exact meaning of involvement, and employees lived experiences (Cankar & Petkovsek, 2013). The involvement of employees also means management can handle attitudes such as NIH syndrome and internal factors that motivate employees to innovate (Bogers et al., 2017). Another implication of this study is that EI is not only underpinned by human resource management theories. This study also complements the emerging literature on the human side of OI, emphasising the role of employees (Ahn et al., 2017; Sartori et al., 2017; Bogers et al., 2018; Sivam et al., 2019)

Seventh, the direct positive influence of TS on OGI is positive but insignificant ($\gamma = 0.070$, $t = 1.007$, $p > 0.10$). The findings suggest that individual employees, scouts and management are aware of the importance of technology scouting. Scouts also have can identify external technology, assimilate it, develop relevant strategies, provide important information that will lead to innovation generation and utilize the acquired technology (Spitsberg et al., 2013). However, the decision to acquire external technology does not emanate from their suggestions. This means employees may react to the newly imported

technology and show negative attitudes. This means Scouts in PSOs may not be satisfied with their jobs and hence lack the commitment to achieving organisational goals. This may also lead the Scouts to “oppose the technology but accept it because there is nothing they can do” and thus become “apprehensive and unenthusiastic” (Qualitative Study). Also, because Scouts develop external relationships with the external environment based on their networks and profession, their loyalty and allegiance may shift towards their professional partners; organisational identity may be lost with low levels of outcomes of innovation activities (Bogers et al., 2017). The current study finding is unique and important given that previous studies (e.g., Wang et al., 2015) examined TS impact on performance in the high-tech sector in Taiwan; . This adds a new dimension to the OI literature. The implication is that TS activity may not be an efficient means by which PSOs derive external knowledge. Also, individuals in the TS unit are less likely to concentrate on OGI. This means that PSOs such as the GRA should focus on developing the integrative capabilities of the scouting unit. Specifically, the GRA should focus on building formal processes that allow individual members to capture, interpret and integrate other information and knowledge about the in-coming technology through knowledge sharing sessions and programs. Thus, the organisation should build the competence of the TS unit to utilize and integrate in-coming knowledge from various sources. This study findings for the literature imply that the influence of TS on innovativeness in the PS much depends on the implementing organisation’s ability to develop the internal integrative capabilities of the individual members. This suggests that it is not enough to build a strong TS unit in the PS, equally, an internal integrative capability of the individuals must be developed.

Eighth, the current study clarifies how and why individual absorptive capacities are important in IOI activities by investigating their moderating effects. The study thus confirms the moderating influence of ABCAP between external knowledge sources and innovation success (Escribano et al., 2009; Ahlin et al., 2014; Wilden & Gudergan, 2014; Lopes & de Carvalho, 2018). ABCAP is a function of past experience, skills, competence, shared knowledge, need for cognition and communication systems and facilitates collaboration between organisations (Wu et al., 2013; Wu et al., 2014; Ojo et al., 2017). Absorptive capacity is a function that facilitates the dynamic development of the

organisation through leadership creativity and shared knowledge (Supartha & Ratih, 2017). This study empirically demonstrates that the process of turning IOI and EI into OGI does not depend on ABCAP. However, the presence of individual absorptive capabilities influences the relationship. This study shows that the presence of internal capabilities (RACAP) increases individual members willingness to innovate. However, individuals with capacities related to external technology acquisition (PACAP) behave negatively towards technology acquisition. The study also demonstrates that the organisation's external technology acquisition (without input from the scouting unit) does not lead to OGI unless integrative capabilities moderate it. The findings show that individual members ABCAP is influenced by individual antecedents such as experience, shared knowledge and involvement. Remarkably, individual members who have a strong need for cognition demonstrate RACAP (positive attitude) while those with low need for cognition show PACAP tendencies (negative attitude). The findings of this study respond to concerns in the OI literature on the need to understand why individual members show different attitudes in external knowledge search and internal knowledge integration (Bogers et al., 2017). This study also fills the gap by demonstrating how ABCAP affects innovation outcomes (Wang et al., 2015). The qualitative findings (Study 2) support this argument. Individual members with no input in acquiring external technology tend to exhibit negative attitudes in the acquisition process. This outcome implies that the moderating influence of ABCAP is affected by contextual and environmental factors (Junni & Sarala, 2013). Another implication is that what accounts for the effect of both PACAP and RACAP in OI is the technology acquisition mechanisms and the role of individual employees with specific absorptive capacities. Thus, an analysis of individual-level ABCAP should consider both the capability (ability) of the individual employee and their motivations (Junni & Sarala, 2013; Minbaeva et al., 2014).

Ninth, Social capital yields returns to individuals, goodwill, access to resources, enhances understanding and builds trust based on a relational network (Nahapiet & Goshal, 1998; Adler & Kwon, 2002). This study shows that interacting with external partners gives access to resources in the OI environment while internal interaction between employees, management facilitates understanding and enables participation. Dynamic capabilities gives the individual employees the ability to act on the network created by social capital.

That is the ability to sense, recognise, absorb, adjust etc. resources and competences for the organisation's benefit (Eisenhardt & Martin, 2000; Lin et al., 2016). However, this study shows that individual employees with certain competencies, especially PACAP may use it against the organisation's interest.

Generally, using the both social capital and dynamic capability theories, this study has demonstrated how employees' involvement in the OI environment (IOI activities) leads to employees' readiness, capacity and ability of employees (R&D, non-R&D and technology scouts) in the PS to implement external technologies. This study contributes to intra-organisational (individual-level) and OI literatures by investigating the theoretical link between IOI activities organisational innovativeness.

Overall, the theoretical implication is that individuals operating in the OI environment need to develop new capabilities, skills and professional competencies such as awareness of diverse culture, communication skills, knowledge-sharing abilities, working with diverse group of people etc. Individual employees also need to develop competencies for managing the collaboration process and relationships skills, team- work and problems solving skills etc (Hernandez-Espallardo et al., 2018). This current study also increases an understanding of the role of employees in the OI environment, the mechanisms through which individual absorptive capacity can enhance or inhibit OGI.

5.2.2 Managerial/policy/practical implication of the study

In terms of practical implications, this study offers several interesting managerial insights for practitioners who wish to achieve readiness, capacity and ability of employees in implementing relevant novel external technologies in the PS. The findings are particularly important to managers and policy makers in the PS of developing countries. One of the main findings of this study is that the success of technology implementation lies in the readiness, capacity and ability of employees.

As a result, this study suggests that PSOs such as the GRA, should consider three critical functions of employees in the OI environment when designing activities concerning the role and interactive behaviour of employees. This means all employees (R&D, non-R&D and technology scouts) should be involved in the process.

There should be collaboration between internal staff and the external partners as well as trust. Managers are thus required to show unwavering support, understand issues relating to collaboration between the internal and external actors and provide the necessary support. During this point, the mindset of the individuals is focused on delivering the project. There must be trust between the collaborating partners and between employees and management for successful IOI collaboration (Sartori et al., 2017). Collaboration between internal and external partners increase success, shared ideas, establishes channel of communication and information exchange, and other opportunities through social networks (González-benito et al., 2016). An important implication of this finding is that management should not concentrate decision making powers at the top as this may influence the way employees collaborate, resist, show commitment and motivated (Bigliardi & Galati, 2016).

Further, the findings show that PS managers should consider EI as the most important factor in achieving OGI. Public sector managers should provide opportunities for employees to participate in OI activities. Indeed, employees of the GRA are motivated to implement new technologies when given the opportunity to participate in its identification, selection and implementation. Besides, employees also want effective top-down and bottom-up communication; a healthy and safe working environment, their well-being as well as the regular measurement of their performance in order to increase participation. Also, employees' level of participation in decision making to achieve OGI increases when their accumulated knowledge, experiences, training and skills is used by the GRA to support and improve performance. Thus, PS employees are motivated to perform when they are satisfied with their jobs (intrinsic motivation such as participation in decision making) (Georgellis et al., 2011) and focused on doing good for the organisation (Perry et al., 2010) because individual employees in the PS possess abilities, skills and knowledge which they can use to generate new ideas, support innovative culture (Hana, 2013) and promote open innovation. Individual employees in participations in decision making enables them to use both their internal and external sources of knowledge to influence innovation creation (Badir et al., 2019). In the PS employees can achieve innovativeness when they have the ability to experiment and are motivated to do so;

managers should give regular feedback to employees about their performance and encourage them to innovate (Demircioglu & Audretsch, 2017).

The current study findings also identify some critical limitations and moderating influence of ABCAP that should be considered when considering the role and behaviour of employees in implementing an inbound OI strategy. Specifically, individual employees in the PS such as the GRA employees appear to resist inbound OI of technology, thereby demonstrating the negative influence of individual PACAP. For instance, this study shows that individuals with recognition capacity have positive attitude towards implementing imported technology. This means individuals with the ability to identify new and valuable knowledge from various sources do not behave in a manner that affects the readiness of others to implement the technology. Such individuals do not go the extra mile to work in the interest of the project. Again, individual members who possess acquisition capacity increases the collaborative effort and hence promote innovativeness. Such individuals are motivated and gather related information from social groups, related parties, customers and other stakeholders in the industry to obtain new information related to the project.

Also, individual members who possess assimilation capacity influenced the EI – OGI relationship negatively, albeit insignificant. This means that such individual members were negatively influenced by their past experiences and the lack of involvement. Such individual employees are articulate in their communications. As such they try to influence the rest of the members negatively. Past experiences of GRA employees may stem from their association with a previous service provider or the manner in which past technologies were acquired and their output.

Also, managers should pay attention to the reaction of employees from the scouting/IT unit. The scouting unit create awareness about emerging technologies and their potential threats. Their recommendations are not usually what is acquired. Government has the final say. As a result employees involved in such search activities may be less committed to their work, show signs of job dissatisfaction, and hence ineffective in technology implementation (Bogers et al., 2017). Technology scouts generally obtain their

information from various sources such as experts, chief technology officers, and human networks. Technology scout's contribution to innovativeness is positive but insignificant. This means that they are aware of the need for technology by the organisation, except that their recommendations are not normally followed. To increase participation, managers must share information with the scouts, establish formal processes by which knowledge about new technologies are captured, interpreted and integrated. Managers should formally engage senior technology officers to influence technology integration because their superior business and technological knowledge facilitates the push-pull behaviours, successful linkages and acceptance of external technology (Armstrong & Sambamurthy, 1999).

The implication for practitioners is that internal EI should be considered alongside collaborations with external partners when undertaking IOI activities. As the two IOI activities positively and significantly affect innovativeness, the use of both practices can increase the innovativeness of employees. Thus, to effectively absorb external knowledge, managers must involve their employees to achieve innovativeness. The study framework explains why organisations should pay attention to individual-level management innovation to enhance OGI. Specifically, PS managers of revenue administrations may use internal management mechanisms to encourage employees to embrace and integrate external technology. Also, as acquisition capacity and other RACAP elements enhance OGI, managers may consider various innovation-based motivators to encourage and facilitate innovativeness. The findings on the important effect of external innovations demonstrate that managers in PSOs should involve suppliers, consultants, and industry experts and combine employees' ideas to ensure successful innovativeness. This suggests the critical influence of both internal capabilities and external innovation sources. Thus, PS managers need to strive to involve employees throughout the innovation process because successful implementation of external innovations demands the support and commitment of managers and the cooperation of employees (Damanpour et al., 2018).

Managers of the GRA can identify three stages by which individuals can participate and be effective. First, at the interface between internal employees and external partners.

Second, internal involvement. Third at the scouting stage. The capabilities to form these functions differ, and management should recognise and identify them as such.

Also, specific motivation packages and capability development programs can be improved by understanding employees' motives, individual capacities, and traditional roles in the organisation (such as scouting). This means that successful technology implementation in the public sector requires understanding the significant role of employees who are the bridge to cross the organisation to the desired destination.

Overall, managers of PSOs such as the GRA should understand that the role of employees in the OI environment is cognitive, emotional as well as physical and a long term process that requires a comprehensive understanding of employees, their values, skills abilities and beliefs (Metha & Metha, 2013). As such, management must promote the positive aspect IOI activities within every activity of the organisation and effectively communicate the significant contributions of individual employees. Management must also consider their views in the engagement process, consider activities relating to their well-being and health, build an organisational climate where individuals can effectively communicate their concerns without fear of victimization, and understand the individual employee's future career plans (Metha & Metha, 2013). This means management must understand and clearly define the role of each employees in the OI process, clearly explain reward systems, design work processes that clearly identify individual capabilities and weaknesses and provide the necessary resources.

5.3 Limitations and future research

Although the study has successfully demonstrated by providing new insights that IOI activities influence how individual employees support and engage in the implementation of novel technologies, it has certain limitations.

First, the current study focused on Ghana, a developing country, and collected data from a government revenue collection agency (one revenue agency) – the GRA to test the hypotheses. The research framework was developed within the Ghanaian context and thus prone to weaknesses related to validity and generalisability. Hence, it cannot empirically prove that the results apply to other revenue agencies in the PS of developing countries.

Consequently, the findings of this study are applicable only within the Ghanaian setting. Generalisation and application of the results can only be made to other countries with similar settings. Therefore, it would be appropriate to replicate this study using the model and a different data set in a different government agency.

This particular limitation opens up opportunities for future studies to investigate individual employee-level involvement in the OI arena in developing countries, especially Africa. This study findings using the cross-sectional data indicate that, in general, employee involvement in IOI activities leads to a higher OGI in developing countries than IOI collaboration. At the same time, technology scouting has no significant effect. This shows the critical role of EI in IOI activities in the PS of developing countries. Notably, employees are motivated (intrinsic) to implement external technology when allowed to participate in decision making concerning the identification, selection and implementation of external technologies. Hence, this study calls for future studies on other developing countries using cross-sectional data to test and extend these findings. As this study is among the few studies investigating this phenomenon in the PS, this study encourages research scholars to analyse the role of individual employee characteristics in enhancing OGI in the developed countries PS.

Second, this study was conducted when the GRA was changing its IT-enabled service provider which could impact the outcome of the study. Data gathered for the study was conducted at a time the GRA was changing its management systems service provider it worked with since 2003 (Ghana Community Network Services - GCNet) to a Korean Customs Service-based (KCS) and Integrated Customs Management Systems (ICUMS). The transition period and the politics surrounding the termination of one service provider and the acquisition of another could impact the responses from participants.

Third, the time horizon used in this study was cross-sectional design which concludes that the variables were all collected at a particular point in time. This implies that perceptions regarding IOI activities – technology acquisition, EI and monitoring emerging technologies in explaining organisational innovativeness were gathered at a particular point in time. As such, the dynamic nature of IOI activities and ABCAP could not be

captured. Thus, a longitudinal study incorporating more variables may help identify the correlational relationship between the variables.

Fourth, individual employee-level involvement was measured across all the functional departments of the GRA, where their relative contributions, goals and appreciation of IOI activities on organisational innovativeness may differ.

To appreciate the relative contributions of the functional units of the GRA vis-a-vis IOI activities, future study is required to elicit the various functional units' appreciations, contributions, support, and capabilities for IOI activities. Also, while this study examined the interaction effects of inbound open innovation collaboration, employee involvement and technology scouting on OGI, future studie could investigate and understand the differences in these interaction effects across functional units.

Fifth, this study used survey data collection method for some measures and complemented it with a semi-structured interview. This may have some limitations. By complementing the quantitative data with the qualitative process, this study minimised and controlled for CMB. But as with all other studies, there could still be some limitations.

To minimize this limitation, future studies involving such variables could incorporate secondary data.

Sixth, IOI activities in the OI environment is a complex phenomenon. This study believes it captured important factors that facilitate and enhances OGI, but there may be other factors that could influence the organisation's innovativeness and innovative performance.

Seventh, data was only gathered from senior staff and management members. This means that junior staff members who are knowledgeable and experienced in the subject area missed the opportunity to enrich the study. This could influence the study's findings and conclusions. Respondents for this research were senior staff members and management who have vested interests in the management of the GRA. As such, datta collection outcomes mostly reflected their opinions of IOI activities while the perspectives of junior staff members in this current study were not captured.

Eighth, this study has a methodological limitation with about the control variables. Although the study controlled for several factors that account for variance in organisation's innovativeness, the study did not include some potentially influencing variables accounted for in past studies, such as firm size, firm age, industry type (Tsai & Yang, 2013; Pallas et al., 2013), organisational culture (Brettel et al., 2015), competitive intensity, intangible factors (market and financial position), and firm age (Rubera & Kirca, 2012).

This inability serves as a limitation to the evaluation of the importance of OGI in this study. This, therefore, presents an opportunity for future researchers to investigate further in this direction.

The study's limitations also open up exciting opportunities for further studies in the future.

First, this research focused on examining the interaction effect between external innovations and internal capabilities. The study only examined two important sources of external innovations: IOI (knowledge in-flows) and TS. There are other relevant sources of external innovations such as horizontal and vertical technology collaborations (Parida et al., 2011; Wang et al., 2015; Akinwale, 2018); knowledge search breadth and depth (Dahlander et al., 2016; Ferreras-Méndez et al., 2015; Lopes & de Carvalho, 2018); customers, suppliers, universities and research organisations, network partners and experts on intellectual property (IPR) (Brunswicker & Vanhaverbeke, 2015b), which were not considered. These sources of external knowledge are also critical in enhancing innovation activities. More value could be added to organisational innovativeness studies when future research is explored in other external knowledge absorption processes.

Second, the study also investigated only two critical internal factors: EI and RACAP, as critical internal sources of innovativeness. The internal sources "contribute by identifying problems and searching for solutions" (Damanpour et al., 2018, p.6). The literature also contains specific vital sources of internal innovations or capabilities such as investment in innovation activities, investment in innovation identification strategies (Brunswicker & Vanhaverbeke, 2015b), technology capability, top management support, organisational culture, organisational structure, connectivity and the establishment of a special unit to

support innovation activities (Zhao et al., 2016; Zhang et al., 2017; Pustovrh et al., 2017; Sulaymonov & Du, 2020), open culture, cross-functional cooperation and information sharing (Wu et al., 2013) (R&D, marketing, and manufacturing capabilities (Su et al., 2009). Internal capabilities such as these are also relevant and play different functions in improving an organisation's innovativeness. Therefore, more value could be added to the OI phenomenon if future research investigates how these activities help integrate external innovations.

Third, there are multiple dimensions of IOI. For instance, Dahlander and Gan (2010) and (Chesbrough & Brunswicker, 2013a) conceptualised IOI as pecuniary (acquiring from the market) and non-pecuniary (sourcing or free revealing - accessing external knowledge without any direct financial compensation to the external partner, which depends on available internal resources. The study only examined the pecuniary perspective (acquisition). In this regard, research on the non-pecuniary perspective is called for.

Fourth, methodologically, the qualitative sample in study 2 may be a subject of possible bias in the selection process as the researcher was free to select the respondents. The sampled response of study 2 was also small as compared to study 1. Thus, responses from study 2 may either be under or over represented. To validate this study, future study based on open ended qualitative study of equal numbers of quantitative respondents would help improve the evidence gathered from this study.

Fifth, the study responds to calls for TS research in innovativeness in the PS of developing economies. The positive but insignificant effect findings show that the impact of TS is not only limited to the private sector and in developed economies. The effect also varies. This study did not explicitly differentiate between environmental scanning and monitoring of emerging technologies (Yan & Cai, 2011) or formal or informal means in acquiring information (Frishammar & Hörte, 2005). Environmental monitoring involves using formal techniques such as market research or competitor analysis to gather intelligence in a planned and controlled manner about emerging technologies. At the same time, scanning relates to actions involved in acquiring information about potential technologies from the environment – the industry environment (business competitors) and the general environment (suppliers and customers) using informal techniques such as gatekeeping

(Frishammar & Hörte, 2005a). Future research is required to measure these techniques separately and in-depth to add value to the degree of effectiveness of TS and the literature on OI in general.

Finally, the current study examined OGI from the cultural dimension to understand innovativeness within the organisation. However, three other dimensions (process, structure and person) (Binder et al., 2016) were not considered in this study. Future research can help develop the innovativeness literature by examining the other perspectives in the light of IOI activities in the PS.

Overall, this study challenges researchers, policymakers, managers or practitioners to proactively assess how and why IOI activities affect OGI under the influence of ABCAP. With further studies that build on this research and incorporate both behavioural and technological innovativeness (Carvalho et al., 2018), a more comprehensive understanding of how organisations obtain innovativeness in IOI activities can be achieved.

5.4 Concluding remarks

While the study finds overall support for the positive influence of IOI activities on OGI, the ability of the organisation to capture, integrate and acquire knowledge is a critical enabler that accounts for the higher levels of innovativeness. Building the organisation's capacity to enhance innovativeness takes time, so managers, policymakers and practitioners must simultaneously work on enhancing internal innovation capabilities and engaging with their external environment. In this regard, both external DCs and external SC can be viewed as the path to capturing the inputs from the external environment, without which OI activities may not be successful. Thus, organisations, policymakers, and managers must dedicate enough resources to develop their dynamic capabilities and social capital.

The use of the OGI construct in this study contributes to efforts in effectively measuring the ability of the organisation to innovate (Wang & Ahmed, 2004). It captures the various elements of the organisation's ability to innovate and thus shifts attention from the

majority of the OI literature that concentrates on performance – a shift towards innovation orientation. This, therefore, gives a fair assessment of the organisation's ability to innovate.

A key message from the findings is that engaging in IOI activities is likely to enhance the willingness to innovate, ability to innovate and the capacity to innovate. However, moderating the relationship with both INT and EXT ABCAP makes the relationship stronger. Therefore, the theoretical framework provides enough evidence for this. The framework thus suggests that the influencing role of ABCAP becomes stronger when we also consider integrating external innovations and internal innovation systems in IOI activities. If IOI activities are critical for OGI, management should design and implement an organisational culture and strategies that integrate external innovations and internal capabilities. Decisions regarding the acquisition of external technologies are political decisions advanced by governments. On the contrary, the task of implementing the acquired technology is the responsibility of management. Hence, to enhance OGI, management devise strategies that will enable internal collaboration and networking among employees to ensure innovativeness.

Another clear message from this study is that successful OGI is not achieved by acquiring the most valuable and new technology (state of the art) by engaging employees in the process and monitoring emerging technological trends. Organisational innovativeness is also achieved through building the appropriate ABCAP, building effective partnerships, networks and collaboration between individual staff members at all levels. These relationships can also be facilitated through effective communication and mutual or shared understanding.

The findings of the research demonstrate that IOI activities are not only important for technological firms, SMEs or manufacturing firms in developed countries, but also for government agencies in the PS of developing countries such as Ghana. Although this study is limited to a government agency in Ghana, it is most likely that IOI activities are advantageous in other developing countries. Government agencies must relate to external partners as well as involve employees.

In conclusion, the researcher believes that the current study has provided more insight on the determinants of IOI activities, leading to OGI. By combining empirical evidence from a revenue administration in a developing country and insights from the extant literature, the study demonstrates how revenue administrations can achieve innovativeness from IOI activities and individual absorptive capabilities. The results from the research suggest that it is not just a matter of acquiring available novel technology per se, but the processes and the activities involved as well as the individual level capabilities that determine innovativeness. This further suggests that organisations should strategically invest in the capabilities of their employees rather than concentrate on a few specialised departments (such as R&D) in technology in-flows.

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Appendices

Appendix 3.1: Summary of the study's methodology and methods

Methodology		
Paradigms/rationale	Positivism	Post-positivism
Epistemology <i>Criteria for evaluation, ways of studying the world, how knowledge is generated</i>	• Objectivity in knowledge (no bias) • Knowledge discovered through scientific method and validity established • Only observable (seen) objects are worthy of investigation • Collected data using validated questionnaire	• Knowledge is subjective and include the perspective of employees • There are multiple sources of knowledge such as experience aside the scientific method • Truth is constructed and depends on the interpretations of people about their world • Knowledge creation is influenced by culture (such as EI, private or public sector)
Ontology <i>The object of the study, the nature of people about reality and the choices they make</i>	• Facts are facts and cannot be interpreted • There exists one reality that people cannot see • The truth (reality) is out there waiting to be discovered • Reality is external and independent of people's mind • Natural laws can be generated through scientific data • Seeing is believing	• Reality is in the minds of people and collectively constructed • Reality is determined by the lived experience of people, their mindset through interaction with their environment, context and other individuals • The way people act is determined by how they see themselves • People can act intentionally and only need opportunity and capacity
Approach/logic	• Deductive by objective observation, research questions, hypotheses	• Inductive approach, finding various interpretations of reality and patterns that guide human behaviour

<i>How people understand the way knowledge is developed</i>	- development and tested empirically. - Prediction, control and explanation of outcomes - Generalisations of universal laws - Replication of findings and use of theory	- Concerned with how humans understand meanings and make sense of their environment - Concerned with understanding the lived experiences of people - Concerned with the credible representation of the views of the people under study.
Axiology <i>The role of the participants, the research, values and participants</i>	- Value free - researcher is independent of the process; no room for bias, feelings, hopes, expectations or perceptions of the respondents or the researcher - Control measures introduced to avoid contamination of the study - Objective relationship between the researcher and the respondents.	- Value-laden - Focuses on understanding the beliefs that govern human behaviour - Bias, hopes, expectations and perceptions are key to the study - Respondents play a key role in the study; their views are considered paramount - Intense and prolonged interaction between the researcher and the respondents to gain deep insights
Common methods		
Mixed method practices	- Establishing causality, laws and relations through quantitative approach (survey using questionnaire) - Seeking relations through qualitative analysis	- Establishing theory and patterns through thematic analysis - Seeking meanings, understandings and interpretations through case studies (interviews)
Common techniques		
	- Identify participants suitable for the study - Draw questionnaire distribution schedule	Schedule interviews with detailed open questions, response taking tool (such as a audio recorder)

Source: Adapted from McGregor and Murnane (2010)

Appendix 3.2: The study's research approach/logic

Stage	Deductive	Inductive	Mixed approach
1	Theoretical framework development	No theoretical framework but the area of the study is identified	Constructs developed based on theoretical framework
2	Relevant variables identified for the study constructs	Respondents identify constructs and discuss them	Variables for constructs identified
3	Develop instruments	Participants identify broad themes	Theoretical framework converted into questions
4	Questionnaire distributions and response to specific questions obtained	Participants discuss broad themes of interest	Discussing of general questions and meaningful constructs identified
5	Analyse answers based on theoretical framework	Theory developed on inductive basis	Analyse data according to theory or theories developed inductively
6	Outcome Test theories to confirm or reject hypotheses	Outcome Theory developed	Either adapt existing theory or present another theoretical framework

Source: Adapted from Ali and Birley (1999)

Appendix 3.3: Attributes of research designs

	Quantitative research design	Qualitative research design	Mixed methods research design
Attributes			
Research philosophy	Mainly associated with positivism	Generally associated with interpretivism	Uses pragmatists philosophy E.g., use of quantitative analysis of published data and followed by qualitative research methods to explore perceptions

Types of designs/research strategies	Experimental designs such as quasi or single subject designs Non-experimental designs such as correlational and survey	Narrative Case study Phenomenology Narrative research Ethnographic	Convergent parallel Explanatory sequential Exploratory sequential Embedded, transformative or multiple phase research design
Theory development approach	Deductive approach	Inductive approach	Deductive, inductive or abductive approach
Features	Examines relationship between variables measured numerically Analyses data using various statistical and graphical techniques Uses controls to ensure data validity	Studies participants' meanings Data collection is not standardised Uses non-probability sampling techniques Research success depends on building rapport and demonstrating sensitivity with participants	Combines both quantitative and qualitative techniques in several manner that ranges from simple, concurrent and to more complex ones Concurrent mixed methods: uses both quantitative and qualitative methods in a single study to collect and analyse data Sequential exploratory: qualitative followed by quantitative

	Often uses probability sampling technique	May use single data collection technique such as semi-structured interview	Sequential explanatory: quantitative followed by qualitative
	Research is independent from object of research		Sequential multiphase: qualitative followed by quantitative, and then followed by qualitative
	May use single data collection technique e.g. questionnaire		

Sources: (Creswell, 2014; Saunders et al., 2016)

Appendix 3.4: Common elements of response rates and improvement strategies

Response rate factor	Explanation	Improving the response rate factor
Location rate	The percentage of participants in the sampling frame who are located	Used phone directories, staff movement/transfer lists
Eligibility rate	Number of contacted participants qualified to participate	Respondents were properly defined (senior staff only could complete the questionnaire)
Cooperation rate	The percentage of participants who are eligible and ready to participate	Emphasised anonymity, confidentiality as well as share the summary of the study with interested respondents
Contact rate	The percentage of respondents who are located and contacted	Made calls and sent messages with the contact persons as agreed
Completion rate	The percentage of participants cooperating and completing the survey	Questionnaires delivered to participants by research assistant, followed by three reminders

Source: Neuman (2014).

Appendix 3.5: Measurement items

1 – Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly agree

Inbound open innovation						
<i>In our organisation, for our new technology acquisition</i> (Sisodiya et al., 2013)						
IOI1	scan the external environment for inputs such as technology, information, ideas, knowledge, etc.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
IOI2	actively seek out external sources (e.g., research groups, universities, suppliers, customers, competitors, etc.) of knowledge and technologies when acquiring new technologies	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
IOI3	believe it is good to use external sources (e.g., research groups, universities, suppliers, customers, competitors, etc.) to complement our own information technology unit.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
IOI4	Often take part in bringing in externally developed knowledge and technology to use in conjunction with our own internally developed capabilities	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
IOI5	seek out technologies and patents from other organisations, research groups, or universities	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Employee Involvement						
EI1	I am encouraged to be totally involved in all decision-making processes	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
EI2	Management lets me participate in achieving organisational objectives	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
EI3	I enjoy working towards achieving organisational goals	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
EI4	I do my best to solve problems that arise in my job	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
EI5	At work, I persist through challenges	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

EI6	I look for innovative ways to do my job efficiently	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
EI7	I participate in activities that will influence my performance evaluation	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
EI8	I fulfil the assigned responsibilities and duties defined in my job description	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
EI9	I am enthusiastic about my work	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
EI10	This organisation inspires me to perform my job	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
EI11	I am allowed to make decisions towards technology acquisition	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
EI12	My contributions are valued by the organisation	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Technology Scouting (Wang et al., 2015)						
TS1	I regularly observe technology trends in my organisation.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
TS2	I usually consider external sources for ideas and knowledge as important for my organisation	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
TS3	I usually collect deep information on our industry for my organisation.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
TS4	I play a role when my organisation adopts contract agreements with research institutions and universities for acquiring new technologies.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
TS5	I play a role when my organisation searches and buys new technology from other organisations and institutions	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Search Capacity						
<i>I have used the following information sources in the technology search process</i> (Ahn et al., 2016)						
SC1	Marketing channels, such as clients, customers and suppliers	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
SC2	Universities or higher education institutes	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

SC3	Specialized channels, such as technical standards, regulations, etc	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
SC4	Human networks, such as Chief Executive Officer/Chief Technology Officers' informal meeting, human network, newly employed workers	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
SC5	Expert level information, such as patent or journal database	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
SC6	General information media, such as trade fairs, conferences, the internet	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
SC7	Other institutional channels, such as other organisations, public/private research institutes	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
	Integrative Capacity (Ahn et al., 2016)					
IC1	I play an important role in adapting the information/technology from outside to improve processes	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
IC2	The information/technology adapted from outside has widely been used to improve service delivery.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
	<i>In my organisation:</i>					
IC3	I regularly write formal reports and memos that summarizes technology learning	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
IC4	I share information during meetings about external technology	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
IC5	I have face-to-face discussions involving all functional teams	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
IC6	I am involved in the integration of technology through the use of experts and consultants	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
IC7	I am encouraged to do formal analysis of failing existing technology	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
IC8	I am encouraged to do formal analysis of successful technology integration	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
	Knowledge Recognition (Lowik et al., 2017)					

KR1	I am always actively looking for new knowledge for my work	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KR2	I intentionally search for knowledge in many different domains to look “outside the box”	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KR3	I am good at distinguishing between profitable opportunities and not-so-profitable information or opportunities	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KR4	I easily identify what new knowledge is most valuable to us	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
	Knowledge Acquisition (Fernhaber and Patel, 2012)					
	<i>In my organisation:</i>					
KA1	I have frequent interactions with other organisations in the industry to acquire new knowledge	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KA2	I engage in cross- functional work	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KA3	I collect information through informal means (e.g. social gatherings with customers and suppliers, trade partners and other stakeholders	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KA4	We are in touch with other stakeholders in the industry	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KA5	I organize special meetings with customers, suppliers, or third parties to acquire new knowledge on process and distribution related innovation.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KA6	I regularly approach third parties outside the industry (such as professional organisations) to gather information.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
	Knowledge Capture (Prajogo & Ahmed, 2006; Chen & Huang, 2009)					
KC1	I am trained in organisation-wide development process, including career path planning	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KC2	I understand the organisation’s ‘top–down’ and ‘bottom–up’ communication processes	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

KC3	My performance satisfaction is formally and regularly measured	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KC4	My experience, knowledge and skills are actively used to support performance improvement.	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KC5	I always maintain a work environment that contributes to the health, safety and well-being of all employees	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
	<i>In my organisation, there are established processes where I:</i>					
KC6	obtain knowledge from customers	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KC7	obtain knowledge from partners	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KC8	obtain knowledge from colleagues	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KC9	share knowledge between supervisors and subordinates	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KC10	share knowledge between employees	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KC11	share knowledge between units/sections/departments	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KC12	effectively manage knowledge into practical use	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
KC13	effectively utilize knowledge into practical use	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
	Knowledge Assimilation (Jansen et al., 2005; Fernhaber & Patel, 2012; Lowik et al., 2017)					
ASS1	I frequently share my new knowledge with colleagues to establish a common understanding	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
ASS2	I translate new knowledge in such a way that my colleagues understand what I mean	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
ASS3	I communicate newly acquired knowledge that might be of interest for our unit	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
ASS4	I quickly analyze and interpret changing business demands	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

ASS5	I quickly understand new opportunities to serve our clients	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
ASS6	I am slow to recognize shifts in our market (e.g., competition, regulation, demography)	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
ASS7	I am able to quickly identify new opportunities to meet our customer needs	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

OTHER INFORMATION

1. **Gender:** Male ☐ Female ☐

2. **Age:**

Below 25yrs ☐ 25 – 35yrs ☐ 36– 46yrs ☐ 47– 57yrs ☐

Above 58yrs ☐

3. **Education:**

SHS/TVET ☐ Diploma ☐ Degree ☐ Masters ☐ Post Graduate ☐

4. **Number of years worked at this organisation**

Under 5 yrs ☐ 6-15yrs ☐ 16-25yrs ☐ 26-35ys ☐ Above 36yrs ☐

5. **Department**

Customs Division (CD) ☐ Domestic Tax Revenue Division (DTRD) ☐

Support Services Division (SSD) ☐

6. **Rank**

Assistant Revenue Officer (ARO) to Principal Revenue Officer (PRO) ☐

Chief Revenue Officer (CRO) to Deputy Commissioner (DC) ☐

7. **What is the level of collaboration between the Policy and Program (P&P) department and the rest of the organisation?**

Low [] Medium [] High [] Have no idea [] Not
applicable []

NOBEL INTERNATIONAL BUSINESS SCHOOL (NiBS)

DOCTOR OF PHILOSOPHY(PhD) IN BUSINESS ADMINISTRATION

QUESTIONNAIRE FOR GHANA REVENUE AUTHORITY (GRA)

This questionnaire is designed to obtain responses from your organisation for a dissertation on the topic:

The role of individual employees in organisational innovativeness: an intra-organizational level analysis.

This dissertation is required to be completed in partial

fulfilment of the requirements for the award of a Doctor of Philosophy (PhD) degree by the Nobel International Business School (NiBS)/Ghana Institute of Management and Public Administration (GIMPA).

Please answer all questions honestly by ticking (✓) the appropriate option for each item

The data gathered from this questionnaire shall be treated with utmost confidentiality and shall be used for the research purpose only.

Thank you,

SURVEY QUESTIONNAIRE

1 – Strongly disagree, 2 – Disagree, 3 – Neutral, 4 – Agree, 5 – Strongly agree

Market Turbulence (Sisodiya et al., 2013)						
MT 1	I cater for more customers' needs now than two years ago	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
MT2	Generally, the revenue performance of the organisation has been unstable for the past two years	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
MT3	Demands and behaviours of customers are not easy to predict	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Technology turbulence (Sisodiya et al., 2013)						
TT1	The technology in our industry is changing rapidly	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
TT2	A lot of revenue enhancement measures have been achieved through technological implementations	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
TT3	In our industry, the modes of operations and service delivery often change	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
Organisational innovativeness (Tsai & Yang (2013))						
FI1	I readily accept technology implemented based on research results	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
FI2	Management actively seeks innovative ideas	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
FI3	Management readily accepts innovation based on ideas from employees	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
FI4	I am encouraged and supported to undertake innovative activities	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
FI5	My new ideas are quickly accepted in our organisation	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐

Appendix 3.6: The study's qualitative interview guide

Name of respondent:

Division and Rank:

Date and time of interview:

Duration of the interview:

Comments before the interview: ...

Introduction

To facilitate the interview, our conversation would be recorded. The recorded conversation can only be accessed by participants in this conversation. The conversation will eventually be deleted after they are transcribed and used for the purpose.

The interview is planned to last for not more than one hour (60 minutes). Within this time, several areas would be covered. Besides the already stated questions, our line of conversation might raise some extra questions and comments.

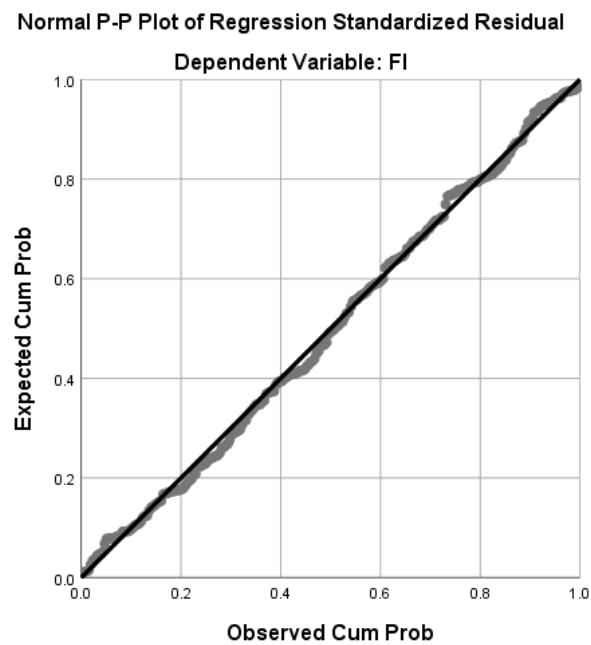
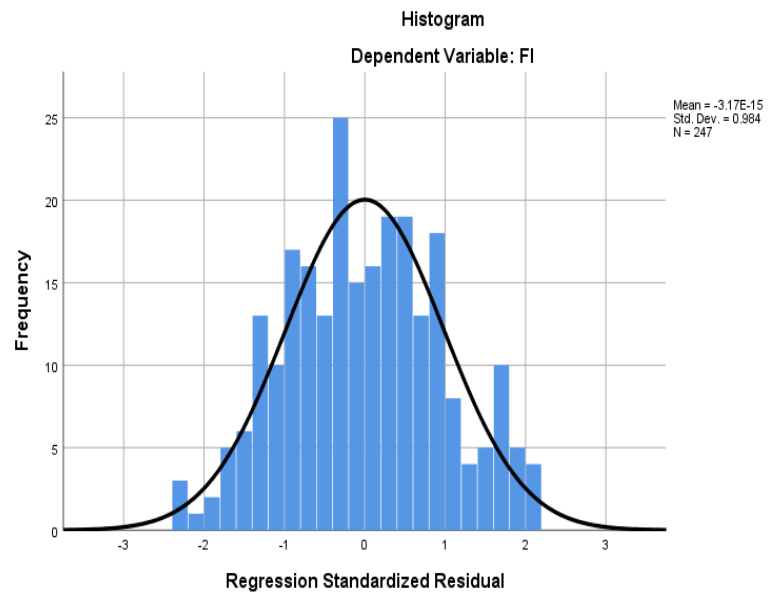
You were selected to participate in this conversation because you have been identified as someone who has a great deal of management knowledge to share about innovation activities in the organisation. This PhD thesis generally focuses on IOI activities in the public sector (as explained earlier) with specific interest in understanding its contribution to organisational innovativeness. This research does not aim to evaluate your organisation's activities, actions or your own experiences. Instead, the study seeks to learn and understand more about role and behaviour of the individual employee during the technology in-flow process. In any case your participation in this interview process is voluntary.

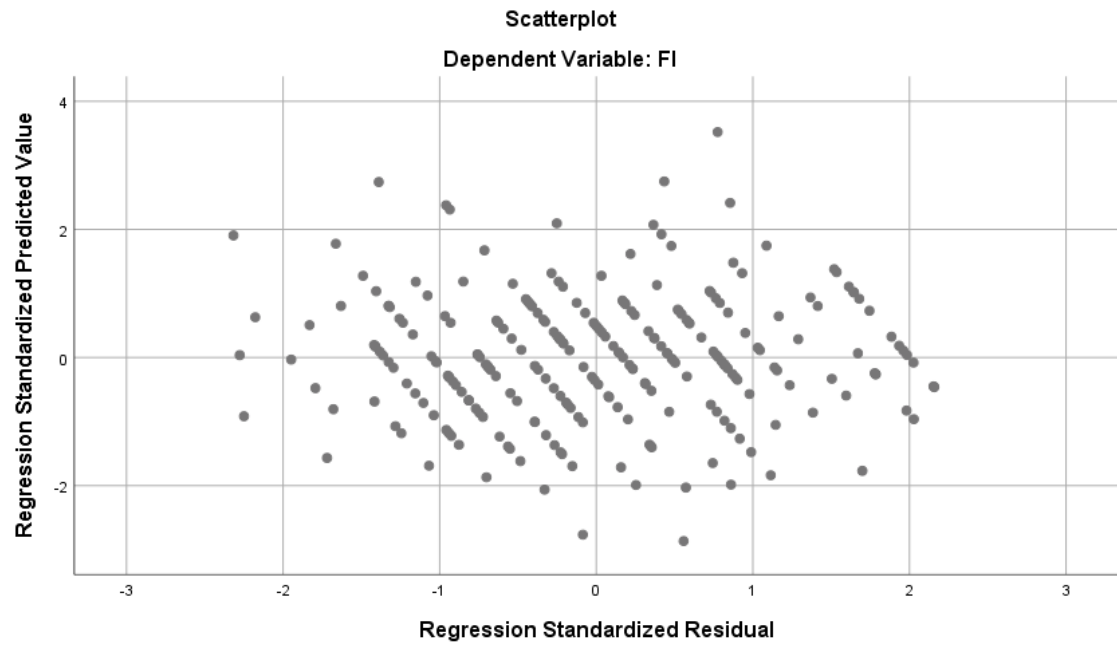
Interview questions

1. Please describe how your organisation obtains its external technology.
2. Who are those mostly involved in the innovation activities of your organisation? In terms of discussions with top management, employees or imposed by political leadership.
3. In your organisation, what are the internal resources, practices and skills (capabilities) required to introduce innovation?

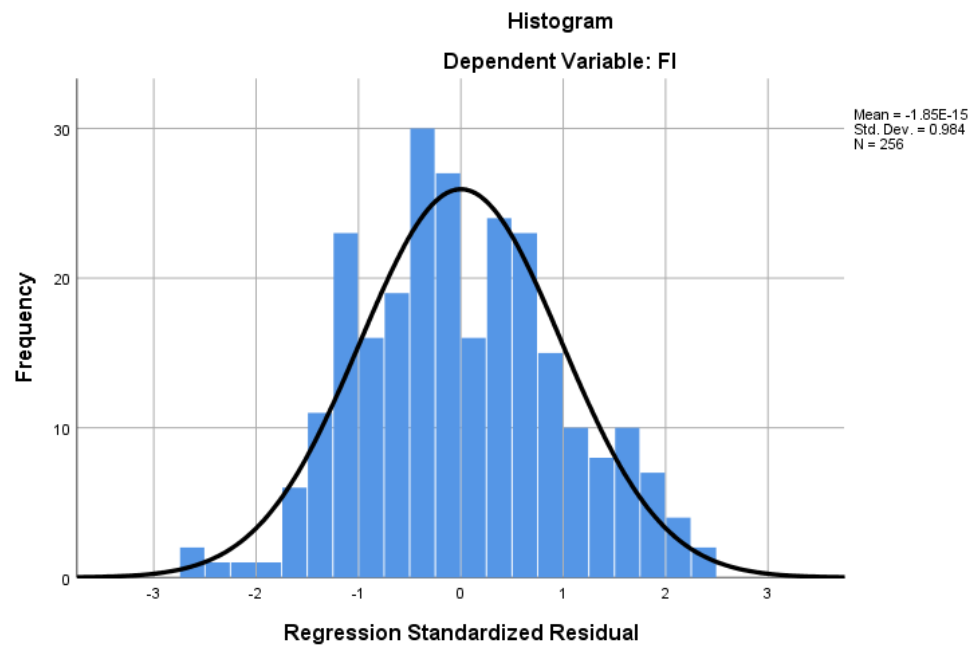
4. Please describe how your employees behave when political leadership suggest and acquire external technology for your organisation to implement.
5. In your organisation, how does involving employees in the technology search process affect their willingness to innovate?
6. What role does the information technology (IT) department as a functional unit play in monitoring emerging technologies and threats from the external environment?

Comments after the interview:

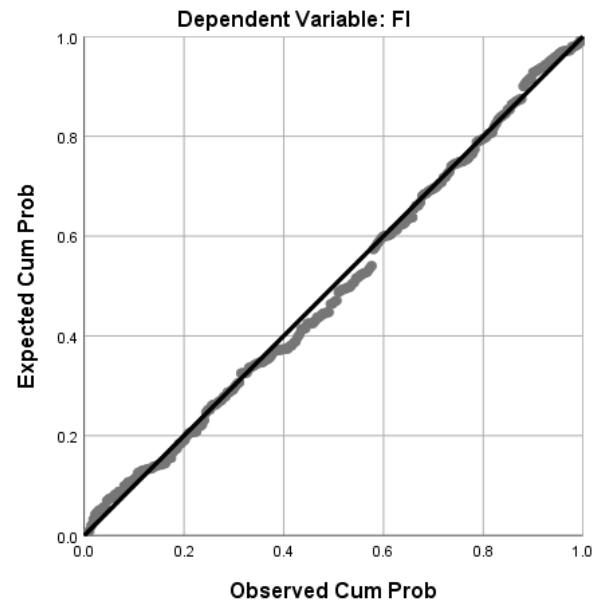
Appendix 4.1: Normality test and homoscedasticity for inbound open innovation



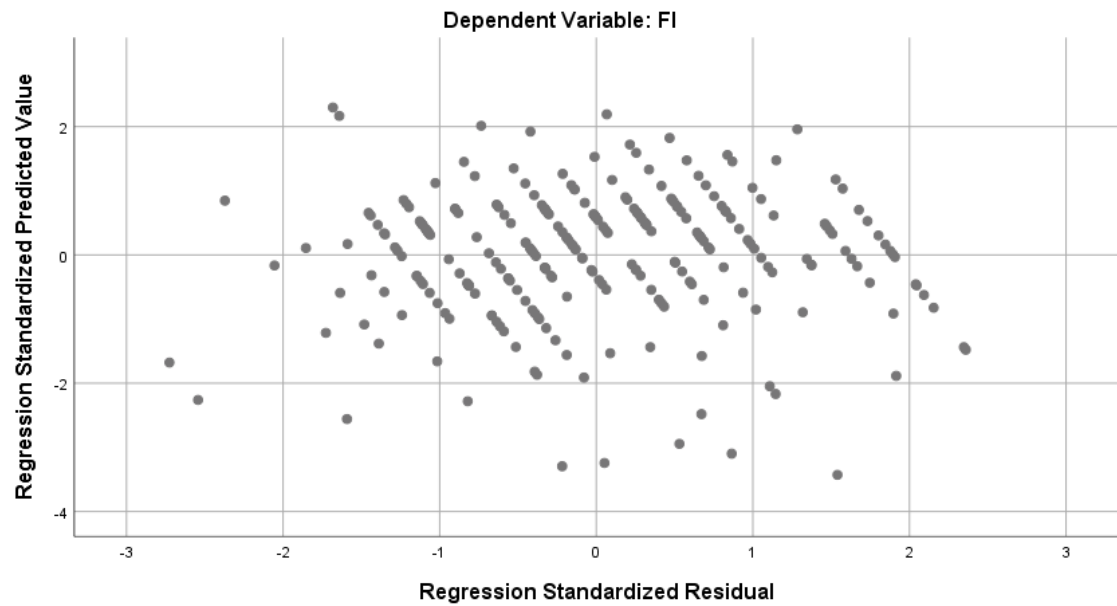
Appendix 4.2: Normality test and homoscedasticity for employee involvement

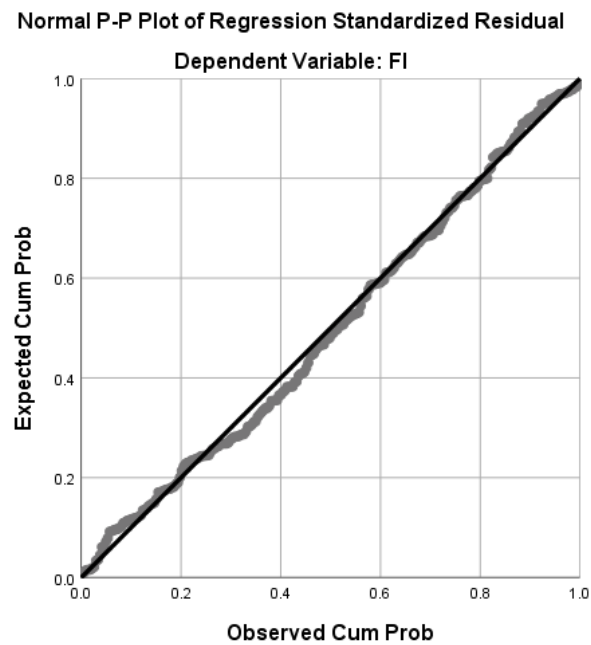
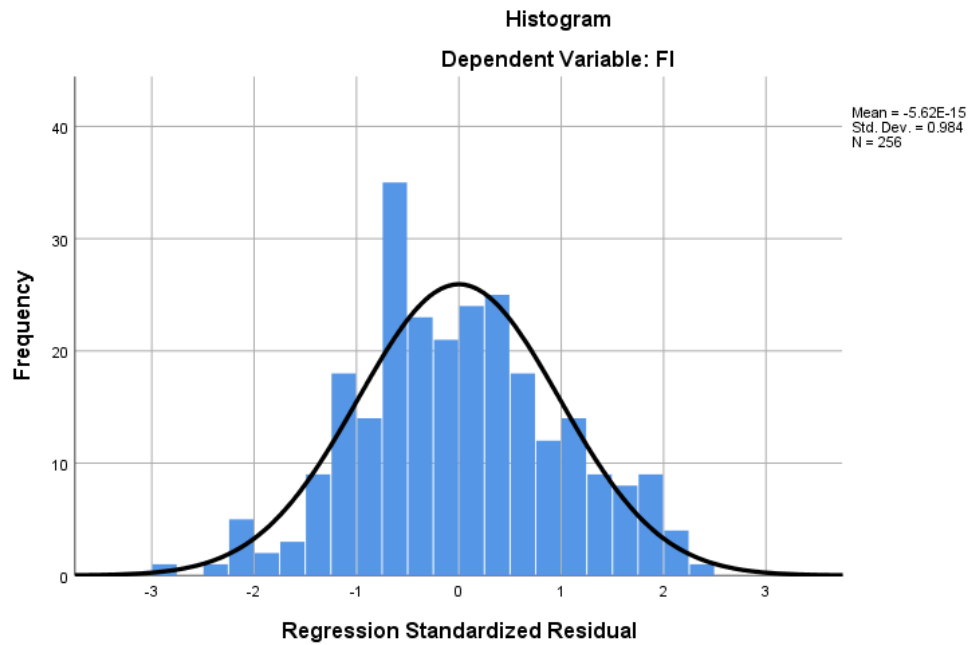


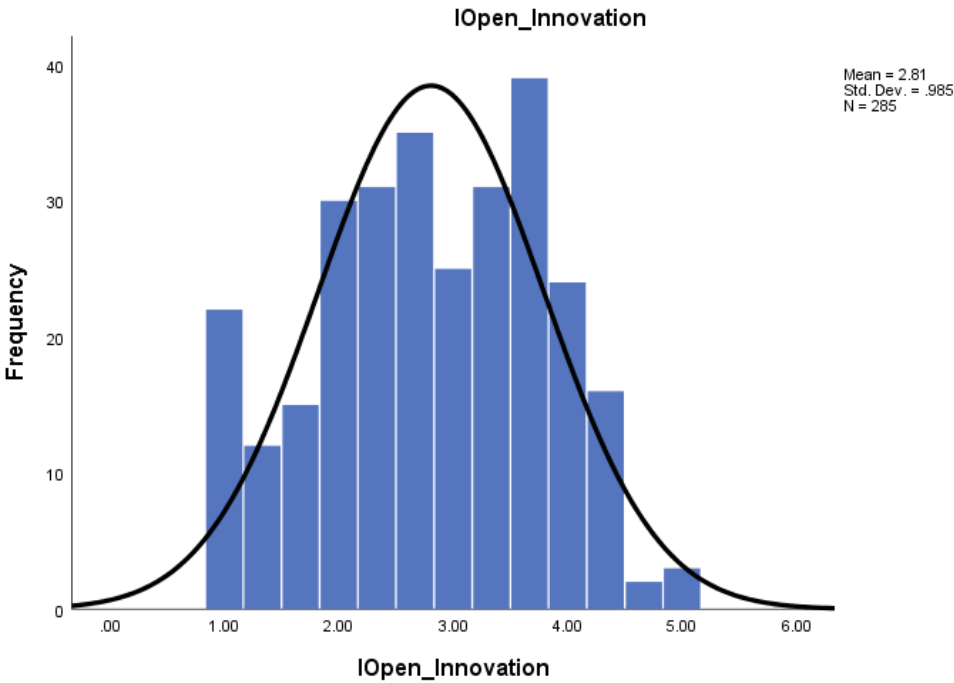
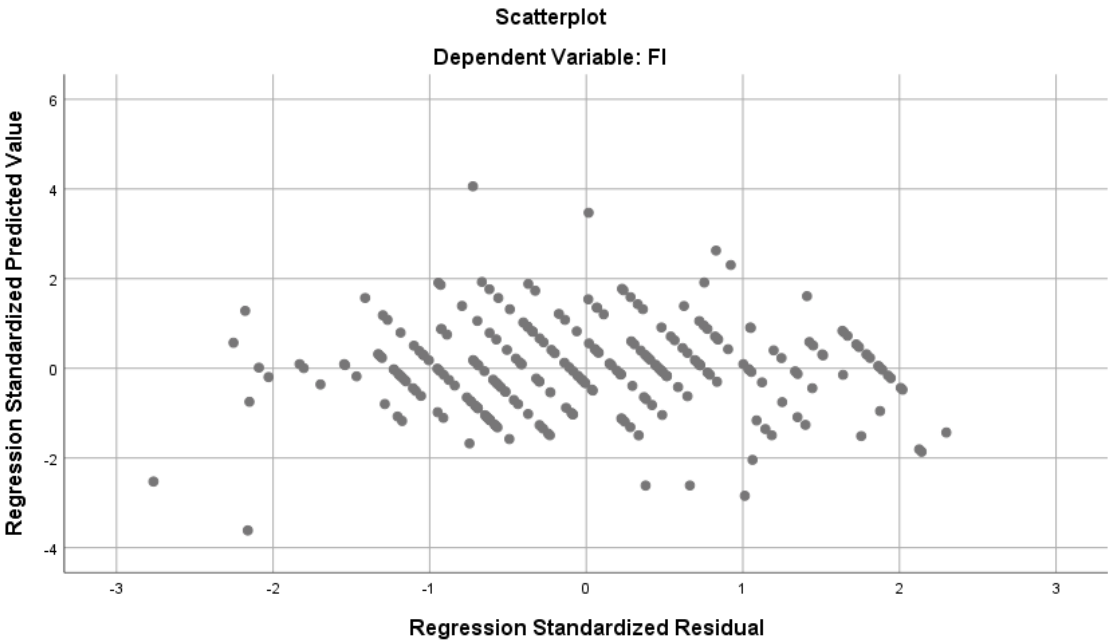
Normal P-P Plot of Regression Standardized Residual

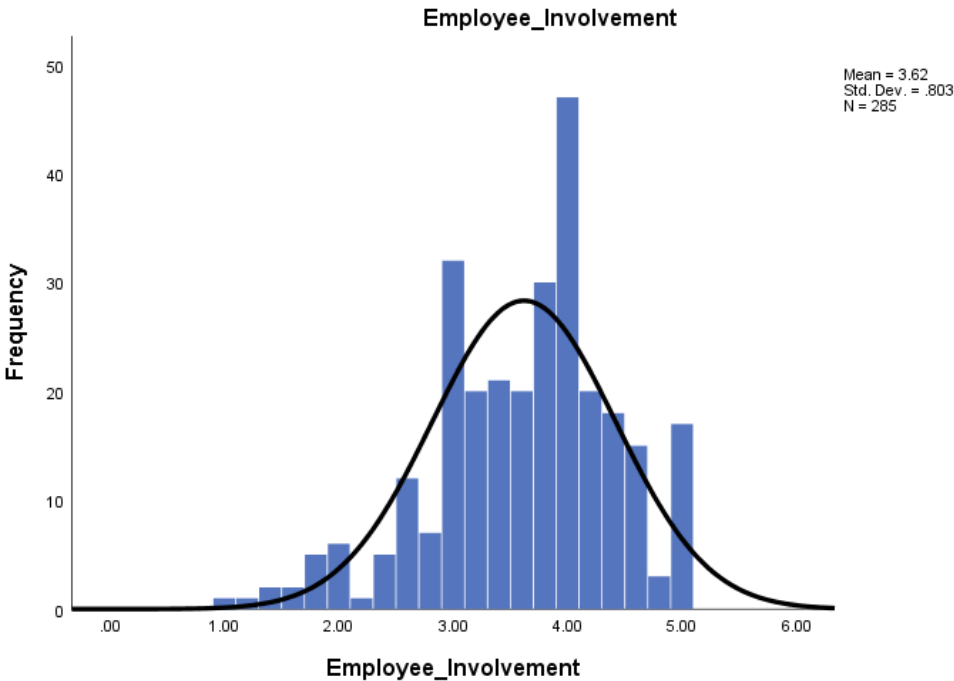
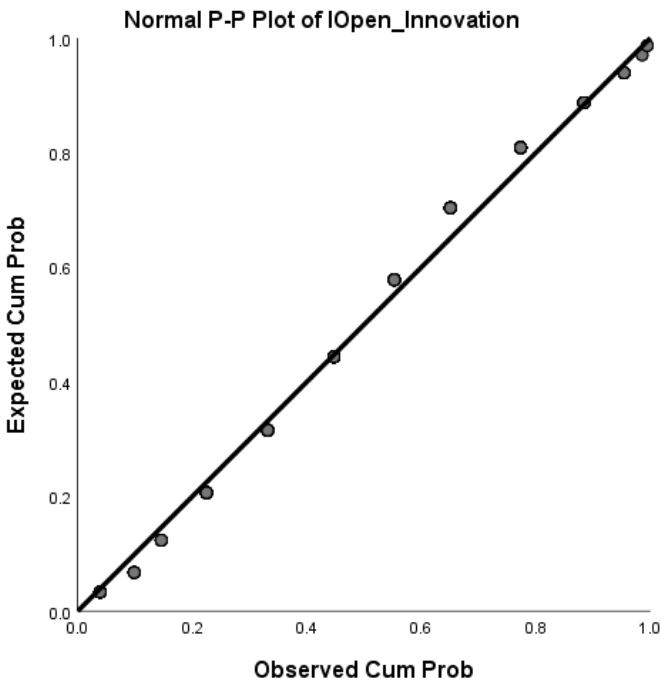


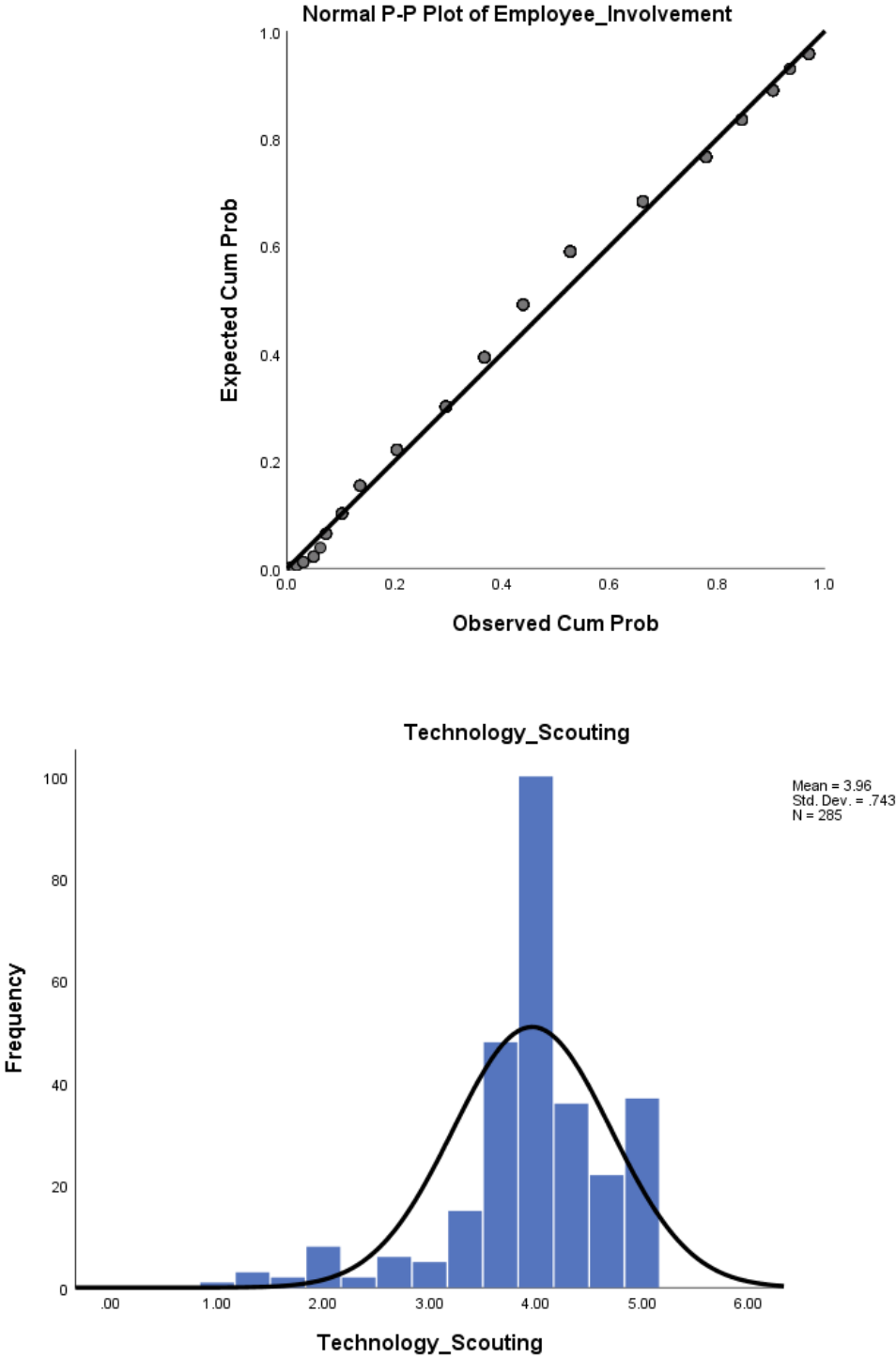
Scatterplot

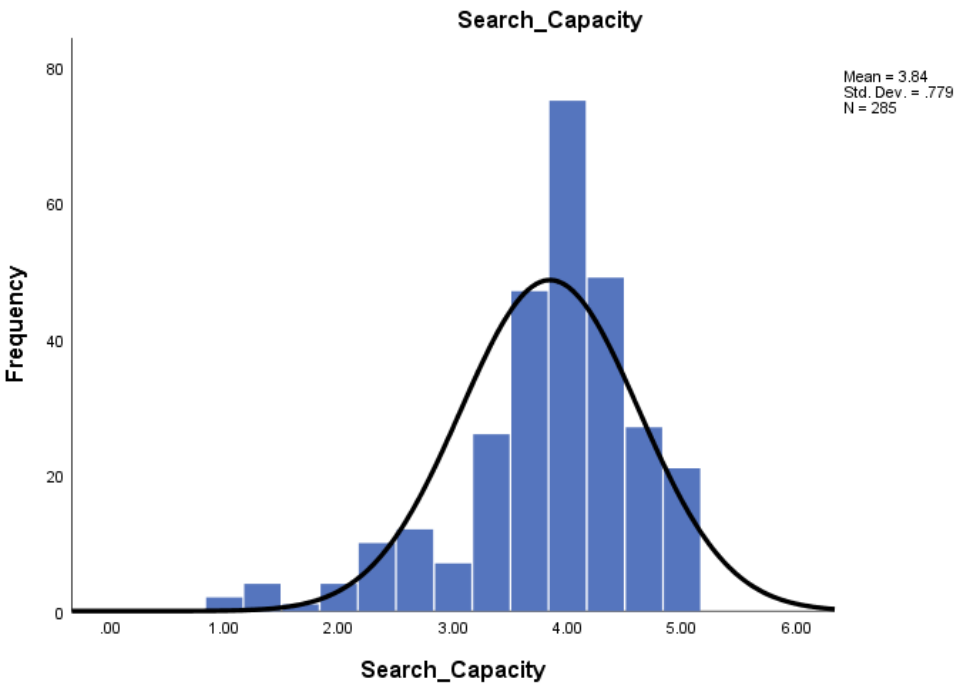
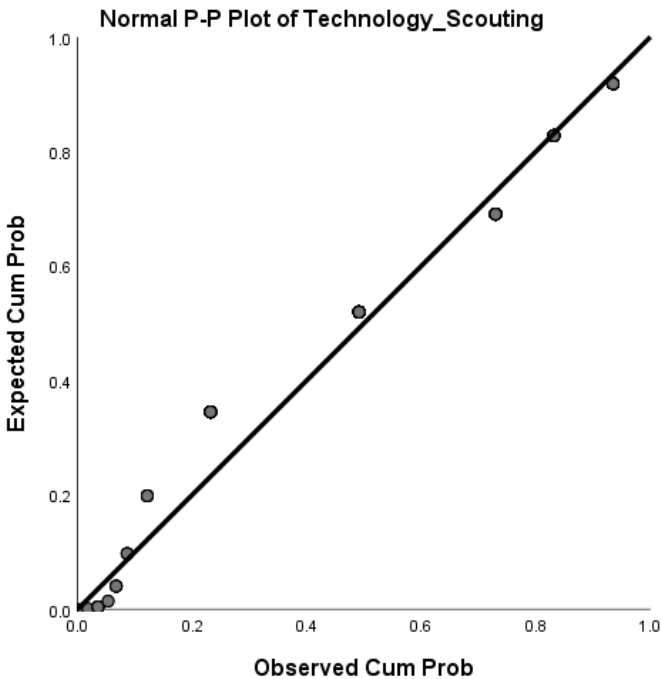


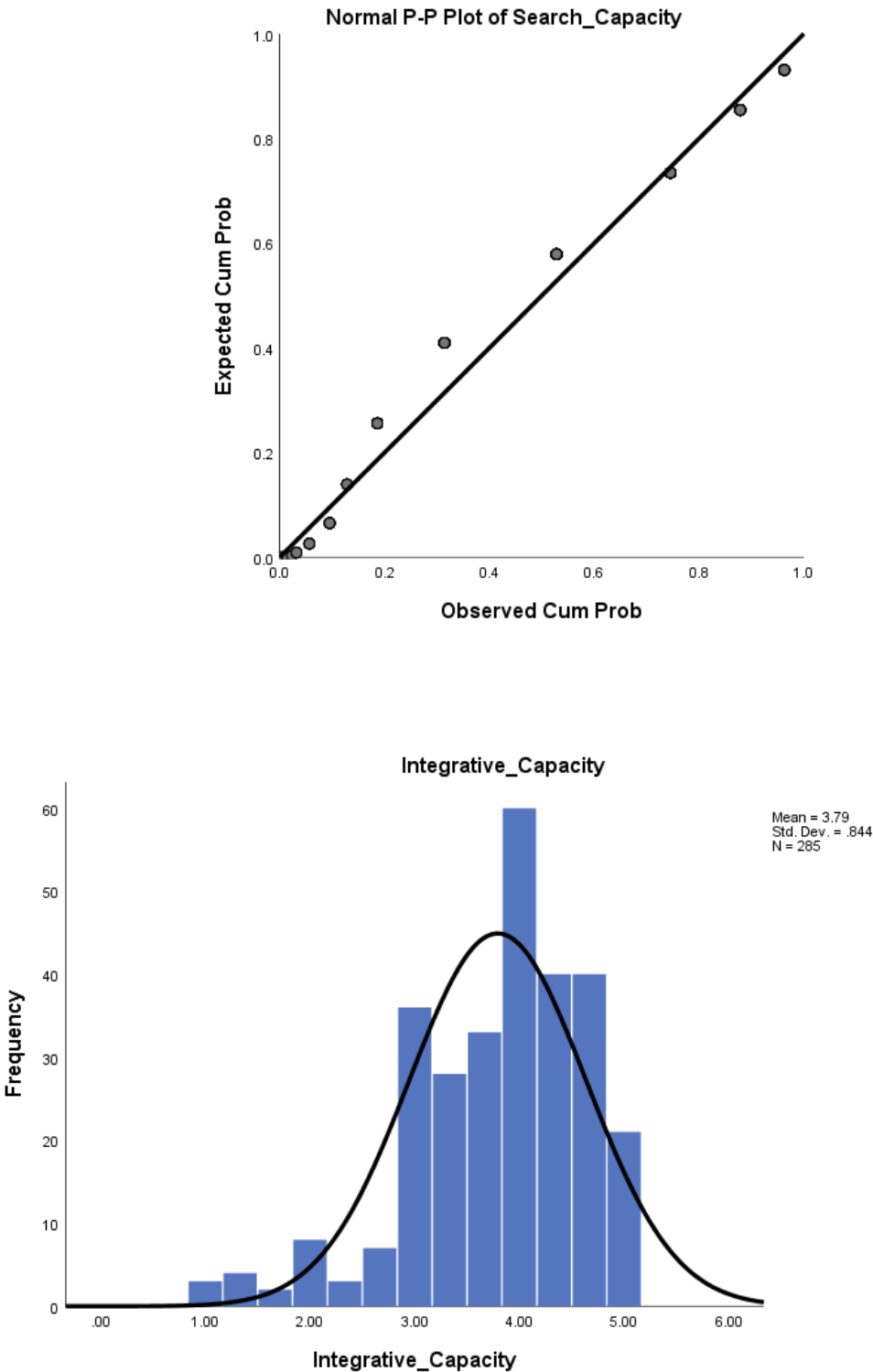
Appendix 4.3: Normality test and homoscedasticity for technology scouting

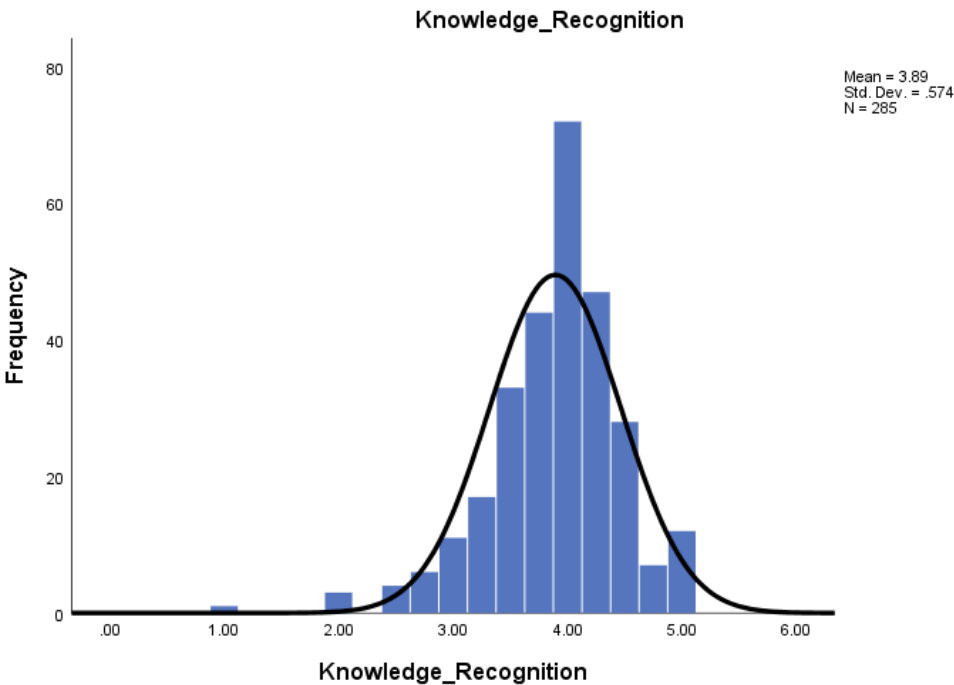
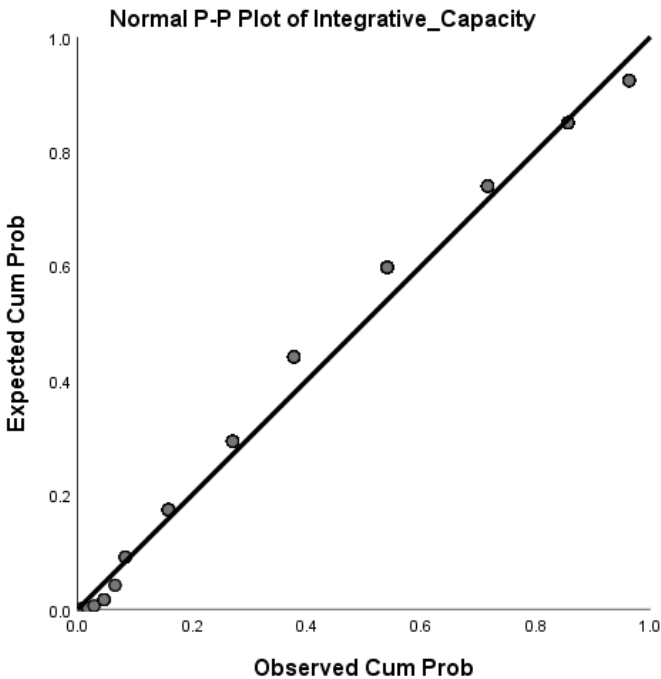


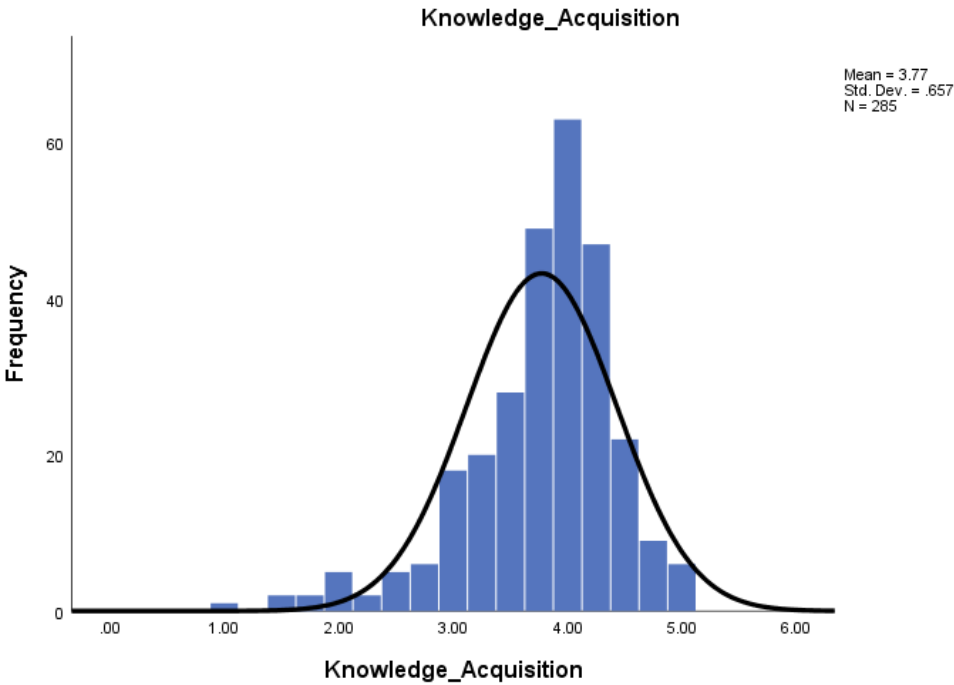
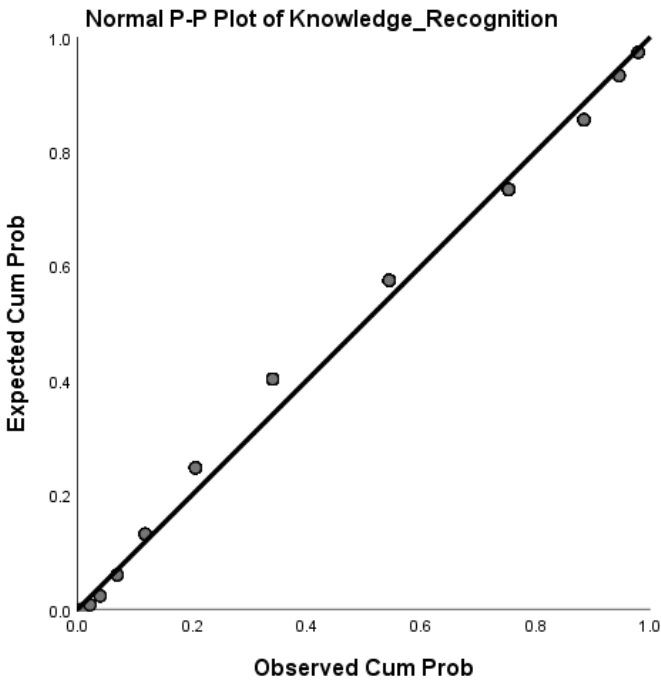


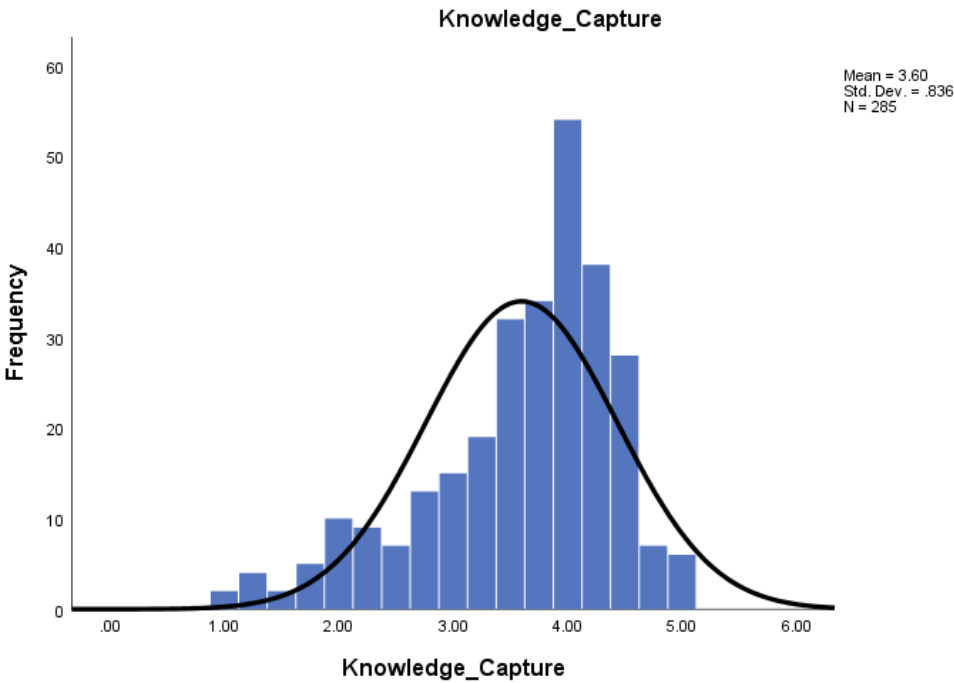
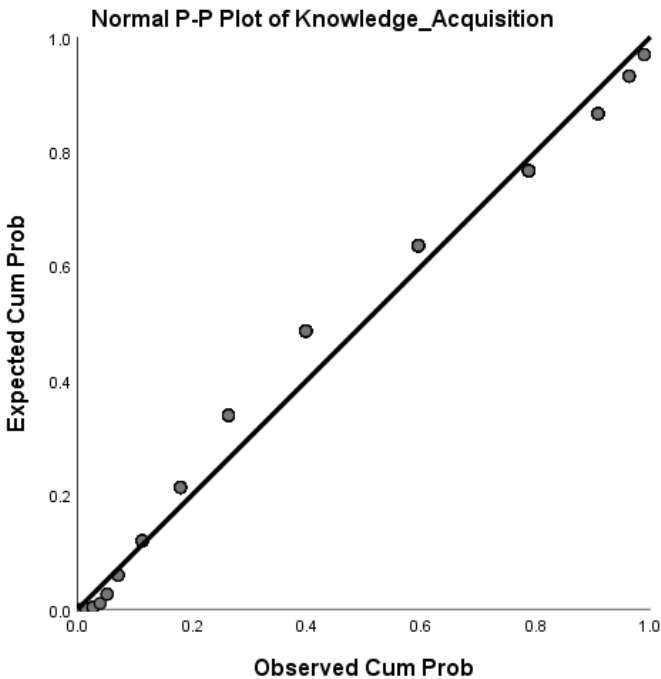


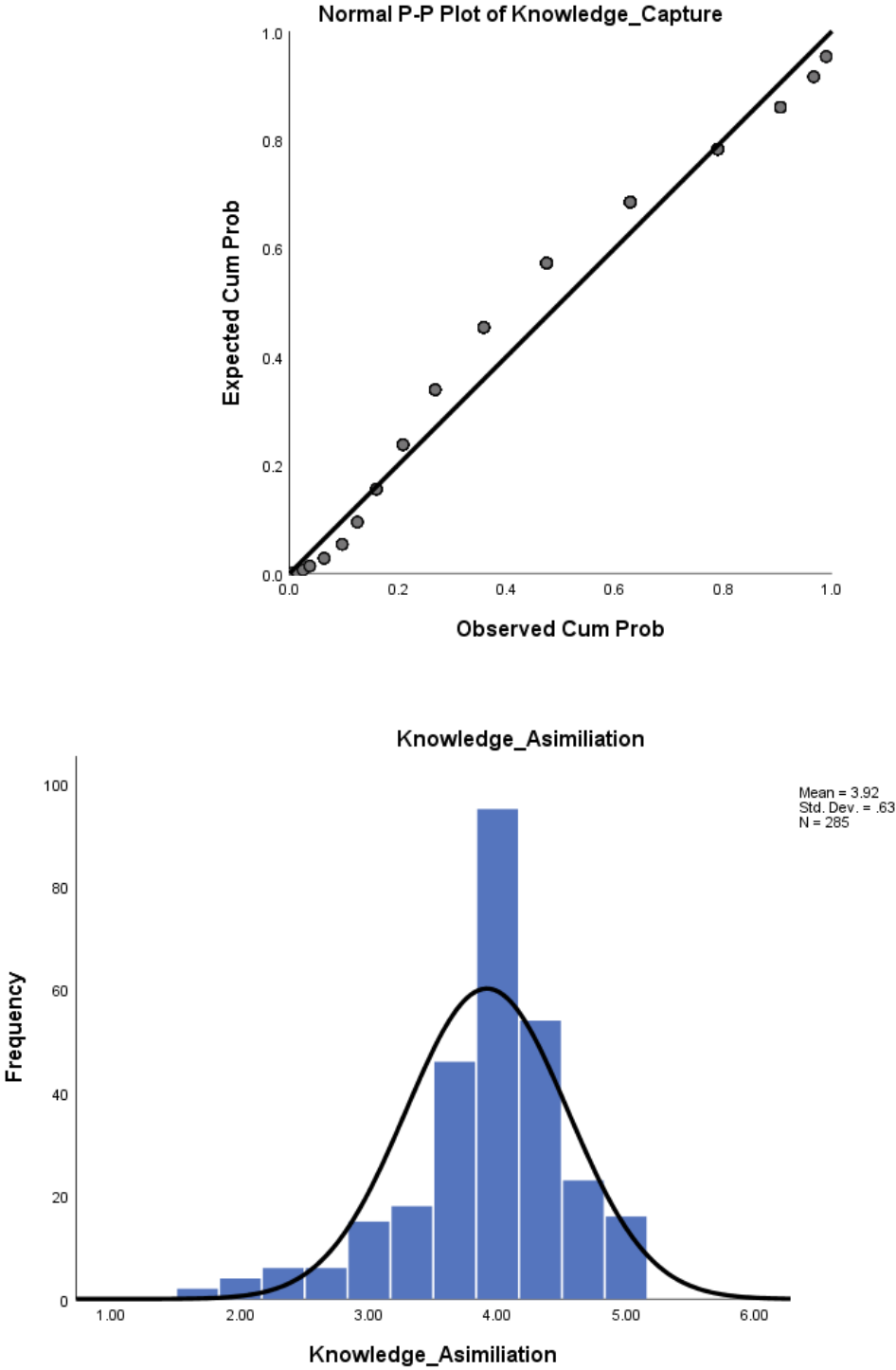


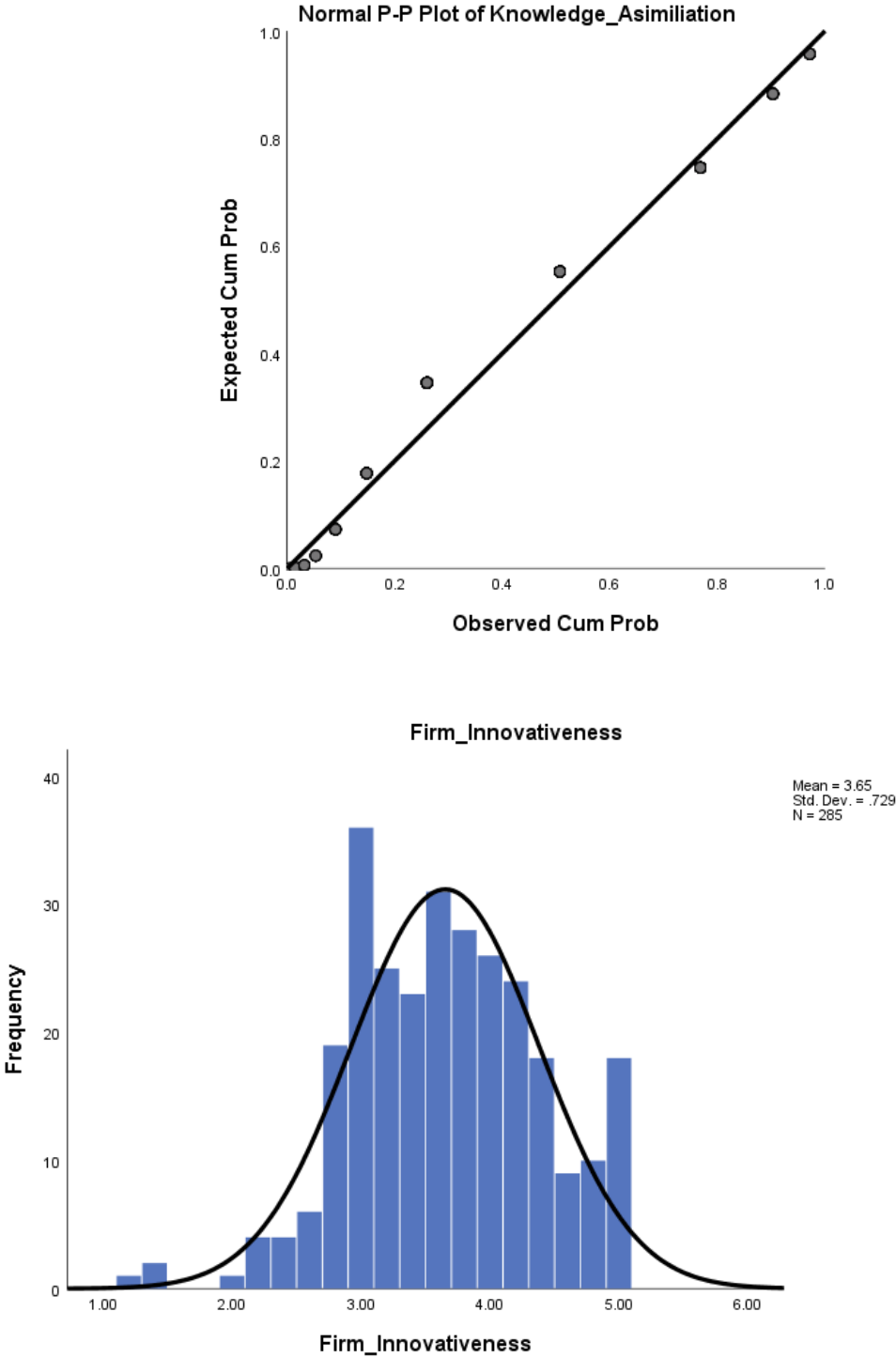


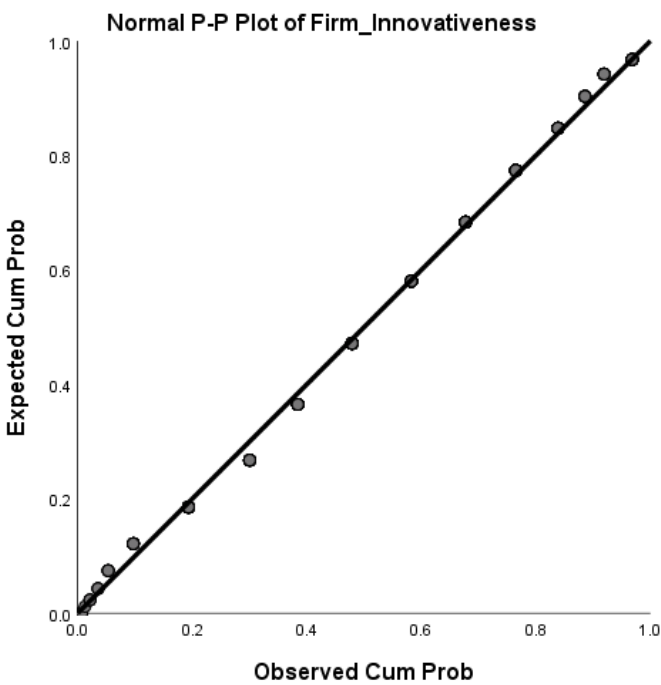












Appendix 4.4: Total variance explained

Component	Total	Initial Eigenvalues		Extraction Sums of Squared Loadings		
		% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	13.158	13.426	13.426	13.158	13.426	13.426
2	8.728	8.906	22.332	8.728	8.906	22.332
3	5.476	5.587	27.920	5.476	5.587	27.920
4	3.931	4.011	31.931	3.931	4.011	31.931
5	3.315	3.383	35.314	3.315	3.383	35.314
6	2.889	2.948	38.262	2.889	2.948	38.262
7	2.338	2.385	40.647	2.338	2.385	40.647
8	2.217	2.263	42.910	2.217	2.263	42.910
9	2.137	2.181	45.090	2.137	2.181	45.090
10	1.985	2.026	47.116	1.985	2.026	47.116
11	1.959	1.999	49.115	1.959	1.999	49.115
12	1.832	1.869	50.984	1.832	1.869	50.984
13	1.675	1.710	52.694	1.675	1.710	52.694
14	1.669	1.703	54.397	1.669	1.703	54.397
15	1.574	1.606	56.003	1.574	1.606	56.003
16	1.442	1.471	57.474	1.442	1.471	57.474
17	1.404	1.433	58.907	1.404	1.433	58.907
18	1.363	1.390	60.298	1.363	1.390	60.298
19	1.334	1.362	61.659	1.334	1.362	61.659
20	1.260	1.285	62.945	1.260	1.285	62.945
21	1.203	1.228	64.173	1.203	1.228	64.173
22	1.185	1.209	65.381	1.185	1.209	65.381
23	1.144	1.168	66.549	1.144	1.168	66.549
24	1.099	1.121	67.671	1.099	1.121	67.671
25	1.070	1.091	68.762	1.070	1.091	68.762
26	1.037	1.058	69.820	1.037	1.058	69.820
27	.982	1.002	70.822			
28	.951	.970	71.793			
29	.907	.926	72.718			
30	.876	.894	73.612			
31	.851	.869	74.481			
32	.833	.850	75.331			