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Strategies to Cultivate Sustainable Open Innovation Culture in High-Tech Organizations

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This is to certify that the doctoral study by

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Abstract

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by

Eyal Banai

MS, George Washington University, 1998

BS, University of Maryland, 1984

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Business Administration

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Abstract

Business leaders must adopt new business practices to sustain their organizations and meet the paradigm of global competition. In the 21st century, innovation and market readiness have become the primary criteria for sustainability of an organization. Some organizational leaders should adopt open innovation strategy to stay competitive and foster a positive impact on their organizations' performance while practicing a systematic inclusion of knowledge from sources outside of the organization. The purpose of this multiple case study was to explore effective strategies business leaders use to cultivate a sustainable open innovation culture. The population consisted of leaders from 200 high technology organizations in the Washington, D.C. area. Purposeful sampling was used to select 4 organizations whose leaders demonstrated successful cultivation of open innovation culture. Schein's culture theory was the conceptual framework for this study. Data were collected through semistructured interviews and review of the organizations' annual reports, publications, websites, and brochures. Data analysis was based on Vaismoradi, Turunen, and Bondas's systematic content and thematic analysis approach, proceding from study data to codes to themes. The outcome led to 4 primary themes: organizational strategic alignment, collaboration as a force multiplier for innovation, organizational culture change, and expert understanding of the customers' needs. Implications for positive social change include fostering innovative organizations whose members bring to the market cost-effective solutions and bridge between market needs and technological solutions. Members of innovative organizations impact underserved communities in terms of material wealth, social welfare, and employment opportunities.

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Dedication

This study is dedicated to my parents, who taught me that gaining knowledge is ageless. This achievement is also dedicated to my wife, Shuki and my children, Yoav, Keren, Rotem, and Leemor, for all of the support and patience they granted me throughout this long doctoral journey.

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Section 1: Foundation of the Study

Open innovation is the flow of knowledge to and from an organization, accelerating internal innovation, enhancing competitiveness, reducing development expenses, and expanding presence in new and existing markets (Chesbrough, 2006a). Open innovation includes the flow of knowledge beyond innovation, encompassing the information generated from all of the organization's activities (Frow, Nenonen, Payne, & Storbacka, 2015), and moves innovation beyond the boundaries of a particular organization (Markman, 2016).

Organizational culture is a key to innovation (Büschgens, Bausch, & Balkin, 2013), and there is a significant link between organizational open innovation culture and an organization's innovation performance (Laursen & Salter, 2006). However, Hutter, Hautz, Repke, and Matzler (2013) found, in their study of 15 small and medium-sized enterprises across a broad range of industries in northern Italy, that more than 85% did not have an open innovation culture. The purpose of this study was to explore effective strategies that business managers of high-technology organizations are using to cultivate and sustain an open innovation culture successfully.

Background of the Problem

The pressure of increasing global business competition compels business leaders to sustain innovation to achieve and maintain a competitive advantage (Fonseca & Lima, 2015). Organizations that aim to stay competitive must find untapped sources of innovation to compete effectively in fast-moving global markets (Changil & Heesang, 2014). The *not invented here* (NIH) culture is the internal resistance within a company to

externally developed knowledge (Hussinger & Wastyn, 2015). Business leaders must strive to overcome the mental barriers of NIH within their organizations to build future competitive capabilities (Schneckenberg, 2014). Organizational openness to adaptation and utilization of external knowledge enables organizations' increased innovation performance (Monteiro, 2016). Open innovation is a new method for moving knowledge into and out of the organization that challenges the traditional approach to innovation management, which has focused on product development through internal knowledge and resources (Hossain, Islam, Sayeed, & Kauranen, 2016). Business leaders who implement open innovation methods challenge the traditional approach by going beyond the organization's boundaries to achieve or enhance its innovative capabilities (Sulaiman, Parimoo, & Banga, 2016). Changes in the global high-technology market have led to the elimination of geographical trade borders and have also made open innovation practices a significant enabler of organizations' competitiveness (Sulaiman et al., 2016). However, some business managers of high-technology companies, such as Kodak, have not opened up their innovation process to fill organizational knowledge gaps and lack strategies to integrate existing open innovation techniques into the organization's innovative ideas in order to increase competitiveness (Virlee, Hammedi, & Parida, 2015).

Problem Statement

The systematic exclusion of knowledge from sources outside of the organization, also described as a closed innovation, has a negative impact on the organization's competitiveness and performance (Antons & Piller, 2015). In a study of 15 small and medium-sized organizations in northern Italy, Hutter et al. (2013) found that more than

85% did not cultivate an open innovation culture. The ability of an organization to be innovative through identification, absorption, cultivation, and dissemination of knowledge has become a primary driver and vital enabler of organizations' survivability and competitiveness (Coras & Tantau, 2014). The general business problem is that some business leaders of high-technology organizations do not cultivate an effective open innovation culture in response to the globalization of the market and the increased competition. The specific business problem is that some business leaders of high-technology organizations lack effective strategies with which to cultivate a sustainable open innovation culture.

Purpose Statement

The purpose of this qualitative multiple case study was to explore effective strategies that business leaders of high-technology organizations use to cultivate a sustainable open innovation culture. The targeted population included 200 high technology organizations in the Washington, D.C. area who specialize in addressing emerging clients' demands effectively in a relatively short period. This population was appropriate for this study because the chosen firms have effective strategies for open innovation.

Individuals in industrialized parts of the world have become increasingly convinced of the importance of science and technology in social change and the impact of innovation on society in terms of material wealth, social welfare, and employment opportunities (Yearley, 2014). There is also a significant correlation between organizational open innovation culture and organizations' innovation performance

(Laursen & Salter, 2006). Through the implementation of open innovation, business leaders can lead their organizations to develop disruptive technologies, catalyzing progress and evolution. Open innovation culture may lead to enhanced technologies that contribute to positive social change, such as clean renewable energy, effective and efficient use of recycled materials, generation of atmospheric drinking water, and delivery of programs that promote healthy behaviors and prevent illness.

Nature of the Study

I selected a qualitative research method for my study. Researchers who use qualitative research methods focus on understanding people's beliefs, attitudes, perspectives, motivations, and values in a specific setting or set of events (Tong, Winkelmayer & Craig, 2014). Qualitative researchers explore lived phenomena through the experiences of individuals in a natural environment (Cronin, 2014; Gunawardhana, Suzuki, & Enkawa, 2015). By using a qualitative method, researchers can provide a framework for collecting and interpreting descriptive facts about an event, a phenomenon, or an experience (Tong et al., 2014). Following Tewksbury's (2009) views, I used, a qualitative method to explore and understand the drivers of an open innovation culture and to achieve a future analytical generalization. I ruled out using a quantitative research method because I aimed to explore the business phenomena using a descriptive method rather than a statistical process and future follow-up on a statistical generalization. I also ruled out a mixed method approach because I wanted to explore bounded events in a real-life scenario rather than to establish a relationship or examine differences between and among variables. Researchers use a mixed methods approach

based on the premise that an effective and credible body of research should include more than one approach (Abowitz & Toole, 2009) and in order to develop an understanding of a phenomenon for which either a qualitative or quantitative approach in isolation would be insufficient (Agerfalk, 2013).

I selected a multiple case study design for this research. According to Yin (2014), researchers choose to use case studies based on the following criteria: (a) the topic of the research is contemporary, (b) the researcher has no control over the participants, and (c) the research questions focus on why and how. I decided to use a case study design for this study because open innovation is an emerging contemporary topic of interest in the high-technology industry; in addition, I had no control over the participants. I ruled out a phenomenological research design because I aimed to explore strategies that business leaders use to effectively develop an open innovation culture, rather than the lived experiences of people existing in the open innovation culture. Researchers who use phenomenological studies focus on the description or interpretation of the human experience as lived by the experiencer (Mayoh & Onwuegbuzie, 2013). I also ruled out a narrative research design because I did not aim to retell an individual's story through the eye of the observer. In addition, because authors do not necessarily need to conduct rigorous research and data collection to use a narrative design, I determined that this method did not apply to a Doctor of Business Administration (DBA) study. Finally, I did not select ethnographic design because I focused on the development of a culture itself in order explore strategies to cultivate and sustain open innovation culture; I did not aim to learn organizational culture. Ethnographers focus on entering their participants' spaces in

order to gain a deeper understanding of how people experience, create, and navigate their social world (Hallett & Barber, 2014). In this study, I focused on how to cultivate a sustainable open innovation culture, rather than on exploring my participants in their own time and space.

Research Question

The principal research question that I explored to answer in this study was: What strategies do business leaders of high-technology organizations use to cultivate a sustainable open innovation culture?

Interview Questions

Using the following interview questions, I addressed the key elements of Schein's (1996) organizational culture theory. In doing so, I used interview questions to ensure that I maintained alignment between the problem statement, the purpose statement, and the conceptual framework. Organizational culture theory provides a framework through which researchers can better understand the specific culture under investigation. The understanding of the culture includes the norms, assumptions, and values that drive the employees' behavior (Schein, 1996).

To ensure alignment between the specific business problem and the purpose statement, I started with broad questions about the organization's innovation and technology strategies and then narrowed the focus in follow-up questions to address how the organization's management developed and implemented strategies for innovation. I continued with questions addressing the challenges to implementing the innovation strategies and processes and ended with questions to compare the organization's

innovation strategies to specific elements of organizational culture theory. Comparing an organization's innovation and organizational culture allowed me to achieve a holistic alignment of the business problem and the conceptual framework.

Question 1: What strategies, if any, has your organization used during the last 12 months to cultivate open innovation culture?

Question 2: What specific activities has your organization undertaken during the last 12 months to develop, deploy, and implement innovation strategy?

Question 3: What specific challenges has your organization faced during the last 12 months while implementing the organization's innovation strategy?

Question 4: What specific actions did your organization take in the last 12 months to identify, capture, disseminate, store, and transfer relevant knowledge among employees through the organization?

Question 5: During the last 12 months, what was the contribution of the organization's executives to the implementing the innovation strategy?

Question 6: During the last 12 months, what was the contribution of the organization's engineering personnel to the implementation of the innovation strategy?

Question 7: During the last 12 months, what was the contribution of the organization's operating personnel (all personnel excluding executives and engineering personnel) to the implementation of the innovation strategy?

Conceptual Framework

The foundation of my conceptual framework was Schein's organizational culture theory (Schein, 1996). Using Schein's work enabled me to analyze strategies of open

innovation and organizational culture through analysis of the three categories of members within the organization. These categories were operators, engineers, and executives. Schein (1996) theorized that the behavior and belief of members of the organization directly affect their collective ability to reconcile intrinsic conflict within these three distinct member categories. Organizational culture comprises the values and beliefs that provide norms of expected behaviors that employees might follow, and it strongly influences employees' behaviors beyond formal control systems, procedures, and authority (Parveen, Senin, & Umar, 2015). Business leaders view organizational culture as the personality of the organization comprised of the collection of shared assumptions, values, and beliefs of the members of the organization that drives the way those members behave (Parveen et al., 2015).

Using organizational culture theory (Schein, 1996) enabled me to explore strategies related to organizational culture, which impact the successful implementation of open innovation strategy. By understanding Schein's theory and the inherent conflict between the three subculture groups within the organization, I addressed the study's specific business problem and explored strategies to cultivate a sustainable open innovation culture. By interviewing four participants from each subculture group, I explored processes with which to overcome the NIH attitude within the organization.

Operational Definitions

*Not invented here (NIH) culture**:*** An organizational culture characterized by internal resistance to externally developed knowledge or to the extension of existing capabilities through external resources; the culture instead favors existing internal

knowledge and capabilities and the internal development of such knowledge and capabilities (Hussinger & Wastyn, 2015).

Open innovation: The use of inflows and outflows of knowledge to accelerate internal innovation (Chesbrough, 2006a). This flow of knowledge includes the distribution of the knowledge into the entire organization's activities, including an enhanced engagement of employees (Frow et al., 2015).

Organizational culture: The collective set of values and beliefs that drive and reflect on the collective behaviors of the employees (Parveen et al., 2015).

Assumptions, Limitations, and Delimitations

In this section, I identify assumptions, limitations, and delimitations of my study. Assumptions comprise points of data that I considered true but did not verify. Limitations include the weaknesses of the study, and delimitations refer to the characteristics I selected to define the boundaries of the study.

Assumptions

Assumptions consist of elements that are somewhat out of the researcher's control but that the researcher accepts as true and takes for granted without further investigation or questioning (Jansson, 2013). To facilitate the research, I made several assumptions at the start of the study. By identifying and providing clarification for these assumptions, I aimed to foster higher awareness and understanding of the scope of the study.

My first assumption related to the validity and reliability of the data I collected from the participants. I assumed that the participants would have relevant knowledge regarding cultivation, implementation, and continuation of open innovation strategies. I

also assumed that the participants would share reliable and documented data. I verified the participants' relevant knowledge regarding open innovation strategies before the selection process and interviews.

My second assumption was that by using the semistructured interview method and presentation of questions, I would encourage the participants to share their knowledge and experience with me. I followed McIntosh and Morse (2015), who stated that researchers use the semistructured interview method to obtain subjective responses from persons regarding their experience of a situation or phenomenon.

My third assumption was that I would be able to collect data from organizational documents, which would enable me to triangulate the data with the information collected through the interviews. Houghton, Casey, Shaw, and Murphy (2013) stated that qualitative research needs to be conducted rigorously and must include prolonged engagement, persistent observation, triangulation of data, peer debriefing, member checking, construction of an audit trail, reflexivity, and thick description. I used triangulation to increase the credibility and reliability of the study.

My last assumption was related to the sufficiency and relevance of the keywords I developed for coding in this study. As a novice researcher, I developed the keywords for this study based on my understanding of the open innovation phenomenon and the proposed research question. I also assumed that I had the ability to mitigate personal biases related to the research and development processes and open innovation.

Limitations

Limitations focus on the internal and external validity of the study; internal validity addresses the rigorous conduct of the study and external validity focuses on the applicability of the findings to larger populations (Connelly, 2013). Brutus, Aguinis, and Wassmer (2013) stated that limitations are useful in understanding the weaknesses of the specific research and are important to determining research credibility; limitations also constitute attributes that influence the interpretation of the research. Kirkwood and Price (2013) identified limitations as the inherent weaknesses of a study, which the researcher does not control. The framework of limitations defines threats to validity consisting of internal validity, statistical conclusion validity, construct validity, and external validity.

In this study, limitations stemmed from to my weaknesses and novice experience in interviewing and collecting data through interviews. The limitations included, but were not limited to, the following.

Bias as a result of professional experience. I have been involved in research and development (R&KD), innovation, and emerging requirements to the market since 1985 and as such, have developed certain thoughts and biases relevant to management R&D and technology development methods. According to Pettigrew (2013), the researcher serves as a data collector and as an interpreter of the experiences of the participants in the study. I acted as a researcher to collect the data and to transfer the experience of the participants while attempting to mitigate any possible bias due to my professional background.

Use of qualitative analysis tools. This study was the first formal study for which I used ATLAS.ti (2016) as a software tool to support coding, retrieval of data and investigate relationships. As a novice researcher, I faced a few limitations in managing and using the software tool, so I included the use of a transcription engine and understood the code's hierarchal structure as a limitation.

Budget and logistics limitation in conducting the research. I had limited resources, including time and funding, with which to conduct the study.

Data restriction. My access to potentially sensitive organizational information may have been limited, which may have complicated data triangulation. I mitigated the risk of data restriction through communication with the participants ahead of time and through clarification of the documents I wanted to review. The selection criteria included participants' willingness to share the documents needed for this study.

Bias in selecting the participants and codes. As a novice researcher, I may have experienced unintended bias in the selection of the participants, as well as bias in selecting codes based on my previous mindset and data. These biases could have potentially affected interview data.

Thematic analysis. My limited experience with thematic analysis may have limited my ability to extract and identify meaningful conclusion from the codes.

Impact of open innovation on organization's success. I found it difficult to define the degree to which open innovation impacted the success of an organization. As such, my determinations of the effect that open innovation had on the organization's success may have been inconclusive.

Identification of exact factors. I also found it difficult to identify and quantify the specific variables that contributed to the successful development and continuation of a culture of open innovation within an organization.

Delimitations

Delimitations constitute intentional boundaries defined by the researcher and arise from a limitation in the scope of the study used in the data collection and analysis processes (Simon & Goes, 2013). Delimitations include characteristics that limit the scope of the research but that are within the researcher's control. I identified several delimitations in this study:

- I established the delimitations of the study on open innovation through the selection of high-technology organizations in a specific geographical area of the United States. These delimitations factors may have skewed the result toward government-related high-technology organizations because the Washington, D.C. area is a hub for high-technology organizations. To offset and mitigate this challenge, I collected broader data from the participants and the organizations.
- I only explored open innovation strategies in high-technology organizations and did not focus on the size of the company, the number of employees, or the length of time for which the organization has existed. Numerous researchers have explored the effects that the limited resources of small and medium-sized business have on the implementation of open innovation (Bigliardi & Galati, 2016; Oakey, 2013; Wynarczyk, Piperopoulos, & McAdam, 2013).

Significance of the Study

Chen, Huang, and Xu (2015) described enterprise innovation strategy as a key component of the enterprise strategy, which should be consistent with the overall enterprise strategy. Chen et al. also stated that, concerning innovation strategy, the enterprise's decision-makers are inseparable from the enterprise leadership governance system. Laursen and Salter (2006) stated that leaders' openness to external sources allows them to draw ideas from the outside, to deepen the pool of technological opportunities available, and to enable a higher level of innovative performance. Due to globalization in the 21st, organizational leaders have been forced to shift their focus from local, regional, or national business aspects, such as value chains and trade, to internationalism (Hamilton & Webster). As a result of globalization, some business leaders have focused on short-term results, thereby cutting investment in long-term research into radical innovation (Coras & Tantau, 2014). Business leaders must adopt new business practices, as described by Coras and Tantau (2014), to meet the paradigm of globalization.

Contribution to Business Practice

The findings from my study on the cultivation and implementation of open innovation strategy have relevance for broader and general business practices. The study was relevant to the competitive global market conditions of the 21st century and may contribute to improving the competitiveness of U.S. high-technology companies within the global market. By using the results of this study, business leaders may be able to improve business practices by enabling alignment among the three subculture groups within their organization, as well as by collaborating with outside expert organizations to

overcome any organizational weakness. These business practices may include organizational transition to enhanced resources accessibility or the funding of innovative synergy to unleash hidden potential within the organization. In addition, in this study, I shed light on the practice of building absorptive capacity within an organization to enable access to new knowledge and to achieve competitive innovation. Through this study, I aimed to explore business practices that business managers can use to increase innovation, competitiveness, and sustainability and to respond effectively to globalization and an increasingly competitive environment.

Wynarczyk (2013) identified innovation as a primary business practice, and Capozzi et al. (2013) noted that 80% of the executives surveyed believed that the best way organizations could position themselves to meet goals is through open innovation. In the 21st century, innovation and market readiness have become the primary criterion for an organization's sustainability (Wynarczyk, 2013). Wynarczyk stated that organizations' international competitiveness depends strongly on several factors, including the cumulative effects and interrelationship of R&D capacity, managerial structure, and competencies, coupled with the external factors of open innovation practices and the ability of the organization to attract external resources for R&D and technological development.

By understanding the strategies that drive effective implementation of open innovation culture business leaders can implement practical techniques to respond to market demands in real time. Through this study, I equipped business managers with effective strategies to innovate and introduce products to the market in a timely manner.

Business leaders can also use the study's findings to develop tools and effective practices with which to mitigate the impacts of globalization and increased competition pressure to become more competitive and sustainable.

Implications for Social Change

Innovation constitutes a primary enabler of social change and is the driving force of progress (Shetty, 2010). Shetty posited that innovation improves global health conditions; without innovation, healthcare providers cannot provide solutions to global health challenges, regardless of how much money organizations invest. Researchers have proven the significant impact of innovation and technology on social change through the correlation of scientific output with countries' development as measured by economic terms (Yearley, 2014). In the 21st century, innovation has become a primary driver of the knowledge society and an enabler of the competitiveness of both organizations and individuals (Coras & Tantau, 2014). In this study, I identified strategies that business leaders can use to cultivate a sustainable open innovation culture and increase their organizations' innovation performance. Through the implementation of open innovation and better innovation performance, business managers can lead their organizations to bring disruptive technologies to market, thus catalyzing progress and evolution. Through this increased innovation performance, organizations' employees and managers may contribute to positive social change in many aspects of society by developing important practical and technological solutions and tools, such as new medicines, new and efficient energy sources, or new methods of water generation.

The business managers at Procter & Gamble Company (P&G) provide an example for managers who, through the implementation of open innovation, were able to contribute to positive social change. P&G operates all of the organization's plants with renewable energy, uses 100% renewable or recycled materials for all products and packaging, and has zero consumer or manufacturing waste sent to landfills (Ozkan, 2015). Ozkan (2015) concluded that P&G's level of innovation enables the company to deliver programs that promote healthy behaviors and prevent illness, such as the *Children Safe Drinking Water Program* (CSDW) and the *Pampers Vaccination Program*, which focuses on vaccinating women and children around the world.

A Review of the Professional and Academic Literature

This section presents an overview of the literature on open innovation, as well as the phenomenon's historical background, strategies, and drivers. The literature review included the following: (a) organization and strategy, (b) historical perspective, (c) the selection and discussion of the theory, (d) the development of the conceptual framework, (e) data validity, reliability, and interpretation, and (f) identification of the gaps in the literature. I used the literature review to establish the foundations and set up the expected findings of the study. A research literature review forms a systematic, explicit, and reproducible method for identifying, evaluating, and synthesizing the existing body of work produced by researchers (Fink, 2013). Researchers use literature review as the foundation and inspiration for research and as a method to glean existing ideas and previous scholars' results regarding the research question. By conducting a good systematic literature review, researchers can provide a trustworthy answer to a study

question, and it can identify gaps in knowledge that require further research (Booth, Sutton, & Papaioannou, 2016). Through the literature review, the researcher also presents the quality of the included studies and provides an indication of how much confidence the readers should have in the results (Booth et al., 2016). In this literature review, I included a presentation of current data on open innovation culture through a systematic methodology.

Organization of the Literature Review

The key to an effective literature review is preparation and organization (Aoki, Enticott, & Phillips, 2013). Organizing the literature review section and presenting the state of the literature on specific selected topics are primary elements in achieving a clear and effective research literature review. I organized the literature review in groups of themes and discussed the data and sources regarding the themes, theoretical concepts, and topics that enabled me to clarify and identify effective strategies to implement open innovation. Thematic analysis method constitutes a qualitative descriptive approach that enables researchers to identify, analyze, and report on patterns within data; as well as to learn core skills for conducting other forms of qualitative analysis (Vaismoradi, Turunen, & Bondas, 2013). In Table 1, I present the organization of the literature review section, including a list of topics and subtopics, as well as the structure of the review.

Table 1.

Literature Review Organization

Level 1 - Literature Review Organization		
Level 2	Level 3	Level 4
Organization of the Literature Review Section		
Literature Research Strategy and Process		
Literature Review Strategy		
Literature Statistics	Statistical Data – Number of Sources Used in the Proposal	
	Statistical Data – Number of Sources Used in the Literature Review Section	
Open Innovation – Historical Perspective		
Definition of Open Innovation		
	The Closed Innovation Paradigm	
	The Open Innovation Paradigm	
	Possible Conditions and Negative Results of Open Innovation Implementations	

(*Table continues*)

Level 1 - Literature Review Organization		
Level 2	Level 3	Level 4
	The Link between Open Innovation and Closed Innovation	
	The Evolution and Growth of Open Innovation – Open Innovation 2.0	
The Main Drivers of Open Innovation		
	The Micro Level: The Individual Domain	The Engineers, Managers, and Executives
The Macro Level: The Organization and Environment Domains		
	The Organizational Culture as a Driver for Open Innovation	
	Firm's Globalization: The Link between Globalization and Open Innovation	
	Firm's Globalization: The Link to Global Collaboration, Global Supply Chain, and Open Innovation	
Theory: Organization Culture	Theory Selection Criteria	

(*Table continues*)

Level 1 - Literature Review Organization		
Level 2	Level 3	Level 4
	Schein's Organizational Culture Model	
Gaps in the Literature		

Note. Presentation of the literature review organization by E. Banai (2016)

Through a literature review, a researcher presents a logically debated case founded on a comprehensive understanding of the current state of knowledge about a topic of study (Machi & McEvoy, 2012). With this review of research literature, I cast a broader net over the data relevant to the research problem statement regarding how business managers effectively cultivate and sustain a strategy of open innovation culture. I researched sources providing specific information about topics such as the internal drivers of high-technology organization forces and barriers to implementing open innovation culture, as well as the external forces affecting the cultivation of open innovation strategy.

I attempted to take a systematic approach to this literature review. Booth et al. (2016) identified clarity, validity, and auditability as the three primary considerations for such a systematic strategy. Through the structure of a systematic literature review, a researcher provides the readers with easier navigation and interpretation (Booth et al., 2016). My literature review strategy included the mitigation of bias. Following the principles of a systematic approach outlined by Booth et al. (2016), I selected items for the review based on their relevance and rigor, rather than based on whether they reported a favorable outcome. In addition, I attempted to achieve transparency, an important

element in my literature review strategy. Through my strategy of literature review, I thus provided an auditable foundation ensuring that my conclusions were grounded in the data presented in the review and that I did not base my findings on any prior conclusions. In the audit trail, I included a detailed and easy-to-follow description of my research steps from the beginning of the study through the development of the data and the reporting of the findings.

Literature Review Strategy

The ability to search the literature efficiently is a valuable skill (Aoki et al., 2013). Aoki et al. also identified the key to an effective search as preparation and organization, starting with a clear understanding of the question the researcher wants to answer and the purpose of the search. My review strategy includes a search of scholarly sources through various databases and the utilization of primary and secondary keywords. Using these databases with open innovation as the primary codes and keywords (listed below and in Appendix C), I identified 9,571 scholarly sources, of which 2,727 were peer-reviewed. Using ATLAS.ti (2016) and its embedded tools as qualitative data software (QDAS), I clarified and gained an understanding of the links among the keywords identified in Table 2. A researcher who uses QDAS can present qualitative data using tables (Kaczynski, Salmona, & Smith, 2014) and thus provide an easier method with which to link and compare themes and codes. Researchers use QDAS to link the research question with the interview questions or to present the used code structure (Kaczynski et al., 2014). To code data, I assumed that words captured in interview transcripts formed basic data that could be broken apart and decontextualized by coding. Once coded, a researcher

can sort codes into categories and then organize them into clear themes (Pierre & Jackson, 2014).

Woods, Paulus, Atkins, and Macklin (2015) described ATLAS.ti as an improved tool for qualitative analysis and interpretation; the tool supports forms of analysis that would be impossible to carry out manually. By using ATLAS.ti researchers can gain the unique ability and flexibility to segment data by creating quotations separately from codes and by grouping documents codes to analyze the data methodically (Paulus & Lester, 2016).

I grouped codes into families that served as filters. Woolf (2012) identified several reasons to use families in ATLAS.ti: (a) families of codes, documents, or memos enable the researcher to filter elements so that only a subgroup is visible, (b) grouping allows the researcher to distinguish between two or more parts of the research, (c) grouping enables the researcher to group code by tasks, and (d) grouping can assist the researcher with queries regarding the data.

Table 2.

Code List for the Proposed Study on Open Innovation

Number	Concept	Key Words and Key Phrases
A	Organization's absorption capacity	• Management attention capacity • Internal R&D capacity • Knowledge search capacity • Open innovation external knowledge integration • Open innovation knowledge management • Internal knowledge dissemination
B	Organizational outbound knowledge	• Open innovation licensing • Unused patents • Open innovation spin-off technology • Open innovation Knowledge exploitation • Knowledge supply • Open innovation data sharing
C	Organizational inbound knowledge	• Open innovation outside-in knowledge • Open innovation knowledge acquisition from external sources • External knowledge sources • Radical open innovation • Organization borders
D	Organization culture	• Organization culture of open innovation

(*Table continues*)

Number	Concept	Key Words and Key Phrases
		• Organizational culture and performance • Organization's implicit assumptions • Organizational internal multi layers • Engineers, operators, executives

Note. Presentation of the Code List for the Study on Open Innovation by E. Banai (2017)

With the above codes and terms, I analyzed the literature and searched different academic databases, including ABI/INFORM Global, Academic Search Complete, Business Source Complete, Emerald Management Journals, ProQuest Central, PsycINFO, SAGE Premier, and Science Direct. I searched articles and data published within the last five years (starting in 2013) and published in or translated into English. The data sources for the literature research included (a) peer-reviewed scientific research articles, (b) peer-reviewed case studies published by other researchers, (c) government publications, and (d) theory-based and research books written by subject matter experts.

In Figure 1, I provide a visual presentation of the mind mapping of my research and literature review strategy. In the literature review, I covered the transition from the NIH attitude of the 20th century (the *industrial century*) to the 21st century (the *knowledge century)*, which is characterized by an innovation paradigm of open innovation. In addition, I included theoretical concepts, as well as drivers for implementation strategies of the open innovation culture. I followed the rationale in the mind mapping to structure and organize the literature review thematically. I started with the historical perspective in Figure 2, transitioning from the 20th century to the 21st century innovation methodology and the NIH attitude's impact on an organization's

innovation performance and competitiveness. I then addressed the selection of the theory and conceptual framework of the study in Figure 3. In addition, I included four additional figures (Figures 4 through 7) focusing on the organization's internal and external drivers and challenges to open innovation culture.

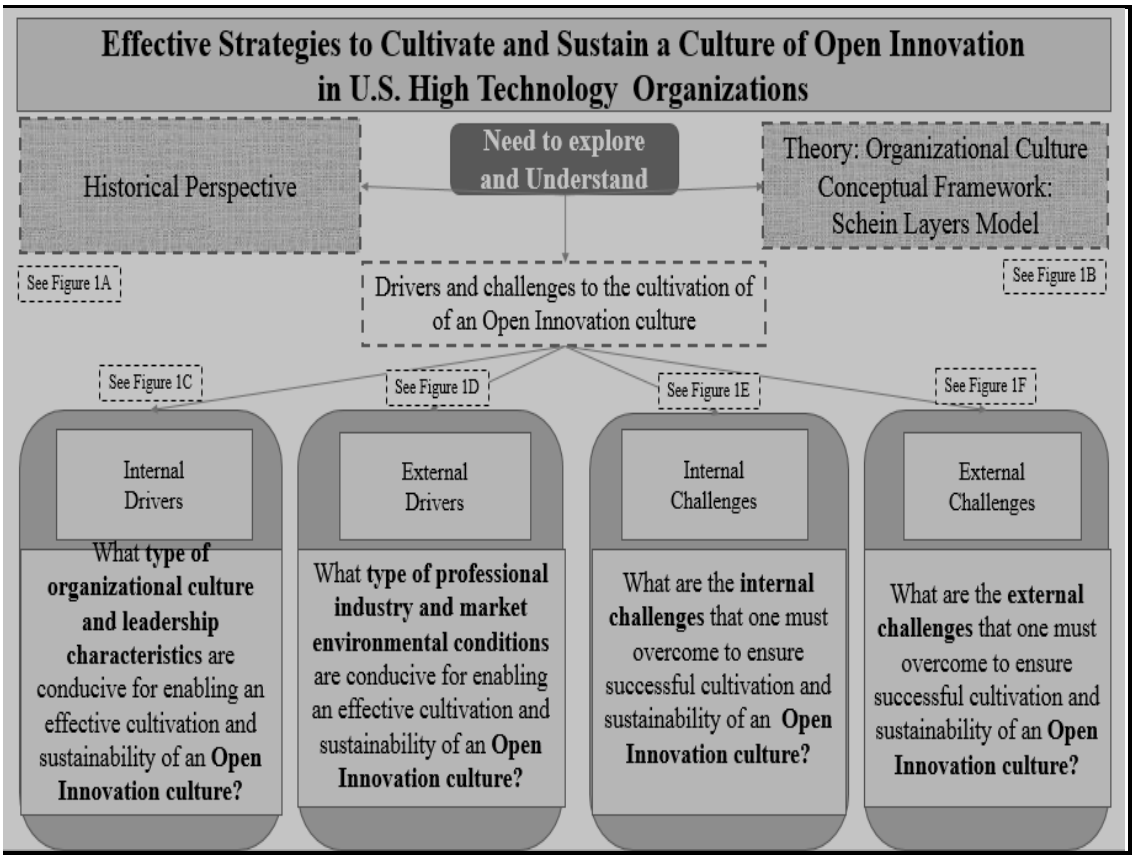

Figure 1. Mind mapping of the entire literature review
Note. E. Banai (2016) developed the mind mapping illustrating the four lenses of the research.

In Figure 2, I illustrate the historical background of the open innovation paradigm. I started from the closed innovation model and the NIH culture of the 20th century and transitioned through various changes in the market, including globalism, to the introduction of the open innovation model in 2003. The literature review's historical

perspective section included an observation on the growth of open innovation to ecosystems networks and crowd sourcing.

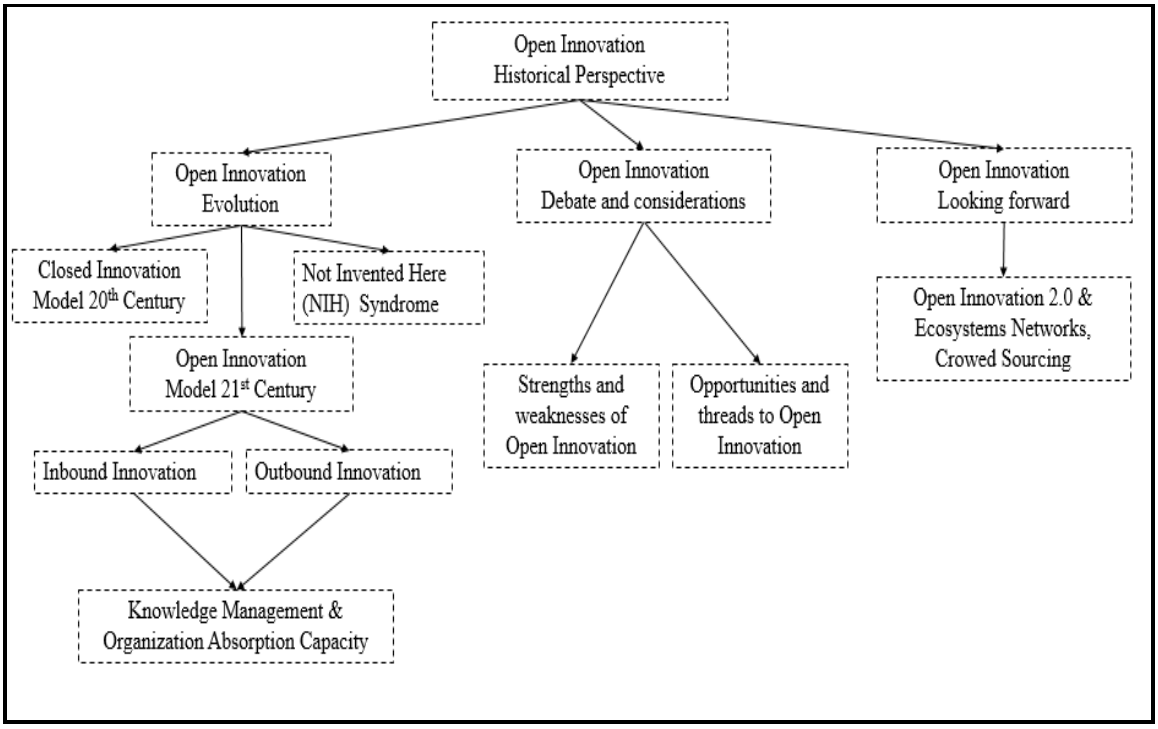

Figure 2. Open innovation background and historical perspective
Note. E. Banai (2016) developed the presentation of the open innovation historical perspective.

In Figure 3, I illustrate the strategy relevant to my selection of the research theory and the conceptual framework model. The literature review included a detailed description of the selection process for both the theory and the conceptual framework for this study. As illustrated in Figure 3, the literature review included a detailed discussion on the organizational culture and Schein's (1996) layer model.

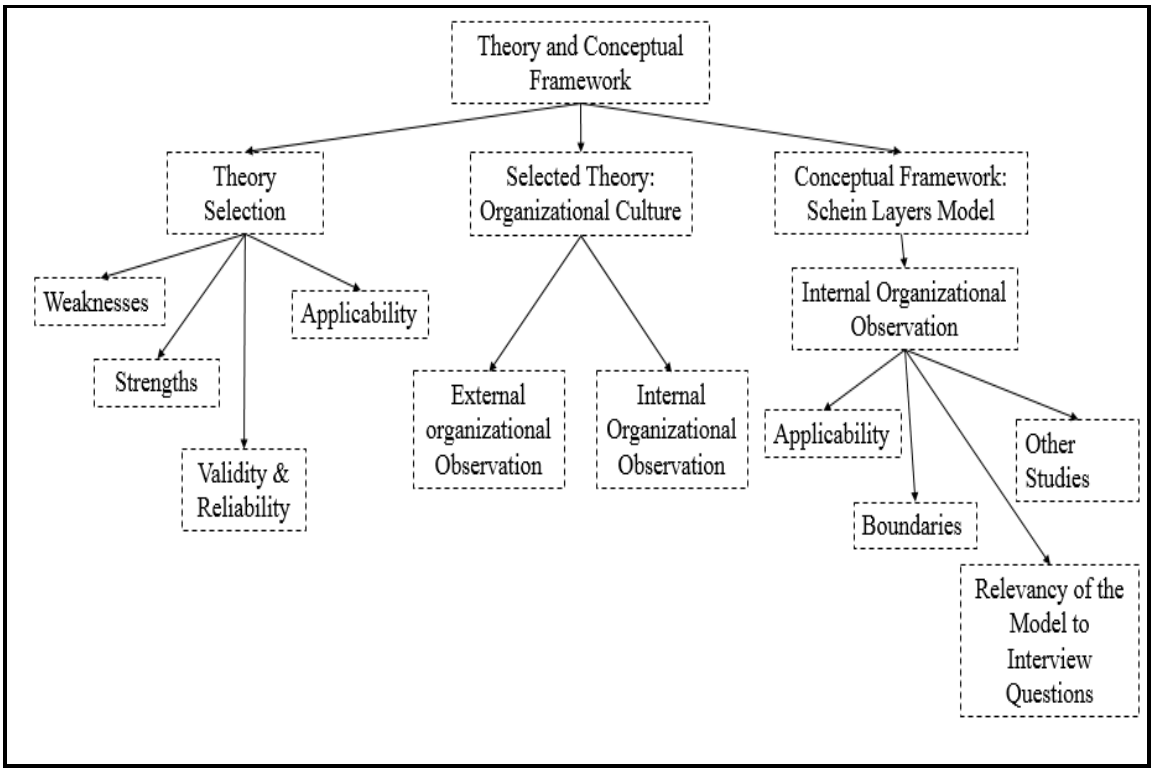

Figure 3. Theory and conceptual framework
Note. E. Banai (2016) developed the presentation of the research theory and conceptual framework.

In Figures 4 to 7, I include detailed descriptions of the four boxes illustrated in Figure 1. Figure 4 includes an illustration of my literature review strategy as it related to the discussion of the organization's open innovation internal drivers. I discussed the drivers within three main categories: cultural, operational, and leadership. Figure 5 includes a similar view to that presented in Figure 3 but focuses on external observations. These observations included two primary categories; environmental drivers, which included external regulations and globalism and market conditions, which included drivers relevant to products, customers, and competition.

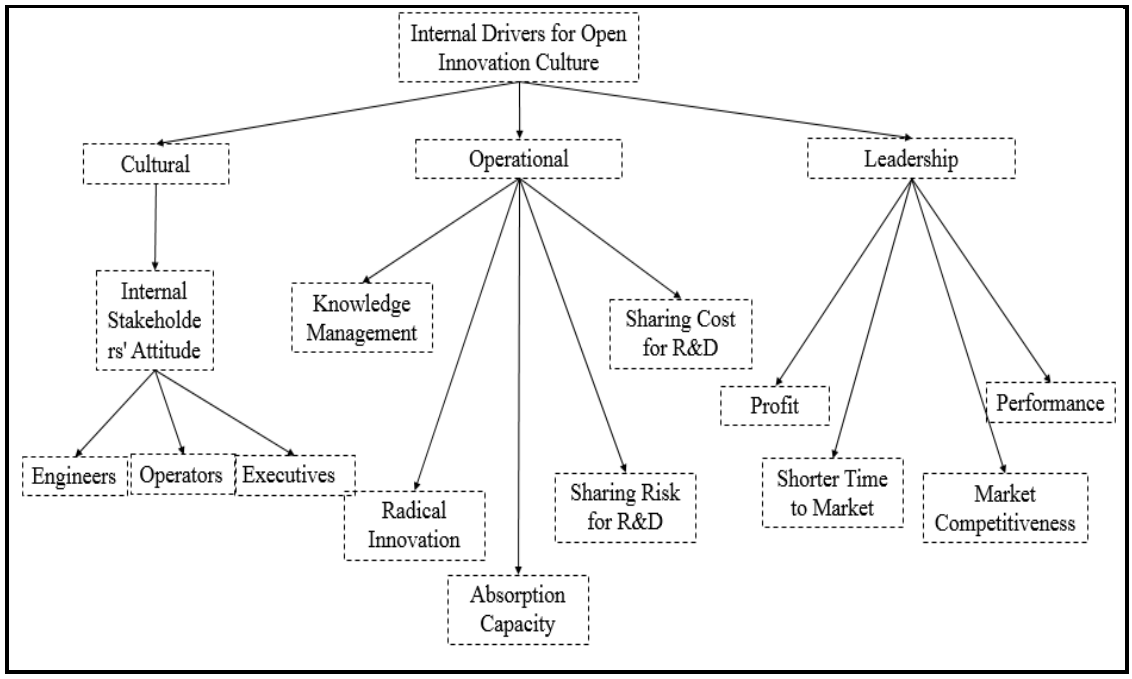

Figure 4. Internal drivers for open innovation culture
Note. E. Banai (2016) developed the presentation of the internal drivers silo.

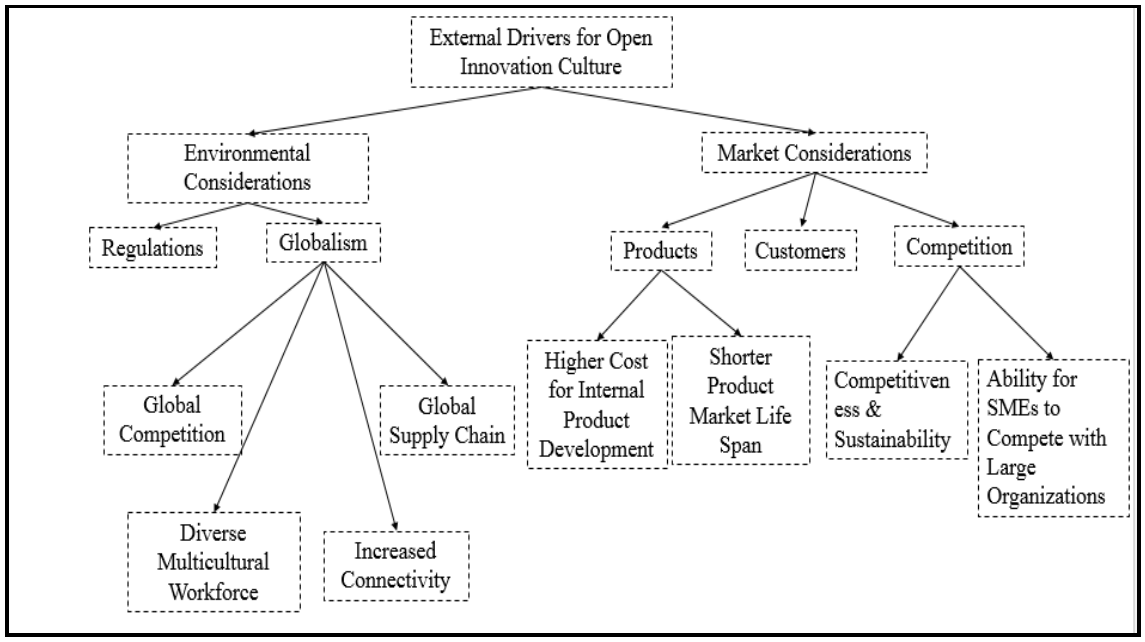

Figure 5. External drivers for open innovation culture
Note. E. Banai (2016) developed the presentation of the external drivers silo.

Figures 6 and 7 provide views of the literature review strategy as it related to challenges to cultivating and sustaining open innovation culture. Figure 5 includes a view of the internal challenges, including employees, management, and knowledge-sharing collaboration. Figure 7 includes a similar illustration of external challenges in the implementation of open innovation.

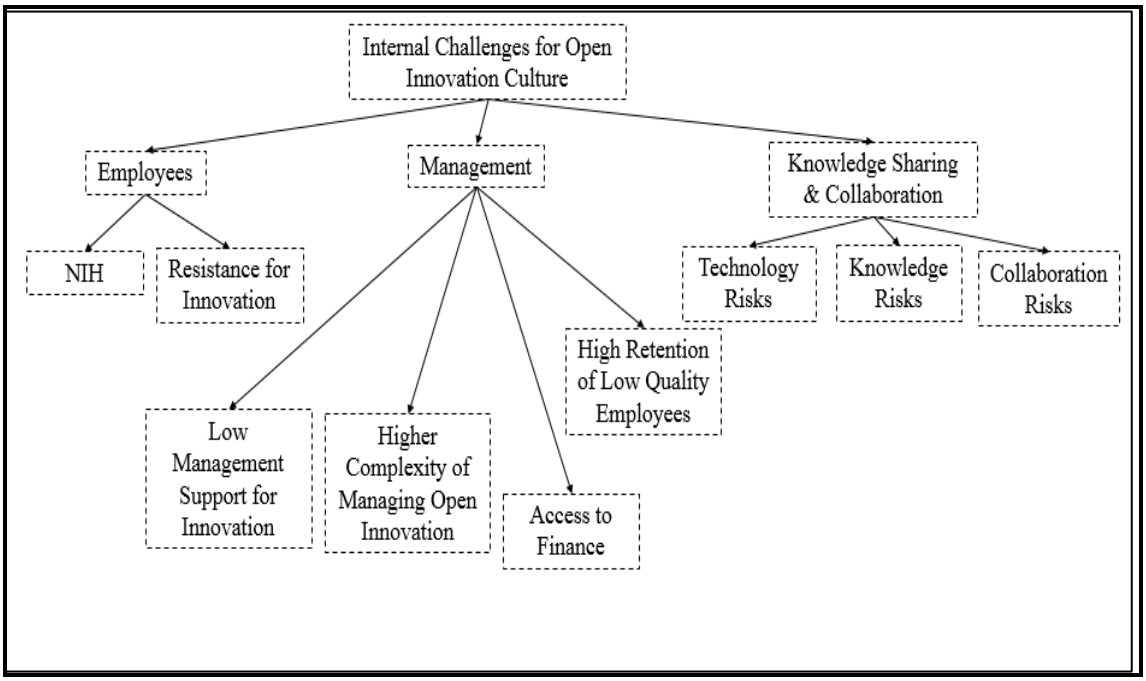

Figure 6. Internal challenges for open innovation culture
Note. E. Banai (2016) developed the presentation of the internal challenges silo.

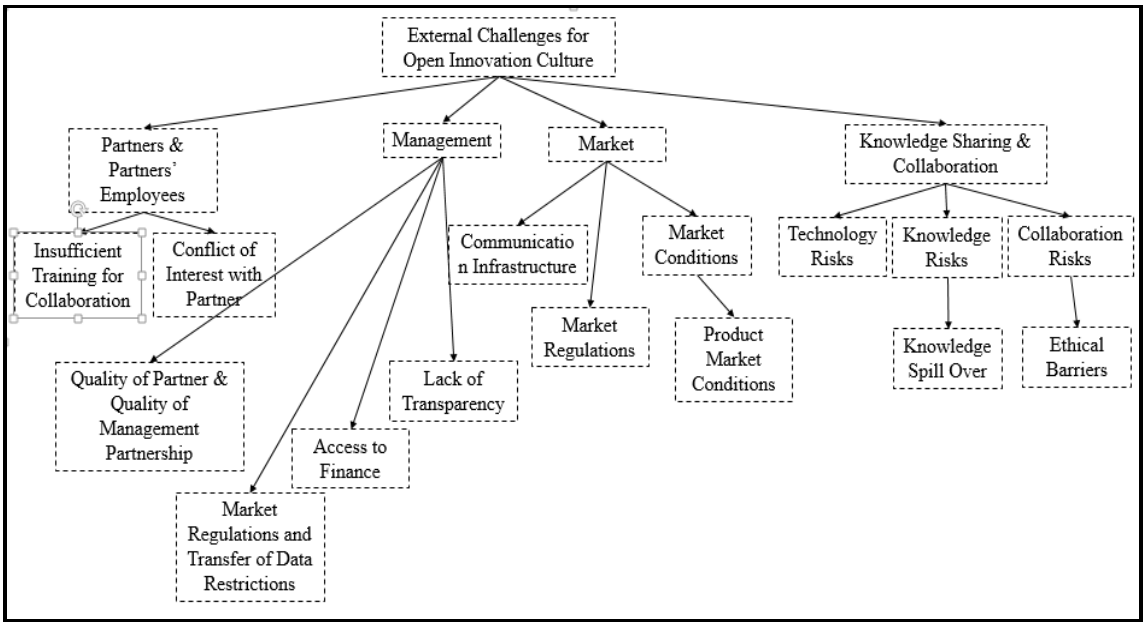

Figure 7. External challenges for open innovation culture
Note. E. Banai (2016) developed the presentation of the external challenges silo.

Literature Statistics

For the statistics of the study literature, I included information regarding the number of data sources used in this study. In addition, the literature review includes separate statistical data for the sources referenced in the literature review section of the study proposal. Table 3 includes details regarding the sources used for this study, while Table 4 includes data on the literature review sources. The statistical information in Table 3 indicates that I met the requirement that at least 85% of the total sources in the study has a publication date of within five years from my anticipated graduation date. Specifically, out of the 208 total sources used for this study, 177 sources, or 86%, had a publication date within five years of my anticipated graduation date. The statistical information in Table 4 indicates that I met the requirement that the literature review section of the study included a minimum of 60 sources. Specifically, I referenced 90

sources in the literature review, and 88 of those sources had a publication date within five years of my anticipated graduation date.

Table 3.

Sources Used in the Study

Source	Total number of sources	Within 5 years of graduation	More than 5 years of graduation
Reviewed sources	208	178	30
Books	28		
Government publications and websites	2		
Other sources	10		

Table 4.

Sources Used in the Study's Literature Review

Source	Total number of sources	Within 5 years of graduation	More than 5 years of graduation
Total Reviewed sources	90	88	2
Books	12		
Government publications and websites	0		
Other sources	3		

Open Innovation: Historical Perspective

In 2003, Chesbrough (2003) introduced the concept of open innovation, which assumes that firms should use both internal and external ideas and paths to market when looking to advance their technology. Open innovation entails a more open system for corporate innovation activities than the traditional vertically integrated model often used in the 20th century, providing a rich, diverse market for technology and for small,

externally oriented R&D labs (West, Salter, Vanhaverbeke, & Chesbrough, 2014). The open innovation approach challenges the traditional approach to the management of innovation processes and has become an important topic in management science (Linton, 2012).

Since the turn of the 21st century, the traditional *closed innovation* model, in which an organization carries out most of its R&D in-house and develops new ideas, innovative products, and technologies in isolation within the firm's closely guarded laboratories, has become increasingly unsustainable (Wynarczyk, 2013). Wynarczyk (2013) also identified that a dramatic shift in the way that technological R&D is mobilized globally; specifically, the open innovation paradigm has replaced the traditional closed innovation paradigm. The way in which business leaders and employees innovate, create new ideas, and bring those ideas to the market has undergone a fundamental change from closed innovation to open innovation (Yun, Jeong, & Park, 2016). Both large and small companies in the 21st century are facing increasingly fierce competition from organizations with limited resources to conduct R&D (Wynarczyk, 2013); such emerging organizations have become successful in commercializing discoveries originally made by others (Chesbrough, 2004).

Since Chesbrough (2003) coined the concept of open innovation as a managerial practice and activity, researchers have paid a significant amount of both positive and negative attention to the concept (Cheng, Yang, & Sheu, 2016; Linton, 2012; Petrou, 2015; West et al., 2014). Chesbrough's original intent was to help organizations expand and broaden their competitive horizons by enhancing their creativity and innovation

process, as well as their ability to commercialize their products or services effectively. The practice of open innovation has helped shift the dominant logic of R&D from internal discovery to external engagement and has encouraged business leaders to experiment with new models for generating and commercializing innovation (West et al., 2014). The changes in the definition of open innovation since its inception by Chesbrough best demonstrate the evolution of the scope of the open innovation paradigm. Chesbrough's first definition was:

> Open innovation means that valuable ideas can come from inside or outside the company and can go to market from inside or outside the company as well. This approach places external ideas and external paths to market on the same level of importance as that reserved for internal ideas and paths. (p. 43)

Three years later, Laursen and Salter (2006) conducted a large-scale empirical study on open innovation and expanded the definition: "an open innovation model is using a wide range of external actors and sources to help them achieve and sustain innovation" (p. 131). In 2006, Chesbrough redefined open innovation to reflect the addition scope and emphasized the notion that knowledge flows both into and out of the firm: "open innovation is the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively" (p. 1). In 2014, in response to increasing interest in nonmonetary knowledge flows, Chesbrough and Bogers (2014) extended the definition of open innovation to: "The distribution of 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" (p.12).

In Figure 8, I include a visual presentation of the transition of innovation from the 20th century into the 21st century. In the 20th century, through the closed innovation paradigm, business leaders grew their organizations through internal resources. In the open innovation paradigm of the 21st century, on the other hand, business leaders can incorporate two growth paths, as illustrated in Figure 8.

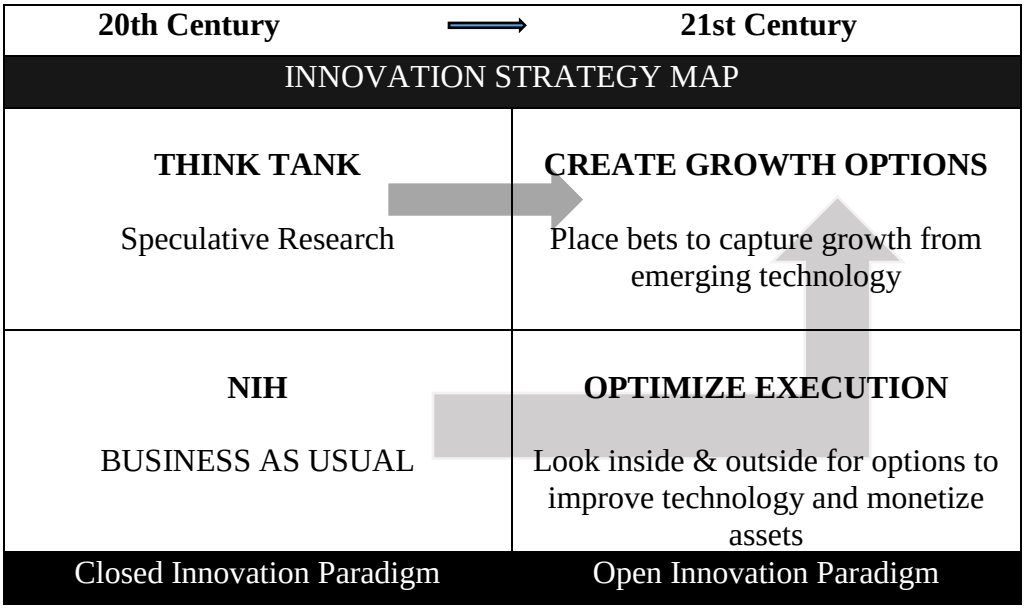

Figure 8. Historical and current views of open innovation
Note. Modified to emphasize the transition from the 20th century closed innovation paradigm to the 21st century open innovation model. The inspiration of the figure is from the work of Chesbrough, H., & Crowther, A. K. (2006). Beyond high-tech: Early adopters of open innovation in other industries. *R&D Management, 36,* 229-236. doi:10.1111/j.1467-9310.2006.00428.x

The first path consists of growth within the current business, while the second path is associated with a potential new business. When internal R&D cannot meet the organization's growth objectives, this constitutes a growing gap. In an open innovation model, business leaders can utilize two paths to overcome this growth gap. The first

strengthens the current resources by optimizing execution. The second path requires the identification of potential emerging technologies and new business (Chesbrough, & Crowther, 2006).

The combination of rising development costs and shortening windows of opportunity, as well as the typically shorter life cycle of a new product, has compressed the economics and increased the risk of investing in innovation, hence reducing the potential for returns on innovation investment (Chesbrough, 2013). Figure 9 illustrates the change in the market and innovation conditions. In the ’closed model – before‘, the expected revenues far exceed the development costs. As development costs rise, product life becomes shorter. In an environment similar to that of the 21st century, when the cost to innovate is high and new products have a shorter life cycle in the market, the incentive to innovate and the potential returns on innovation investment is low. It is thus harder to justify investment in innovation. One can gain an alternative, more dynamic view of this trend by comparing the growth rate of R&D expenses to the growth rate of sales within an industry. In a case in which the two curves are growing at a similar rate, the business model is sustainable; however, if the R&D expense curve is growing at a faster rate than the sales curve, the business model is unsustainable (Chesbrough, 2013). By utilizing outside knowledge through the open innovation strategy, business leaders and employees can innovate, develop, and introduce products faster and with a smaller investment than can be done using the closed innovation model (Chesbrough, 2013).

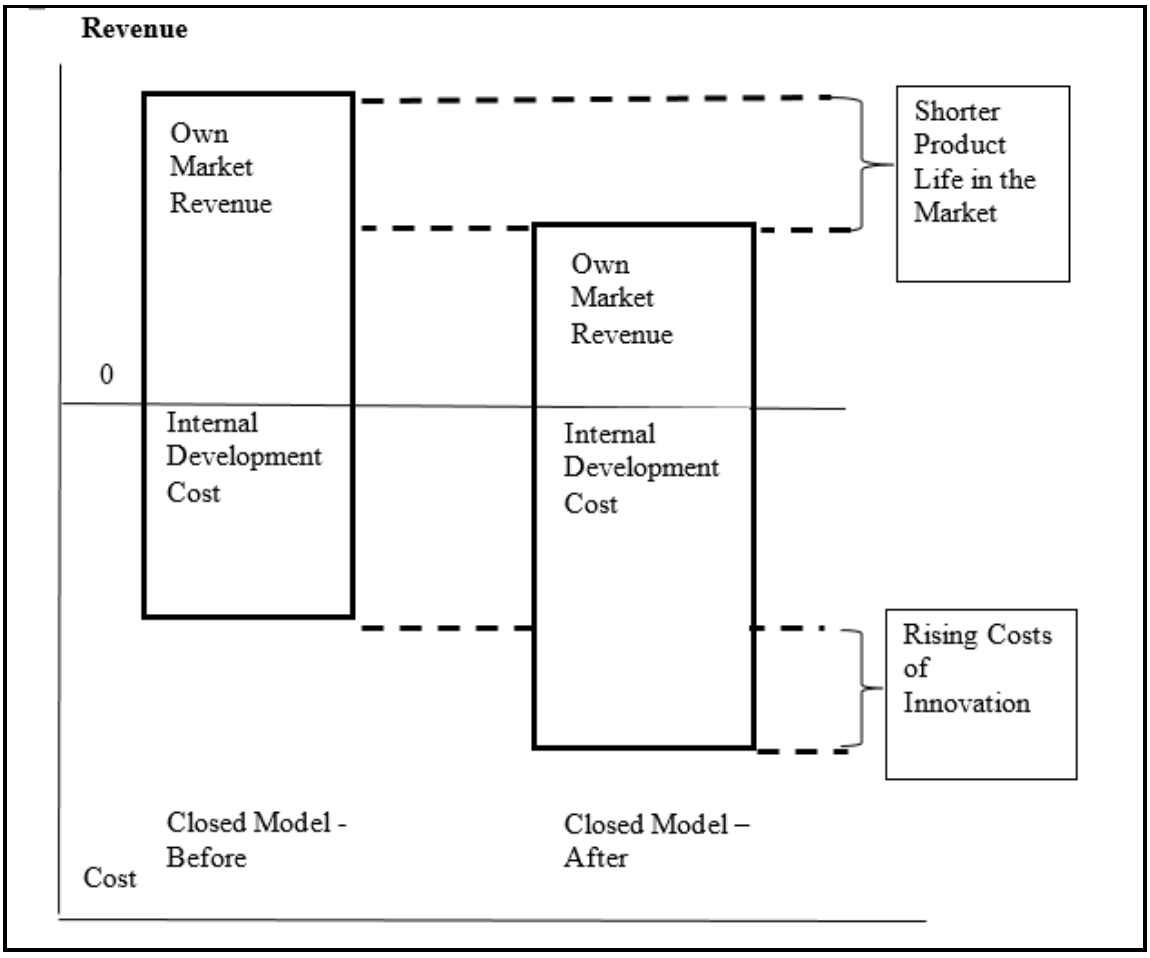

Figure 9. The economic pressure of innovation
Chesbrough, H. (2013). *Open business models: How to thrive in the new innovation landscape*. Boston, MA: Harvard Business Press. *Note*. "reprinted with permission"

Definition of Open Innovation

Open innovation refers to the process that moves innovation beyond the boundaries of a particular organization (Markman, 2016). Kim, Kim, and Foss (2016) defined open innovation as a cognitive model for creating and integrating practices with which to profit from innovation. Hossain et al. (2016) defined open innovation as a paradigm that assumes that business leaders can and should use both internal and external ideas and paths to market as they look to advance their organizations' technology. Open

innovation refers to the use of both inflows and outflows of knowledge to improve internal innovation and to expand the markets for external exploitation of innovation (Cheng & Huizingh, 2014).

The closed innovation paradigm. Closed innovation refers to a process of innovation in which an organization's leaders purposely relies on internal knowledge and resources without taking into account input from sources outside the organization (Dries et al., 2014). Leminen, Turunen, and Westerlund (2015) identified closed innovation as activities that come about within a single organization without collaboration with outside parties. Closed innovation often refers to NIH culture, characterized by an attitude of resistance toward knowledge derived from external sources (Antons & Piller, 2015). Employees with NIH attitude typically reject new ideas from outsiders without considering the organization's best interest, the quality of the knowledge, or the benefits that the outside knowledge may bring to the organization (Hussinger & Wastyn, 2015). Under the closed innovation culture, business leaders and employees launch research projects based on their internal science and technology knowledge, as illustrated in Figure 10 (Chesbrough, 2012). According to Chesbrough (2012), the traditional innovation process is no longer an option because projects can only enter the process from the organization's internal knowledge base and can only exit it one way, by going into the market. In the open innovation process, by contrast, projects can enter or exit at various junction points and in various ways, as illustrated in Figures 11 and 12 and detailed in the following open innovation paradigm section.

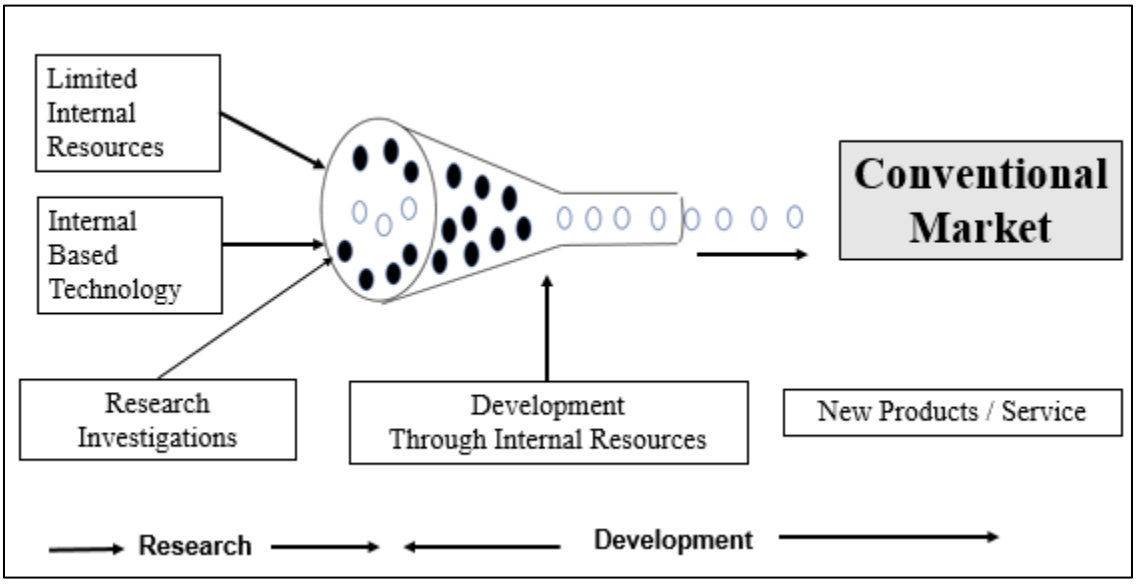

Figure 10. Closed innovation
Note. Modified and inspired from Chesbrough, H. (2012). Open innovation: Where we've been and where we're going. *Research-Technology Management*, *55*(4), 20–27. doi:10.5437/08956308X5504085. Reprinted with permission.

The open innovation paradigm. The open innovation paradigm refers to the concept that business leaders and employees use both external and internal ideas, as well as internal and external channels to market, as they look to advance their technology (Marilungo, Coscia, Quaglia, Peruzzini, & Germani, 2016). Open innovation provides a culture through which organizations extend their internal resources to increase their innovative capabilities (Sulaiman et al., 2016). The open innovation culture consists of the notion that the members of the organization should innovate with external partners by sharing both risk and reward. The boundaries between an organization and its environment, including competitors, customers, and suppliers, have become more porous, and innovations can more easily transfer inward and outward from the organization (Marilungo et al., 2016). Markman (2016) recognized that firms might not have all the internal resources and knowledge needed to innovate successfully; by using an open

innovation strategy, members of the organization bring new technology and products to market more successfully.

External sources of knowledge are becoming increasingly important and external channels to market are becoming increasingly valuable (Chesbrough, 2004). The emphasis on actively seeking out and engaging in successful collaborations with external sources has gradually become a key factor in enhancing the innovation performance of enterprises in the 21st century environment (Lasagni, 2012). Potential growth in revenue and new products is a central catalyst for organizations to adopt open innovation culture (Chesbrough & Crowther, 2006). Chesbrough (2003) suggested that some specific and relevant knowledge and resources are no longer proprietary to a single firm and that some complementary and valuable knowledge and resources may reside with stakeholders other than a firm's employees. Such stakeholders may include vendors, customers, competitors, and, to some extent, educational institutes. To gain access to this outside knowledge, an organization's leadership has to introduce changes to the organization's culture and resource capabilities in order to enable absorption and assimilation of the knowledge (Chesbrough, 2003). Chesbrough (2003) also emphasized that by expanding the organization's research capabilities outside its boundaries, the organization will innovate faster than it would if it followed the traditional closed innovation model. Dynamic organizations do not isolate themselves; they are open to sharing and collaboration about ideas, knowledge, and resources with partners, such as consumers, users, employees, supply chain partners, and others (Sulaiman et al., 2016).

Figures 11 provides a visual presentation of the multiple channels of inbound and outbound knowledge. An organization that cultivates an open innovation culture can embed and apply knowledge from outside parties and can turn outbound technology to third parties through licensing. The figure shows that an organization that adopts the open innovation model can target and reach new markets through research and development. Figure 11 adds the R&D timeline to the process of the inflow and outflow of knowledge and illustrates that the information is flowing in both directions, from the technology side to the market and from the market side back to the technology.

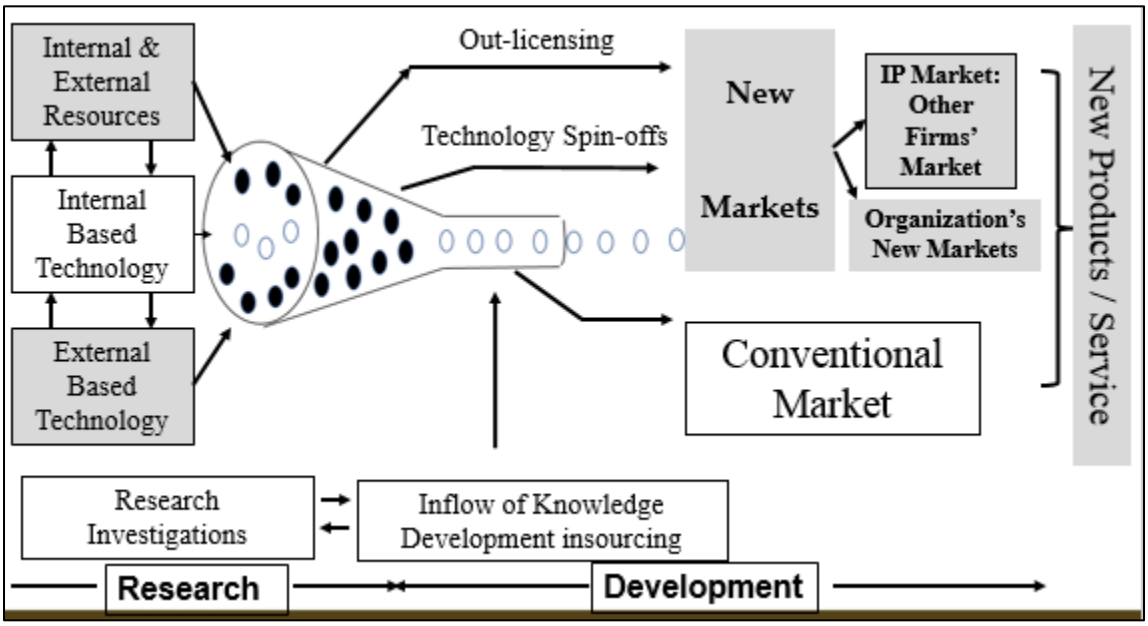

Figure 11. The model of open innovation
Note. Modified and inspired from Chesbrough, H. (2012). Open innovation: Where we've been and where we're going. *Research-Technology Management*, *55*(4), 20–27. doi:10.5437/08956308X5504085. Reprinted with permission.

There are two important kinds of open innovation: *outside-in,* also referred to as inbound, and *inside-out*, also referred to as outbound (Chesbrough, 2012). Inbound open innovation involves opening a company's innovation processes to many kinds of external

inputs and contributions. In an inbound process, the organization's members acquire knowledge from external sources, such as suppliers, customers, competitors, and universities, in order to complement internal innovation (Ahn et al., 2016). The outbound knowledge process takes place when an organization's members aim to exploit internal knowledge (Ahn et al., 2016).

The outbound open innovation requires organization members to allow unused and underutilized ideas to flow outside the organization for other firms to use in their businesses and business models (Chesbrough, 2012). Researchers have produced substantial data supporting the effect of both outbound and inbound open innovation on an organization's innovation performance (Garriga, von Krogh, & Spaeth, 2013; Parida, Westerberg, & Rishammar, 2012). For example, inbound open innovation activities promote diverse relationships with a wide range of knowledge sources, enabling an organization's members to acquire new solutions that can increase the possibility of successful radical innovation (Sabidussi et al., 2014). Outbound open innovation activities include licensing agreements, as well as technical and scientific knowledge supply (Cheng et al., 2016). Outbound activities allow the organization's members to commercialize internal knowledge for further use by other organizations (Hu, McNamara, & McLoughlin, 2015); such exploration of internal R&D technologies through commercialization enhances radical innovation performance (Inauen & Schenker-Wicki, 2012). In Figure 12, I provide a visual representation of the relationships between the inbound and outbound open innovation activities and the radical innovation performance of the organization. By utilizing both inbound and

outbound paths through knowledge acquisition and knowledge sharing, organization's members can achieve radical innovation.

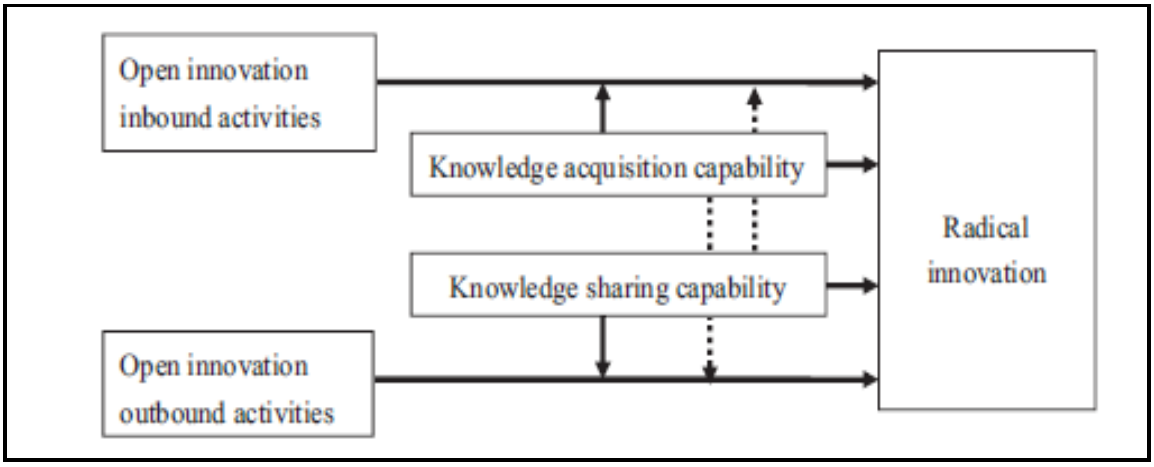

Figure 12. The relationship of outbound and inbound activities with radical innovation
Note. From Cheng. C.C., Yang, C., & Sheu, C. (2016) "Effects of open innovation and knowledge-based dynamic capabilities on radical innovation: An empirical study." *Journal of Engineering and Technology Management*, *41*, 79-91. Copyright 2016 by Elsevier. Reprinted with permission.

Sulaiman et al. (2016) developed a framework to analyze and evaluate how firms' members can make use of an open innovation system and achieve higher performance. When managers and employees develop the ability to collaborate with external partners, they gain access to various resources, skill sets, new markets, and lower costs. In the current business world of the 21st century, organizations' members must innovate collaboration with others, including their customers, suppliers, and other value chain partners (Sulaiman et al., 2016).

Sulaiman et al. (2016) identified three primary steps in the open innovation framework, illustrated in Figure 13. In the first step, business leaders prepare the organization to shift from closed innovation to open innovation through an internal organizational process to absorb external knowledge and resources. The changes in this

first step include organizational change, cultural change, changes in absorption capability, and the development of complementary assets. The second step consists of the practical methods or modes that the organization's members use in external collaboration in order to benefit from open innovation. These methods can take the form of technology transfers, funding, supplier perspectives, user perspectives, and institutional perspectives. In the third step, business leaders establish what they hope to gain from open innovation; these benefits can include higher access to resources, exploration of hidden potentials, development of new skills for employees, lower project costs, new innovative products, and increased capabilities.

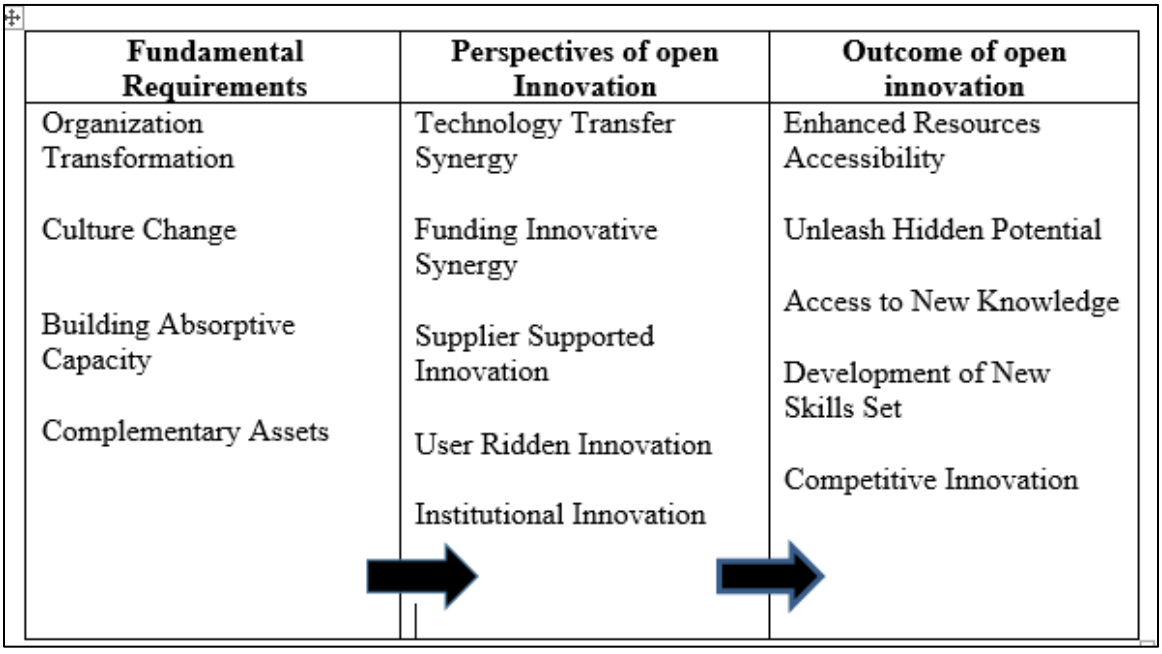

Figure 13. Fundamentals, perspectives, and outcomes of open innovation framework
Note. Modified and inspired from Sulaiman, S., Parimoo, D., & Banga, S. (2016). Open innovation a new paradigm in innovation landscape: An analytical overview. *International Journal of Innovative Research and Development, 5*(7), 70-76. Retrieved from http://www.ijird.com/index.php/ijird/article/view/96242. Reprinted with permission

Chen and Kao (2016) identified the Wikinomics organization as an organization whose members practice mass collaboration in a business environment in order to enhance competitive capability. Wikinomics refers to a new world of web-based economics with a foundation that includes principles and cultural values such as participation, collaboration, and collectivism (Priftis, Bondolfi, & Boisselier, 2014). Priftis et al. (2014) defined the Wikinomics process as *mass creativity*, referring to mass collaboration and creation by crowds. Five principles of Wikinomics' organizational openness relate to open innovation: collaboration, openness, sharing, integrity, and interdependence.

In Figure 14, I illustrate these five principles and their link to the two methods of open innovation. Collaboration forms a crucial element in a Wikinomics organization, and organizations' members must base this collaboration on resources of similar or complementary properties in order to achieve the desired benefits (Chen & Kao, 2016). Openness means revealing internal information to other organizations or stakeholders. Sharing enables partners to use valuable knowledge assets owned by the other organization, including the use of patents and copyrights. Integrity means a culture of honesty and the promotion of collaboration, resulting in more effective collaboration. Interdependence refers to the fact that modern organization theory has already changed from a closed-system theory to an open-system theory and that the development and existence of an organization are closely related to the external environment (Chen & Kao, 2016). An organization cannot survive by itself in the 21st century and must depend on

the resources, technology, information, and workforce provided by the external environment in order to survive (Chen & Kao, 2016).

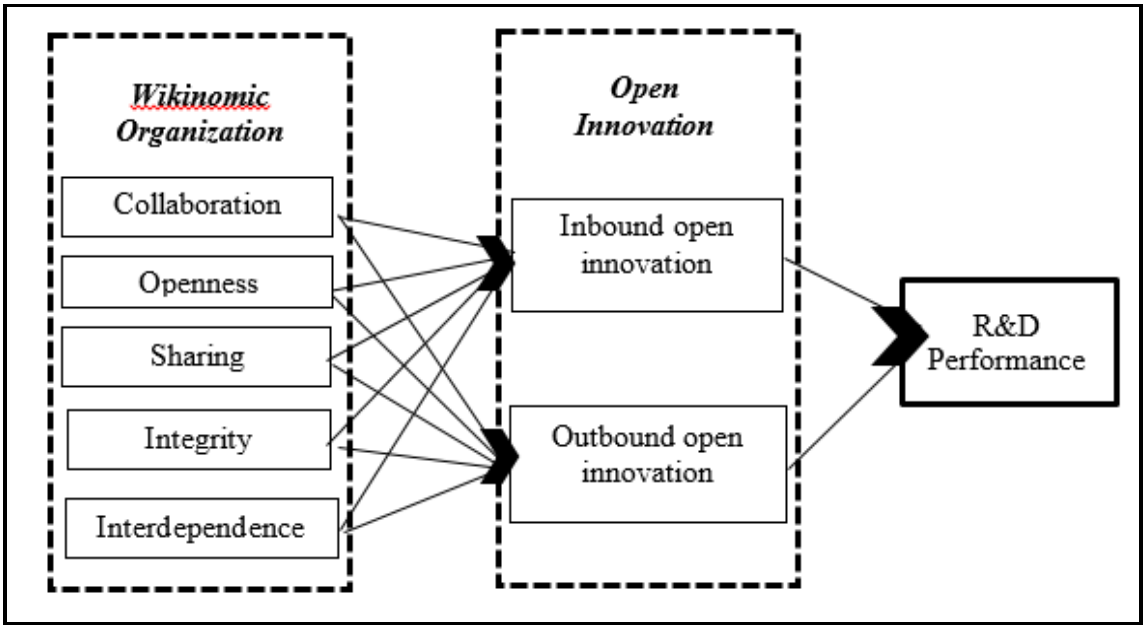

Figure 14. Wikinomics organization and open innovation
Note. Chen, D. N., & Kao, P. F. (2016, June). *The impacts of wikinomics on open innovation in organizations: A study based on SMEs in Taiwan*. Paper presented at Pacific Asia Conference on Information Systems. Retrieved from http://aisel.aisnet.org/pacis2016. Reprinted with permission

Possible barriers and risks in implementation of open innovation. Chesbrough (2012) identified several conditions and boundaries that business leaders need to satisfy in order to implement open innovation successfully. The first condition consists of workforce mobility. To advance knowledge, the organization's leaders need to have the ability to move people (Chesbrough, 2012); specifically, to take full advantage of the outbound open innovation, employees need to be able to move with a project. The second condition consists of the need for internal R&D within the organization. To effectively transfer knowledge, an organization's members need a certain amount of creative ability, as open innovation works best when people can collaborate side-by-side and move from

one organization to another (Chesbrough, 2012). The third condition consists of the need for an organization's leaders to establish intellectual property rules to enable open innovation. Martínez-Torres (2013) also emphasized that the availability of a strong public knowledge base, a mobile and educated working population, and ample external financing for innovation constitute the three conditions that have enabled open innovation to emerge.

In parallel to the conditions for successful implementation of open innovation identified by Chesbrough (2012), researchers also identified potential negative impacts that could result from implementing an open innovation model. Spithoven, Vanhaverbeke, and Roijakkers (2013) identified some of these possible negative effects that cooperation might generate, including: (a) the need to monitor costs associated with cooperation, (b) the increased likelihood of a leakage of core knowledge from the organization, (c) the reduction in effectiveness in searching for new technologies due to fewer relevant personnel to evaluate and absorb the new technologies, and (d) the reduction in internal R&D capabilities as an organizations members come to depend more on external R&D resources. When employees have fewer internal capabilities, they will have less ability to introduce a new product or service successfully (Spithoven et al., 2013).

Chesbrough (2006a) emphasized that a key assumption for an effective open innovation culture is that an organization's members will distribute knowledge widely both internally and externally. This assumption implies that an organization's members need to identify useful external knowledge sources and capture knowledge relevant to the

business (Ooms, Bell, & Kok, 2015). To implement a strategy of open innovation, an organization's leaders also must ensure internal absorption capacity (Lin, McDonough, Lin, & Lin, 2013; Ooms et al., 2015). The absorption capacity of an organization is its ability to recognize the value of new external information, assimilate that information, and effectively apply it to commercial ends (Wynarczyk, 2013). According to Wynarczyk (2013), an organization's internal R&D capacity forms a key component of the organization's absorption capacity due to its impact on innovation, ability to access external knowledge, and competitiveness. Oakey (2013) and Wynarczyk et al. (2013) stressed that small and medium-sized companies face limitations in the form of size, managerial capacity, skills, and awareness of and access to external knowledge and financing; these factors limit members' ability to implement open innovation. Berchicci (2013) found that when firms' members increasingly rely on external R&D activities, they show a better innovative performance up to a point; however, beyond this point, a greater share of external R&D activities reduces a firm's innovative performance. Thus, too much openness results in negative impacts on the organization's long-term innovation because managers lose control over core competence (Kim et al., 2016).

When managers shift attention to resources outside the company's market, they may dilute the organization's focus at the expense of its customers (Coras & Tantau, 2014). Risk sharing forms one of the primary motives for implementing an open innovation strategy. However, by implementing an open innovation strategy, business leaders may, in fact, increase the risk inherent in collaboration with different partners, including loss of intellectual property (Tantau & Coras, 2013).

Open innovation and collaboration offer an economical way to access knowledge from outside an organization. However, if managers do not have sufficient expertise in managing collaboration might face increased costs and barriers, as well as a loss of intellectual property (Coras & Tantau, 2014). Organizations that engage in research and development cooperation face significantly more imitation risks than firms that do not cooperate on research and development (Veer, Lorenz, & Blind, 2016). Business managers of high-technology organizations must realize these risks and develop a mitigation plan for R&D cooperation. In Figure 15, I show the primary risks that an organization may face when implementing open innovation strategy.

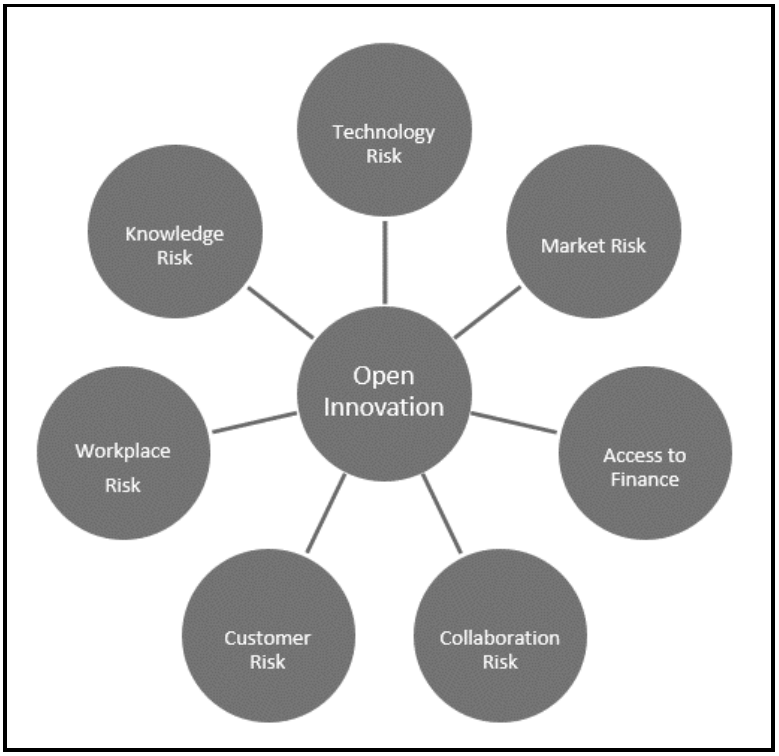

Figure 15. Risks in implementing open innovation
Note. In Figure 15, I illustrated the potential risks of implementing open innovation culture. I was inspired from: Coras, E. L., & Tantau, A. D. (2014). Open innovation–The good, the bad, the uncertainties. *The USV Annals of Economics and Public Administration*, *14*(1), 38-47. Retrieved from http://www.seap.usv.ro/annals/ojs/

In Table 5, I present additional information regarding these risks, including observation and details of the different risks from both external and internal perspectives. Managing these various risks requires a holistic management mitigation and risk reduction plan. Table 5 includes a list originated by Coras and Tantau (2014) that tallies the risks an organization may face in implementing an open innovation strategy. Coras and Tantau posited that openness requires higher management attention, coordination, and control abilities, all of which translate into high costs. While knowledge exchange from the foundation of open innovation, such collaboration poses significant risks due not only to the potential failure of the collaboration but also to the potential loss of competitive advantage.

Table 5

Details of Open Innovation Risks

Risk Driver	Type	Description
Workforce	Internal	Employees NIH attitude and resistance to innovation. Poor understanding of their role. Even when an organization already engages in open innovation strategy, the need to mitigate NIH attitude continues.
	External	Insufficient training of employees and familiarity with partner
	Internal	High retention of low quality employees, low management support for innovation
Knowledge sharing	External	Insufficient expertise of partner
	External	Ethical barrier due to leaking critical internal resources
	Internal	Higher complexity of managing open innovation, difficulty in balancing innovation with daily tasks
	Internal	Low control of external resources compared to internal resources
Collaboration	External	Conflicting interests with partners
	External	Lack of trust and communication among partners, collaboration suddenly ends due to partner leaving
	External	Collaboration objectives may not be met due to poor quality of partners or poor management of partnership
Market	External	Volatile and ambiguous industry regulations Unethical behavior of the partners related to the state administration bodies Lack of market information and transparency
Clients	External	Large volume of paperwork, administrative burdens Constantly changing needs of the clients, requiring customized products
Finance	External	Lack of financial capital to support open innovation, high commercialization costs Higher management, coordination and control costs

(*table continues*)

Risk Driver	Type	Description
Technology	External	Technology leakage to rivals, risk from technological uncertainty, inability to adapt to technology advances
Intellectual Property	External	Knowledge spillover /core knowledge flow towards the competitors: Inexistence of formal contracts

Note. From "Open innovation–The good, the bad, the uncertainties," by E. L. Coras and A. D. Tantau, (2014), *The USV Annals of Economics and Public Administration, 14* (1), 38-47. Adapted with permission.

The link between open and closed innovation. The way in which organization's members innovate, create new ideas, and bring them to the market has undergone a fundamental change from closed innovation to open innovation (Yun et al., 2016). To cope with an increasingly competitive environment, business leaders constantly invest in innovative activities and in creating technological capabilities (Berchicci, 2013). Berchicci (2013) posited that focusing only on internal R&D and the development of internal capabilities is no longer sufficient to cope with increasing costs, shorter product life cycles, and greater technological complexities. Rather, business leaders must shift from a vertically integrated in-house R&D structure to an open R&D structure by tapping into external sources of knowledge through licensing, alliances, and technology agreements (Berchicci, 2013).

The basic premise of the open innovation model differs directly from that of the traditional closed innovation system in which the organization's members generate ideas from research and development conducted internally behind closed doors (Sulaiman et al., 2016). The link between open and closed innovation within the organization is crucial (Kim et al., 2016). The attention of the organization's management is a limited resource;

management can only allocate time and funding to a relatively small number of innovative ideas at the same time. Because of this resource limitation, management must understand the critical component influencing the relationship between openness and innovative performance by organizing open innovation activities (Kim et al., 2016). According to Chesbrough (2003), several factors of open innovation outdated the closed innovation paradigm. The factors that drove the change include increased availability and mobility of skilled workers, the growth of venture capitalists, unutilized external ideas sitting, and the increasing capability of external suppliers (Chesbrough, 2003).

However, too much openness can have negative impacts on an organization's long-term innovation because managers can lose control over core competence (Kim et al., 2016). Business leaders must balance open and closed innovation because pursuing only one type of innovation will breed imbalance between an organization's potential absorption capacity and realistic absorption capacity (Kim et al., 2016).

Organization's absorption capacity. Absorption capacity refers to the information pathways between the firm and the environment and the internal communication pathways between departments within the organization (Wynarczyk et al., 2013). To benefit from external knowledge and to engage in the knowledge acquisition process, an organization's members must develop absorption capacity (Ahn et al., 2016). Absorption capacity, which is the ability to recognize the value of new information, assimilate it, and apply it to commercial ends, forms a critical component in the relationship between openness and innovation performance (Kim et al., 2016). In order to innovate, an organization's members must direct their attention to the sources of

innovation; however, attention is also a limited resource. Innovative performance thus requires an organization's members to shift their attention beyond current technological or organizational domain and to follow up attention with actions (Kim et al., 2016).

An organization's knowledge management or absorption capacity is crucial to the successful implementation of open innovation. Absorption capacity relates to the organization's inbound and outbound knowledge. In an inbound open innovation process, after acquiring the necessary external information, an organization's members need to integrate that information with internal information in order to generate a higher level of knowledge that can be used for internal innovation (Kim et al., 2016). The outbound open innovation process aims to disseminate internal knowledge in current markets and innovative new markets (Mortara & Minshal, 2014). In the outbound open innovation process, organizations with strong dissemination capacity disclose knowledge to less informed economic agents (Kim et al., 2016). In Figure 16, I illustrate the process of the open innovation model, the absorption and management of external knowledge flowing into the organization, and the dissemination of the internal organizational knowledge to the outside. Business leaders must understand how to measure the correct balance between an organization's absorption capacity and the factors needed to cultivate and sustain an open innovation strategy.

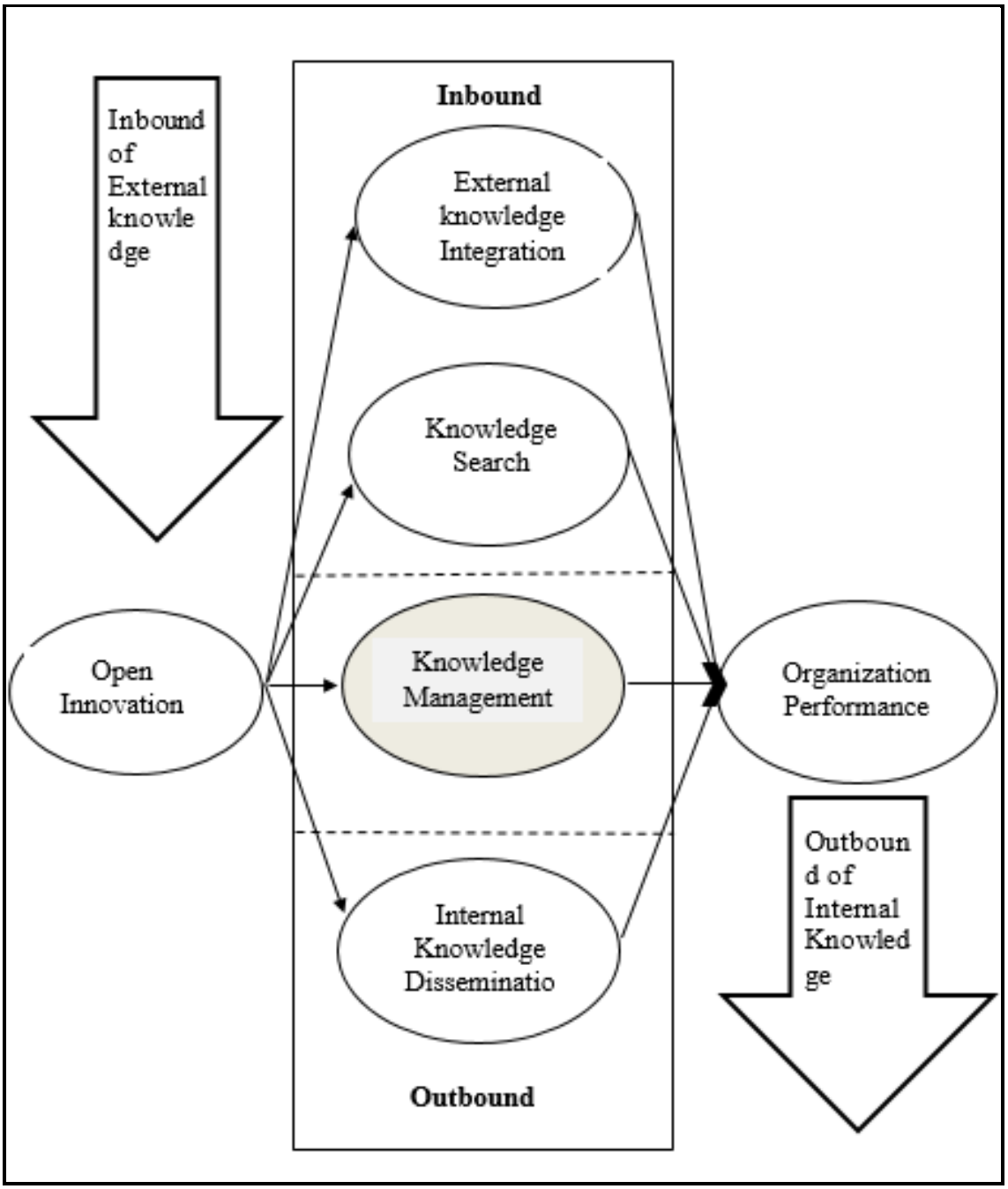

Figure 16. Organization knowledge absorption and dissemination
Note. Inspired and modified from Kim, B., Kim, E., & Foss, N. J. (2016). Balancing absorption capacity and inbound open innovation for sustained innovative performance: An attention-based view. *European Management Journal*, *34*, 80-90. http://dx.doi.org/10.1016/j.emj. 2015.10.002. Reprinted with permission.

The evolution and growth of open innovation into open innovation 2.0. The discipline of innovation is constantly evolving. In the 20th century, scientists drove new inventions; in the 21st century, Chesbrough (2003) introduced open innovation, a systematic process through which ideas can pass to and from different organizations (Curley, 2015). Procter and Gamble Company provides a role model for the open innovation strategy; the organization's members have utilized ideas and innovations from outside the company to create almost half of the company's new products (Ozkan, 2015). As the process of innovation moves forward, business leaders and employees must use an intelligent combination of existing and emerging technologies to produce new products and services, but firm members may face challenges in developing those technologies on their own (Curley, 2015). Kotsemir and Meissner (2013) described the historical evolution of innovation into the open innovation model in seven phases:

1. From the late 1950 to the 1960s: A linear approach to implementing technology.
2. From the late 1960s to the first half of 1970s: A market need pull-based approach responding to customer demands.
3. From the second half of the 1970s to the end of the 1980s: A coupling model of interaction of different functions and an interactive model that included interaction with research institutions and the market.
4. From the end of the 1980s through the early 1990s: An integrated model.
5. In the 1990s: A networking model focused on system integration and networking.
6. In the 2000s: an open innovation model focused on innovation collaboration and multiple exploitation paths.

7. Emerging seventh phase: A model of the open innovator focused on the individual and presenting a framework of conditions through which individuals can become more innovative.

Contrary to Kotsemir and Meissner (2013), Curley (2015) stated that the unit of competition no longer consists of the organization or the individual but rather centers on the strength of the ecosystem in which the individual and the organization participate. Thus, open innovation 2.0 has evolved as a nonlinear and systematic phenomenon spanning organizations, disciplines, and stakeholders (Curley, 2015). Curley suggested that open innovation 2.0 principles includes an integrated multidisciplinary collaboration, shared values, cultivated innovation ecosystems, unleashed exponential technologies, and a focus on innovation adoption. Figure 17 illustrates the transition from the closed innovation model of the 20th century to the 21st century open innovation model and into the ecosystem and innovation network model. The ecosystem innovation model refers to collaboration between numerous parties with various professional specialization.

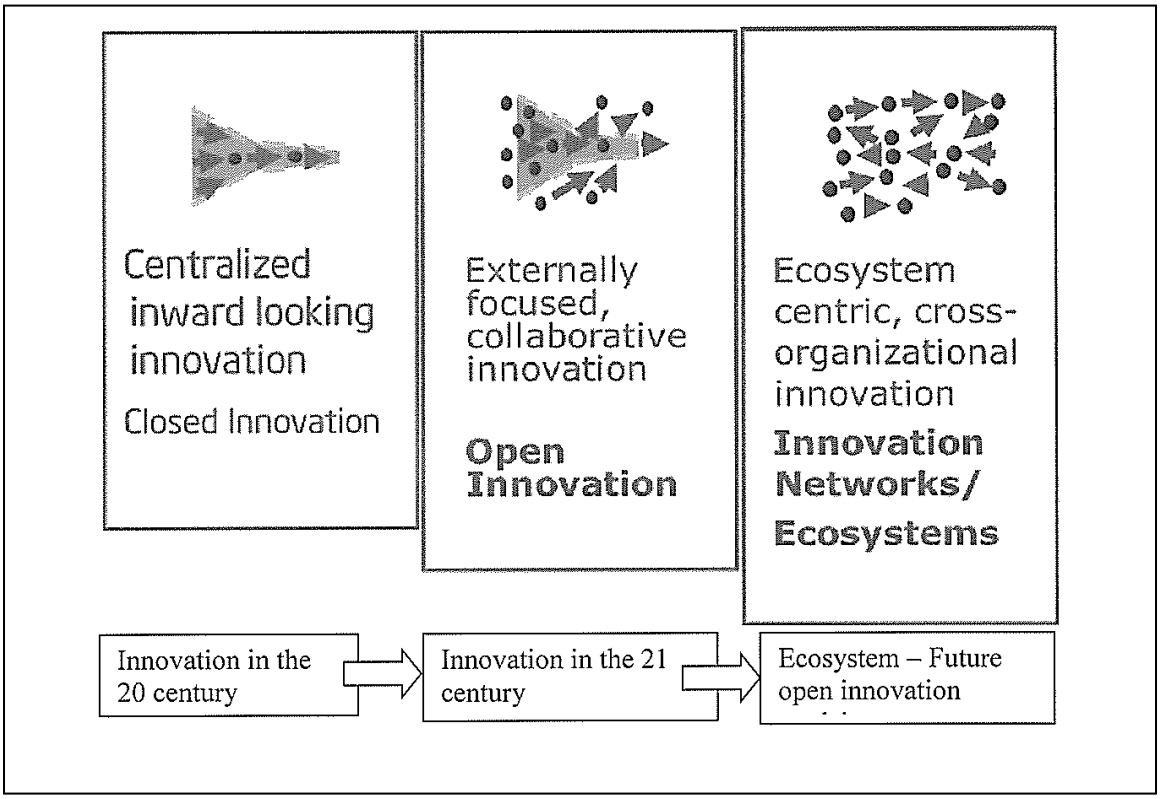

Figure 17. Organization knowledge absorption and dissemination
Note. Inspired by: Curley, M. (2015). The evolution of open innovation. *Journal of Innovation Management*, *3*(2), 9-16. Retrieved from http://www.open-jim.org. Reprinted with permission

The open innovation 2.0 paradigm characterized by the use of the quadruple helix model. The helix model allows government, industry, academia, and individual participants to work together to innovate and create far beyond the scope of what any one organization or a person could do alone (Villarreal & Calvo, 2015). As portrayed in Figure 18, Curley (2015) described the cooperation between the various actors in the quadruple helix innovation model. Curley (2015) stated that the evolution of open innovation could help drive the development of shared value solutions, which in turn can drive changes far beyond the scope of what any one organization could achieve on its own. The principles of open innovation 2.0 and the quadruple helix innovation include

integrated collaboration, co-created shared value, cultivated innovation ecosystems, innovation of exponential technologies, and focus on adoption. As competition in the 21st century moves from competing organizations to competing ecosystems, business leaders must share vision and information.

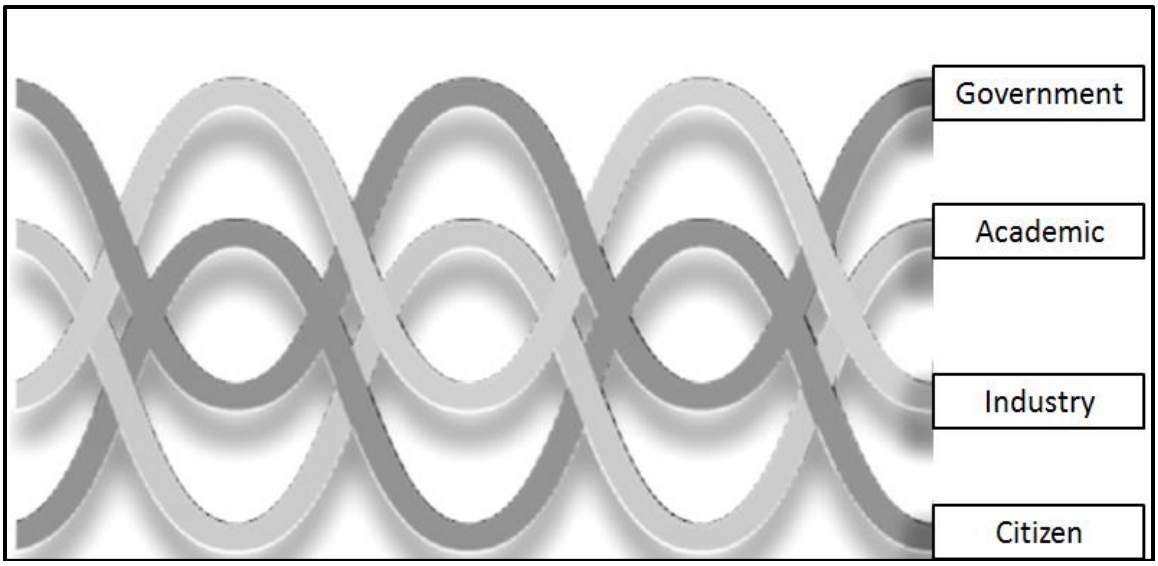

Figure 18. Quadruple helix innovation
Note. From Curley M. (2015). "The Evolution of Open Innovation," *Journal of Innovation Management*, *3*(2), 9-16. Reprinted with permission.

As illustrated in Figure 19, Villarreal and Calvo (2015) identified the innovation ecosystem as the knowledge space among all the agents involved in the innovation system. In addition to simple inbound and outbound knowledge, these authors introduced other considerations and factors that affect the open innovation strategy. The impact of the total global innovation network, macroeconomic regulatory market factors, and infrastructure, as well as product market conditions, comprise a few of the considerations introduced with the innovation ecosystem view.

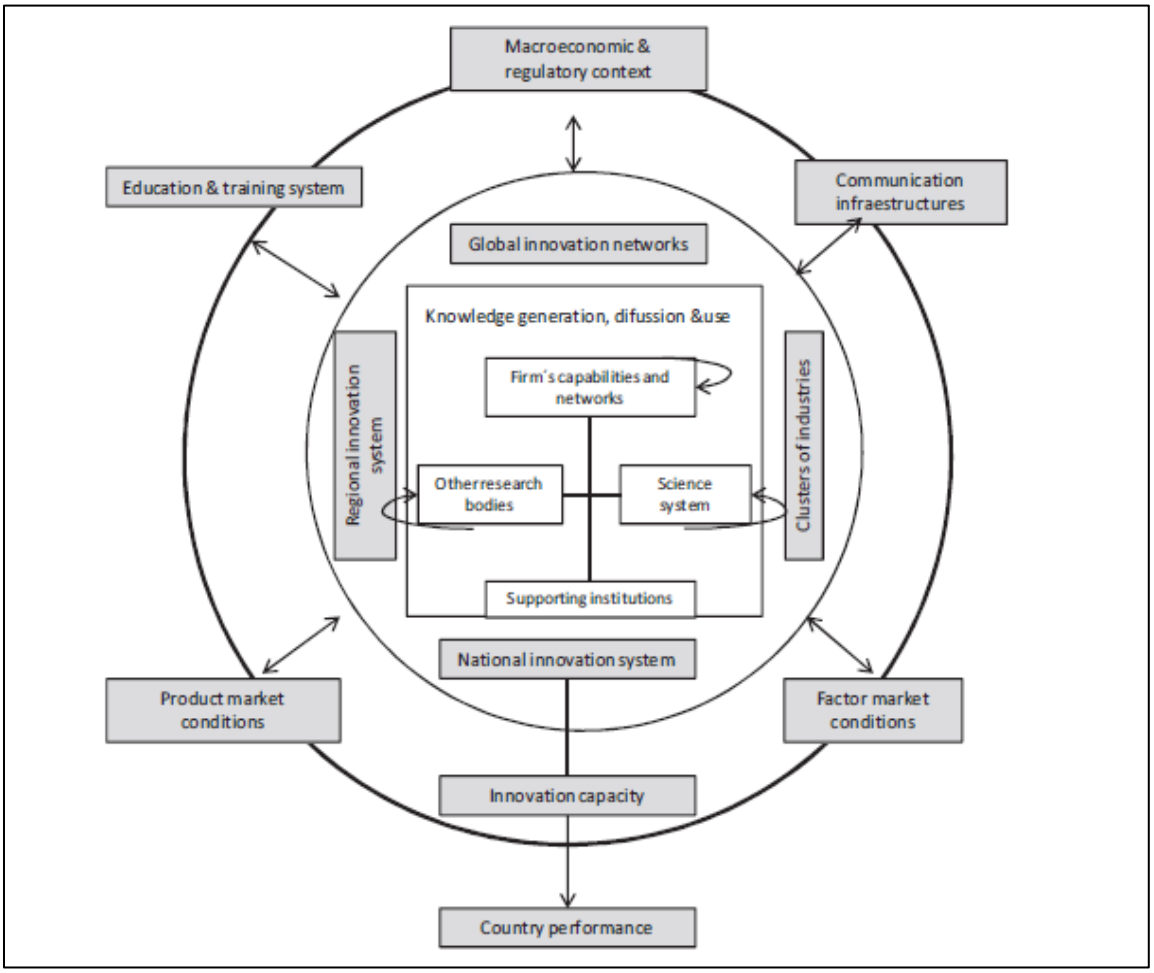

Figure 19. Innovation system, actors, and linkage
Note. From "The triple helix model to the global open Innovation model: A case study based on international cooperation for innovation in Dominican Republic," by O. Villarreal and N. Calvo, 2015, *Journal of Engineering and Technology Management*, *35*, 71-92. Reprinted with permission.

The Main Drivers of Open Innovation

The inherent primary driver of open innovation is communication between stakeholders (Coras & Tantau, 2014). Coras and Tantau (2014) identified the primary motivation for open innovation development as: (a) the drastic shortening of product life cycles, (b) the globalization of competition, (c) the accompanying growth in the number of possible innovators, (d) the influence of technologies on international markets, and (e)

the increasing difficulty of protecting and monitoring intellectual property and expertise. Coras and Tantau posited that innovation collaboration allows organizations to gain needed skills, technologies, assets, and other resources from outside the organization and to enhance the firm's capabilities while reducing the firm's cost and risk. Table 6 includes the primary drivers and motives for organizations to pursue open innovation.

Table 6

Motives to Pursue Open Innovation

Cost Reduction	Knowledge Acquisition	Risk-Sharing	Resources Availability
Shorten Time to Market		Competitiveness	

Note. Inspired by: Coras, E. L., & Tantau, A. D. (2014). Open Innovation–The good, the bad, the uncertainties. *The USV Annals of Economics and Public Administration*, *14*(1), 38-47. Retrieved from http://www.seap.usv.ro/annals/ojs

Chen and Kao (2016) also identified the primary drivers for open innovation strategy. Due to the rapid change in technology, decreasing product lifecycle, and increasing R&D cost, organizations with mere innovation by their R&D department can hardly keep up with the rapidly changing industrial environment. Thus, the use of external knowledge for innovation has become a necessity. Chesbrough's (2006b) model of open innovation, which refers to the notion that the borders between organizations should be porous, enables an organization to move to a new innovative business model, in which it cooperates with partners from outside-in and inside-out (Chen & Kao, 2016).

A successful transformation from a closed innovation paradigm to one of open innovation requires focus and reinforcement on two levels (Markman, 2016). The first, the macro-level foundation, includes organizational and environmental elements, such as collaboration with external partners. The second, the micro-level foundation, includes the actors that instigate and lead a significant organizational change process (Mortara & Minshall, 2014).

The Micro Level: The Individual Domain

When some business leaders attempt to shift from the closed innovation model to the open innovation model, they fail to provide a method of organizing and managing open innovation internally. By using a micro-level observation, they can better evaluate the significant internal organizational change process (Mortara & Minshall, 2014; Salter, Criscuolo, & Ter Wal, 2014). Salter et al. (2014) posited that in the shift to an open innovation model, individuals face difficulties in building new partnerships, transferring knowledge across firm boundaries, and finding a good fit between external knowledge and the organization's objective. de Araújo Burcharth, Knudsen, and Søndergaard (2014) found that open innovation practices are related to employees' attitudes toward knowledge, specifically the level of negative attitudes toward the acquisition and sharing of knowledge. de Araújo Burcharth et al. identified that employees' NIH attitude influences the extent of use of open innovation practices negatively. Management can use specific types of professional training to diminish the impact of negative NIH attitudes (de Araújo Burcharth et al., 2014).

Salter et al. (2014) identified the individual-level challenges to open innovation, specifically the challenges that individuals face at different stages of external engagement. These challenges include: (a) getting the right mindset, (b) building partnerships, (c) starting the conversation, and (d) taking advantage of the collaboration. Table 7 includes a summary of these challenges.

Table 7

Individual-level Challenges of Open Innovation at Various Stages of External Engagement

Stage of Engagement	Company Stance	Individual-Level Challenge
Individual-Level Challenge	All scientists and engineers are expected to embrace open innovation.	Perception of external engagement as second best.
Building Partnerships	Established procedures have to be followed when building collaboration with new parties.	Preference for the safety of comfortable partners with whom they worked in the past.
Starting the Conversation	No disclosure of internal knowledge to third parties without confidentiality agreement in place.	Difficulty to overcome the paradox of disclosure when starting new collaborations.
Taking Advantage	Managerial pressure to increase the number of R&D projects that involve external parties.	Difficult to make external knowledge digestible regarding alignment with internal knowledge, procedures, and objectives.

Note. From "Coping with open innovation," by A. Salter, P. Criscuolo, and A. L. Ter Wal, 2014, *California Management Review, 56*(2), 77-94. Reprinted with permission.

Figure 20 further displays the four challenges and practices to overcoming the individual-level challenges identified by Slater, Mohr, and Sengupta (2014):

- External engagement as second best. Local in-house knowledge, although perhaps less advanced than knowledge from external sources, is easily accessible and transferable, which makes external knowledge second best.
- The safety of comfortable partners. Individuals involved in open innovation tend to focus on interactions with the firm's key partners, and not necessarily with the expert partner.
- Overcoming the paradox of disclosure. Individuals often find it difficult to know how much information to disclose to an external party in order to establish a mutual interest in collaboration.
- Making external ideas digestible. Identifying useful external knowledge is just the start of a potentially successful open innovation process. Sometimes individuals and organizations do not realize the importance of the process of assimilating the external knowledge into the organization.

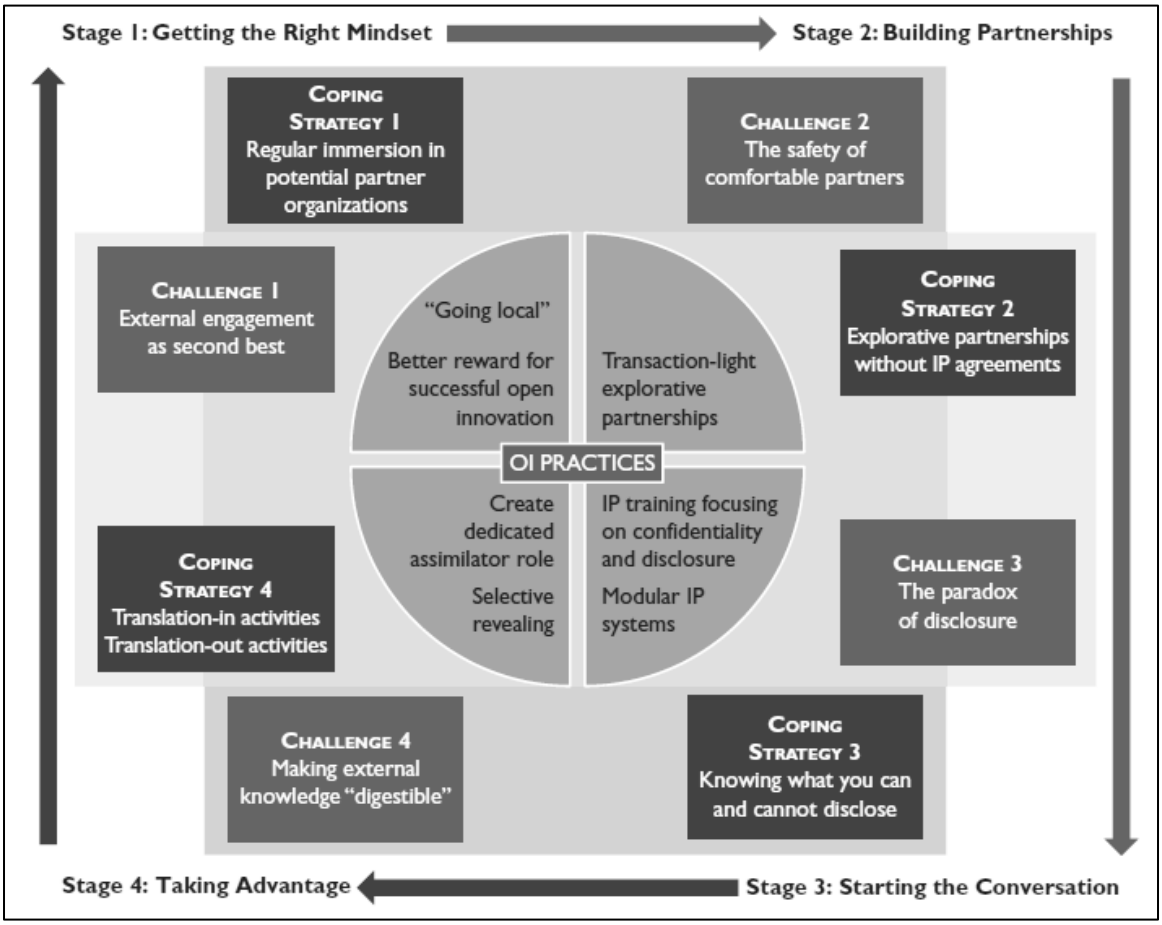

Figure 20. Open innovation practices emerging from individual-level challenges
Note. From "Coping with open innovation," by A. Salter, P. Criscuolo, and A. L. Ter Wal, 2014, *California Management Review*, *56*(2), 77-94. Reprinted with permission.

The engineers, managers, and executives. An organization's shift from closed to open innovation requires profound changes in internal processes and the structure of the organization (Markman, 2016). The shift also always involves changes in the attitudes, mindsets, and behaviors of the individuals within the organization. Markman (2016) identified that a micro-level perspective is essential to understanding the open innovation processes within an organization. Once an organization's managers decide to make open innovation a strategic priority, every member of the organization must follow suit and adopt a shared view of open innovation (Markman, 2016). Markman focused on

the indispensable role of leadership within the organization to enable the internal implementation of open innovation. In this study, I expanded the observation within the micro level of the organization, into three levels or groups of individuals.

In this study, I followed Schein's (1996) multi-layers theory, as it relates to organizational culture. Schein defined an organization's culture as the set of shared, implicit, taken-for-granted assumptions that a group of individuals holds and that determines how they perceive, think about, and react to various environments (Schein, 1996). Schein's multi-layered model of organizational culture offers a useful framework for thinking about processes that foster innovation (Hogan & Coote, 2014). Schein posited that organizational culture and behavior are a function of the ability to reconcile intrinsic conflict among members of the various categories (Hogan & Coote, 2014). Schein also identified three different cultures within an organization: the *operators*, the *engineers*, and the *executives*. The operators consist of the line managers and workers who make and deliver the products and services that fulfill the organization's basic mission. The operator group typically becomes the target of change programs and organizational learning efforts. The engineers include the technocrats and the core designers in any functional group, who all share a common occupational culture. The engineers deal with the core technology that underlines what organization does. Schein posited that the engineers prefer systems, machines, routines, and rules that are automatic and very reliable. The need for engineering or basic design drive them toward simplicity, elegance, and routinized solutions that often ignore the social realities of the workplace. The third group is the executives, who share a common set of assumptions based on the

daily realities of their status and role (Schein, 1996). Schein argued that the executives have the role of financial accountability to the owner and shareholders, often embodied in the principle to keep stock prices and dividends as high as possible. In essence, the "executives" status comprises the place where ultimate accountability lies. Schein posited that each group has its motives and characteristics. While the operators have a culture to improve effectiveness by building learning capabilities, the engineer's culture drives them to replace people with machines. The executive's culture drives them to increase financial returns and to have less concern about teamwork, collaboration, commitment, and involvement. An organization, as a unit, would not be a reliable learning system unless it reconciled the built-in conflict between these three cultures (Schein, 1996). In this study, I used Schein's model to explore how managers cultivate and sustain open innovation strategies. In particular, I explored the three individual levels within the organization by interviewing participants from the three groups that Schein identified.

The Macro Level: The Organization and Environment Domains

Through the macro-level observation, a researcher tries to identify the organizational practices that a firm uses to leverage external sources of knowledge and to capture value from collaboration (Salter et al., 2014). I used a macro-level observation to focus on organizational culture and globalization as external drivers of open innovation.

The organizational culture as a driver for open innovation. A shift from a closed innovation model to open innovation requires a firm's leaders to underpin two levels of foundations: the micro-level foundation and the macro-level foundation. The macro-level foundation requires a restructuring of workflows and alliances involving

collaboration with external partners (Markman, 2016). The open innovation paradigm assumes that an organization's members can and should use both external and internal ideas and paths to market as they look to advance technology (Parveen et al., 2015). Parveen et al. (2015) posited that open innovation in the organization interacts with the external environment and results in the adaptation of either the inbound or outbound innovation process. Through the macro-level observation, I focused on organizational culture and globalization as external drivers of open innovation.

Firm's globalization: The link to global collaboration, global supply chain, and open innovation. Globalization involves the creation of linkages between nations, as well as organizations. Globalization forms a process in which physical, political, cultural, and economic barriers are reduced or removed (Hamilton & Webster, 2015). According to Hamilton and Webster (2015), globalization stimulates exchanges in goods, services, money, and people; as these exchanges grow, businesses become increasingly integrated and interdependent. The global economy has changed firms' focus from local, regional, or national business aspects, such as value chains and trade, to internationalism (Hamilton & Webster, 2015). In response to globalization, many business leaders have focused on short-term results, thereby cutting investment in long-term research into radical innovation (Coras & Tantau, 2014).

As illustrated in Figure 21, the global average annual export growth rate from 1993 to 2013 was nearly 5%, while the average annual growth rate in global output for the same period was only about 2.5% (Hamilton & Webster, 2015). Thus, international trade and exports have become an even more crucial component of business performance

in a competitive market (Hamilton & Webster, 2015). Companies have increasingly started to trade in international markets; as a result, their employees must interact with demanding customers and competent suppliers, meet high-quality requirements and seek ideas and knowledge to stay competitive and find new markets.

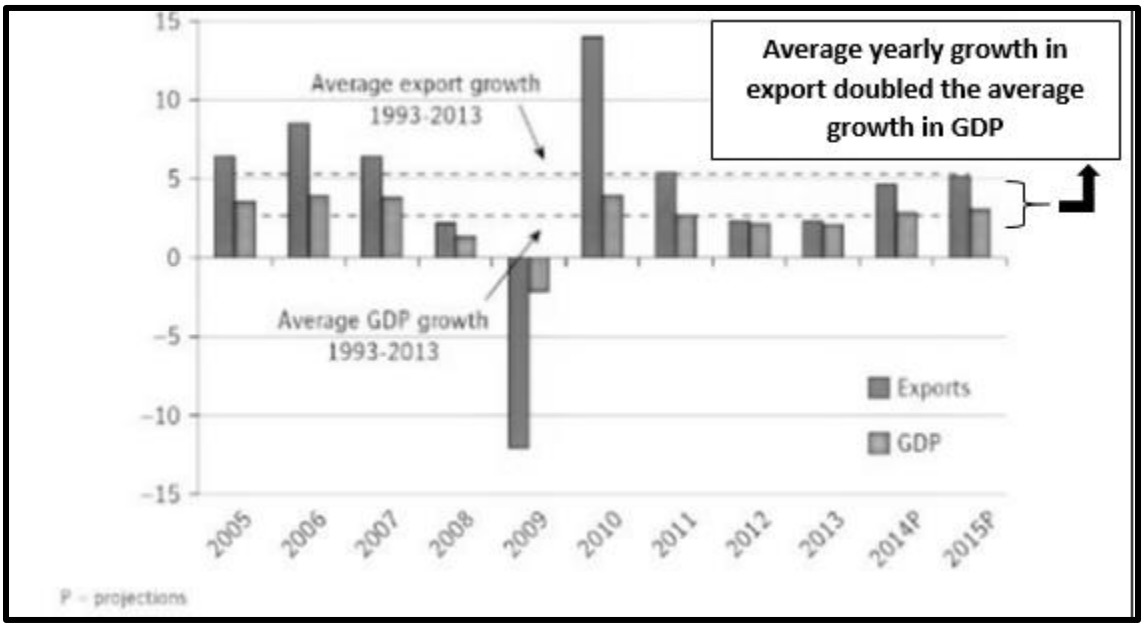

Figure 21. Growth in world exports by volume of goods and GDP percentage
Note. I modified this figure to emphasize the growth in export. Original figure from: Hamilton, L., & Webster, P. (2015). *The international business environment*. Oxford, UK: Oxford University Press. Reprinted with permission.

Globalization involves a common thread of increasing connectivity (Pieterse, 2015), and the boom in information and communications technologies forms part of the infrastructure of globalization. As individuals become more aware of the smaller nature of the world and of receding cultural differences, they have become increasingly sensitive to those differences (Pieterse, 2015). The phenomenon of advancing modernization has created a widespread understanding that growing global interconnectedness leads to

increasing cultural standardization and uniformity, as seen in the global sweep of consumerism (Pieterse, 2015).

Business leadership in the emerging global order face a new paradigm. The challenges of the past, such as homogenous workforce culture, limited technology access, and limited access to global resources such as personnel, capital, talent, and natural resources, have given way to a world without boundaries. Instead, business leaders operating in different territories, cultures, and industries face a new set of challenges that result from competitive global business pressure and the desire for continuation. Globalization has exposed companies to a multicultural and diverse workforce and has enabled organizations' members to become more innovative, particularly regarding product innovations (Parrotta, Pozzoli, & Pytlikova, 2014).

Capozzi et al. (2013) noted that 80% of the executives surveyed believed that the best way organizations could position themselves to meet goals was through open innovation. Innovation is critical to an organization's competitiveness and can take the form of a new product, a new service, a new technology, a new manufacturing procedure, or a new management method (Chen & Kao, 2016). Chen et al. (2015) described enterprise innovation strategy as a key component of the organization strategy, which should be consistent with the overall enterprise strategy. Chen et al. also posited that the organizations' decision makers on innovation strategy are inseparable from organizational leadership governance system.

Increasing global competition and access to technology have led organizations' supply chains to become the primary battlefields on which firms compete. Thus, business

leaders must engage in greater supply chain collaboration and the adaptation of an open innovation strategy in order to utilize resources and knowledge from partners outside the firm (Chen, Brennan, & Zeng, 2013). Innovation is pivotal to survival and success in the market, and open innovation allows business leaders to collaborate with global customers, suppliers, and other sources of innovation (Shamah & Elsawaby, 2014). According to Chesbrough (2003), business leaders would benefit more from integrating an open innovation strategy by making greater use of external ideas and technologies in their own business. Lifshitz-Assaf (2017) echoed Chesbrough's statement regarding the benefits of open innovation strategy and identified that the open innovation model introduces a real option for advancing scientific and technological breakthroughs under tight time and resources constraints. An organization's supply chain (SC) comprises an organizational structure connecting supplier, manufacturers, distribution centers, and retailers (Blos, Da Silva, & Miyagi 2015). Through SCs, an organization's members aim to produce and distribute goods to the final customers with the right quantity, at the right place, and at the right time with minimum cost (Blos et al., 2015). With the fast pace of globalization, firms' leaders must secure a wide and efficient global supply chain network to ensure sustainability and competitiveness; in addition, these supply chains have provided even the smallest company with the ability to maximize customer satisfaction (Ross, 2013). The flow of knowledge, as part of an open innovation strategy, enables members of a supply chain to come together to create a true value chain for the organizations' stakeholders. In the competitive landscape of the global market, knowledge-sharing between actors within the organization, global buyers, and suppliers

has never been more critical for the organization's ability to be innovative and to achieve competitiveness and sustainability.

Innovation is a critical issue to organizations' competitiveness (Chen & Kao, 2016), and in order to be competitive in a global market, business leaders must develop a holistic innovation strategy, as previously discussed. With the model of open innovation, openness redefines the competitive boundaries of organizations and enables an organization's members to introduce innovation to the market as an integrator, not just an owner (Chen & Kao, 2016). Adopting an open innovation strategy requires organizational openness.

Theory: Organization Culture

The concept of organizational culture originated from cultural anthropology (Schein, 1996). Büschgens et al. (2013) defined organizational culture as a complex set of values, beliefs, assumptions, and symbols that define the way in which a firm conducts its business. Organizational culture includes the values and beliefs that establish expected employee behaviors (Parveen et al., 2015); an organization's culture strongly influences employee behavior beyond formal control systems, procedures, and authority and can include dress code, physical layout, and overall feel of the workplace (Wiewiora, Trigunarsyah, Murphy, & Coffey 2013). Schein (1996) described organizational culture as a social force that is largely invisible yet very powerful. Organizational culture affects employee performance and organizational effectiveness (Awadh & Alyahya, 2013). According to Harwiki (2013), organizational culture is the social glue that binds together

members of an organization, while leaders operate to align the culture of the organization with a vision of the organization.

Researchers have positioned organizational culture as a key area of management and organization studies, as well as practice (Alvesson, 2012). Alvesson emphasized the importance of organizational culture as a way to understand organizational life in all its richness and variation.

Organizational culture includes the ways in which people know and understand the values and beliefs of a specific group of people or an institution (Taplay, Jack, Baxter, Eva, & Martin, 2014). As Schein (1985) stated, organizations' members establish organizational values and beliefs over time, validate those values and beliefs, and then teach them to new members who enter into the culture. Organizational beliefs and values make up the guiding principles that influence the development of individuals' attitudes toward the organization, as well as how individuals within that culture make decisions or invest their time (Taplay et al., 2014).

The term *organizational culture* became more widely used in the late 1970s as more researchers engaged in organizational analysis (Alvesson & Sveningsson, 2015). Throughout the 1980s and 1990s, some researchers viewed organizational culture as the single most important element in organizational success; however, other researchers have since revised this view of organizational culture (Alvesson & Sveningsson, 2015). Organizational culture remains an essential, influential factor in analyzing organizations and comprises an important element in establishing the organization's competitive advantages and organizational performance (Dauber, Fink, & Yolles, 2012). Dauber et al.

classified organizational culture into three categories: (a) dimensions approach, (b) interrelated structure approach, and (c) typology approaches. The dimension approach focuses on measuring organizational culture empirically. The interrelated structure approach concentrates more on linking the concept of organizational culture to other constructs or characteristics of organizations and less on single variables. Typology approaches focus on predefined key characteristics that divide and cluster organizations into certain categories, not necessarily on defining the relationship of these characteristics to one another.

Theory selection criteria. Researchers use a theoretical framework to justify the research questions, the problem, and the significance of a study, as well as to determine the research design and the analysis plan (Grant & Osanloo, 2014). Along with the problem statement, I used a conceptual framework to set the stage for the presentation of the specific research question driving exploration of my study on open innovation. The theoretical framework provided a grounding base, or an anchor, for the literature review and, most importantly, the methods and analysis. The theoretical framework also provided a vocabulary for that I used to explain the design and describe the results of the study to help articulate the problem, as suggested by Dine, Caelleigh, & Shea (2015).

Researchers establish numerous theories and varying perspectives on the same issue; thus, each researcher must decide which lens to use or which blueprint to follow to build an argument, establish the context of the problem, and explain findings (Grant & Osanloo, 2014). To explore how business managers effectively cultivate and sustain a

strategy of an open innovation culture in a high-technology organization, I evaluated two possible theories: diffusion of innovation theory and organizational culture theory.

The diffusion of innovation theory focuses on the process of delivering innovation, including new ideas, applications, products, and technologies, via a specific channel between the members of a social system (Akca & Özer, 2014). Researchers use diffusion of innovation to explore how individuals react to the implementation of innovation and the factors that drive individuals to adopt an innovation or a new technology (Agag & El-Masry, 2016; Wei, Lowry, & Seedorf, 2015). The organizational culture theory, on the other hand, enabled me to evaluate the entire organization. McMullen, Griffiths, Leber, and Greenhalgh (2015) found that an individual's tendency to adopt innovation usually stems from that individual's organizational culture and the indirect messages conveyed to them by managers. Organizational culture theory comprises numerous theories that attempt to explain and predict how organizations and their members will behave in varying organizational structures, cultures, and circumstances (Shafritz, Ott, & Jang, 2015). Previous researchers of organizational culture have focused on the link between organizational culture and numerous activities of the organizations, including, but not limited to, the link to innovation. For example, Cao, Huo, and Zhao (2015) discussed the link between organizational culture and supply chain, Rich and Mero (2015) and Uddin, Luva, and Hossian (2013) discussed the link between work behavior and performance, and Gupta and Kumar (2013) discussed the link between organizational culture and sustainability.

Product innovation is key to organizational renewal and success, enabling the organization's members to remain aligned with rapidly evolving customer needs in high-velocity environments (Slater et al., 2014). To enable radical innovation, a firm needs a comprehensive set of organizational components that includes organizational culture, senior leadership, organizational architecture, organizational development processes, and strategy (Slater et al., 2014).

In this study on the cultivation of open innovation strategies in high-tech organizations, I explored various drivers and enablers for effective implementation of open innovation. To enable the exploration of a wide scope of set organizational components, which affect the organizational innovation strategy, I examined both the micro layers and the macro layer of the organizational environment. The micro layers include the organization's internal actors, while the macro layer includes the organizational environment, as well as external stakeholders. I selected the organizational culture theory in order to understand the phenomena and provide a wider evaluation of the organization. In addition, I used the organizational culture theory to support the different aspects of the research question and the exploration methodology of this study.

Schein's organizational culture model. Schein, Costas, Kunda, Schultz, and Connolly (2015) conducted observations of the values and norms in organizations and described the culture of the organization in a three-level model. The first is the level of *artifacts*. Schein (1996) described artifacts as everything that a person sees and feels when he or she enters the organization, including the behavior of its members. The second level includes *adopted values*, which Schein described as what the organization's

leaders claim they want the organization to be. Schein observed that disconnects often exist between the artifacts and some of the claimed values. The third level is *shared tacit assumptions*, which, according to Schein, constitute values that had been explicit at one point in time but became taken for granted and increasingly non-negotiable.

According to Alvesson and Sveningsson (2015), Schein developed an influential model of an organizational culture consisting of these three interrelated levels: The governing *assumptions* constitute the core of the organizational culture and guide everyday thinking and action in organizations. The *values* and *norms* prescribe how the organization's members should work and refer to principles, objectives, and codes that the organization's leaders value as significant. The *artifacts* level is the most concrete level and includes the expressions of the governing assumptions, such as physical, behavioral, and verbal manifestations.

In Schein's cultural model, the various levels influence each other mutually, as the governing assumptions expressed in norms influence behavior. Schein's model enables researchers to analyze the interconnection of deeper assumptions and beliefs with embraced values and organizational symbolic and material artifacts (Alvesson & Sveningsson, 2015). Schein's model also enables researchers to gain an understanding of the difficulty in achieving organizational culture change; such change requires, at a minimum, that the normally hidden assumptions become explicit and targeted.

Schein emphasized the importance of distinguishing between several layers of organizational culture; this is in contrast to the notion that organizational culture is a single construct. Hogan and Coote (2014) illustrated Schein's cultural layers, as

presented in Figure 22 relating to the culture of innovation. In Figure 22, Hogan and Coote illustrated the process of how values trigger norms and artifacts and determine patterns of behavior. Norms are expectations of acceptable behaviors held by members of the organization and have the force of social obligation (Schein, 1996). For example, innovative behaviors can result from norms that support cooperation with external organizations. Organizational norms derive from organizational values and are manifested in artifacts, while values are the least visible and artifacts represent the most visible layer of the organizational culture (Schein, 1996). Organizational artifacts are evident in organizational symbols, rituals, language, and physical workspace arrangements (Schein, 1996). In Figure 22, I present a few examples relevant to open innovation in order to illustrate the different layers of the organizational culture.

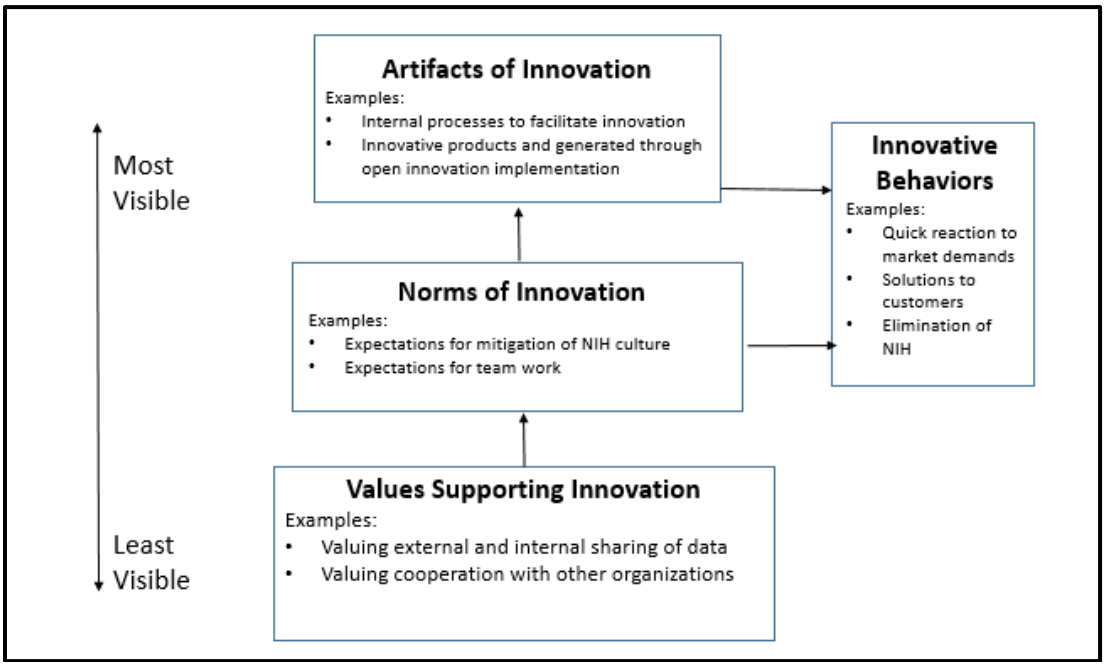

Figure 22. Layers of organizational culture that supports innovation
Note. From "Organizational culture, innovation, and performance: A test of Schein's model," by S. J. Hogan and L. V. Coote, 2014, *Journal of Business Research, 67,* 1609-1621. Copyright 2014 by Elsevier. Adapted with permission

According to Dauber et al. (2012), Schein's model consists of three domains: (a) basic underlying assumptions, (b) espoused values, and (c) artifacts. Schein distinguished between observable and unobservable elements of culture. Dauber et al. illustrated the certain hierarchy between these domains (Figure 23). Visible behavior influences and is influenced by unobservable assumptions through rules, standards, and prohibitions.

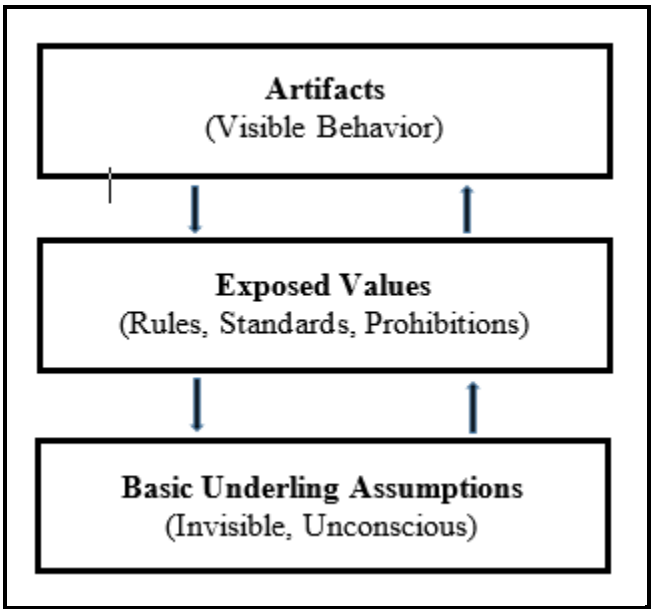

Figure 23. Organizational culture model by Schein
Note. From "A configurational model of organizational culture," by D. Dauber and G. Fink and M. Yelles, 2012, *SAGE Open,* 2 (1), 1-16. Reprinted with permission.

Gaps in the Literature

Although numerous researchers have explored open innovation since Chesbrough (2003) coined the paradigm, I identified three primary gaps in the literature. First, business leaders lack a roadmap with which to understand whether or not to adopt an open innovation culture. The evolution of open innovation definitions shows that organizations' open innovation culture is not a fixed status but rather a moving and fluctuating level of openness that exists in the large space and the external global

environment of the organization. Numerous researchers have identified the effects of open innovation on an organization's performance (Berchicci, 2013; Kim et al., 2016; Parida et al., 2012); however, researchers to date have failed to provide practical tools for business managers to assess their organizational needs for the implementation of open innovation.

The second gap in the literature related to the absorption capacity of an organization. Numerous researchers have posited that the ability of organizations to adopt open innovation successfully depends on their members' absorption capabilities (Kim et al., 2016; Ooms et al., 2015). However, again, researchers need to provide business managers with tools to assess the capacity and needs of their organizations.

The third important gap in the literature concerned Schein's model. In the review of the literature, I did not find articles or studies on organizations that follow Schein's three-layer model of engineers, operators, and executives. In this study on open innovation, using Schein's model, I aimed to contribute to business leaders' practical understanding of the model; however, future researchers should further explore the implementation of Schein's model in order to contribute to a better understanding of organizational culture.

Transition

In the first section of this study, I included information regarding the research problem, the general problem statement, and the specific business problem. In Section 1, I included general information and the justification for my research on open innovation culture, specifically regarding strategies for cultivating and sustaining an open innovation

culture within high-technology organizations. In the first section, I also provided the rationale for the research method, the research design, and the participant sample.

In the second section, I provide an outline of the research components, including details on the intent of the study, data collection, and analysis. I also present a description of the role of the researcher, the selection of the research participants, and a review of the validity and reliability of qualitative research studies.

Section 2: The Project

In Section 1, I provided the rationale and the support for the existence of a business problem associated with the pressure on the business manager for innovation. The rapidly evolving market of the 21st century mandates that business managers enable innovation within their organization. The general business problem faced by business managers of high-technology organizations centers on how to cultivate and sustain a culture of open innovation. Through a review of the literature, I gained a reinforced understanding of how open innovation affects the innovation performance of an organization, as well as how innovation affects the competitive performance of an organization. By using open innovation, as shown in Figure 11, business managers can utilize multiple channels of external inbound knowledge and outbound knowledge. In the extant literature, previous researchers reinforced the notion that by cultivating the open innovation model, business leaders can drive outbound technology through licensing, as well as through targeting new markets through research and development. In Section 2, I present subsections covering (a) the research purpose, method, and design; (b) the role of the researcher and participants; (c) the research population and sample; and (d) methods of data collection and analysis. I conclude with an overview of bias, reliability, and validity.

Purpose Statement

The purpose of this qualitative multiple case study was to explore effective strategies that business leaders in high-technology organizations use to cultivate a sustainable open innovation culture. The targeted population included executives,

engineers, and operators from four high-technology organizations in the Washington, D.C. area who specialize in addressing emerging clients' demands effectively in a relatively short period. This population was appropriate for this study because the Washington, D.C. area is a growing hub for high-tech companies in the United States (Porter, 1998).

Individuals in industrialized parts of the world have become increasingly convinced of the importance of science and technology in social change and of the impact of innovation on society in terms of material wealth, social welfare, and employment opportunities (Yearley, 2014). In addition, there is a significant correlation between organizational open innovation culture and organizations' innovation performance (Laursen & Salter, 2006). Through the implementation of open innovation, business leaders can lead their organizations to develop disruptive technologies, catalyzing progress and evolution. Open innovation culture enhances technologies that contribute to positive social change, such as clean, renewable energy, renewal and recycled materials, and the generation of atmospheric drinking water, and deliver programs that promote healthy behaviors and prevent illness.

Role of the Researcher

Researchers often use interviews to collect data and to interpret the story behind a participant's experiences (Doody & Noonan, 2013). When using qualitative research methods, researchers primarily collect and interpret data from direct contact with study participants. The researcher serves as a data collector and an interpreter of the experiences of the sample population (Pettigrew, 2013). Researchers can follow a line of

questions to gain information about a topic or to further explore responses or findings (Doody & Noonan, 2013). Thus, the researcher needs to describe relevant aspects of self, including any biases and assumptions, expectations, and relevant experiences.

In this study, I collected, documented, and analyzed the data. I formed the primary means of data collection, interpretation, analysis, and findings. The data collection involved interviews with 12 participants from high-technology organizations and review of documents from programs involving open innovation techniques. I structured the interview questions to start with a broad strategy question about the organization's innovation and technology and to end with questions regarding the strategy of cultivation and the continuation of the open innovation culture.

Relationships with the Topic, Participants, and Research Area

I serve as an executive of a multinational corporation headquartered in the Washington, D.C. area that specializes in the rapid response to the demands of emerging high-technology markets. I have worked on numerous efforts and projects that have included the development of solutions for emerging market needs, as well as technology transfer. My involvement and experience in techniques for technology transfers, as well as in R&D efforts between different international organizations, made the topic of this study of primary interest to me.

Researcher's Role Related to Ethics

The Office for Human Research Protection (2016) established the ethical principles and guidelines for the protection of humans in research studies, including a distinction between research practice, the three basic ethical principles, and the

application of these principles. The three core principles consist of respect for persons, beneficence, and justice. The three primary areas of application consist of informed consent, assessment of risk and benefit, and selection of subject. I followed these guidelines, specifically the three basic ethics of research, including treating all participants equally and with respect and ensuring no harm to the participants. I ensured that participants received comprehensive information relevant to the study and that they agreed to participate voluntarily.

Researcher's Processes to Mitigate Bias and Ensure Transparency

When using research designs for case studies, researchers must reduce both respondent and researcher biases, which may occur during data collection and analysis (Yin, 2014).

Acquiescence bias. To mitigate the risk of a respondent's tendency to agree with whatever the interviewer presents, I presented only questions that did not imply a correct answer.

Social desirability bias. To prevent a situation in which a participant answered a question in a way that he or she thought would lead to being accepted, I included phrases that encouraged the participant to use his or her views.

Habituation. To mitigate a situation in which the participant repeated the same answer to a similar question, I attempted to engage in discussion and to vary the wording of the questions.

Confirmation bias. To mitigate the impact of prior beliefs and the use of information provided by the participants to confirm those beliefs, I continually reevaluated the participants' responses.

Culture bias. In this study, I interviewed participants from three different professional cultures: executives, operators, and engineers. I attempted to understand each participant's beliefs and activities regarding those cultures.

Question-order bias. I asked general questions before specific questions and attempted not to affect participants' answers by the order of the questions.

Leading question. I attempted not to elaborate on the participant's answer in order to avoid changing the meaning of that answer. In addition, I actively solicited criticism from other business managers familiar with open innovation and employed a panel of experts to evaluate my input and interpretation of collected data.

Foley and O'Conner (2013) stated that qualitative researchers rely on interview protocols as a tool to achieve commonality and to increase the consistency and reliability of the data. I followed an interview protocol (Appendix B) and thus ensured the consistency of the interviews with each participant. Specifically, I confirmed consistency by following the same scripted questions for all interviews. In addition, by using the interview protocol, I helped the participants understand the purpose of the questions, as well as what type of data I aimed to collect from them. I used the interview protocol to ensure that I did not forget any task within the planned process of the interview, that I met the time reserved for the interview, and that I provided the participants with a respectful and trustful atmosphere.

In order to mitigate bias and avoid viewing data through a personal perspective, researchers must practice transparency and establish audit trails. I followed Moravcsik's (2014) views that transparency is essential to social science research, as it permits scholars to assess research and to speak to one another. Moravcsik also stated that production transparency requires researchers to explain how they made their choices of evidence, theory, and method, in order to provide readers with a better awareness of the potential biases that a particular piece of research may contain. By following these suggestions, I provided a stronger foundation and explanation of my interpretation of the data and was able to better mitigate personal bias. Following Houghton et al. (2013), I achieved reliability by using an audit trail. I outlined the decisions made throughout the research process and provided notes, including the rationale for the methodological research and judgment. Researchers use audit trails to add to the trustworthiness of the study by allowing others to examine the process by which a researcher can present a faithful description to the reader (Houghton et al., 2013).

Participants

I used the following criteria for eligibility and selection of the participants: (a) the participants used their own experience to provide data regarding their organizations' use of open innovation strategy and transfer of knowledge and expressed an interest in sharing supporting documents during the interview process; (b) the participants were employed in a high-technology organization in the Washington, D.C. area; (c) the organization, with the participation of the individual participants, competed in a market that required the ability to respond effectively and efficiently to emerging challenges; (d)

each participant was either an executive, an engineer or an operator with his or her company; and (e) the participant was willing to share the organization's documents relevant to the topic of the study.

The 12 participants in the study worked at high-technology organizations in the Washington, D.C. area, at which they regularly face the need to address emerging clients' demand in a short period. I achieved alignment because the participants had relevant information and documented experience with implementation of innovation strategies in high-tech organizations. In addition, the ability to review internal company documentation regarding participants' ability to respond effectively and efficiently to emerging challenges or market needs supported the alignment between the participants and the research question. I sent to the participanting organization the data use agreement and a letter of cooperation from a research partner.

Strategy for Access to the Participants

Researchers face constraints in their choice of research participants by what is practicable and also depend on gaining access to the organizations and the intended participants (Symon & Cassell, 2012). To select participants effectively and to gain access to the organizations and the participants, I used a strategy of first casting a broad net and then focusing on relevant and most suitable participants and going through several cycles of elimination. I selected the Washington, D.C. area and potential participants based on my familiarity with companies and executives in this area that meet the selection criterion for the study. I used numerous tactics to gain access to the participants. I used my personal and professional connection to the community of high-

technology organization in the Washington, D.C. metro area. As a member of the National Defense Industrial Association (NDIA) and as a professional who has worked on the research and development of high-tech industries for 30 years, I have developed personal and professional credibility and connections that assisted me in gaining access to the participants' organizations. Second, I used a phased entry tactic. I communicated the research question and the purpose of the study in advance to the leaders of different organizations; at the same time, I gained basic information regarding the characteristics of those organizations. In this way, I was able to more effectively select organizations that met the study criteria and to develop a positive foothold in those organizations. In addition, I ensured participants' open access to a full copy of the study, as the findings may assist management personnel in their cultivation of the organization's innovation strategy. Other secondary tactics included the use of LinkedIn, NDIA, and the Chamber of Commerce networks.

Strategies for Establishing a Working Relationship with Participants

Before the interview, I emailed an invitation letter to the prospective participants, providing general information regarding the focus of the study. Following the Institutional Review Board (IRB) approval, I then sent the participants a more detailed email with an explanation of the intent of the study and a request to sign and return the informed consent form. The informed consent form included the Walden University IRB approval number. By utilizing the IRB approval, and adhering closely to the research protocol, I put in place adequate protection and procedures concerning the human research subjects. Following the participants' responses, I contacted those participants

who signed the consent form and scheduled an interview with them. At that time, I reemphasized that the interview and participants' involvement was voluntary and confidential and then sent the participants a copy of the interview questions. Participants received adequate information relevant to volunteering in order to be able to make an informed decision regarding whether or not to volunteer.

The relationship between the researcher and the participant forms a key element in the success of a study (Manning & Kunkel, 2014). Rubin and Rubin (2012) posited that researchers should establish trust with the participants regarding the intended purpose and outcome of the study in order to collect relevant data. To build trust with the participants, I focused on four primary elements. First, I demonstrated competence in conducting the interview and in understanding the phenomena of open innovation. Second, I acted with integrity and demonstrated openness and honesty. Third, I demonstrated care and concern for the participants' well-being and privacy. Fourth, I demonstrated my reliability and accountability.

In addition, I demonstrated reliability and credibility by presenting participants with the informed consent form, a reassurance of confidentiality, and a detailed explanation of the purpose of the study. By using this detailed process of selecting and working with the participants, I increased the probability of building a trusted working relationship with participants.

Research Method and Design

Researchers must align the research method and the research design with the purpose of the study (Wahyuni, 2012). Wahyuni stated that the research purpose and question form the starting point for the research method and design because these factors provide clues about the substance that the researcher aims to assess. In this study, I explored the lived experiences of 12 participants from high-technology organizations in the Washington, D.C. area in order to obtain important data regarding how business managers from high-technology organizations cultivate and sustain open innovation culture in their organizations. I used a qualitative research method and a multiple case research design to gain a solid foundation from which to explore the open innovation phenomenon.

Research Method

I selected a qualitative research method for this study. Researchers use a qualitative research method to understand individuals' perspectives of the world (Bell, 2014). In addition, the utilization of a qualitative method provides a framework for data collection and the interpretation of descriptive facts about an event, a phenomenon, or an experience. Researchers who utilize qualitative research methods tend to focus on the meaning, traits, and defining characteristics of events and people in a specific setting and culture (Tewksbury, 2009). Through qualitative research methods, researchers can explore and understand the drivers of an open innovation culture and achieve an analytical generalization (Tewksbury, 2009).

For the study, I followed Denzin and Lincoln (2011), who noted that qualitative researchers collect data by observing behaviors, exploring documents, and interviewing participants to record their perceptions. Yin (2014) believed that researchers should establish direct contact with participants in their natural environment in order to gain a thorough understanding of complex issues in qualitative studies.

I ruled out quantitative research methods for the study because I intended to explore business phenomena. I did not aspire to establish relationships between and among factors and variables. Quantitative researchers rely on statistical inference from a larger sample and stochastic modeling (Ketokivi & Choi, 2014), which were not applicable to this study. Through a quantitative study, a researcher generates numerical data and quantifies variables such as attitudes, opinions, and behaviors from which inferences can be made about a larger population. By using a quantitative method, a researcher can focus on using specific definitions and variables to examine relationships and differences between and among variables (Tewksbury, 2009).

I ruled out a mixed-methods approach because I intended to explore bounded events in a real-life scenario; I did not aim to establish a relationship or examine differences between and among variables. Researchers use a mixed method approach based on the premise that an effective body of research should include more than one approach to establish research credibility (Abowitz & Toole, 2009). Researchers use a mixed methods approach when developing an understanding of a phenomenon for which either a qualitative or a quantitative approach in isolation would be insufficient (Agerfalk, 2013). For this study, I selected a qualitative method to allow open-ended exploration in

the research process in order to gain a detailed understanding of the open innovation phenomenon.

Research Design

I selected a multiple case study design for this research. According to Yin (2014), the selection of a case study hinges on the following criteria: (a) the topic of the research is contemporary, (b) the researcher has no control over the participants, and (c) the questions focus on why and how. Yin also noted that researchers use case study research designs in order to achieve analytic generalization rather than statistical generalizations commonly associated with quantitative studies. Ridder, Hoon, and Baluch (2014) posited that scholars use a case study research design to explore and explain a complex phenomenon in natural conditions. I deemed a case study design to be appropriate for this study because open innovation is an emerging contemporary topic of interest in the high-technology industry and because I had no control over the participants. In addition, I focused my research and interview questions on how and why. In case studies, researchers typically include different sources for the data collection, such as interviews, documentation, and observations; according to Yin (2014), in situations in which a researcher's knowledge is minimal or limited, case study research is appropriate. By analyzing and presenting practice through case study research, researchers can provide a powerful argument that can be further supported by the connections that readers may make between the case and their own experiences (Miles, 2015). I selected a case study following Miles's (2015) belief that a case study method would allow for the generation of data through multiple methods from multiple sources. I also selected a multiple case

approach following Baškarada's (2014) view that research studies based on multiple cases typically lead to more robust outcomes compared to single case research. Single case research can be subject to credibility limitation, while researchers using multiple cases reinforce the creditability of the study.

A researcher who uses a case study can compare groups and provide both differences and similarities in the data, which is vital for the exploration of the research question, and for further development of emergent theory (Dasgupta, 2015). By using a multiple case design, the researcher establishes replication and presents a stronger, more credible study than a single case study would allow (Yin, 2014). The use of a multiple case design provides for replication of an experiment or study, meaning that a researcher can compare the conclusion from one case with the results from the other cases. In this research, the units of analysis consisted of the 12 individual employees of high-technology organizations from the Washington, D.C. area. I followed Willis (2014), who identified that multi-case studies provide a more effective generalization. In a multiple case study, researchers take a holistic exploration approach, evaluating each case separately within the context and then drawing conclusions (Dasgupta, 2015). Dasgupta further posited that multiple case studies are appropriate when research questions indicate a cross-case analysis. I used a cross-case analysis to explore the cultivation of open innovation strategies in various high-technology organizations in the Washington, D.C. metro area.

I ruled out the phenomenological research design. Researchers who use phenomenological studies focus on the description or interpretation the human experience

as lived by the experiencer (Mayoh & Onwuegbuzie, 2013). Phenomenological studies include the exploration of lived experiences through specific events and the drivers of those events but do not take into account the actual realities of the events (Fellows & Liu, 2015). Gray (2013) identified that by following phenomenology, a researcher must put aside the prevailing understanding of phenomena and revisit the immediate experience in order to allow new meanings to emerge. As such, a case study researcher focuses on the individual or the group, while the phenomenological researcher directs his or her attention to the lived experiences of the individuals. In this study, I aimed to explore the strategies that business leaders use to cultivate an open innovation culture, rather than the lived experience of people through the open innovation culture.

I also ruled out an ethnographic research design. Ethnographic researchers focus on the search for patterns in the life experiences of a group or culture through participant observation, document analysis, and semistructured interviews (Abbas, 2015). Researchers using ethnographic studies to focus on understanding culture, observing and documenting how subjects interact in a natural state, and understanding how individuals and groups live in social spaces (Hallett & Barber, 2013). I did not use an ethnographic research design in this study because I focused on understanding effective strategies to cultivate a culture, rather than on studying the culture itself. In this study, I explored elements of culture; rather than focusing *primarily* on trying to understand the culture, I focused on trying to understand effective strategies for implementing and sustaining the culture.

I also excluded discussion concerning grounded theory and narrative research designs because neither applies to a DBA study; in addition, I determined that a narrative research design would not be ideal for this study research question. In a DBA study, the researcher focuses on the research of practical business problems rather than on the development of a theory. On the other hand, researchers who use grounded research design focus on conceptual thinking and theory building in a social setting (Khan, 2014). Researchers use a narrative research to understand human experiences, through the stories that people tell (Von Contzen & Alders, 2015). In this study, I focused on exploring a practical business phenomenon rather than attempting to develop a narrative of the phenomena.

Blomberg and Volpe (2016) identified that a researcher achieves data saturation when the research topic has been fully explored. Fusch and Ness (2015) posited that a researcher would achieve data saturation when the following occur: (a) there is enough information to replicate the study, (b) the limits of the ability to obtain additional new information have been met, and (c) further coding is no longer feasible. To ensure data saturation, I collected and investigated additional data sources until I reached the point at which no new themes or codes could be obtained.

Hagaman (2014) suggested that a researcher could achieve data saturation in the first interview, regardless of a study population. By following the participant selection criteria, I anticipated that the 12 selected participants would provide rich data for the exploration of the strategies to cultivate and sustain a culture of open innovation. I

preemptively selected additional stand-by participants to interview in case a lack of data saturation emerged following the interview of the 12 primary participants.

Population and Sampling

A researcher should define the targeted population by identifying specific qualities that are common to all the objects in the population. As such, I selected a population of 200 high-technology organizations in the Washington, D.C. area that specialize in addressing emerging clients' demands effectively in a relatively short period. This population was appropriate for this study because the D.C. capital region is a growing hub for high-tech companies (Porter, 1998).

In qualitative studies, researchers should choose proper sampling methods in order to best achieve the goals of the study, provide insight into the research problem, and explore different viewpoints (Marshall & Rossman, 2016). Acharya, Prakash, Saxena, and Nigam (2013) identified two primary classifications of sampling methods: the probability samples and the non-probability samples. According to Acharya et al., the probability sample, in which each person in the population has an equal chance of selection for the study, constitutes the gold standard in sampling methodology. A researcher who uses probability sampling ensures generalizability of the study results to the population (Acharya et al., 2013).

For this study, I used a selective sampling method with specifically purposeful sampling. Researchers often use purposeful sampling in qualitative research in order to identify and select of information-rich cases (Palinkas et al., 2015). Purposeful sampling

involves identifying and selecting individuals with knowledge of or experience with the study phenomenon (Patton, 2015).

Description and Justification of Number of Participants

Researchers have different views regarding the ideal standard for sampling size in qualitative research (Shorten & Moorley, 2014). A sample is a subset of the population that the researcher selects as representative of the larger population; since researchers cannot study an entire population, they need to take a sample (Acharya et al., 2013). Ando, Cousins, and Young (2014) stated that a sufficient sample size for thematic analysis might be 12 interviews of individuals, provided that all themes match with most codes. Ritchie, Lewis, Nicholls, and Ormston (2013) identified four main reasons for the typically small samples in qualitative research. First, if the researcher analyzes the data rigorously, he or she will gain data saturation with a small sample, and will reach a point of diminishing return, at which point an increase in the sample size will no longer contribute new knowledge. Second, researchers who use qualitative research method do not need the sample to be of sufficient scale to provide estimates or to determine statistically significant relationships between variables. Third, the type of information that researchers gain in qualitative studies should be rich in detail; to achieve this, the sample size must be manageable. Finally, qualitative researchers use rigorous research resources, such as interviews and surveys; therefore, they will not be able to manage hundreds of interviews or observations unless they intend to spend several years conducting the research or utilizes a substantial amount of resources, including professional interviewers (Ritchie et al., 2013).

Researchers in qualitative studies often use smaller sample size than researchers in quantitative studies (Dworkin, 2012). The primary reason for this difference is that researchers using qualitative research methods aim to gather a detailed understanding of a phenomenon or a meaning, which is often centered on the how and why of a particular issue or phenomena. The qualitative researcher is concerned less with making generalizations regarding a larger population and relies less on hypothesis testing. Qualitative researchers use an inductive process, grounded theory, and in-depth interviews, aiming to create and analyze relationships between themes and categories in order to understand the experience of the participants (Dworkin, 2012).

Achieving Saturation

Hagaman (2014) suggested that a researcher could reach data saturation in the first one interview, regardless of a study population. By following rigorous selection criteria for the participants, I anticipated that the 12 selected participants would provide rich data for the exploration of the strategies to cultivate and sustain a culture of open innovation. I preemptively selected additional stand-by participants whom I could interview in case a lack of data saturation emerged following the interview of the 12 primary participants.

Criteria for the Selecting of Participants and Interview Setting

Bungay, Oliffe, and Atchison (2016) posited that ultimately, purposeful sampling in qualitative research is driven by the research purpose, questions, and study design. I purposely selected participants with information-rich experience in cultivating strategies of open innovation responding to emerging market requirements in high-technology

organizations. I based the composition of the sample participants of four executives, four engineers, and four operators from high-tech companies on Schein's (1996) model of organizational culture theory.

Yin (2014) posited that researchers who aim to gain a deep understanding of an event or setting can use purposeful sampling to maximize data collection. Yin also stated that the use of purposive sampling in multiple case study research requires a minimum of only one participant for each distinct case. In this study, the targeted population consisted of individuals employed by high-technology organizations, as these individuals relevant to open innovation techniques and strategy. I selected 12 participants located in the Washington, D.C. area, who were able to provide data regarding their organizations' use of open innovation strategy and transfer of knowledge. The 12 participants were part of a public list of high-technology companies provided by the NDIA. According to Porter (1998), the Washington, D.C. metro area is a growing hub for high-technology companies.

Ethical Research

Ethics constitute norms for conduct that distinguish between acceptable and unacceptable behavior, and they play a vital role in research (Mikesell, Bromley, & Khodyakov, 2013). Researchers wishing to interact with living people must seek approval from their respective IRBs. The Code of Federal Regulations (45 CFR 46.107 [a]) requires each research board to possess the professional competence necessary to review specific research activities. An essential part of research is the assurance of ethical

practices during the research data collection and analysis phases (Taylor & Thomas-Gregory, 2015).

The Informed Consent

Every participant has the right and freedom to decide not to participate in the study, as well as the right to gather information about the research before participating in the study. Each participant received the informed consent form and had to acknowledge, date, and sign the form. I used the informed consent form to provide written, mutual communication between myself and the participants, through which participants expresses their willingness to participate in the research. I signed all of the informed consent forms in front of each participant, and I sealed all of the hard copies of the forms and kept them in a secure place.

The participants could withdraw from the study at any given time through a simple request to stop, even after making the initial decision to participate. Participants could withdraw by email, surface mail, telephone, or in person.

Incentives for Participants

To ensure informed consent, each participant must be competent to make a decision, must be given adequate disclosure of pertinent information, must comprehend that information, and must make a voluntary decision to participate. Researchers should provide information regarding incentives as part of the informed consent form (Cseko & Tremaine, 2013). Since I believe that incentives can influence prospective participants' decision making, I did not provide any incentives to participate in this study. However, the participants could receive a copy of the completed study upon request.

Ethical Protection to Participants

Stevens (2013) posited that a researcher must meet four primary ethics criteria to comply with the research ethical guidelines and regulations: (a) protection from harm, (b) informed consent, (c) right to privacy, and (d) honesty. I designed this study to comply with the standards for conducting research with human beings, as detailed below:

Protection from harm. To mitigate the risk to participants in this study, I provided each participant with an identification (ID) code, such as Id7, to conceal their identities. These secured IDs formed the only method of identifying the participants.

Right of privacy. I kept all data collected during the study, including hard copies of forms and digital copies of the interviews, strictly confidential. I secured all interview audio files, as well as the consent forms and the ID codes of the participants in a secure place. I alone had access to the ID codes, and I did not identify the participants in any publication of this study.

Honesty. Throughout the entire study, I adhered to all customary, acceptable, and publicly available guidelines and regulations relevant to honesty and respect for intellectual property. I reported the result of the study in a complete and honest manner, with no attempt to change the findings to support a particular conclusion.

Following the procedures of the IRB, as well as the procedures set for this study, I ensured trust and credibility. I used the following procedures to conduct this study:

1. I contacted each potential participant and discussed the purpose of the study and determined their interest to participate in the study

2. Upon agreement to join the study and following explanation of the purpose of the study and the procedures of the study, I advised each participant that participation was voluntary and that the participant could cease his or her participation in the study at any time.
3. I advised the participants of my role as the researcher.
4. I advised the participants that they could elect not to answer any specific question that might make them uncomfortable by verbally advising me of that decision.
5. I informed each participant of the privacy protection and confidentiality of his or her responses.
6. I provided each participant with a signed hard copy of the informed consent form.
7. Each participant signed the informed consent form.
8. I securely stored all the data from the data collection phase through the data analysis phase and completion. Five years from the conclusion of the study, I will destroy the data.

Data Collection Instruments

Scholars use qualitative research to explore how individuals attach meanings or conceive of actions, events, or programs taking place in a real-world setting (Yin, 2013). Yin (2013) identified six sources of data, which include interviews, archival records, direct observation, documentation, participant observation, and physical artifacts. I

primarily used interviews, documentation, and archival records as sources of data for this study.

The researcher serves as a data collector and an interpreter of the experiences of the sample population in the study (Pettigrew, 2013). Dabić and Stojanov (2014) identified that a researcher should choose a data collection method based on the type of information sought; as such, I primarily used face-to-face, semistructured interviews to collect data. Researchers use interviews in qualitative research when they are interested in collecting facts or gaining insights into or understanding of participants' opinions, attitudes, experiences, processes, behaviors, or predictions (Rowley, 2012).

Interviews are beneficial because they: (a) yield rich data, details, and new insights; (b) permit face-to-face contact with respondents; (c) provide the opportunity to explore topics in depth; (d) allow the interviewer to experience the affective, as well as cognitive, aspects of responses, (e), allow the interviewer to explain or help clarify questions, increasing the likelihood of useful responses, and (f) allow the interviewer to be flexible in administering interviews to particular individuals or in particular circumstances. Seidman (2013) stated that researchers conducted in-depth interviewing in order to understand the lived experience of other people and the meaning of that experience. The disadvantages of interviews, however, include the following: (a) interviews are expensive and time-consuming; (b) interviews need well-qualified, highly trained interviewers; (c) the interviewees may distort information through recall error, selective perceptions, or desire to please the interviewer; (d) flexibility can result in inconsistencies across interviews; and (e) the volume of information received can be very

large and may be difficult to transcribe and reduce data. Chan, Fung, and Chien (2013) found that when researchers maintain their curiosity regarding facts that they might not know, participants can express themselves more freely. Denzin and Lincoln (2011) found that researchers can bring the sensitivity, flexibility, and responsiveness needed for scientific inquiry into a study by communicating their role as people who are collecting and analyzing data.

When a researcher uses the interview method for data collection, he or she assumes that the participants' perspectives have meaningful knowledge and that the participants' perspectives can lead to the success of the research (Rossetto, 2014). The researcher can use an-in person interview when interpersonal contact is important and when a follow-up opportunity is of interest. Often researchers classify interviews based on their level of structure, ranging from structured interviews to semistructured interviews (the most common form) to unstructured interviews (Rowley, 2012). In structured interviews, the interviewer will pose questions in the same order with every interviewee, while in unstructured interviews, the interviewer may adapt the questions and their order based on what the interviewee says (Rowley, 2012). According to Rowley (2012), semistructured interviews take a variety of different forms, with varying numbers of questions and varying degrees of adaptation of questions and question order to accommodate the interviewee.

A researcher using semistructured, face-to-face interviews for data collection can gain numerous advantages. First, the researcher has the opportunity to develop a rapport with the participants. Second, a researcher can capture verbal and nonverbal messages, as

well as participants' emotions and behaviors (Irvine, Drew, & Sainsbury, 2013). Third, the interviewer has control over the interview process and can ensure the interviewee's focus on the interview questions.

As with any data collection technique, however, the semistructured, face-to-face interviewing technique has a few weaknesses. First, these interviews can be costly depending on the number and location of interviews. Second, the quality of the data collection during an interview depends on the interviewer's abilities to conduct an efficient interview. Third, a researcher conducting face-to-face interviews can only conduct a limited number of interviews compared to interviewers who use online questionnaires or other online data collection techniques.

By using face-to-face interviews in this study, I gained access to relevant documents from the participants regarding their organizations' strategies and culture. By using existing company records, researchers can often gain insights into a setting and group of people that they cannot observe or note in another way. Advantages of using documentation include the following: (a) documents are available locally and are generally easy to locate within the company records; (b) they are inexpensive; (c) they are grounded in the setting and language in which they occur; (d) they are useful for determining value, interest, positions, political climate, and public attitudes; (e) they provide information regarding historical trends or sequences; and (f) they are unobtrusive and thus provide the opportunity for study of trends over time. I faced several disadvantages, however, including: (a) documents may be incomplete, (b) they may be inaccurate or of questionable authenticity, (c) locating suitable documents may pose

challenges, and (d) analysis may be time-consuming and gaining access to documents may be difficult.

Reliability and Validity of Data Collection

To maximize the reliability and credibility of the study, I followed the member checking and transcript review approach, used a panel of experts, and conducted an interview field test. Member checking constitutes a quality control process by which the researcher seeks to improve the accuracy, credibility, and validity of what is recorded during the interview (Koelsch, 2013). In the member checking process, participants receive the opportunity to review their statements for accuracy. According to Koelsch (2013), the researcher conducts member checking to assess the accuracy with which he or she represented the participant's subjectivity. I conducted the interviews and then transcribed, coded, and analyzed them to identify emerging themes. I then interpreted what each participant provided and shared the interpretation with that participant for validation, verification, and feedback. Foley and O'Conner (2013) posited that qualitative researchers rely on interview protocols as a tool to achieve commonality and add to consistency and reliability. I established and followed the interview protocol (Appendix B).

I selected a qualitative research method for the study and chose to collect data through case study interviews and documents. Yin (2014) posited that researchers can enhance the construct validity and reliability of their study by using multiple sources of evidence. Researchers who utilize qualitative research methods focus on the meaning, traits, and defining characteristics of events and people in a specific setting and culture

(Tewksbury 2009). In addition, by utilizing a qualitative method, researchers can establish a framework for data collection and the interpretation of descriptive facts about an event, a phenomenon, or an experience. As suggested by Tewksbury (2009), I used a qualitative method to explore and understand the drivers of an open innovation culture to achieve a future analytical generalization.

Data Collection Technique

Data collection constitutes the process of gathering and measuring information on topics of interest in a systematic method in order to enable a researcher to answer the stated research question. The primary data collection techniques used in qualitative research include the following: (a) interviews, (b) surveys and questionnaires, (c) observations, (d) focus groups, and (e) analysis of documents and material. I used semistructured interviews as the primary data collection technique to gain knowledge relating to the strategies that managers of high-technology organizations utilize to cultivate and sustain open innovation culture. In addition, I collected other data and materials from the participants, including program documents or documents presenting the organization's culture and strategy. I found such relevant information useful for triangulation purposes, which, according to Yin (2014), provides validity to the research finding.

In this study, the data collection involved interviews of 12 participants from high-technology organizations and data collection from documents of programs involving emerging requirements. I structured the interview questions to begin with a broad strategy question about the organization's innovation and technology and to end with

questions regarding techniques of implementation of open innovation. A qualitative research interviewer attempts to understand human behavior, data, and meaning and to learn from the participants (Rossetto, 2014). In this study, I used the interview process to collect detailed information regarding the participants' experience of the cultivation and continuation of an open innovation strategy within their organizations. I incorporated follow-up questions to support the additional collection of data and to provide clarity. I attempted to conduct interviews in comfortable settings in order to help me build rapport and familiarity with the participants. Scheibe, Reichelt, Bellmann, and Kirch (2015) posited that a researcher should expect a certain degree of insecurity from participants toward the research topic and that researchers should use a personal approach during the interview to help mitigate this insecurity. To provide participants with a high level of ease, I chose a location that was comfortable for the participants and ensured that the location had minimal noise or other disturbances. To mitigate any possible risk of disruption and possible cancelation of the interview, I scheduled a backup date for each interview, as a contingency.

Following the receipt of the signed informed consent form from the participants, I contacted each participant to schedule a face-to-face interview. Foley and O'Conner (2013) posited that qualitative researchers rely on interview protocols as a tool to achieve commonality and add to the consistency and reliability of the study. To establish and ensure that the thrustworthiness of the foundation of this study, I followed the interview protocol (Appendix B) and the following process during the interview.

Each participant had to consent to the recording of the interview. In addition, each participant received a copy of the interview protocol before the interview, as well as the transcript and the audio files of the interview.

I took the following steps actions to ensure proper setting and preparation for the interviews:

Informal beginning. I began the interview process with an informal conversation to establish a relaxed environment and to develop trust with the participant. Rubin and Rubin (2012) posited that researchers should establish trust with the participants regarding the intended purpose and outcome of the study

Advance copy. I provided each participant with a copy of the interview questions. The advance copy allowed the participant to become familiar with the research topic.

Privacy and anonymity. I assured each participant that he or she would remain anonymous during and following the research effort.

Length. Interviews lasted 45-60 minutes, not including up to 15 minutes for review of any documents that the participant may have presented.

Semistructured interviews. The interviews were semistructured, and if the participants raised interesting topics or thoughts regarding the research question, I allowed for further unstructured discussion and follow up questions. I used the interview questions to collect data from the participants in order to explore their first-hand experience related to the research question.

In addition to the data collected from the interviews, I also collected data from the participating organizations' documents. Owen (2014) stated that a researcher examines

written documents to gain a deeper understanding and description of the participant's convictions, conduct, and experiences.

Panel of experts. Upon receiving IRB approval, I provided the interview questions and protocol to a panel of experts, which consisted of experienced professionals from the high-technology industry. I recruited the panel participants from my professional network, selecting individuals who work with high-technology organizations and are familiar with open innovation culture. A panel of experts can review interview documents for content and face validity (Yunus, Nordin, Salehi, Embi, & Salehi, 2013). After incorporating input from the panel of experts and applying modifications to the interview protocol and questions, I conducted a pilot field test with acting participants from my professional network. I followed the exact interview protocol during the field test, which allowed me to gain accurate input relevant to the proposed interview process and protocol. The field test provided insight into (a) whether the questions were clear, (b) whether I could receive rich and relevant data through the answers to the interview questions, (c) whether I could ask all the interview questions within the time allocation of 45 minutes, and (d) whether modification of the interview questions was necessary.

Invitation for the interview. After completing the field test and verifying that the interview answers generated by the panel included rich and relevant data, I sent an invitation to participants to interview.

Transcripts review. Upon the conclusion of the formal interviews, I transcribed the interviews and provided each participant with a copy of his or her interview transcript

for member checking. In the member checking process, the researcher asks the participants to review and verify the accuracy of the interview transcript (Blomberg & Volpe, 2016; Yin, 2014). Houghton et al. (2013) stated that member checking involves allowing participants to read the transcription of their respective interviews to ensure that the transcriptions have been accurately recorded and are, therefore, credible.

Data Organization Technique

Researchers must act with integrity, avoid bias and conflict of interest, and minimize moral hazards (Vanclay, Baines, & Taylor, 2013). Qualitative researchers prioritize the depth and quality of the data collected and attempt to go beyond descriptions to provide an in-depth understanding of a phenomenon (Anyan, 2013); thus, the organization of the data is crucial for the integrity of the research. By keeping research records and logs, which provided information and reflection on the data collected, I ensured the integrity of the study and mitigated the risk of bias. The organization of collected data is crucial for an accurate review, analysis, and reporting and promotes an effective research process (Vanclay et al., 2013). As part of my efforts to keep a research log, I developed a log of all of the articles and documents referenced and used in the study. I used Excel files to sort the documents. I also establish a reflective journal to record my thoughts and findings during the research process. Peredaryenko and Krauss (2013) stated that a researcher can use a reflective journal to facilitate inner dialog and mitigate bias.

Secured Storage of Data

Before starting the study, I developed a method for organizing the data. For this study, I used data organization and coding to ensure that I easily retrieve and view the various data files through data organization and coding. I created a password-protected Excel sheet to record all signed consent forms, the date and time of each semistructured interview, and the location for each interview. Each participant received a code, such as EX-Y1Y that included a combination of four letters and a digit. I used the first batch of letters to identify the role of the participant in the organization and whether the participant was an *operator*, *engineer* or an *executive* based on Schein's (1996) observation on organization culture. I used the letter "E" to identify a participant as an *engineer*, the letter "O" to identify a participant as an *operator*, and "X" to identify a participant as an *executive*. The second batch of letters identified the organization, and I added a third letter or a digit randomly for masking purposes.

In the cataloging and filing organization process, I labeled every document, external discs, and digital audio files with information regarding the participant. Upon receiving or generating data, I filed all of the hard-copy materials, including transcripts of interviews, consent forms, and other relevant data. Based on the coding and labeling system. I stored all sensitive and coded data in a secure place and will destroy the data five years after the research publication date.

Data Analysis

Researchers engaging in qualitative studies focus on observing, describing, interpreting, and analyzing the way in which people experience, act on or think about

themselves and the world around them (Bazeley, 2013). According to Bazeley (2013), data analysis involves a close engagement with the data collected and the illumination of its meaning and significance through insightful and technically sophisticated work. Yin (2014) posited that data analysis consists of examining, categorizing, tabulating, or testing evidence to address the initial proposition of a study. Gläser and Laudel (2013) stated that through data analysis, researchers produce information structured by categories that the researcher can then use in the subsequent search for patterns in the data and the integration of these patterns into a systematic, theoretically embedded explanation. The process of analyzing data in qualitative studies, as well as in multiple case studies, calls for analyzing the data at various levels ranging from general to specific (Yin, 2014).

To enable a high level of understanding and analysis of the data, as well as to add rigor to the study, I employed methodological triangulation principles. Methodological triangulation strengthens the validity and reliability of the research (Yin, 2014). Researchers use triangulation to explore different levels and perspectives of the same phenomenon, as well as to ensure the validity of the study results (Fusch & Ness, 2015). Triangulation requires the researcher to use data from a variety of sources and to apply various methods to gain more reliable knowledge (Graue, 2015). In Figure 24, I illustrate the two primary sources of data I used in this study for triangulation purposes: the 12 interviews of the participants and documents from the four participating organizations.

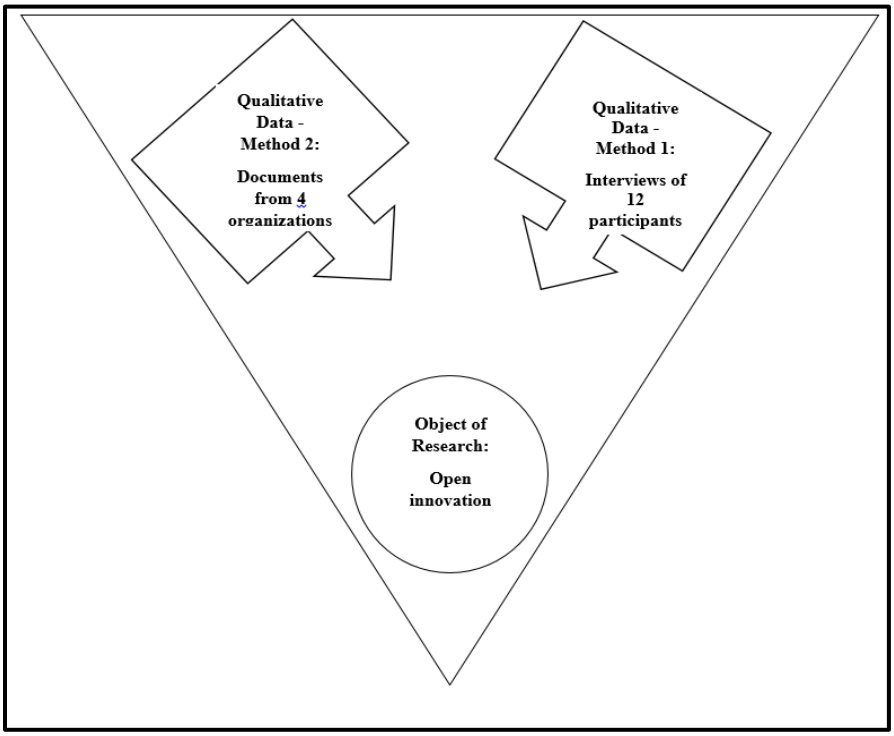

Figure 24. Elements of triangulation process
Note. Inspired by Graue, C. (2015). Qualitative data analysis. *International Journal of Sales, Retailing & Marketing*, *4*(9), 5-14. Retrieved from http://www.ijsrm.com/ijsrm/home.html. Reprinted with permission

Following Vaismoradi et al. (2013), I used a thematic analysis, in which I aimed to examine analytically narrative materials from life stories by breaking the text into small units of content and submitting them to descriptive treatment. Vaismoradi et al. (2013) identified thematic analysis as an independent qualitative descriptive approach that provides core skills to researchers for conducting various forms of qualitative analysis. Clarke and Braun (2013) defined thematic analysis as a method for identifying and analyzing patterns in qualitative data and stated that this method has various benefits: (a) thematic analysis works with a wide range of research questions, including questions about people's experiences or understandings and questions about the representation and construction of particular phenomena in particular contexts; (b) thematic analysis can be

used to analyze different types of data from secondary sources, such as media and transcripts of focus groups or interviews; (c) thematic analysis works with large or small data sets; and (d) thematic analysis can be applied to produce either data-driven or theory-driven analyses.

I followed a data analysis process identified by Vaismoradi et al. (2013):

1. Familiarizing oneself with data through transcribing data, reading and rereading the data, and noting down initial ideas.
2. Generating initial codes and coding interesting features of the data systematically across the entire data set, collating data relevant to each code.
3. Collating codes into potential themes and gathering all data relevant to each potential theme.
4. Reviewing themes and checking whether the themes work in relation to the coded extracts and the entire data set, generating a thematic map.
5. Performing ongoing analysis for refining the specifics of each theme and the overall story that the analysis tells, generating clear definitions and names for each theme.
6. Selecting vivid, compelling extract examples, relating back to the analysis of the research question and literature, and producing a report of the analysis.

The data sources included interviews with 12 participants and information and documentation from within the participants' organizations, as well as government sources. Foley and O'Conner (2013) posited that qualitative researchers rely on interview protocols to achieve commonality and add to the consistency and reliability of the study.

Pierre and Jackson (2014) stated that researchers interview and observe people to collect data in the form of words. In addition, I gained primary data through the interviews and the evaluation of the various materials, using more than one data source for each case, such as program documents or documents that present the organizational culture and strategy. I used this primary information to triangulate the interview data in order to provide validity to my research findings, as posited by Yin (2014).

Coding Plan and Key Themes

I used ATLAS.ti (2015) a QDAS to support coding and retrieval of data and to investigate relationships. Woods et al. (2015) stated that researchers using QDAS to support coding and retrieval of data can differentiate coded data by participant characteristics and can investigate conceptual relationships. Researchers use codes to discover themes contained within transcripts and to reach data saturation, as well as to obtain higher reliability, validity, and creditability. The use of a software program such as ATLAS.ti simplifies the process of identifying themes and pattern recognition as part of the data analysis process. The presentation, interpretation, and implications of the findings represent distinct phases of the research process (Davies & Hughes, 2014). Davies and Hughes (2014) posited that the findings constitute the heart of the researcher's report. The use of QDAS enables the researcher to present qualitative data using tables and allows for creativity in linking research questions to interview questions or in presenting the code structure (Kaczynski et al., 2014).

Reliability and Validity

Reliability constitutes the ability of another researcher to obtain the same results if

he or she repeated the same study, while the validity refers to the soundness of the study and to how well the research represents the actual phenomenon (Morse, 2015). Chan et al. (2013) posited that researchers should put aside their knowledge, beliefs, values, and experiences in order to describe the participants' life experience accurately and to achieve higher validity. Noble and Smith (2015) posited that validity refers to the integrity and application of the methods undertaken and the precision in which the findings accurately reflect the data, while reliability describes consistency within the employed analytical procedures.

Reliability in qualitative research refers to dependability and the ability to repeat research findings successfully (Lincoln & Guba, 1985). Trustworthiness encompasses the following attributes: credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). Houghton et al. (2013) posited that these four criteria proposed by Lincoln and Guba form the framework for determining the rigor of research. These authors also suggested that credibility refers to the value and believability of the research findings and that dependability refers to the stability of the research data. According to Houghton et al., *confirmability* refers to the neutrality and accuracy of the data and is similar to dependability, while transferability refers to whether or not the research findings are transferable to another similar situation.

Reliability

To enable and enhance the reliability of the study and to ensure that the findings would be transferable to other similar contexts, I used member checking of data interpretation, transcript review, and peer debriefing. Member checking involves

allowing the participants to read the transcription of their interviews (Houghton et al., 2013). I presented the participants with the transcripts, my interpretations, and my analysis of the interview in order to ensure that I recorded the interviews accurately and that the interpretation and analysis of the interviews were credible. To support the credibility of my findings, I used peer debriefing, which allowed external colleagues or experts to support the credibility of findings (Houghton et al., 2013). According to Sinni, Wallace, and Cross (2014), peer debriefing refers to the external audit that the researcher receives from another person to verify the data and its meaning.

Validity

Chan et al. (2013) stated that the researcher is a human being who inevitably influences the research process; however, the researcher needs to adopt all possible measures to ensure that the findings are as close as possible to what the participants truly experienced. Morse (2015) referred to the strategies identified by Lincoln and Guba for ensuring validity and divided them into four primary categories: (a) credibility, which includes prolonged engagement, persistent observation, triangulation, peer debriefing, negative case analysis, referential adequacy, and member checks; (b) transferability, which includes robust and rich data description; (c) dependability, which includes triangulation and audit trail, and (d) confirmability, which includes triangulation and audit trail.

Credibility. I ensured the credibility of the study through the methodological pursuit of prolonged engagement, negative cases analysis, peer debriefing, and member checking. With prolonged engagement, the researcher invests the time needed to gain a

full understanding of the phenomena under study. Peer debriefing means sharing the data with peers who can provide feedback regarding the credibility of the data. With both prolonged engagement and persistent observation, the researcher must spend sufficient time in the field or on case study sites to gain a full understanding of the phenomenon (Houghton et al., 2013). I explored in detail the phenomenon of open innovation in four different high-technology organizations in order to enhance the credibility of the research.

Houghton et al. (2013) posited that triangulation enhances the credibility of research through the confirmation of data. Carter, Bryant-Lukosius, DiCenso, Blythe, and Neville (2014) posited that triangulation is a qualitative research strategy to test validity through the convergence of information from different sources. In this study, I compared the data explored in case studies from four different organizations and 12 participant interviews and compared the data with company documents.

Transferability. The transferability of a set of findings from one context to another rests more with the future researchers who would make that transfer than it does with the original researcher (Marshall & Rossman, 2016). I enabled future researchers to determine the transferability of my findings by adhering to detailed audit trail, data collection, and analysis techniques, by providing a detailed description of my thoughts, and by achieving both data saturation and appropriate participant sample size. An audit trail allows for an examination of the process by which a researcher can present a faithful description to the reader (Houghton et al., 2013). External validity exists when there are opportunities to transfer the findings (Lincoln & Guba, 1985). Houghton et al. (2013)

identified that to determine transferability; the researcher must describe the original context of the research adequately so that readers can judge the study. I interviewed 12 participants from four different organizations to ensure appropriate sampling of participants and explored four cases of implementation and cultivation of open innovation strategies to provide a detailed description of the phenomenon. Data saturation constitutes an important element in ensuring transferability and credibility. By using the purposeful sampling method, I supported data saturations through a selection of participants with rich experience related to my research phenomenon, as suggested by Ando et al. (2014).

Confirmability. I achieved confirmability by using triangulation and audit trail methods. A researcher can enhance the research credibility by triangulation, which is the confirmation process of comparing data gathered from multiple sources to verify the findings (Houghton et al., 2013). Yin (2013) posited that methodological triangulation improves the validity of a case study. A researcher can provide a successful audit trail by outlining the decisions he or she made throughout the research process to provide a rationale for the methodology and judgments (Houghton at al., 2013). By comparing the data from and between the different case studies, as well as comparing the various organizational documents, I achieved triangulation and confirmability.

Data saturation. I followed Dworkin (2012), who identified data saturation as the point at which further data collection no longer provides new relevant data.
I also followed the methodology identified by Fusch and Ness (2015) to achieve data saturation. Fusch and Ness stated that a researcher achieves data saturation when the

following events occur: (a) there is enough information to replicate the study, (b) the limits of the ability to obtain additional new information reached, and c) further coding does not present new links. When new codes do not generate new links, the researcher most likely has effectively retrieved the links from the data.

Transition and Summary

In Section 2, I covered the following: (a) the role of the researcher, (b) the rationale for selecting a qualitative research design, (c) the criteria for selecting the participants, and (d) the data collection and data analysis techniques used. I also connected the conceptual theory to the research problem and research design, and I explored strategies for the cultivation and continuation of open innovation. Finally, I provided data concerning the reliability and validity of the study. In Section 3, I outline the findings of the study, possible contributions to business practices, recommendations for implementation, and implications for social change.

In Section 3, I present the findings following the analysis of the collected data. I used qualitative data analysis software to organize and link codes and themes to identify effective strategies to cultivate and sustain an open innovation culture. To achieve credibility, dependability, and repeatability, I triangulated data from the interviews of 12 participants from four different organizations with a substantial number of documents from the four organizations. In Section 3, I also present the implication for professional business practice.

Section 3: Application to Professional Practice and Implications for Change

Introduction

The purpose of this qualitative multiple case study was to explore effective strategies that business leaders use to cultivate a sustainable open innovation culture in high technology organizations. I analyzed the data and grouped the primary codes using four families reflecting the four lenses (Figure 1): (a) internal drivers, focusing on what type of organizational culture and leadership characteristics are conducive to enabling an effective cultivation of an open innovation culture; (b) external drivers, focusing on what type of market environmental conditions are conducive for enabling effective cultivation of an open innovation culture; (c) internal challenges, focusing on the internal challenges that individuals must overcome to ensure the successful cultivation of an open innovation culture; and, (d) external challenges, focusing on the external challenges that individuals must overcome to ensure the successful cultivation of an open innovation culture.

Four primary themes emerged as successful strategies for business leaders to cultivate a sustainable open innovation culture: (a) organization's strategic alignment, (b) collaboration as a force multiplier for innovation, (c) organizational culture change, and (d) in-depth understanding of the customers' needs. The findings of this study confirm that business leaders must adopt new global competition and business practices to meet the paradigm of global innovation and competition. Business leaders must understand the strategies that drive effective implementation of an open innovation culture in order to implement practical techniques to respond in real time to market demands.

Presentation of the Findings

The overarching research question for this study was: What strategies do business leaders of high technology organizations use to cultivate a sustainable open innovation culture? Antons and Piller (2015) identified that the systematic exclusion of knowledge from sources outside of an organization causes a negative impact on the organization's competitiveness and performance. Antons and Piller also stated that organizational competitiveness is a critical element for the sustainability of an organization in the business environment of the 21st century.

In this section, I present my findings in relation to the research question and the research conceptual framework. The presentation of the findings section includes details of how the findings relate to the existing body of knowledge on open innovation and I present data and illustrations representing the results of the analysis. I also provide an in-depth discussion of how the findings contribute to the field of open innovation and organizational culture.

I selected four high technology organizations in the Washington, D.C. metro area that have cultivated open innovation culture successfully, and I interviewed three participants from each organization. The 12 participants included an executive, an engineer, and an operator from each of the four organizations. I selected an executive, an engineer, and an operator from each organization to reflect the theoretical model of this research. I collected the data using semistructured face-to-face interviews and documents from each organization. I used Atlas.ti software to organize and analyze the data.

After the interviews of the 12 participants and the review of the organizations' relevant documents, I reached data saturation. I could not obtain and additional information, and no further coding or themes emerged. I followed O'Reilly and Parker's (2013) observation and established a transparent and detailed audit trail, as well as a member checking process to achieve credibility, repeatability, and transferability of the findings. My findings were consistent with the purpose of this study and with Schein's culture theory.

Presentation of the Four Evaluation Lenses and the Codes

As I presented previously in the mind mapping of this research (see Figure 1), I focused my exploration on internal and external drivers and challenges to the cultivation open innovation culture. I analyzed the data through four lenses: (a) internal drivers, focusing on what type of organizational culture and leadership characteristics are conducive for enabling an effective cultivation and sustainability of an open innovation culture; (b) external drivers, focusing on what type of professional industry and market environmental conditions are conducive for enabling an effective cultivation and sustainability of an open innovation culture; (c) internal challenges, focusing on the internal challenges that individuals must overcome to ensure the successful cultivation and sustainability of an open innovation culture; and (d) external challenges, focusing on the external challenges that individuals must overcome to ensure the successful cultivation and sustainability of an open innovation culture.

Following the data collection phase, I coded all of the data and created families of codes through the four silos or lenses. During the analysis of the interview transcripts and

the organizations' documents, I generated a total of 246 primary and secondary codes. Following the coding phase, I clustered the 246 codes into four families that mirrored the four silos identified in Figure 25. Four primary themes and six secondary themes emerged from the analysis of the code families. In Figure 19, I include an illustration of the development process of the themes.

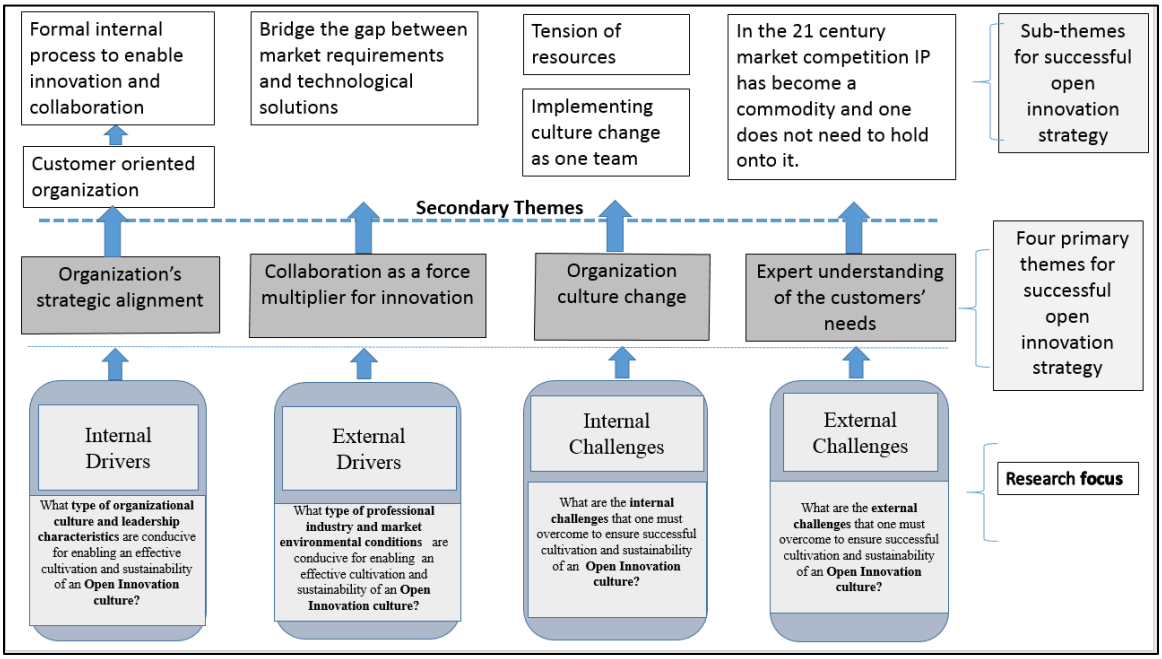

Figure 25. The development process of themes through the research lenses
Note. E. Banai (2016) developed the presentation of the themes as part of this research

Through the four families of codes, four primary themes emerged. From the external challenges observation, a primary theme and a subtheme emerged. The primary theme was the ability to understand customers' needs, while the subtheme was the ability to adapt to markets in which intellectual property is no longer a crucial asset but rather a commodity. From the internal challenges observation, the primary theme was the need to change the organization's culture to adapt to open innovation culture. The subtheme was the tension of resources within the organization. From the external drivers observation,

the primary theme was collaboration as a force multiplier for innovation. The subtheme was the ability to bridge the gap between the requirements and technological solutions. From the internal driver observation, the primary theme was the ability to implement the required organizational culture change as one team. The two subthemes were the ability to become a customer-oriented organization and the ability to incorporate formal internal processes to enable innovation and collaboration. In Figure 25, I include a presentation of the four research lenses and the emerged primary and secondary themes.

Figures 26, 27, 28, and 29 include the neighborhood maps of the primary codes I gathered through the four research lenses. In Figure 26, I present the codes that generated through the internal drivers lens. The area of the internal drivers generated more codes than any of the other three evaluation silos. The theme that from this silo was the need for organizational strategic alignment.

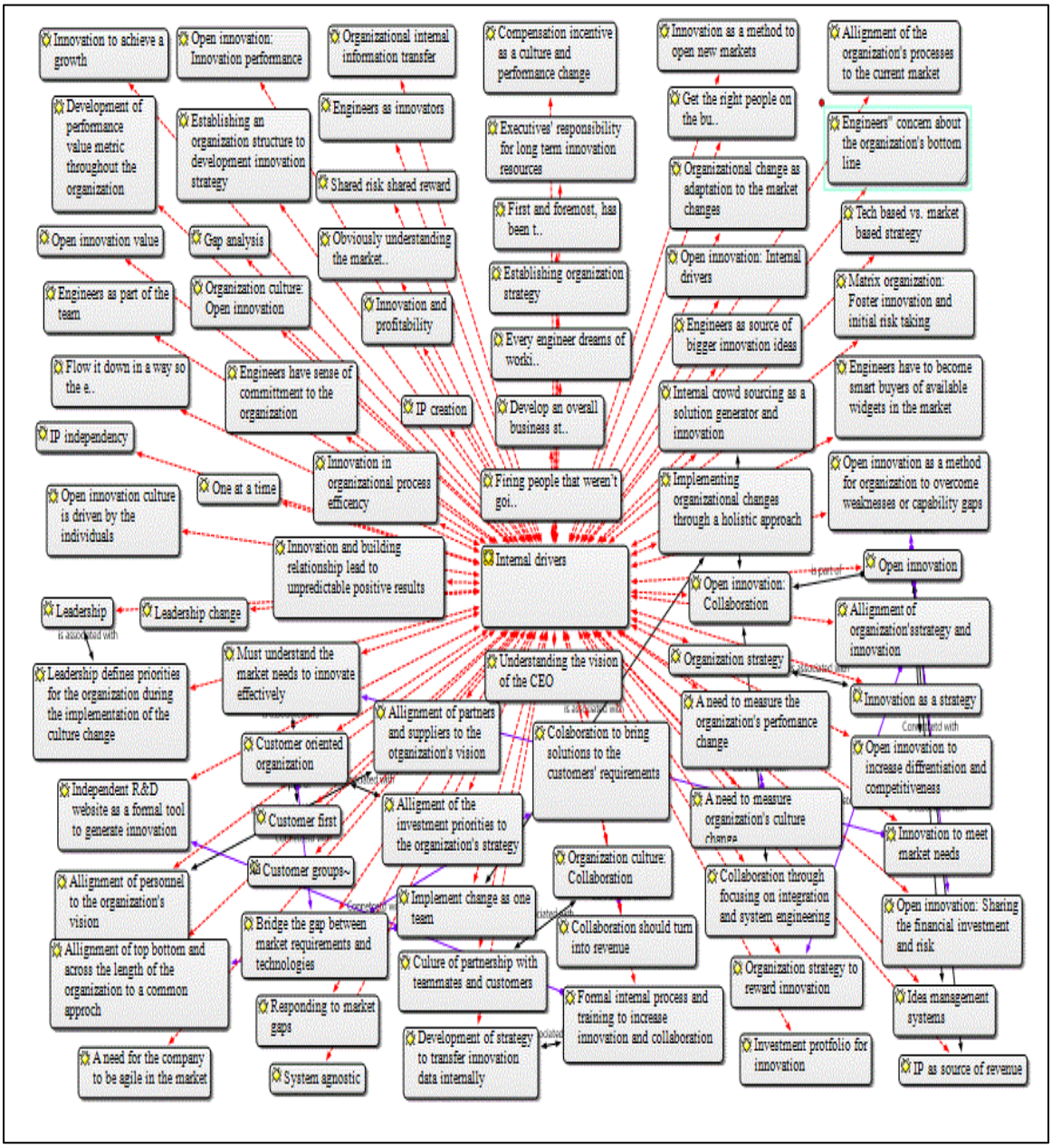

Figure 26. The primary codes neighborhood from the internal drivers silo
Note. E. Banai (2016) developed the presentation of the codes through internal drivers lens using Atlas.ti (Atlas.ti, 2016).

Figure 27 includes the external drivers silo and the associated codes. The primary theme that emerged through the external drivers silo was the notion of external collaboration as a force multiplier for organizational innovation.

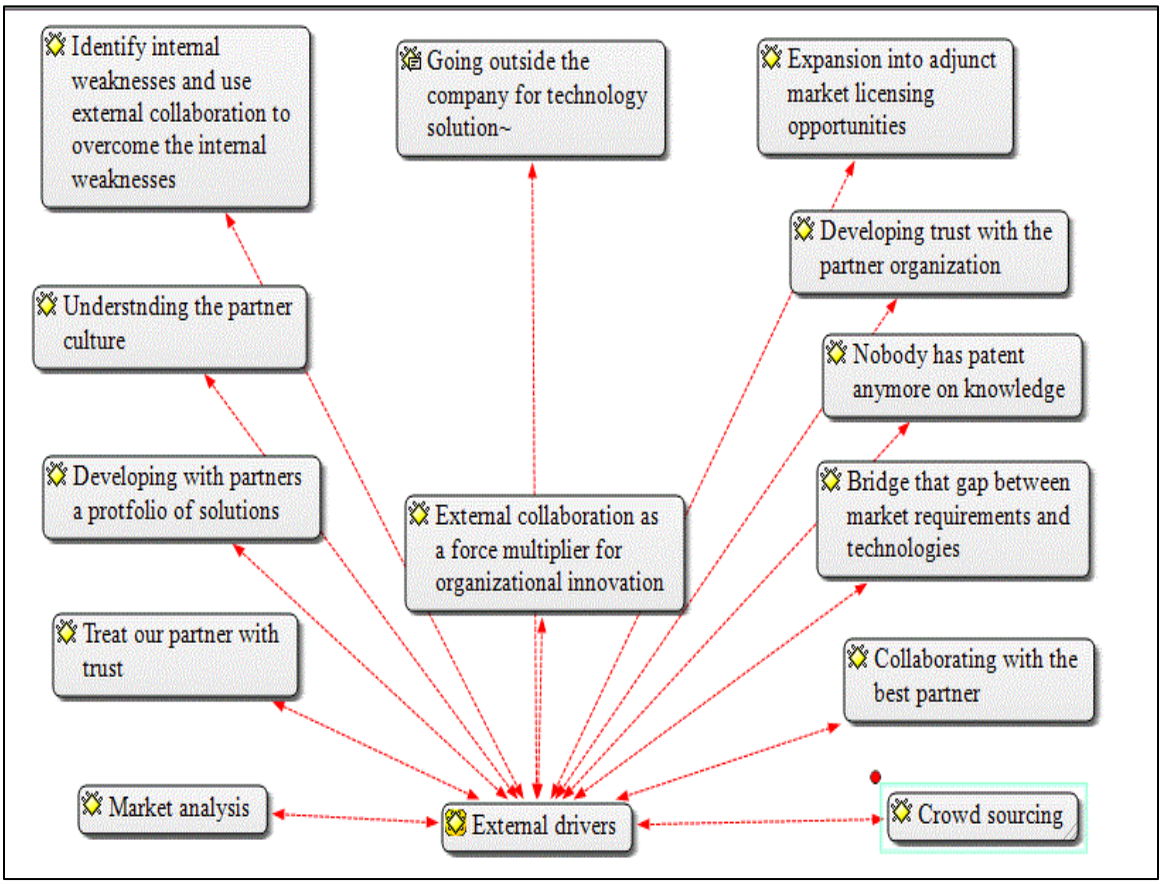

Figure 27. The primary codes neighborhood from the external driver silo
Note. E. Banai (2016) developed the presentation of the codes through external drivers lens using Atlas.ti (Atlas.ti, 2016).

In Figure 28, I present a view of the external challenges silo and the associated codes. The primary theme that emerged from the evaluation of the external challenges was the need for organization culture change.

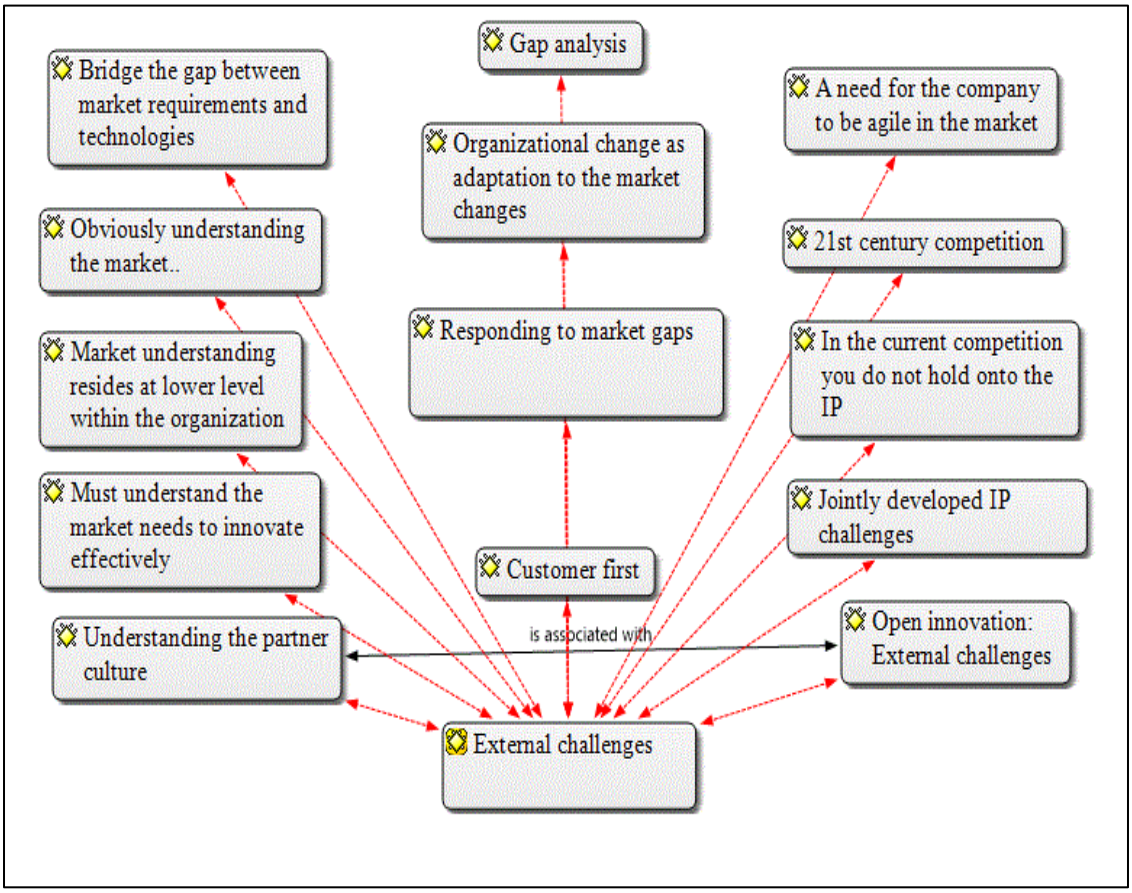

Figure 28. The primary codes neighborhood from the external challenge silo
Note. E. Banai (2016) developed the presentation of the codes through external challenges lens using Atlas.ti (Atlas.ti, 2016).

Figure 29 includes a presentation of the codes generated through the evaluation of the internal challenges. The emerged theme from the internal challenges silo was the need for the organization's members to develop an expert understanding of the customers' needs.

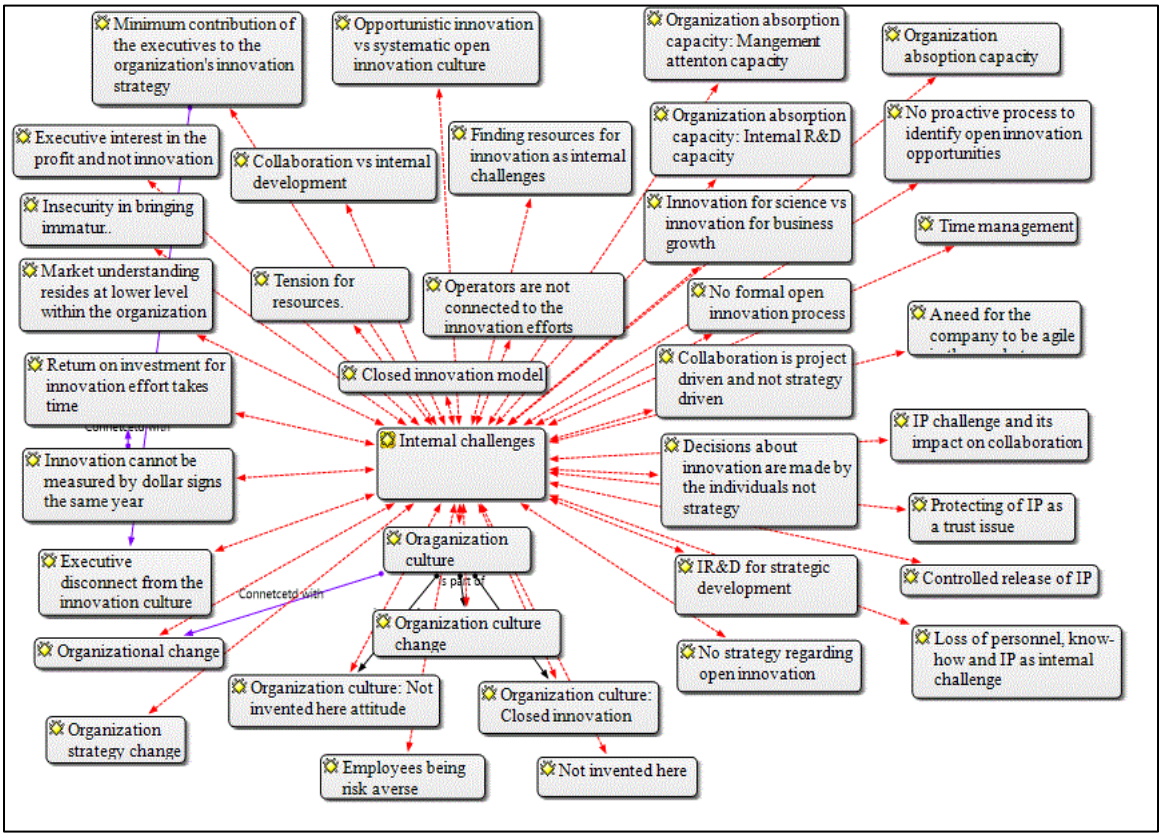

Figure 29. The primary codes neighborhood from the internal challenge silo
Note. E. Banai (2016) developed the presentation of the codes through internal challenges lens using Atlas.ti (Atlas.ti, 2016).

Presentation of the Themes

In this section, I present a discussion of the four primary themes emerging from the four silos described in Figure 25: (a) alignment of the organization strategy, including corporate vision, investment in innovation, allocation of resources, and policy regarding collaboration and intellectual property; (b) collaboration as a force multiplier for innovation; (c) the need for a critical organizational culture change to enable open innovation culture; and (d) the need for the organization's members to achieve and maintain expert understanding of the customers' needs. In addition to these four primary themes, seven secondary themes also emerged (see Figure 25). Schein (1992) stated that

leaders create an organizational culture based on three sources: (a) beliefs, values, and assumptions; (b) the learning experience of members of the organization; and (c) new beliefs, values, and assumptions brought in by new members of the organization. The four primary themes that I identified in this study form part of the key values and assumptions that business leaders teach to and impose on their employees in order to cultivate open innovation culture. Schein also identified primary and secondary culture-embedding mechanisms in organizations. Primary embedding mechanisms make up the pillars of the organizational climate, while secondary mechanisms tend to reinforce rather than create culture. However, members of an organization should focus on secondary mechanisms as an organization stabilizes. Similar to the way in which Schein listed primary and secondary culture-embedding mechanisms, I grouped my identified themes into two groups. The first group includes the four primary themes, which make up the pillars of the business leader's drive to implement a culture of change within the organization. The second group includes the secondary themes, which form the cultural artifacts that will become the driving forces for the cultivation of a sustainable open innovation culture by the organization's members.

Theme 1: Internal Drivers--Organization's Strategic Alignment

Leaders of organizations must align their organizations' open innovation strategy with their business strategy in order to benefit from open innovation (Hosseini, Kees, Manderscheid, Rogliner, & Rosemann, 2017). Hosseini et al. (2017) identified that collaboration is a strategic choice and that an organization's degree of openness goes hand-in-hand with corresponding internal structures and processes; these processes are

essential for improving the organization's innovation performance through open innovation. Saebi and Foss (2015) identified the importance of aligning organizations' internal organizational processes with their business models and strategies. The organization's open innovation strategy must allow for a certain degree of organizational porousness in order for members to accept knowledge inflow and outflow across the organizational boundaries (Saebi & Foss, 2015).

The first primary theme that emerged from my analysis of participant interviews and organizational documents was the importance of the organization's strategic alignment. The organization's strategic alignment makes up a primary internal driver of the cultivation and enabling of an open innovation culture. All participants indicated the critical need for alignment between the organization's open innovation vision and the organization's business strategy. Participant EN-A2S stated:

> When I use that term alignment that is kind of what I am trying to get at here, when I come in, I want to make sure that what I am doing is aligned with what the executive team sees as the overall vision.

Other participants, such as OP-A3B, echoed this acknowledgment of the criticalness of an alignment between the leadership's and organization's strategy and the organization's open innovation strategy and processes. Participant OP-A3B stated:

> We have to make sure the team is in line with what the goal is that you're looking to accomplish, and on a frequent basis you're coming back together as an executive team and the IPT team to make sure you're staying in line with resolving it. Here at AAAA, we like to call it the AAAA's business operating

> system, and it is really aligning the people, the processes, the tools, to drive superior performance. But more than documents, more than processes, it is really the way we think.

The theme that emerged from the participants' statements regarding the importance of strategic alignment between the organization's vision and open innovation strategy was consistent with the literature review. Hosseini et al. (2017) found that successful strategic alignment requires an organization's open innovation strategy to be aligned with its business strategy. Moreover, organizations' members must be able to adapt the employed open innovation methods in response to changes in their corporate environment (Hosseini et al., 2017)

First subtheme for emergent Theme 1—customer-oriented organization. The importance of operating as a customer-oriented organization emerged as a secondary theme when I evaluated the data through the internal drives silo. An organization, which includes market and innovation orientation as well as internal structures and processes, is likely to be indicative of an adequate degree of organizational openness and a well-considered selection of open innovation approaches (Bader & Enkel, 2014). The documents collected from all four organizations included mission statements and organizational processes that emphasize the need to have a detailed understanding of the customers' requirements. The documents collected from organization OOO illustrated a similar method of operation focusing on customer orientation. The documents included the following statement relevant to the organization strategy: "Creates a common way of thinking, operating and improving that promotes a lasting partnership with our

customer." The strategy document of the organization (OOOO) also included the following statement: "Focuses on eliminating anything that does not delight our customer." Organization AAAA's strategic processes included the following statement, which again highlights the importance for the organization to be aligned with its customers: "Align our business with our customer with functional support provided by a matrix organizational structure." In addition, the documents from organization SSSS included the following: "Customer Supporting Systems drive the ongoing performance of the business." That organization's mission statement also included the following wording: "Customer Satisfaction determines if the thinking, systems, and tools are resulting in a positive customer experience."

Participants from all four organizations echoed the need for the organization's innovation strategy to be aligned with the customers' needs. Participant EN-A25 described the change his organization had to go through to align itself with its customers, saying: "In the last year the organization has gone through a complete reorganization to be customer focused." The participant also stated, "In our organization business operating system, we are talking about people, processes and tools and the objective here is to drive the desired results so that we can compete effectively in the marketplace and meeting our customer requirements." The same participant also stated the following:

> Now we are going to have customer facing executives (CFE) and we are going to be responsive to the customer. Engineering has got to be aligned to that so now we need to have a customer driven engineering organization so what are those three CFEs that those organizations are going to bring in and need from us

relative to the products.

Participant EX-O1J from organization OOO echoed a similar strategy to cultivate an alignment between the organization's strategy and the customers' needs:

> When we are developing a product particularly in response to our evolving knowledge about an upcoming competition, we look throughout the breadth and depth of the system, and we are seeking competitive advantage. So, as we do that as we get that more refined view of what we think the customer wants we develop a refined view of what the architecture would be.

Participant OP-A3B stated: "It is being able to listen to what the customer wants and putting that into our mission statement and our values to be customer focused and looking at what the customer wants." This participant continued, "By talking to a customer, we have a better understanding of what it is the customer needs."

In the literature on innovation, previous researchers have supported the need for an organization's members to develop a detailed understanding of customers' requirements (Kaushik, 2013; Ross, 2015; Wang & Tseng, 2014). Wang and Tseng (2014) stated that rapid changes in new technologies and swift fluctuations in customers' tastes intensify this need to identify emerging customer requirements. Kaushik (2013) recognized that in the competitive market environment of the 21st century, an organization's members need to be customer-oriented and to achieve this, the organization's leaders have to institute practices that foster such an approach. Kaushik found that the practice of customer orientation requires nurturing a suitable culture and capturing information on customer needs and wants; a truly customer oriented

organization will focus on ensuring customer-centered innovation. Kaushik identified three primary elements in the framework of a customer-oriented organization: (a) develop a deep understanding of what customers truly value; (b) drive delivery of desired customer value, track customer satisfaction; and (c) innovate to retain and reward loyal customers. Kaushik presented an approach similar to that identified by several participants in this study, specifically participants EN-A25 and EX-O1J. The documents collected from the organizations and the mission statements of the four organizations also identified the need for customer-oriented structure. The participants from all four organizations, as well as the documents, emphasized the need to understand the customers' requirements; however, through my observation of the four organizations, I saw different levels of maturity in the process used to identify these requirements. In two out of the four organizations, leaders assigned internal bodies to develop a detailed understanding of customers' current and future needs. The leaders of these two organizations also implemented internal processes to spread information about customers' needs to other relevant personnel within the organization.

Second subtheme—formal internal process to enable innovation. Kaushik (2013) stated that to develop a deep understanding of what customers value, an organization's members need to focus on creating interactions with the customer. These interactions are captured through the organization's systems and processes. Customer-orientation is not a one-step process, and organizations' members need to go through various stages and processes to reach a level of maturity (Kaushik, 2013). Customer preferences change over time, and it is essential for organizations' members to continue

engaging with customers in order to ascertain the value that customers are seeking. In a customer-oriented organization, employees and leaders need to keep up with the changing requirements and adapt their offerings through innovation to meet the customers' requirements (Kaushik, 2013).

The documents collected from all four organizations included data on formal internal processes through which leaders enable and promote sharing of knowledge, collaboration, and innovation. Through these primary formal processes within the four organizations, members of the organizations can identify methods for new ideation and innovation. As presented in figure 7, I also found the literature review to support the need for an organization's leaders to establish formal processes through which to share and absorb external knowledge. Sulaiman et al. (2016) identified the primary steps in this process: (a) preparation of the organization to shift from closed innovation to open innovation system, (b) practical methods or modes that the organization's members use in external collaborations to benefit from open innovation, and (c) definition of the expectations that the firm has from open innovation. Participant EX-A1A exemplified this process when he said: "If you get to make this open innovation work you have to have the technical robustness, the processes both the technical processes and the business processes to make that work." Participant EX-A1A also provided a detailed response regarding the importance of the organization's internal processes in enabling success:

> Well let me back up, the whole thing is about repeatability; any organization can be successful, so the question is how repeatable in the organization is the success? And what does the repeatability depend on? There's no difference between the

> CMMI [Capability Maturity Model Integration] level 1 and CMMI level 5 business; they can both be successful. The question is how likely are they to repeat the success going forward? And what's the basis of their success? So, the CMMI level 1 organization, very successful organization, relies on heroic people doing heroic work to be successful and you can still be successful. But the repeatability of heroes doing heroic work is suspect. Level 5 organization, very successful organization. It relies on robust processes and procedures that anyone, any well-educated employee can perform. So, your repeatability is reliant on heroes doing heroic work it's reliant on average people doing work within the processes that you laid out.

Participant OP-S3J identified the internal formal process as the link between important elements of the organization, saying: "Our connection with suppliers, partners, strategic partners, customers, competitors, it is just this swirl of activity, but it is driven through that process." Participant EN-S2P tied the organizational internal process to the organization's culture and innovation: "Yes, it is part of the culture. Process kind of brings to mind something that we are training people to do, to think a certain way. . . We are offering opportunities for innovation outside of their normal business responsibilities but related to then and to future opportunities." While participants EX-A1A, EN-S2P, and OP-S3J evaluated the internal process from different perspectives, all three recognized the critical role that the organization's formal internal processes play in innovation and business performance.

Theme 2: Collaboration as a Force Multiplier for Innovation

In the literature review, I included numerous references in which researchers provided both the rationale for an organization's leaders to cultivate an open innovation strategy and the benefits of that strategy (Berchicci, 2013; Chesbrough, 2003; Coras & Tantau, 2014; Curley, 2015; Wang, Chang, & Shen, 2015). Chesbrough (2013) stated that the combination of rising development costs, shortening windows of opportunity, and the typically shorter life cycle of a new product have compressed the economics and increased the risk of investing in innovation, hence reducing the potential for return on innovation investment. Chesbrough (2013) also identified that by utilizing outside knowledge through the open innovation strategy, a firm's members could innovate, develop, and introduce products faster and with a smaller investment than they could by using the closed innovation model. In Figure 9, I included an illustration of the rising cost of product development and the shortening of the product life. Berchicci (2013) examined the challenges that organizations' members face in balancing internal and external R&D activities in order to profit from the external knowledge. Berchicci highlighted that it is no longer sufficient to focus only on internal R&D and the development of internal capabilities to cope with increasing costs, shorter product life cycles, and greater technological complexities. Coras and Tantau (2014) stated that innovation collaboration allows organizations' members to gain needed skills, technologies, assets, and other resources from outside the organization and to enhance the firm's capabilities while reducing the firm's cost and risk. In Table 6, I include the primary drivers and motives identified by Coras and Tantau (2014) for organizations'

members to pursue open innovation and achieve shortened time to market and increased competitiveness.

The study participants echoed the notion that collaboration enables an organization's members to overcome weaknesses, share development investments, reduce risk, and bring a product to market faster. Through the interview data, I determined that all of the four participating organizations collaborate with outside partners during the development phases of a product in order to overcome internal weaknesses. Participant EN-O2R stated: "Where we think we are experts, we will work very hard through internal resources. Where we think we are not experts we will look out." Participant EN-A2S echoed the same idea and specifically noted that collaboration forms a method for the organization to overcome the weaknesses of its internal resources:

> I didn't have the capacity, so I couldn't have done it internally myself, so right there I knew we had to collaborate. When we went through some of the technical challenges in going through that, there were some concerns laid out by the current engineering staff that we don't have the capabilities to do this and we knew of companies that had those capabilities so now what I have got is we have people who have been through the process, we have demonstrated on one end our ability to develop and build current products here, it's with TDP [Technical Data Package] technology transfer, open innovation from the customer, they are sending us a TDP and sharing it with us so that we can compete for a program, and then doing a lot of work where we have shared a lot of IP with (name coded), and they have shared a lot of IP with us. So, through that, I fully expect we will

> strengthen our engineering organization by things we've accomplished and finding gaps that we need to fill by hiring or training or cross training or something like that.

Participant EX-B1B also recognized that in order to innovate and achieve complex developments, the organization's members need to collaborate with outside sources and enable inbound knowledge transfer:

> Whereas a lot of other kinds of innovation are too complex, you have to do the knowledge transfer, you have to do it jointly. So, there is a nice neat handoff that at [name coded] we were able to take advantage of. This is another case where the foundational patent and IP here was from an outside small company.

Both of these participants, EX-B1B and EN-A2S, focused on the importance of joint and collaborative development rather than on development by one organization. The participants also identified the benefits of joint development compared to the common practice of outsourcing for R&D services by an outside subcontractor or service provider. Hartley, Sørensen, and Torfing (2013) stated that collaborative innovation brings together a range of stakeholders in interactive arenas to facilitate the cross-fertilization of ideas, mutual and transformative learning and the development of joint ownership of new solutions. Participant EX-A1A presented a strategic overview of the organization and its approach to open innovation strategy and collaboration in R&D:

> AAAA has historically been very slow in developing new products and tending to want to develop everything in house, control everything in house. . . .If you get to make this open innovation work you have to have the technical robustness, the

> processes both the technical processes and the business processes to make that work. You need to find business partners on the other side if you're going to be in open innovation the basic assumption there is someone else out there willing to operate with you on a key piece of technology or development that is important to you in total, but you are just not going to go all the way to invest on that. You're going to be selective on the things you choose to invest in.

From the data that emerged from the participating organizations' documents, I recognized similar notions that collaboration is a force multiplier for innovation. Although the types of the documents available differed from one organization to another, I selected primary documents from all organizations, such as mission statements, taglines, or official organizational documents. In its Science and Technology Strategy Overview document, organization BBBB presented the following statement: "Science and technology programs are vehicles to demonstrate internal cross-disciplinary collaboration, external collaboration and open innovation, development of intellectual capital, and scientific impact in areas of mission significance to BBBB." In its annual report, organization AAAA included as part of its vision the following statement: "At AAAA, we are committed to creating and maintaining a work environment that values learning, sharing and collaboration. We recognize that bringing diverse experiences to bear allows us to reach more creative and robust solutions." Organization SSSS, which I found to have the highest level of open innovation culture maturity and commonality within participants, included a statement about collaboration in its organization's tagline. In the tagline, the organization's leaders stated that the organization's vision is

collaboration and the focus is to build upon the best ideas and solutions, no matter their origin.

Through the literature review, the data collected during the interviews, and the documentation, I discovered a consistent approach to using collaboration as a method to overcome internal weaknesses and to enable innovation and development of new products with lower investment risk and faster delivery to the market.

Theme 3: Organizational Cultural Change

An organization's transition from a closed innovation culture to a culture of open innovation requires a significant cultural change within the organization, both for the internal organization processes, such as internal know-how transfer or intellectual property management and for external collaboration methods and procedures, such as co-development.

Rosemann and vom Brocke (2015) identified six primary factors and capability areas relevant for implementing open innovation: (a) culture, (b) strategic alignment, (c) governance, (d) methods, (e) information technology, and (f) people. Hosseini et al. (2017) confirmed that culture affects innovation success and that compared with closed innovation, open innovation calls for a different mindset for all personnel within the organization. Employees need to change their practices and processes to accept new ideas, knowledge, and technologies. According to Hosseini et al., cultural values and beliefs are vital for open innovation practices, and organizations' members must implement and adapt a culture of innovation in order to enable open innovation practices. When an organization transitions to open innovation strategies, leaders must define and

develop appropriate culture and behavior, such as an attitude of accepting risk, leadership attention, and control of intellectual property.

The need for implementing an organizational culture change emerged as the primary theme through the evaluation of the internal challenge silo; the method of implementing the organizational culture change as one team emerged as the subtheme under this silo. When evaluating what type of organizational culture and leadership characteristics are conducive for enabling the effective cultivation of an open innovation culture, I uncovered a strong theme, particularly through the responses to interview questions 1, 5, 6, and 7. Participants from all four participating organizations emphasized the crucial need to implement the organizational culture change as one team. In order to drive change as one integrated team, business leaders must first provide an updated and unobstructed vision for the organization. Leaders must develop a formal process for the organizational change, including the training of all personnel and the dissemination of the new vision to all layers within the organization.

Three of the seven interview questions were pertinent to the attitude and the contribution of subgroups to the implementation of open innovation culture. I followed Schein's (1996) organizational culture theory and focused on questions relevant to the attitude of the executives, the engineers, and the operators subgroups within the organization. Schein theorized that the behaviors and beliefs of members of the organization directly affect those members' collective ability to reconcile intrinsic conflict within three distinct member categories, which include executives, engineers, and operators. Numerous participants acknowledged the presence of a different attitude

among the subculture groups in the organization. However, all of the participants responded to these three questions about the attitude toward the culture change with a degree of recognition that these subculture groups must be unified under the organization's vision and culture change.

During the interviews, participants from all three subgroups (engineers, executives, and operators) and all four organizations emphasized the importance of implementing the culture change as one team. The participants agreed that in order to implement the culture change process, firms' leaders should align all of the subgroups with the organization's vision and rationale for change. Participant OP-A3B stated that in organization AAAA, leaders took a holistic approach to the organizational change, which in return created value implementation as one team. Participant EN-A2S said: "the objective of that is to align the top, bottom, and cross lengths of the organization to a common approach and common strategy on how we're going to get things done." The same participant also described the internal challenges present in the process of culture change within the organization. Participant EN-A2S emphasized that the effort of organizational change as one team takes a continuous effort and it is an evolving process:

> It did not happen overnight, and it is not done. It is going to continue to evolve, but if you have 1100 people in the organization, it is a challenge. It is like steering a ship, you are not going to turn it on a dime, and there are going to be challenges. You have got an overall culture; you have subcultures, we have a lot of that experience in this facility.

The importance of implementing an organizational culture change as one team

was a common thread during the interviews, specifically in the participants' responses to interview questions 1, 5, 6, and 7. This notion of implementing the culture change as one team is consistent with Schein's (1996) organizational change model. Schein theorized that successful implementation of a culture change relates to leaders' ability to reconcile the intrinsic conflict among members of the various subcultures within the organization.

Theme 4: Expert Understanding of the Customers' Needs

The fourth theme that emerged during the analysis of the external challenges silo was the need for the organization's members to have an expert understanding of the customers' needs. In the analysis of the fourth silo, I focused on the external challenges that must be overcome to ensure successful cultivation and sustainability of an open innovation culture. When an organization's members understand their customers' requirements, they can develop products and bring them to market in a more timely manner and at lower risk than if they develop a product based on technological capabilities rather than on customers' needs. Chesbrough (2013) identified the advantage in shortening the time to market and reducing development costs by using the open innovation strategy. The ability to reduce development risks and shorten the time to market can be key in helping organizations survive the aggressive nature of the 21st century global market. Organizations' members can leverage this advantage to overcome the combination of rising development costs, shorter product life cycles, and increased risks from investing in innovation.

Parida, Sjödin, Lenka, and Wincent (2015) recognized that in order to increase their global offerings, organization' members need to focus extensively on understanding

their customers. During my analysis of the internal driver silo, I identified a customer-oriented organization subtheme. Through a customer-oriented organization methodology, an organization's members can maintain access to their customers. On the other hand, in my analysis of the external challenges silo, I found that to gain an expert understanding of the customers' needs, organizations' members must continuously pursue detailed and expert information regarding customers' current, future, and latent requirements. Parida et al. identified that a primary step in developing global customer insight is collaboration, which includes a focus on processes to identify customers' needs and gain access to key operational requirements.

Ross (2015) also stated that to maintain organizational success, organizations' members need to understand customers' needs is essential. The documents from the participating organizations included significant portions of the processes and activities that organizations' members use to gain an external understanding of their customers' needs. For example, organization OOOO's mission and strategy statement included the following:

> The world in which our customers operate is constantly changing. That is why we are focused on innovation and continuous improvements to ensure our products and customer support services can successfully handle the rigors of customer's jobs and perform at the highest level. Our mission is to partner with customers to deliver superior solutions that safely and efficiently move people and material at work, around the globe, and around the clock.

In addition, OOOO documents included a description of the organization's innovation activities: "We aim to develop product families and technology families that will endure as each model or version evolves to meet customer needs." In its operating system, OOOO organization sets a consistent goal of understanding the customer:

> The operating system provides us with a common set of business practices, tools, and measurements to guide our daily work. These practices, tools, and measurements enable us to more effectively execute our (coded) strategy and ensure we are focused on our number one priority, our customer.

Organization SSSS included a very aggressive approach to understanding the customer needs, including a policy of being system-agnostic and intellectual property agnostic; this means that organization SSSS strives to provide customers with the best available technology with less intellectual property dependency. In its documents, SSSS emphasized its differentiation in the market: "SSSS provides best technology available. . . less intellectual property dependency and increased industry collaboration facilitates rapid, cost effective upgrades."

Participant EX-A1A explained the restructuring of organization AAAA to enable a better understanding of customers' needs:

> What we have tried to create is a customer-facing organization, so then the role of those people in the organization are to basically validate this is what the customer wants, how much they are going to pay for it, and for me to address that market I need these things. So then on the other side of the organization is all the resources that deliver solutions to a customer.

Participants OP-A3B added the following:

> By having customer-facing executives that their solo job is really to go in and understand the customer's needs and get into the customer not just trying to sell [name omitted], sell solutions, that is where that solution came out. So, it was not a customer came to us and said, "I have a need for this" but by talking to a customer we have a better understanding of what it is the customer needs, and then you come back and say "This is what we need to be able to satisfy what the customers' demands are."

Due to expert understanding of customers' needs, the rising cost of product development, and the requirement to bring solutions to the market in a timely manner, intellectual property has become a commodity. The interviews and the documents from organizations SSSS, AAAA, and OOOO revealed the adaptation of an adjusted strategy, moving from traditional product development to a model of system integration in which the organizations' members use other parties' intellectual property. Due to the challenge of responding rapidly to customers' needs, the higher cost of product development, and the organization's financial risk, leaders of these organizations implemented R&D collaboration and system integration strategy. In this system integration strategy, the organization's members integrate other partners' innovations and subsystems to meet the demands of the 21st century market environment.

Connecting the Findings to the Conceptual Framework

The foundation of my proposed conceptual framework is Schein's organizational culture theory (Schein, 1996). Schein identified three different cultures within an organization; the *operators*, the *engineers*, and the *executives.* Hogan and Coote (2014) stated that Schein's multi-layered model of organizational culture offers a useful framework for thinking about processes that foster innovation. By following Schein's theory, I came to understand that successful organizational change is a function of the ability to reconcile intrinsic conflict among members of the various categories. I followed up on Schein's organizational culture model and his focus on three subcultures to analyze the interview data through the three member categories.

I selected the four participating organizations based on a set of criteria, including a criterion that the organization responds successfully, on a regular basis, to emerging clients' demands within a short period. During my observation of the four organizations, and through the evaluation of the interview data, I noticed that the maturity level of the open innovation culture differed among the four organizations. Some organizations' members practiced a more homogenized method of collaboration, and the different subculture personnel (executives, engineers, and operators) shared a similar innovation vision and collaboration culture. In comparison, other organizations practiced a more fragmented culture, and the collaboration strategy was not as homogenized or synchronized. In addition, none of the 12 participants identified a method or a tool that they used within their organizations to measure the level of maturity of or the progress in cultivating the open innovation culture.

Based on my observations that the participants did not identify any method used to measure their progress in cultivating open innovation culture, and because I did not find relevant previous research data in the literature, I recognized this as a gap that requires further future research. By limiting my observation to the four participating organizations and the 12 participants, I was able to further explore the level of maturity of the open innovation culture within each organization and to evaluate the links to Schein's (1996) organizational culture model.

By identifying how often the three participants from each organization used the same codes and themes during the interviews, I explored the level of commonality and similarity in the participants' responses. I initially studied each organization separately to determine whether the executive, the engineer, and the operator from the same organization provided similar codes in their responses to the seven interview questions. In Figure 30, I include a flowchart that illustrates the process of the first evaluation.

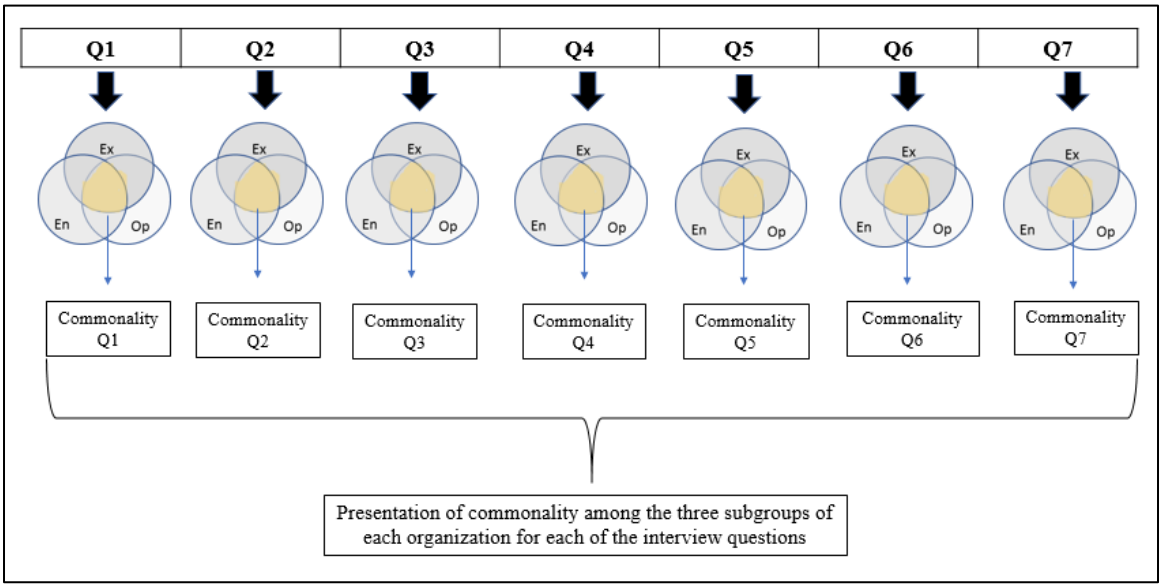

Figure 30. Comparison of subcultures alignment within an organization
Note. E. Banai (2017) developed the presentation of the flow process for the first evaluation

Through this exploration, I identified a different level of homogeneity in the participants' answers among the four organizations. For example, all three participants from organization SSSS -- the executive, the operator, and the engineer -- responded in a similar way and with shared reactions to five of the seven interview questions. The answers with common comments generated similar codes after I coded and analyzed the data. For the other two questions, two out of three participants had shared reactions and yielded similar codes when I coded the interviews. For comparison purposes, all three participants of BBBB responded with similar answers to only two questions and thus yielded similar codes after I coded them. For two other questions, the participants of BBBB responded with no shared reactions. Table 8, below, includes a summary of the observation I made regarding the commonality among the participants of each organization.

Table 8

Details of Observation of the Commonality Between Participants.

Organization / No. of question	Number of answers in which all participants answered with similar themes	Number of answers in which 2 out of the 3 participants answered with similar themes	Number of answers in which none of the participants answered with similar themes
SSSS	5	2	
AAAA	3	4	
OOOO	2	4	1
BBBB	2	3	2

In addition to studying the commonality and homogeneity in the participants' answers within on organization, I followed Schein's (1996) organizational culture model. After I coded the interviews answers, I explored the commonality of codes and themes among participates of the same subgroups across the four participating organizations. In this exploration, I compared the commonality of the codes of interview answers between the executives, engineers, and operators. Figure 31 includes presentation of the flow process of the second evaluation. Figure 31 includes the process when I evaluated the answers among the four executives. I used the same process to compare the answers among the operators and then the answers among the engineers.

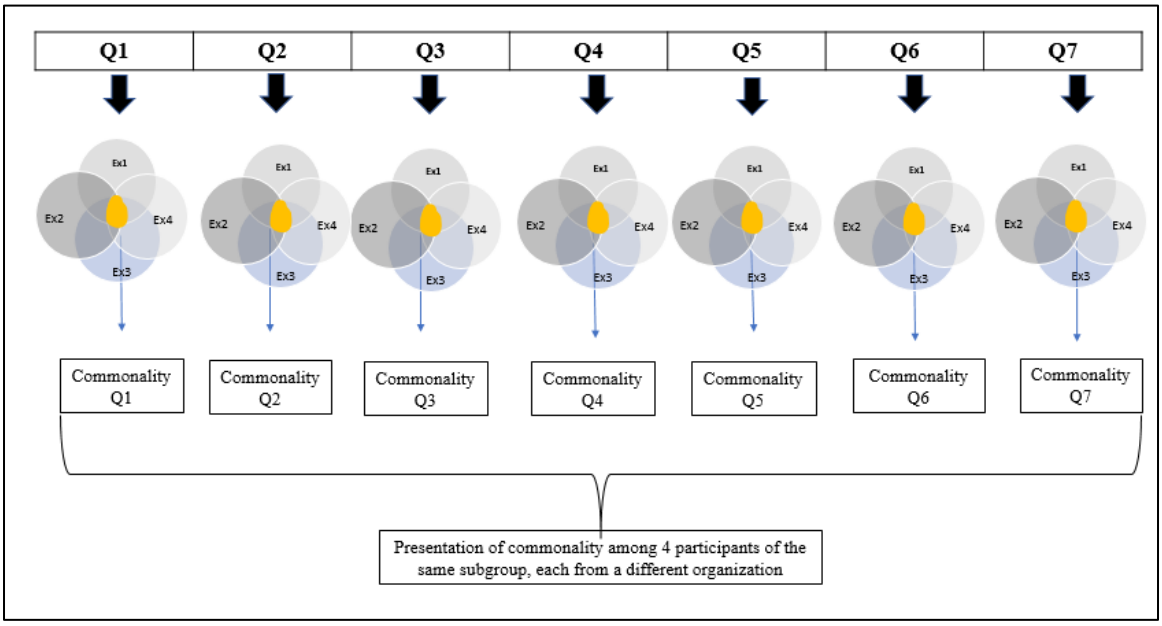

Figure 31. Comparison of subcultures alignment across organizations
Note. E. Banai (2017) developed the flow process for the second evaluation.

In the second evaluation, which included a comparison of the groups of executives, engineers, and operators, I explored data consistent with Schein's theory (1996). Schein (1996) theorized that the behaviors and beliefs of an organization's members directly affect those members' collective ability to reconcile intrinsic conflict within the three distinct member categories or subcultures. As presented in Table 9 below, I identified only minor differences between the three subgroups. Since I purposely selected four organizations for this study that demonstrated successful cultivation of open innovation culture, it is logical that the three groups showed similar values and beliefs. When I analyzed the interview answers, I found the similarity and shared reactions by the participants' three subgroups, and after I coded them, the answers had similar codes and themes.

Table 9

Details of Observation of the Commonality Among Subgroups of Participants

Subgroup	All participants of the same subgroup across the four organizations answered with similar themes	3 out of the 4 participants from the same subgroup answered with similar themes	2 out of the 4 participants from the same subgroup answered with similar themes	None of the participants from the same subgroup answered with similar themes	Total answers
Executives	2	4	1		7
Engineers	1	4	1	1	7
Operators	1	3	2	1	7

Application to Professional Practice

Wynarczyk (2013) identified that in the 21st century, both large and small companies face increasingly fierce competition from organizations with limited R&D resources. The leaders of these emerging organizations have successfully commercialized discoveries originally made by others (Chesbrough, 2004). However, in the competitive environment of the 21st century, in which innovation is critical to organizations' competitiveness (Chen & Kao, 2016), business leaders also find it harder to justify innovation investment due to the increasing cost to innovate and the typically short market life of a new product. Organizations' members thus need to innovate, create new ideas, and bring them to the market through a fundamental change from closed innovation to open innovation (Yun et al., 2016).

Through my findings in this study, I offered business leaders methods and techniques with which to cultivate a sustainable open innovation culture in their organization. By implementing these recommendations, business leaders will better position their employees to compete and innovate through open collaboration. Business leaders should use the findings of this study to facilitate their organization's internal and external drivers, as well as to overcome the external and internal challenges to enable their organization's members to cultivate an open innovation culture. To cultivate a sustainable open innovation culture successfully, business leaders should specifically implement the following primary activities: (a) cultivate an alignment between the organization's business vision and the organization's innovation strategy; (b) enable open innovation collaboration with outside partners who are subject matter expert in their field in order to overcome organizational weaknesses and bridge the gap between market requirements and technological solutions; (c) enable organizational change as one team in which all subcultures within the organization are aligned with clear organizational vision and strategy and in which conflicts are resolved; and (d) establish a continous process that enables the organization's members to develop an expert understanding of the current, future, and latent requirements of their customers.

Implications for Social Change

In this qualitative multiple case study, I aimed to explore effective strategies that business leaders use to cultivate a sustainable open innovation culture in high technology organizations. The higher cost of research and development in the high technology industry and the shorter life of a new product in the market have reduced organizations'

return on investment in the innovation of new products. Business leaders, who have the responsibility to increase their organization's profitability, need to resolve the conflict between these two phenomena. In addition, business leaders must recognize the need to innovate, as identified by Chen and Kao (2016) who stated that in the 21st century, innovation is critical for organizations' competitiveness and sustainability.

The importance of the social dimension of innovation has become a widely accepted idea, and the process of innovation itself has become part of social action (Cajaiba-Santana, 2014). Sabadie (2014) stated that funding of collaborative R&D projects in the European Community has contributed to the scientific advancement of industrial technologies in Europe and that the scientific advancement has created new knowledge in areas like nanomedicine, forestry, energy, electronics, textiles, machine tools, and robotics. Similar to the data presented by Sabadie (2014), when business leaders successfully cultivate a sustainable open innovation culture within their organizations, both the employees and the markets in which the organizations are active will benefit. Curley (2015) identified that by adapting an open innovation, business leaders could help drive the development of shared value solutions, which in turn can drive changes far beyond the scope of what any one organization could achieve on its own

Osburg and Schmidpeter (2013) recognized that open innovation is a source for creating new solutions and that open innovation is a must for social innovation. To solve problems in today's society, many parties must constantly collaborate to determine the most pressing problems and the best approaches with which to resolve them (Osburg &

Schmidpeter, 2013). Competitive and sustainable organizations, whose members innovate and bridge between market requirements and technological solutions, impact our society in terms of material wealth, social welfare, and employment opportunities. For example, in my review of studied organizations' documents, I found that organization BBBB's members developed a dialysis-like system to treat sepsis by using open innovation culture and collaboration with members of both government and academia. Members of BBBB also developed a breakthrough technology through which paralyzed patients can regain conscious control of their fingers, hand, and wrist by using the collaboration method. In addition, members of organization OOOO developed autonomous capabilities to ground platforms, which reduce risk for operators in hazards and risky environments, through co-development of intellectual property with private and governmental partners. As these examples show, individuals all over the globe benefit from increased and rapid innovation and the competitiveness, strength, and sustainability of organizations and economies.

In addition to the social changes implemented by the participating organizations' open innovation strategy, numerous examples can be found of other organizations whose members have implemented social change through open innovation strategies. The leaders of General Electric, which is one of the leading companies with an open innovation culture, started a project called First Build (Firstbuild, 2017). First Build is a collaboration platform connecting designers, engineers, and thinkers to focus on solving problems and create new home appliances (Firstbuild, 2017). Similarly, Samsung's leaders developed an accelerator program through which to provide office spaces, capital,

and product support to entrepreneurs to help them build software and services (Samsungnext, 2017)

Recommendations for Action

In this study, I found that in order to keep their organizations relevant and competitive in the 21st century, leaders and employees of high-technology organizations need to enable innovation through collaboration. Members of a high-technology organization need to shift their expertise from in-house development of intellectual property for a product to system solutions. Business leaders should shift the organization's attention to enable members to bridge the gap between their customers' requirements and practical solutions through collaboration and integration of outside expert partners. To meet the customers' requirements, members of a high technology organization must become more agnostic to the product's intellectual property and focus instead on a system solution. Tantau and Coras (2013) identified that organizations whose members implement open innovation strategy may face the risk of loss of intellectual property. However, the findings of this study show that product intellectual property may not necessarily be a crucial asset that the organization's members must guard but may rather be a commodity. I purposely selected participants from high-technology organizations with information-rich experiences in cultivating strategies of open innovation. Through my analysis of the documents and the interviews from all four organizations, I showed that the leaders of these organizations enabled the outflow and inflow of knowledge and IP. The organization whose members demonstrated the highest level of maturity in its open innovation strategy also stated in its organizational statement

that the organization's operation is agnostic to the ownership of the IP. In the interviews, the participants identified that understanding customers' needs is of the highest importance to the organization's success and that the organization's members can achieve product IP through collaboration with partners.

The higher product development costs and risks that an organization encounters in the 21st century, combined with a shorter life span of a product on the market, have reduced the importance of a product intellectual property. In parallel, the ability of an organization's members to integrate innovations by outside parties enables the organization to introduce innovative products to the market at lower costs and lower risks.

In this study, I provided business leaders with specific elements of strategies and processes with which to cultivate a sustainable open innovation culture in their organizations. These strategies include: (a) organizational alignment between the organization's business strategy and its innovation strategy; (b) implementation of formal internal process to enable innovation; (c) collaboration to overcome internal organizational weaknesses and enabling rapid and timely deployment of practical solutions to meet customers' needs; (d) implementation of organizational cultural change; and (e) the development of an expert understanding of customers' current, future, and latent requirements.

Business leaders and individual members of high technology organizations, as well as others in academia, research and development organizations, and governmental bodies can apply the findings of this study. The innovation ecosystem is the knowledge

space among all the agents involved in the innovation system, including universities, nonprofit R&D organizations, and governments (Villarreal & Calvo, 2015). The impact of the total global innovation network, macroeconomic regulatory market factors, and infrastructure, as well as product market conditions, comprise only a few of the considerations introduced with the innovation ecosystem view. In this study, I showed several similarities across all four organizations and highlighted areas where action is needed. First, I identified a degree of misalignment and lack of homogeneity among the executive, engineer, and operator subcultures in all four participating organizations, even those with a high level of open innovation maturity. Leaders need to make ongoing and continuous effort to reconcile these conflicts between subculture groups within the organization. The second similarity between the four organizations was the ongoing and continuous need to forecast and understand customers' requirements. Organizations' leaders need to adopt an organizational structure that promotes customer orientation, and all members of an organization need to continuously pursue an expert understanding of their customers' needs. Third, I identified the need to innovate continuously to stay relevant and competitive in the market. To do so, organizations' members must collaborate in development and innovation; this, in turn requires an organizational cultural change and the adoption of an open innovation strategy.

Upon successful completion of the DBA program, I will present the findings of this study to the four participating organizations and the 12 participants. I also plan to publish the findings in relevant NDIA publications and conferences, such as the Association of the United States Army, AFEI (Association for Enterprise Information),

and System Engineering Conference. In addition, I will publish the study in R&D and innovation peer-reviewed publications, such as International Journal of Innovation Research and Development and Innovation Management Review.

Recommendations for Further Research

Open innovation is a new phenomenon, coined by Chesbrough in 2003. Since 2003, numerous researchers have explored the wide scope of open innovation characteristics, including its benefits, strengths, risks, and weaknesses. Researchers should continue to explore and develop a method or a tool for business leaders to measure their organization's level of open innovation practice. All four organizations in this study practiced an advanced degree of open innovation. However, the level of maturity of open innovation differed across each organization, and the level of open innovation practices differed among the different member groups within the organization. In the literature review, I did not include studies providing information regarding the measurement of the maturity of an organization's open innovation culture. The development of such a tool would help business leaders align their organization with the desired level of openness and would reduce the risks associated with too much openness. Through such a study, future researchers could provide training and guidance to young entrepreneurs on how to implement and cultivate open innovation.

Researchers should also focus on exploring and evaluating the relationship between open innovation and its impact on an organization's success, possibly using a mixed method to provide business leaders with additional tools with which to assess the organization's progress during the cultivation of the open innovation culture. Also,

researchers should direct future studies to the exploration and identification of exact factors that contribute to the successful cultivation of a sustainable open innovation culture.

Reflections

Prior to my doctoral study, I developed an interest in exploring the effects of the 21st century global business market, including globalism and increased competition, on business leaders. The notion that business leaders have to adopt new business practices in order to enable their organization to compete and innovate successfully intrigued me. In this study, I aimed to explore strategies to enable business leaders and their organizations to respond successfully to emerging customer requirements through the adoption of an open innovation culture. This DBA research process allowed me to explore a personal interest in the open innovation strategy while learning and gaining an understanding of structured research methodology.

The DBA experience proved to be a challenging journey. It has been over 30 years since I attained my Master's degree, and the process of re-entering a research environment with the required discipline took time and effort. However, the benefits of this journey have surpassed the challenges and my expectations. The DBA study provided me with the unique tools and knowledge needed to conduct professional research. In particular, I gained the knowledge to mitigate bias through the use of existing data in peer-reviewed journals and research log. More importantly, I was privileged to conduct a research study on a phenomenon that is current and relevant to business leaders, such as myself, who are facing a business environment of intense competition

and rapid changes. The research process and findings of this study strengthened my understanding of the benefits and risks associated with open innovation strategy. The findings enabled me with the knowledge of how to cultivate a sustainable open innovation culture as part of my responsibilities as a business leader.

Conclusion

The research question: What strategies do business leaders of high-technology organizations use to cultivate a sustainable open innovation culture? is a current and significant topic for business leaders. The way in which organizations' members innovate and create new ideas and bring them to the market is undergoing a fundamental change from closed innovation to open innovation (Yun et al., 2016). In the 21st century, innovation and market readiness have become the primary criterion for an organization's sustainability, while companies are facing increasingly fierce competition from organizations with limited R&D resources (Wynarczyk, 2013).

Business leaders must adopt new business practices to sustain their organizations and meet the paradigm of global innovation and competition. By understanding the strategies that drive effective implementation of an open innovation culture, business leaders can implement practical techniques to respond in real time to market demands. In this research, I explored methods, processes, and strategies that should help business leaders to cultivate a sustainable open innovation culture and lead their organization to higher competitiveness and sustainability.

References

Abbas, R., & Court, D. (2015). Two ethnographic researchers embark on a narrative journey. *Qualitative Report, 20*, 1448-1457. Retrieved from http://tqr.nova.edu/

Abowitz, D. A., & Toole, T. M. (2009). Mixed method research: Fundamental issues of design, validity, and reliability in construction research. *Journal of Construction Engineering and Management*, *136*(1), 108-116. doi:10.1061/(ASCE)CO.1943-78-7862.0000026

Acharya, A. S., Prakash, A., Saxena, P., & Nigam, A. (2013). Sampling: Why and how of it? *Indian Journal of Medical Specialties*, *4*, 330–333. doi:10.7713/ijms.2013.0032

Agag, G., & El-Masry, A. A. (2016). Understanding consumer intention to participate in online travel community and effects on consumer intention to purchase travel online and WOM: An integration of innovation diffusion theory and TAM with trust. *Computers in human behavior*, *60*, 97-111. doi:10.1016/j.chb.2016.02.038

Agerfalk, P. J. (2013). Embracing diversity through mixed methods research. *European Journal of Information Systems, 22*, 251-256. doi:10.1057/ejis.2013.6

Ahn, J. M., Ju, Y., Moon, T. H., Minshall, T., Probert, D., Sohn, S. Y., & Mortara, L. (2016). Beyond absorption capacity in open innovation process: The relationships between openness, capacities and firm performance. *Technology Analysis and Strategic Management, 28,* 1009–1028. doi:10.1080/09537325.2016.1181737

Akca, Y., & Özer, G. (2014). Diffusion of innovation theory and an implementation on enterprise resource planning systems. *International Journal of Business and Management*, *9*(4), 92-114. doi:10.5539/ijbm.v9n4p92

Alvesson, M. (2012). *Understanding organizational culture*. London, UK: Sage.

Alvesson, M., & Sveningsson, S. (2015). *Changing organizational culture: Cultural change work in progress*. New York, NY: Routledge.

Ando, H., Cousins, R., & Young, C. (2014). Achieving saturation in thematic analysis: Development and refinement of a codebook 1, 2, 3. *Comprehensive Psychology*, *3*(1), 1-7. doi:10.2466/03.CP.3.4

Antons, D., & Piller, F. T. (2015). Opening the black box of "Not Invented Here": Attitudes, decision biases, and behavioral consequences. *The Academy of Management Perspectives*, *29*, 193-217. doi:10.5465/amp.2013.0091

Anyan, F. (2013). The influence of power shifts in data collection and analysis stages: A focus on qualitative research interviews. *Qualitative Report*, *18*, 1-9. Retrieved from http://tqr.nova.edu/

Aoki, N. J., Enticott, J. C., & Phillips, L. E. (2013). Searching the literature: Four simple steps. *Transfusion*, *53*, 14–17. doi:10.1111/j.1537-2995.2012.03790.x

Atlas.ti (Version 7) [Computer software]. Retrieved from http://atlasti.com/

Awadh, A. M., & Alyahya, M. S. (2013). Impact of organizational culture on employee performance. *International Review of Management and Business Research*, *2*(1), 168-175. Retrieved from http://www.irmbrjournal.com/

Bader, K., & Enkel, E. (2014). Understanding a firm's choice for openness: Strategy as determinant. *International Journal of Technology Management 23*, 156-182. doi:10.1504/IJTM.2014.064590

Baškarada, S. (2014). Qualitative case study guidelines. *Qualitative Report, 19*(40), 1-18. Retrieved from http://nsuworks.nova.edu

Bazeley, P. (2013). *Qualitative data analysis: Practical strategies*. London, UK: Sage.

Bell, J. (2014). *Doing your research project: A guide for first-time researchers*. Berkshire, UK: McGraw-Hill Education

Berchicci, L. (2013). Towards an open R&D system: Internal R&D investment, external knowledge acquisition and innovative performance. *Research Policy, 42*(1), 117-127. doi:10.1016/j.respol.2012.04.017

Bigliardi, B., & Galati, F. (2016). Which factors hinder the adoption of open innovation in SMEs? *Technology Analysis & Strategic Management, 28*(8), 1-17. doi:10.1080/09537325.2016.1180353

Blomberg, L. D., & Volpe, M. (2016). *Completing your qualitative dissertation: A road map from beginning to end* (3rd ed.). Thousand Oaks, CA: Sage Publications.

Blos, M. F., Da Silva, R. M., & Miyagi, P. E. (2015). Application of an agent-based supply chain to mitigate supply chain disruptions. *IFAC-PapersOnLine, 48*, 640-645. doi:10.1016/j.ifacol.2015.06.154

Booth, A., Sutton, A., & Papaioannou, D. (2016). *Systematic approaches to a successful literature review*. London, UK: Sage.

Brutus, S., Aguinis, H., & Wassmer, U. (2013). Self-reported limitations and future directions in scholarly reports analysis and recommendations. *Journal of Management, 39*, 48-75. doi:10.1177/0149206312455245

Bungay, V., Oliffe, J., & Atchison, C. (2016). Addressing underrepresentation in sex work research reflections on designing a purposeful sampling strategy. *Qualitative Health Research, 26*, 966-978. doi:10.1177/1049732315613042

Büschgens, T., Bausch, A., & Balkin, D. B. (2013). Organizational culture and innovation: A meta-analytic review. *Journal of Product Innovation Management, 30*, 763–781. doi:10.1111/jpim.12021

Cajaiba-Santana, G. (2014). Social innovation: Moving the field forward. A conceptual framework. *Technological Forecasting and Social Change*, *82*, 42-51. doi:10.1016/j.techfore.2013.05.008

Carter, N., Bryant-Lukosius, D., DiCenso, A., Blythe, J., & Neville, A. J. (2014). The use of triangulation in qualitative research. *Oncology Nursing Forum, 41*, 545-547. doi:10.1188/14.ONF.545–547

Cao, Z., Huo, B., Li, Y., & Zhao, X. (2015). The impact of organizational culture on supply chain integration: A contingency and configuration approach. *Supply Chain Management: An International Journal*, *20*, 24-41. doi:10.1108/ SCM-11-2013-0426

Capozzi, M. M., Van Biljon, P., & Williams, J. (2013). Organizing R&D for the future. *MIT Sloan Management Review*, *54*(3), 19-20. Retrieved from http://sloanreview.mit.edu/

Chan, Z. C., Fung, Y. L., & Chien, W. T. (2013). Bracketing in phenomenology: Only undertaken in the data collection and analysis process. *Qualitative Report*, *18*, 1–9. Retrieved from http://tqr.nova.edu/

Changil, C., & Heesang, L. (2015). Hetero expert innovation. *Research Technology Management*, *58*(2), 40-46. doi:10.5437/08956308X5802187

Chen, D. N., & Kao, P. F. (2016, June). *The impacts of wikinomics on open innovation in organizations: A study based on SMEs in Taiwan*. Paper presented at Pacific Asia Conference on Information Systems. Chia-Yi, Taiwan.

Chen, J., Huang, S., & Xu, Q (2015). Firm innovation systems: Perspectives of researches on state-owned key enterprises. *Frontiers of Engineering Management*, *2*(1), 64-70. doi:10.15302/J-FEM-2015017

Chen, W., Brennan, L., & Zeng, D. (2013). Exploring supply chain collaborative innovation: Evidence from China. *Irish Journal of Management*, *32*(2), 5-27. Retrieved from http://iamireland.ie/journal.html

Cheng, C. C., & Huizingh, E. K. (2014). When is open innovation beneficial? The role of strategic orientation. *Journal of Product Innovation Management*, *31*, 1235-1253. doi:10.1111/jpim.12148

Cheng, C. C., Yang, C., & Sheu, C. (2016). Effects of open innovation and knowledge-based dynamic capabilities on radical innovation: An empirical study. *Journal of Engineering and Technology Management*, *41*, 79-91. doi:10.1016/j.jengtecman.2016.07.002

Chesbrough, H. (2003). The logic of open innovation: Managing intellectual property. *California Management Review*, *45*(3), 33-58. doi:10.2307/41166175

Chesbrough, H. (2004). Managing open innovation. *Research Technology Management*, *47*(1), 23-26. Retrieved from http://www.iriweb.org/rtm

Chesbrough, H., & Crowther, A. K. (2006). Beyond high-tech: Early adopters of open innovation in other industries. *R&D Management*, *36*, 229-236. doi:10.1111/j.1467–9310.2006.00428.x

Chesbrough, H. W. (2006a). *Open innovation: The new imperative for creating and profiting from technology*. Boston, MA: Harvard Business Press.

Chesbrough, H. (2006b, December). *Open innovation and open business models: A new approach to industrial innovation.* Paper presented at the Joint OECD/ Dutch ministry of economic affairs conference on globalization and open innovation, the Netherland.

Chesbrough, H. (2012). Open innovation: Where we've been and where we're going. *Research-Technology Management*, *55*(4), 20-27. doi:10.5437/08956308X5504085

Chesbrough, H. (2013). *Open business models: How to thrive in the new innovation landscape*. Boston, MA: Harvard Business Press.

Chesbrough, H., & Bogers, M. (2014). Explicating open innovation: Clarifying an emerging paradigm for understanding innovation. In H. Chesbrough, W. Vanhaverbeke & J. West (Eds.), *New Frontiers in Open Innovation*, (pp. 3-28). Oxford, UK: Oxford University Press

Chesbrough, H. (2015). From open science to open innovation. *Institute for Innovation and Knowledge Management, ESADE*. Retrieved from https://www.fosteropenscience.eu/content/open-science-open-innovation

Clarke, V., & Braun, V. (2013). Teaching thematic analysis: Overcoming challenges and developing strategies for effective learning. *Psychologist*, *26*(2), 120-123. Retrieved from https://thepsychologist.bps.org.uk/

Connelly, L. M. (2013). Limitation section. *Medsurg Nursing*, *22*(5), 325-326. Retrieved from http://www.medsurgnursing.net/

Coras, E. L., & Tantau, A. D. (2014). Open innovation–The good, the bad, the uncertainties. *The USV Annals of Economics and Public Administration*, *14*(19), 38-47. Retrieved from http://www.seap.usv.ro/annals/ojs/index.php/annals

Cronin, C. (2014). Using case study research as a rigorous form of inquiry. *Nurse Researcher*, *21*(5), 19-27. doi:10.7748/nr.21.5.19.e1240

Cseko, G. C., & Tremaine, W. J. (2013). The role of the Institutional Review Board in the oversight of the ethical aspects of human studies research. *Nutrition in Clinical Practices, 28,* 177-181. doi:10.1177/0884533612474042

Curley, M. (2015). The evolution of open innovation. *Journal of Innovation Management*, *3*(2), 9-16. Retrieved from http://www.open-jim.org/

Dabić, T., & Stojanov, Z. (2014). Techniques for collecting qualitative field data in education research: Example of two studies in information technology field. *Singidunum Journal of Applied Sciences,* 362-367. doi:10.15308/SInteZa–2014–362V367

Dasgupta, M. (2015). Exploring the relevance of case study research. *Vision, 19*(2), 147-160. doi:10.1177/ 097226291557661

Dauber, D., Fink, G., & Yolles, M. (2012). A configurational model of organizational culture. *SAGE Open,* 2 (1), 1-16. doi:10.1177/2158244012441482

Davies, M. B., & Hughes, N. (2014). *Doing a successful research project: Using qualitative or quantitative methods* (2nd ed.). New York, NY: Palgrave Macmillan.

de Araújo Burcharth, A. L., Knudsen, M. P., & Søndergaard, H. A. (2014). Neither invented nor shared here: The impact and management of attitudes for the adoption of open innovation practices. *Technovation*, *34*, 149-161. doi:10.1016/j.technovation.2013.11.007

Denzin, N. K., & Lincoln, Y. S. (2011). *The Sage handbook of qualitative research*. Thousand Oak, CA: Sage.

Dine C.J., Caelleigh A.S., & Shea J.A. (2015). Review process. In S.J. Durning, & J.D. Carline (Eds.), *Review Criteria for Research Manuscripts* (pp. 3-6). Washington, DC: Association of American Medical Colleges.

Dries, L., Pascucci, S., Török, Á., & Tóth, J. (2014). Keeping your secrets public? Open versus closed innovation processes in the Hungarian wine sector. *International Food and Agribusiness Management Review*, *17*(1), 147-162. Retrieved from https://www.ifama.org/ABOUT-IFAMR

Doody, O., & Noonan, M. (2013). Preparing and conducting interviews to collect data. *Nurse Researcher*, *20*(5), 28-32. doi:10.7748/nr2013.05.20.5.28. e327

Dworkin, S. L. (2012). Sample size policy for qualitative studies using in-depth interviews. *Archives of Sexual Behavior, 41*, 1319-1320. doi:10.1007/s105080120016–6

Fellows, R. F., & Liu, A. M. (2015). *Research methods for construction*. Chichester, UK: John Wiley & Sons.

Fink, A. (2013). *Conducting research literature reviews: From the Internet to paper*. Thousand Oaks, CA: Sage.

Firstbuild (2017). Retrieved August 11, 2017, from https://firstbuild.com/

Foley, D., & O'Connor, A. J. (2013). Social capital and networking practices of indigenous entrepreneurs. *Journal of Small Business Management, 51*, 276-296. doi:10.1111/jsbm.12017

Fonseca, L. M., & Lima, V. M. (2015). Countries three wise men: Sustainability, innovation, and competitiveness. *Journal of Industrial Engineering and Management, 8*, 1288-1302. doi:10.3926/jiem.1525

Frow, P., Nenonen, S., Payne, A., & Storbacka, K. (2015). Managing co-creation design: A strategic approach to innovation. *British Journal of Management, 26*, 463-483. doi:10.1111/ 1467–8551.12087

Fusch, P. I., & Ness, L. R. (2015). Are we there yet? Data saturation in qualitative research. *Qualitative Report, 20*, 1408-1416. Retrieved from http://tqr.nova.edu/

Garriga, H., von Krogh, G., & Spaeth, S. (2013). How constraints and knowledge impact open innovation. *Strategic Management Journal, 34*, 1134-1144. doi:10.1002/smj.2049

Gläser, J., & Laudel, G. (2013, March). Life with and without coding: Two methods for early–stage data analysis in qualitative research aiming at causal explanations. In *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research. 14*(2). Retrieved from http://www.qualitative-research.net/index.php/fqs/article/view/1886/3529

Grant, C., & Osanloo, A. (2014). Understanding, selecting, and integrating a theoretical framework in dissertation research: Creating the blueprint for your "house." *Administrative Issues Journal: Education, Practice, and Research*, *4*(2), 12-26. doi:10.5929/2014.4.2.9

Graue, C. (2015). Qualitative data analysis. *International Journal of Sales, Retailing & Marketing*, *4*(9), 5-14. Retrieved from http://www.ijsrm.com/ijsrm/

Gray, D. E. (2013). *Doing research in the real world*. Los Angeles, CA: Sage.

Greco, M., Grimaldi, M., & Cricelli, L. (2016). An analysis of the open innovation effect on firm performance. *European Management Journal, 34*, 501-509. doi:10.1016/j.emj. 2016.02.008

Gunawardhana, M. N., Suzuki, S., & Enkawa, T. (2015). Effect of business model complexity on supply chain management: A case study of apparel value networks. *Journal of Economics, Business and Management*, *3*(1), 67-75. doi:10.7763/joebm.2015.v3.157

Gupta, S., & Kumar, V. (2013). Sustainability as corporate culture of a brand for superior performance. *Journal of World Business, 48*, 311-320. doi:10.1016/j.jwb.2012.07.015

Hagaman, A. (2014, November). Qualitative interview ‘saturation’ across four cultural settings: How many interviews are really enough? Paper presented at the 142nd APHA Annual Meeting and Exposition. New Orleans, LA.

Hallett, R. E., & Barber, K. (2014). Ethnographic research in a cyber era. *Journal of Contemporary Ethnography, 43*, 306-321. doi:10.1177/0891241613497749

Hamilton, L., & Webster, P. (2015). *The international business environment*. Oxford, UK: Oxford University Press.

Hartley, J., Sørensen, E., & Torfing, J. (2013). Collaborative innovation: A viable alternative to market competition and organizational entrepreneurship. *Public Administration Review, 73*(6), 821-830. doi:10.1111/puar.12136

Harwiki, W. (2013). The influence of servant leadership on organization culture, organizational commitment, organizational citizenship behavior and employees' performance (Study of outstanding cooperatives in East Java Province, Indonesia). *Journal of Economics and Behavioral Studies, 5*, 876-885. Retrieved from http://ifrnd.org/

Hogan, S. J., & Coote, L. V. (2014). Organizational culture, innovation, and performance: A test of Schein's model. *Journal of Business Research, 67*, 1609-1621. doi:10.1016/j.jbusres.2013.09.007

Hossain, M. (2013). Open innovation: So far and a way forward. *World Journal of Science, Technology and Sustainable Development, 10*, 30-41. doi:10.1108/20425941311313083

Hossain, M., Islam, K. Z., Sayeed, M. A., & Kauranen, I. (2016). A comprehensive review of open innovation literature. *Journal of Science and Technology Policy Management, 7*(1), 2-10. doi:10.1108/JSTPM-02-2015-0009

Hosseini, S., Kees, A., Manderscheid, J., Rogliner M., & Rosemann, M. (2017). What does it take to implement open innovation? Towards an integrated capability framework. *Business Process Management Journal*, *23*, 87-107. doi:10.1108/BPMJ-03-2016-0066

Houghton, C., Casey, D., Shaw, D., & Murphy, K. (2013). Rigour in qualitative case-study research. *Nurse Researcher, 20*(4), 12-17. doi:10.7748/nr2013.03.20.4.12.e326

Hu, Y., McNamara, P., & McLoughlin, D. (2015). Outbound open innovation in bio-pharmaceutical out-licensing. *Technovation, 35*, 46-58. doi:10.1016/j.technovation.2014.07.004

Hussinger, K., & Wastyn, A. (2015). In search for the not-invented-here syndrome: The role of knowledge sources and firm success. *R&D Management, 46*, 945-957. doi:10.1111/radm.12136

Hutter, K., Hautz, J., Repke, K., & Matzler, K. (2013). Open innovation in small and micro enterprises. *Problems and Perspectives in Management, 11*(1), 12-22. Retrieved from http://businessperspectives.org/component/option,com_ journals/task,journal/ id,3/Itemid,74/

Inauen, M., & Schenker-Wicki, A. (2012). Fostering radical innovations with open innovation. *European Journal of Innovation Management, 15*, 212-231. doi:10.1108/14601061211220986

Irvine, A., Drew, P., & Sainsbury, R. (2013). 'Am I not answering your questions properly?' Clarification, adequacy and responsiveness in semistructured telephone and face-to-face interviews. *Qualitative Research, 13*, 87-106. doi:10.1177/1468794112439086

Jansson, N. (2013). Organizational change as practice: A critical analysis. *Journal of Organizational Change Management, 26*, 1003-1019. doi:10.1108/JOCM-09-2012-0152

Kaczynski, D., Salmona, M., & Smith, T. (2014). Qualitative research in finance. *Australian Journal of Management, 39*(1), 127-135. doi:10.1177/0312896212469611

Khan, S. N. (2014). Qualitative research method: Grounded theory. *International Journal of Business and Management, 9*, 224-225. doi:10.5539/ijbm.v9n11p224

Kaushik, M. (2013). Customer-oriented organizations: a framework for innovation. *Journal of Business Strategy*, 34, 49-56. doi:10.1108/JBS Jun-2012-0013

Ketokivi, M., & Choi, T. (2014). Renaissance of case research as a scientific method. *Journal of Operations Management, 32*, 232-240. doi:10.1016/j.jom.2014.03.004

Kim, B., Kim, E., & Foss, N. J. (2016). Balancing absorption capacity and inbound open innovation for sustained innovative performance: An attention-based view. *European Management Journal, 34*(1), 80-90. doi:10.1016/j.emj. 2015.10.002

Kirkwood, A., & Price, L. (2013). Examining some assumptions and limitations of research on the effects of emerging technologies for teaching and learning in higher education: Examining assumptions and limitations of research. *British Journal of Educational Technology*, *44*, 536-543. doi:10.1111/bjet.12049

Koelsch, L. E. (2013). Reconceptualizing the member check interview. *International Journal of Qualitative Methods*, *12*, 168-179. Retrieved from https://ejournals.library.ualberta.ca/index.php/IJQM/

Kotsemir, M. N., & Meissner, D. (2013). Conceptualizing the innovation process–trends and outlook. *Higher School of Economics Research Paper No. WP BPR, 10*. Retrieved from http://dx.doi.org/10.2139/ssrn.2249782

Lasagni, A. (2012). How can external relationships enhance innovation in SMEs? New evidence for Europe. *Journal of Small Business Management*, *50*, 310-339. doi:10.1111/j.1540 -627X.2012.00355.x

Laursen, K., & Salter, A. (2006). Open for innovation: The role of openness in explaining innovation performance among UK manufacturing firms. *Strategic Management Journal*, *27*, 131-150. doi:10.1002/smj.507

Leminen, S., Turunen, T., & Westerlund, M. (2015). The grey areas between open and closed in innovation networks. *Technology Innovation Management Review*, *5*(12), 6-18. Retrieved from http://timreview.ca/

Lifshitz-Assaf, H. (2017). Dismantling knowledge boundaries at NASA: The critical role of professional identity in open innovation. *Administrative Science Quarterly*. 1-37. doi:10.1177/0001839217747876

Lin, H.-E., McDonough, E., Lin, S.-J., & Lin, C. (2013). Managing the exploitation/exploration paradox: The role of a learning capability and innovation ambidexterity. *Journal of Product Innovation Management, 30*, 262-278. doi:10.1111/j.1540-5885.2012.00998.x

Lincoln, Y., & Guba, E. (1985). *Naturalistic inquiry*. Thousand Oaks, CA: Sage.

Linton, J. D. (2012). What's hot and what's not: A summary of topics and papers in technology innovation management that are getting attention. *Technovation, 32*, 653-655. doi:10.1016/j.technovation.2012.10.002

Machi, L. A., & McEvoy, B. T. (2012). *The literature review: Six steps to success*. Thousand Oaks, CA: Corwin Press.

Manning, J., & Kunkel, A. (2013). *Researching interpersonal relationships: Qualitative methods, studies, and analysis*. Thousand Oaks, CA: Sage.

Markman, A. B. (Ed.). (2016). *Open innovation: Academic and practical perspectives on the journey from idea to market*. New York, NY: Oxford University Press.

Marilungo, E., Coscia, E., Quaglia, A., Peruzzini, M., & Germani, M. (2016). Open innovation for ideating and designing new product service systems. *Procedia CIRP, 47*, 305-310. doi:10.1016/j.procir.2016.03.214

Marshall, C., & Rossman, G. B. (2016). *Designing qualitative research* (6th ed.). Thousand Oaks, CA: Sage.

Martínez-Torres, M. D. R. (2013). Application of evolutionary computation techniques for the identification of innovators in open innovation communities. *Expert Systems with Applications, 40*, 2503–2510. doi:10.1016/ j.eswa.2012.10.070

Mayoh, J., & Onwuegbuzie, A. J. (2013). Toward a conceptualization of mixed methods phenomenological research. *Journal of Mixed Methods Research*, *9*(1), 91-98. doi:10.1177/ 1558689813505358

McIntosh, M. J., & Morse, J. M. (2015). Situating and constructing diversity in semistructured interviews. *Global Qualitative Nursing Research, 2*, 1-12 doi:10.1177/2333393615597674

McMullen, H., Griffiths, C., Leber, W., & Greenhalgh, T. (2015). Explaining high and low performers in complex intervention trials: a new model based on diffusion of innovations theory. *Trials*, *16*(1), 5-7. doi:10.1186/s13063-015-0755-5

Mikesell, L., Bromley, E., & Khodyakov, D. (2013). Ethical community-engaged research: A literature review. *American Journal of Public Health*, *103*(12), e7-e14. doi:10.2105/AJPH.2012.301605

Miles, R. (2015). Complexity, representation and practice: Case study as method and methodology. *Issues in Educational Research, 25*, 309-318. Retrieved from http://www.iier.org.au/iier.html

Monteiro, F., Mol, M., & Birkinshaw, J. (2016). Ready to be open? Explaining the firm level barriers to benefiting from openness to external knowledge. *Long Range Planning*. Advance online publication. http://dx.doi.org/10.1016/j.lrp.2015.12.008

Moravcsik, A. (2014). Transparency: The revolution in qualitative research. *PS: Political Science & Politics, 47*(1), 48-53. Retrieved from https://www.cambridge.org/core/journals/ps-political-science-and-politics

Morse, J. M. (2015). Critical analysis of strategies for determining rigor in qualitative

inquiry. *Qualitative Health Research, 25,* 1212-1222. doi:10.1177/1049732315588501

Mortara, L., & Minshall, T. (2014). *New frontiers in open innovation*. Oxford, England: Oxford University Press.

Noble, H., & Smith, J. (2015). Issues of validity and reliability in qualitative research. *Evidence Based Nursing*, *18,* 34-35. doi:10.1136/eb-2015-102054

Oakey, R. P. (2013). Open innovation and its relevance to industrial research and development: The case of high-technology small firms. *International Small Business Journal*, *31*(3), 319-336. doi:10.1177/0266242612458942

Office for Human Research Protection (2016). *Belmont Report*. Retrieved from http://www.hhs.gov

Onwuegbuzie, A. J., Leech, N. L., & Collins, K. M. (2010). Innovative data collection strategies in qualitative research. *Qualitative Report*, *15,* 696-726. Retrieved from http://tqr.nova.edu/

Ooms, W., Bell, J., & Kok, R. A. (2015). Use of social media in inbound open innovation: Building capabilities for absorption capacity. *Creativity and Innovation Management*, *24*(1), 136-150. doi:10.1111/caim.12105

O'Reilly, M., & Parker, N. (2013). Unsatisfactory saturation: A critical exploration of the notion of saturated sample sizes in qualitative research. *Qualitative Research Journal*, *13,* 190-197. doi:10.1177/ 1468794112446106

Osburg, T., & Schmidpeter, R. (2013). *Social innovation. Solutions for a sustainable future.* London, UK: Springer.

Owen, G. T. (2014). Qualitative methods in higher education policy analysis: Using interviews and document analysis. *Qualitative Report*, *19*(26), 1-19. Retrieved from http://nsuworks.nova.edu/tqr/vol19/iss26/2

Ozkan, N. N. (2015). An example of open innovation: P&G. *Procedia-Social and Behavioral Sciences*, *195*, 1496-1502. doi:10.1016/j.sbspro.2015.06.450

Palinkas, L. A., Horwitz, S. M., Green, C. A., Wisdom, J. P., Duan, N., & Hoagwood, K. (2015). Purposeful sampling for qualitative data collection and analysis in mixed method implementation research. *Administration and Policy in Mental Health and Mental Health Services Research*, *42*, 533-544. doi:10.1007/s10488-013-0528-y

Parida, V., Sjödin, D. R., Lenka, S., & Wincent, J. (2015). Developing global service innovation capabilities: How global manufacturers address the challenges of market heterogeneity. *Research-Technology Management*, *58*(5), 35-44. Retrieved from http://www.tandfonline.com

Parida, V., Westerberg, M., & Frishammar, J. (2012). Inbound open innovation activities in high-tech SMEs: The impact on innovation performance. *Journal of Small Business Management*, *50*, 283-309. doi:10.1111/j.1540-627X.2012.00354.x

Parrotta, P., Pozzoli, D., & Pytlikova, M. (2014). The nexus between labor diversity and firm's innovation. *Journal of Population Economics*, *27*, 303-364. doi:10.1007/s00148-013-0491-7

Parveen, S., Senin, A. A., & Umar, A. (2015). Organization culture and open innovation: A quadruple helix open innovation model approach. *International Journal of Economics and Financial Issues*, *5*, 335-342. Retrieved from

http://www.econjournals.com/index.php/ijefi

Patton, M. Q. (2015). *Qualitative research & evaluation methods* (4th ed.). Thousand Oaks, CA: Sage.

Paulus, T. M., & Lester, J. N. (2016). ATLAS.ti for conversation and discourse analysis studies. *International Journal of Social Research Methodology, 19,* 405-428. doi:10.1080/13645579.2015.1021949

Peredaryenko, M. S., & Krauss, S. E. (2013). Calibrating the human instrument: Understanding the interviewing experience of novice qualitative researchers. *Qualitative Report, 18,* 1-17. Retrieved from http://tqr.nova.edu/

Petrou, A. (2015). Open innovation's strategic business value (SBV) context: Arm model conceptualization. *International Journal of Organizational Innovation*, *7*(4), 17-30. Retrieved from http://www.ijoi-online.org/

Pettigrew, A. M. (2013). The conduct of qualitative research in organizational settings. *Corporate Governance: An International Review, 21,* 123-126. doi:10.1111/j.1467-8683.2012.00925.x

Pierre, E. A. S., & Jackson, A. Y. (2014). Qualitative data analysis after coding. *Qualitative Inquiry*, *20*, 715–719. doi:10.1177/1077800414532435

Pieterse, J. N. (2015). *Globalization and culture: Global mélange* (3rd ed.). Lanham, MD: Rowman & Littlefield

Porter, M. E. (1998). *Clusters and the new economics of competition* (Vol. 76, No. 6, pp. 77-90). Retrieve www.hbr.org

Priftis, A., Bondolfi, T., & Boisselier, Y. (2014, August). Revisiting the Wikinomics concept: Towards new methodological approaches. In Cao Y. (Ed.), *New Horizons in Web Based Learning* (pp. 153-161). Tallinn, Estonia: Springer International

Ridder, H. G., Hoon, C., & Baluch, A. M. (2014). Entering a dialogue: Positioning case study findings towards theory. *British Journal of Management, 25*, 373-387. doi:10.1111/1467-8551.12000

Reilly, R. C. (2013). Found poems, member checking and crises of representation. *Qualitative Report, 18*(15), 1-18. Retrieved from http://tqr.nova.edu/

Rich, L., & Mero, N. P. (2015, January). The link between organizational culture and work behavior: The value of regulatory focus. *Academy of Management Proceedings*, *2015*, p. 15593. http://aom.org/proceedings/

Ritchie, J., Lewis, J., Nicholls, C. M., & Ormston, R. (Eds.). (2013). *Qualitative research practice: A guide for social science students and researchers* (2nd ed.). Los Angeles, CA: Sage.

Rosemann, M., & vom Brocke, J. (2015). The six core elements of business process management. In *Handbook on business process management 1* (pp. 105-122). Berlin, Germany: Springer.

Ross, D. F. (2013). *Competing through supply chain management: Creating market-winning strategies through supply chain partnerships* (2nd ed.). New York, NY: Springer Science & Business Media.

Ross, P. F. (2015). Understanding customer needs. *Statistical journal of the IAOS, 31*(2), 291-295. doi:10.3233/SJI-150865

Rossetto, K. R. (2014). Qualitative research interviews: Assessing the therapeutic value and challenges. *Journal of Social and Personal Relationships, 31,* 482-489. doi:10.1177/0265407514522892

Rowley, J. (2012). Conducting research interviews. *Management Research Review, 35,* 260-271. doi:10.1108/01409171211210154

Rubin, H. J., Rubin, I. S. (2012). *Qualitative interviewing: The art of hearing data.* (3rd ed.). Thousand Oaks, CA: Sage.

Sabadie, J. A. (2014). Technological innovation, human capital and social change for sustainability. Lessons learnt from the Industrial Technologies Theme of the EU's Research Framework Programme. *Science of the Total Environment, 481,* 668-673. https://doi.org/10.1016/j.scitotenv.2013.09.082

Sabidussi, A., Lokshin, B., de Leeuw, T., Duysters, G., Bremmers, H., & Omta, O. (2014). A comparative perspective on external technology sourcing modalities: The role of synergies. *Journal of Engineering and Technology Management, 33,* 18-31. doi:10.1016/j.jengtecman.2014.02.001

Saebi, T., & Foss, N. J. (2015). Business models for open innovation: Matching heterogeneous open innovation strategies with business model dimensions. *European Management Journal, 33*(3), 201-213. doi:10.1016/j.emj.2014.11.002

Salter, A., Criscuolo, P., & Ter Wal, A. L. (2014). Coping with open innovation. *California Management Review, 56*(2), 77-94. doi:10.1525/cmr.2014.56.2.77

Samsung next (2017). Retrieved September 17, 2017, from http://samsungnext.com

Scheibe, M., Reichelt, J., Bellmann, M., & Kirch, W. (2015). Acceptance factors of mobile apps for diabetes by patients aged 50 or older: A qualitative study. *Medicine 2.0*, *4*(1), e1-4. doi:10.2196/med20.3912

Schein, E. (1985). *Organizational culture and leadership: A dynamic view*. San Francisco, CA: Jossey-Bass.

Schein, E. H. (1992). *Organizational culture and leadership* (2nd ed.). San Francisco, CA: Jossey-Bass.

Schein, E. H. (1996). Culture: The missing concept in organization studies. *Administrative Science Quarterly*, *41*, 229–240. doi:10.2307/2393715

Schein, E. H. (2006). *Organizational culture and leadership* (3rd ed.). San Francisco, CA: Jossey-Bass.

Schein, E. H., Costas, J., Kunda, G., Schultz, M., Connolly, T. H., Wright, S., & Wah, D. W. H. (2015). Opinions: All about culture. *Journal of Business Anthropology*, *4*(1), 106-150. Retrieved from http://ej.lib.cbs.dk/index.php/jba

Schneckenberg, D. (2014). Strategic incentive systems for open innovation. *Journal of Applied Business Research, 30*(1), 65-72. doi:10.19030/ jabr.v30i1.8283

Seidman, I. (2013). *Interviewing as qualitative research: A guide for researchers in education and the social sciences*. New York, NY: Teachers college press.

Shafritz, J. M., Ott, J. S., & Jang, Y. S. (2015). *Classics of organization theory*. Boston, MA: Cengage Learning.

Shetty, P. (2010). Conventional innovation isn't enough. *Appropriate Technology*, *37*(3),

8-9. Retrieved from http://www.researchinformation.co.uk/apte.php

Shamah, R. M., & Elsawaby, S. M. (2014). Trust as a nucleus key for open innovation. *Journal of Business & Retail Management Research, 9,* 110-127. Retrieved from http://jbrmr.com

Shorten, A., & Moorley, C. (2014). Selecting the sample. *Evidence Based Nursing, 17,* 32-33. doi:10.1136/eb-2014-101747

Simon, M. K., & Goes, J. (2013). Assumption, limitations, delimitations, and scope of the study. Retrieved from http://www.dissertationrecipes.com

Sinni, S. V., Wallace, E. M., & Cross, W. M. (2014). Perinatal staff perceptions of safety and quality in their service. *BMC Health Services Research*, *14*, 591-623. doi:10.1186/s12913-014-0591-4

Slater, S. F., Mohr, J. J., & Sengupta, S. (2014). Radical product innovation capability: Literature review, synthesis, and illustrative research propositions. *Journal of Product Innovation Management, 31,* 552-566. doi:10.1111/jpim.12113

Spithoven, A., Vanhaverbeke, W., & Roijakkers, N. (2013). Open innovation practices in SMEs and large enterprises. *Small Business Economics*, *41*, 537-562. doi:10.1007/s11187-012-9453-9

Stevens, M. (2013). *Ethical Issues in Qualitative Research*. Social Care Workforce Research Unit, King's College London. Retrieved from http://www.kcl.ac.uk/sspp/policy-institute/scwru/pubs/2013/conf/stevens14feb13.pdf

Symon, G., & Cassell, C. (Eds.). (2012). *Qualitative organizational research: Core methods and current challenges*. Los Angeles, CA: Sage.

Sulaiman, S., Parimoo, D., & Banga, S. (2016). Open innovation a new paradigm in innovation landscape: An analytical overview. *International Journal of Innovative Research and Development, 5*(7), 70-76. Retrieved from http://www.ijird.com

Tantau, A., & Coras, E. (2013). A risk mitigation model in SME's open innovation projects. *Management & Marketing, 8,* 303-328. Retrieved from http://www.managementmarketing.ro

Taplay, K., Jack, S. M., Baxter, P., Eva, K., & Martin, L. (2014). Organizational culture shapes the adoption and incorporation of simulation into nursing curricula: A grounded theory study. *Nursing Research and Practice*, *2014*. 1-12. doi:10.1155/2014/197591

Taylor, R., & Thomas-Gregory, A. (2015). Case study research. *Nursing Standard, 29,* 36-40. doi:10.1086/421629

Tewksbury, R. (2009). Qualitative versus quantitative methods: Understanding why qualitative methods are superior for criminology and criminal justice. *Journal of Theoretical and Philosophical Criminology, 1*(1), 38-58. Retrieved from http://www.jtpcrim.org/

Tong, A., Winkelmayer, W. C., & Craig, J. C. (2014). Qualitative research in CKD: An overview of methods and applications. *American Journal of Kidney Diseases, 64,* 338-346. Retrieved from http://www.ajkd.org/

Uddin, M. J., Luva, R. H., & Hossian, S. M. M. (2013). Impact of organizational culture on employee performance and productivity: A case study of telecommunication sector in Bangladesh. *International Journal of Business and Management*, *8*(2), 63-77. doi:10.5539/ijbm.v8n2p63

Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. *Nursing & Health Sciences*, *15*, 398-405. doi:10.1111/nhs.12048

Vanclay, F., Baines, J. T., & Taylor, C. N. (2013). Principles for ethical research involving humans: Ethical professional practice in impact assessment: Part I. *Impact Assessment and Project Appraisal*, *31*, 243-253. doi:10.1080/14615517.2013.850307

Veer, T., Lorenz, A., & Blind, K. (2016). How open is too open? The mitigating role of appropriation mechanisms in R&D cooperation settings. *R&D Management*, *46*, 1113-1128. doi:10.1111/radm.12232

Villarreal, O., & Calvo, N. (2015). From the triple helix model to the global open innovation model: A case study based on international cooperation for innovation in Dominican Republic. *Journal of Engineering and Technology Management*, *35*, 71-92. doi:10.1016/j.jengtecman.2014.10.002

Virlee, J., Hammedi, W., & Parida, V. (2015). Open innovation implementation in the service industry: Exploring practices, sub-practices and contextual. *Journal of Innovation Management*, *3*(2), 106-130. Retrieved from http://www.open-jim.org/

Von Contzen, E., & Alders, M. (2015). Collective Experience in Narrative: Conclusions and Proposals. *Narrative, 23*, 226-229. doi:10.1353/nar.2015.0012

Wahyuni, D. (2012). The research design maze: Understanding paradigms, cases, methods, and methodologies. *Journal of Applied Management Accounting Research, 10*(1), 69-80. Retrieved from http://maaw.info/JAMAR.htm

Wang, C. H., Chang, C. H., & Shen, G. C. (2015). The effect of inbound open innovation on firm performance: Evidence from high-tech industry. *Technological Forecasting and Social Change, 99*, 222-230. doi:10.1016/j.techfore.2015.07.006

Wei, J., Lowry, P. B., & Seedorf, S. (2015). The assimilation of RFID technology by Chinese companies: A technology diffusion perspective. *Information & Management, 52*, 628-642. doi:10.1016/j.im.2015.05.001

West, J., Salter, A., Vanhaverbeke, W., & Chesbrough, H. (2014). Open innovation: The next decade. *Research Policy, 4*3, 805-811. doi:10.1016/j.respol.2014.03.001

Wiewiora, A., Trigunarsyah, B., Murphy, G., & Coffey, V. (2013). Organizational culture and willingness to share knowledge: A competing values perspective in Australian context. *International Journal of Project Management, 31*, 1163-1174. doi:10.1016/j.ijproman. 2012.12.014

Willis, B. (2014). *The advantages and limitations of single case study analysis*. (Doctoral dissertation). Retrieved from http://www.e-ir.info

Woods, M., Paulus, T., Atkins, D. P., & Macklin, R. (2015). Advancing qualitative research using qualitative data analysis software (QDAS). Reviewing potential

versus practice in published studies using ATLAS.ti and NVivo, 1994–2013. *Social Science Computer Review, 34*, 597-617. doi:10.1177/0894439315596311

Woolf, N. (2012). *A little structure in your codes will make your research a lot easier.* Retrieved from http://atlasti.com/wp-content/uploads/2014/05/Woolf_2007-03_12.pdf

Wynarczyk, P. (2013). Open innovation in SMEs: A dynamic approach to modern entrepreneurship in the twenty-first century. *Journal of Small Business and Enterprise Development*, *20*, 258-278. doi:10.1108/14626001311326725

Wynarczyk, P., Piperopoulos, P., & McAdam, M. (2013). Open innovation in small and medium-sized enterprises: An overview. *International Small Business Journal, 31*, 240-255 doi:10.1177/0266242612472214

Yearley, S. (2014). *Science, technology, and social change (Routledge Revivals)*. New York, NY: Routledge.

Yin, R. K. (2013). Validity and generalization in future case study valuations. *Evaluation, 19*, 321-332. doi:10.1177/1356389013497081

Yin, R. K. (2014). *Case study research: Design and methods* (5th ed.). Thousand Oaks, CA: Sage.

Yun, J. J., Jeong, E., & Park, J. (2016). Network analysis of open innovation. *Sustainability*, *8*, 729-750. doi:10.3390/su8080729

Yunus, M. M., Nordin, N., Salehi, H., Embi, M. A., & Salehi, Z. (2013). The use of information and communication technology (ICT) in teaching ESL writing skills. *English Language Teaching*, *6*(7), 1-8. doi:10.5539/elt.v6n7p1

Appendix A: Research Ethical Procedures

The following are the ethical procedures that need to be adhered to in conducting this study:

1. Contact each possible participant and discuss the purpose of the study and determine their interest to participate in the study
2. Upon agreement to join the study, and following explanation relevant to the purpose of the study and the procedures of the study, advised the participant that the participation is voluntary, and the participant can cease at any time his or her participation in the study.
3. Advise the participant of my role as the researcher.
4. Advise the participants that they can elect not to answer any specific question that might make them uncomfortable.
5. Inform each participant of the privacy protection and confidentiality of his or her responses.
6. Provide a hard copy of the informed consent form. The form will be signed by the researcher.
7. The participant signs the informed consent form.
8. Secure storage of all the data will take place immediately following the data analysis phase. Upon completion of 5 years from the conclusion of the study, the researcher will destroy the data.

   Participants did not receive any benefits or incentives to participate in this study.

The participants will receive a copy of the completed study upon request.

Appendix B: Interview Protocol

Desired Goal	Prerequisite activity	Activity	Time allocation	Required resources	Outcome and deliverables
Setting up					
Selection of participants	List of potential participants	Select 15 participants (15=12+3) where 12 = Number of required participants 3=Additional stand by participants I will choose 3 extra participants, one from each category, engineering, operators, executives	3 weeks before tentative interview date	Mailing list of potential participants as per criteria	Selection of 15 participants
Schedule the interviews	IRB approval	Contact 15 participants and schedule a time for the interview. Send Consent Form for signing Provide the participants an advance detailed written review on the administrative aspects of the interview	2 week	Consent form	1. Schedule specific time and place for Z interviews 2. Obtain confirmation that each participants is willing to be recorded 3. Confirm that each participant posses the list of documents

					you wish to review.
Ensure full transparency and participants understanding of the interview questions prior to the interview	IRB approval	Send advance copy of the interview questions to all the participants	30 min	Email access and addresses of all participants	Familiarity of the participants with the interview questions
Functional and quality recording during the interview	Acquire two audio recorders and new sets and back up of batteries.	Conduct a preliminary test of the recording equipment and verify that the quality of the recording is acceptable	10 min	Have two audio recorders with power cords. One as a primary unit, and the second as a backup. A second backup will be my IPhone 3 fresh sets of applicable batteries	Recorders tested and ready for the interview
On time arrival	Coordination of the interview time and place	Arrive to the interview place at least 30 minutes before the interview	variable	Available transportation to the interview place	Readiness and ensure having enough extra time to overcome any challenges

Selection of convenient and quite place for the interview	Check the location in advance of the interview	Check the location for minimal outside noise or any disturbance for the recording		N/A	A quiet and convenient place for the 12 interviews
Familiarity with the interview questions	IRB approval	Have the list of the interview questions ready. In addition, be ready with additional follow up probing questions	3 hours	N/A	Clear understanding of all the questions, their orders and the backup questions
		The Interview			
Conduct interviews	Participant is ready for interview and all other administrative requirement were completed	Conduct each interview for 45-60 minutes. Follow the planned list of questions and interview protocol. 35 minutes will be devoted to the specific seven primary questions. Possible 10 minutes to the two back up questions, if needed. Additional 10 -15 minutes will be used for the opening discussion and the thank you statement at the conclusion of the interview.	45-60 min each interview	Recorder Note pad & Pen	Collect interview data from the participants

		All throughout the interview I will attempt to take notes of the body language and demeanor of the participants. These may include observing the way the participant responds (tone of voice, face, etc.).			
Achieve informal beginning to the interview	N/A	Start the interview process with an informal conversation. The script for the initial conversation is: Good morning/afternoon Dear [state the name of the participant] Thank you very much to agree to share with me your experience and expertise relevant to your organization's [state the name of the organization] processes and culture for innovation. Today is (Date, month, and year] We are here to conduct an interview as part of my DBA research on effective strategies to implement Open Innovation culture. We received a signed copy of the Consent	3 min each interview	N/A	Establish a relaxed environment and develop trust with the participant

		form signed by you, [state the name]. We also received a verbal confirmation that you [state the name] received a copy of the interview questions and you have prepared the documents we wish to review after the interview.			
Ensure participants understand the arrangement you have made to maintain the confidentiality of the data	N/A	The following is the script: [State the name of the participant}, please be advised that all the data collected during this interview, and any other data collected from you for the purpose of this research will be kept fully confidential. I will establish a code for you and I will keep any of your data under this code. In addition, all the data will be secured in a locked cabinet and will be destroyed after five years from the publication of the study.	2 min	N/A	Participants comfortable and being assured that the data will be kept confidential be kept
Ensure the participant feel comfortable with the interview	N/A	The following is the script: [State the name of the participants], prior to starting Prior to conducting the	1 min	N/A	Participants feels comfortable and confident with the interview process

and has no question		interview, I would like to take a moment and make sure that you feel comfortable with the setting and process of the interview. I would like to ensure that you understand the entire process of the interview, and the transcription process. Specifically, I will send you the transcript of the interview for member checking with three days after the interview. Also, if you have any additional question, please do not hesitate to ask me now. Be advised that at any time during this interview, you may ask to stop the interview, if you wish to.			
Casually set up the scope of the interview subject	N/A	The following is the script [state the name of the participant] According to Chesbrough (2003), who coined the open innovation paradigm in 2003, innovation is a primary strategic requisite for an organization sustainability in the 21	3 min		Achieve initial talk about innovation as a background for the interview questions

		century global market condition. Based on your relevant knowledge and rich experience with [name of the organization], I will be most interested to listen to your thoughts and first hand involvement with the organization processes to cultivate and sustain open innovation culture.			
Ask the interview questions in a clear way, and provide the participant ample time to respond to each question. Provide ample time to the participants to answer each question		Throughout the interview I will attempt to take notes of the body language and demeanor of the participants. These may include observing the way the participant responds (tone of voice, face, etc.). The following are the list of the questions: Question 1: What strategies, if any, has your organization used during the last 12 months to cultivate open innovation culture?	30-35 min 1 min for the question 3 min for	Recorder	Interview data collection that contribute to the study

		Question 2: What specific activities has your organization undertaken during the last 12 months to develop, deploy, and implement innovation strategy? Question 3: What specific challenges has your organization faced during the last 12 months while implementing the organization innovation strategy? Question 4: What specific actions did your organization take in the last 12 months to identify, capture, disseminate, store, and transfer relevant knowledge among all employees through the organization? Question 5: During the last 12 months, what was the contribution of the organization's executives to the implementing the innovation strategy? Question 6: During the last 12 months, what was the contribution of the organization's engineering personnel			

		to the implementation of the innovation strategy? Question 7: During the last 12 months, what was the contribution of the organization's operating personnel (all personnel excluding executives and engineering personnel) to the implementation of the innovation strategy? **<u>Follow up questions:</u>** Question 8: Does your company has a specific process to proactively identify open innovation opportunities? If yes, please provide details. If not, why not? Question 9: Until today, what specific criteria have your company used to trigger an inbound or outbound open innovation process? I will allocate 1 minute to ask each question, and an average of 4 minutes for each answer. If needed, I will add two			

		follow up questions with the same allocation of time. 1 minute for each question and four minutes for the response			
Have follow up questions in case the participants did not address some of the concerns for the interview		Question #1A: Please describe one example of either inflow knoweldge or outflow knowledge process that the organization took, which enabled the organization to improve its market competitiveness? Question #2A: Are there any limitations for the absorption of the inflow knowledge into your organization?			
Review of the documents	Participants presented and provided relevant documents	Review the documents and allow the participant to present and explain the documents	5 min	N/A	Data collection through documents of the organization
Thank the participant, and ensure the participant that he or she will	End the interview	The following is the script: [State the name of the participant], allow me to thank you very much for the very	1 min	N/A	Achieve continue positive atmosphere and relationship

receive a copy of the study		interesting information you provided and for your contribution for this study. I hope that based on your input, and this study, we will be able to explore and provide some business managers relevant data on how to cultivate and sustain a culture of open innovation.			with the participants
Ensure length of interview to no more than 60 minutes	Be familiar with the interview questions and the follow up questions.	Check the progress of the interview and verify time. If the participants present documents, ensure that there is ample time for presentation of the documents and follow up questions.	The duration of the interview	Have a watch during the interview	Interview to not exceed 60 minutes and not be a burden to the participants. If more time is needed, ask if the participants' schedule allows extending the interview duration
		Post Interview			
Ensure collection of all equipment and documents	End of the interview	Collect all the forms, documents and the recording equipment	1 min	N/A	Have all the equipment and documentation from the interview. Do not forget any equipment
Request the participant to allow	Conclude the	The following is the script:	1 min	Email and summary	Verification that my understanding

transcript review and member checking	interview	[State the name of the participant] in order to ensure that my understanding of the information you provided in this interview is indeed approve by you, I would like to send you the transcript of the interview and ask you to confirm it, or alternatively correct or modify the document. This process will assure us that we are aligned with the information I will use for this study. I plan to send you the transcript during the following week. I hope that you will have the time to review it and email it back to me. With your permission I will follow up with you a day after I will send you the transcript and conduct the member checking follow up discussion with you.		of all the interviews	of the participants input is in agreement with the participant
Verify clarity of the audio recording	Conclude the interview	A preliminary analysis of the audio files	30 min	Recorder	Verification of the clarity and quality of the audio files

Appendix C: Short List of Codes and Keywords

Codes:

- Open Innovation
    - OI_adaptation
    - OI_closed
    - OI_competition
    - OI_inbound
    - OI_leadership
    - OI_management
    - OI_operators
    - OI_organization borders
- Collaboration Innovation
- Not Invented Here Attitude
    - NIH (Not Invented Here)
- Closed innovation
- Organizational Structure
    - Conceptual Framework – Schein
- Emerging high-technology market requirements
- Knowledge absorption capacity
- Globalization
- Open innovation supply chain
- Open innovation research and development