Titre: Title:	Open Innovation Practices in the Professional Services Industry
Auteur: Author:	Shadi Farha
Date:	2016
Type:	Mémoire ou thèse / Dissertation or Thesis
Référence: Citation:	Farha, S. (2016). Open Innovation Practices in the Professional Services Industry [Thèse de doctorat, École Polytechnique de Montréal]. PolyPublie. https://publications.polymtl.ca/2458/

URL de PolyPublie: PolyPublie URL:	https://publications.polymtl.ca/2458/
Directeurs de recherche: Advisors:	Nathalie De Marcellis-Warin
Programme: Program:	Génie industriel

UNIVERSITÉ DE MONTRÉAL

OPEN INNOVATION PRACTICES IN THE PROFESSIONAL SERVICES INDUSTRY

SHADI FARHA
DÉPARTEMENT DE MATHÉMATIQUES ET DE GÉNIE INDUSTRIEL
ÉCOLE POLYTECHNIQUE DE MONTRÉAL

THÈSE PRÉSENTÉE EN VUE DE L'OBTENTION
DU DIPLÔME DE PHILOSOPHIAE DOCTOR
(GÉNIE INDUSTRIEL)
DÉCEMBRE 2016

UNIVERSITÉ DE MONTRÉAL

ÉCOLE POLYTECHNIQUE DE MONTRÉAL

Cette thèse est intitulée :

OPEN INNOVATION PRACTICES IN THE PROFESSIONAL SERVICES INDUSTRY

présentée par : FARHA Shadi

en vue de l'obtention du diplôme de : Philosophiae Doctor

a été dûment acceptée par le jury d'examen constitué de :

Mme BEAUDRY Catherine, D. Phil, présidente

Mme DE MARCELLIS-WARIN Nathalie, Doctorat, membre et directrice de recherche

M. ARMELLINI Fabiano, D. Sc., membre

Mme ZHEGU Majlinda, Ph. D., membre externe

DEDICATION

"Every good gift and every perfect gift is from above, coming down from the Father of lights with whom there is no variation or shadow due to change."

(James 1:17)

I want to dedicate this work to **God**, for all His miraculous gifts that I don't deserve. To **Saint Charbel**.

To Mom and Dad, for all the teachings you gave us, the sacrifices you did and for always believing in us. Your love, care, and presence in my life keep me going.

To my four best friends in life:

My wife Nayla who supported, trusted and comforted me throughout this long and challenging journey, and my three brothers, Ramy, Fadi, and Naji who always have my back.

To my soon to be born child that I can't wait to hold.

To all my friends and family who have encouraged me to continue.

To my beloved home country, Lebanon, for all the great memories and values you instilled in me.

ACKNOWLEDGMENTS

I would like to acknowledge the priceless contributions from the following individuals whose help was key for the completion of this work:

- Mrs. Nathalie De-Marcellis-Warin, for all her coaching and guidance throughout the past few years' journey, in order to get to the finish line.
- The members of the Jury, Mrs. Catherine Beaudry, Mrs. Majlinda Zhegu, and Mr. Fabiano Armellini for their time and valuable comments.
- Special acknowledgements to Mr. Carl St-Pierre, whose priceless support and guidance have made this work possible. He has helped me enormously in the amazing world of statistics.
- My wife Nayla and my twin brother Fadi, for reviewing my work and helping me get it better. I couldn't have done it without them.

RÉSUMÉ

L'innovation ouverte (IO) est devenue un sujet très populaire tant dans la litérature que dans l’industrie. Les articles académiques ont proliféré, les chercheurs étudient de plus en plus l'IO, et le monde professionnel investit pour s’ouvrir davantage. L'intérêt dans l’IO est donc là et grandissant. D'un point de vue académique, la litérature sur le sujet a été jusqu'à présent surtout concentrée sur les secteurs manufacturier et technologique, avec moins d'accent sur les services. Grâce à un examen approfondi de la littérature, on observe une tendance croissante chez les auteurs pour mettre l'accent sur les services dans l'innovation ouverte, avec un nombre croissant d'études empiriques réalisées ces dernières années. Cependant, les entreprises de services professionnels (*PSF*, par exemple les services comptables, fiscaux, conseil, de négociation, et d'ingénierie) sont très légèrement couvertes jusqu'à présent. Les firmes de ce secteur à forte concentration de connaissance jouent un rôle important en tant qu'intégrateurs, intermédiaires et catalyseurs de l'innovation dans l'écosystème, les rendant théoriquement plus inclusifs et ouverts par nature. Cela en fait un domaine d'étude intéressant pour l'IO. Compte tenu de cette lacune importante, l'objectif de cette thèse est donc de mieux comprendre l'innovation ouverte dans les PSF, ses applications et ses effets sur la performance.

Pour contribuer à combler cette lacune, un modèle conceptuel intégrant tous les éléments constitutifs de l'IO a été élaboré sur la base de la revue de la littérature. Ce modèle a ensuite été élargi pour tenir compte des particularités des services et des PSF en particulier. Cela a été réalisé grâce à une recherche exploratoire (20 entrevues) dans plusieurs firmes du secteur et certains de leurs clients au Canada. Le modèle révisé et les propositions d'hypothèses ont ensuite été testés à l'aide d'une enquête auprès d'une des plus importantes firmes de services professionnels au Canada (5 000 à 10 000 employés), récoltant 345 répondants. En parallèle, l'enquête a également été ouverte à un plus grand nombre d'entreprises du secteur afin de valider les résultats à l'externe, récoltant 55 autres réponses. Enfin, cinq leaders de l'industrie ont été interviewés afin d'obtenir leurs commentaires et leurs idées sur les résultats.

Les entrevues et observations sur place ont confirmé que les services professionnels appliquent plusieurs des pratiques ouvertes d'innovation mises de l'avant dans la théorie. Collaborer avec des partenaires extérieurs, acquérir des connaissances et des innovations en dehors des frontières de

l'entreprise, partager ouvertement les connaissances et les innovations internes avec le public et les clients, sont toutes des activités clés que les services professionnels effectuent régulièrement. La nature de leur travail, très orientée vers la création de valeur par le biais des connaissances et du transfert à des clients, rend les PSF plus enclins à s'engager dans des pratiques d’IO. La recherche actuelle a prouvé que l'innovation ouverte est applicable dans les entreprises de services professionnels, avec certaines particularités. Le processus *inbound* (vers l’intérieur) est plus important que le processus *outbound* (vers l’extérieur), mais les pratiques d’IO ne sont pas toutes appliquées. Par exemple, les *spin-ins*, les *spin-off* d’innovations, et les fusions et acquisitions n'ont pas été jugés très importantes dans les pratiques d'IO des PSF. Les pratiques couplées d'IO sont également appliquées avec quelques particularités. Ils se révèlent être plus intenses dans l'innovation pour les clients, que pour celles axées sur l'interne de l'entreprise. Les dirigeants des entreprises sont plus ouverts à la collaboration externe, mais n'ont pas traduit cela en pratique : les employés trouvent qu’il n’y a pas suffisamment de temps à consacrer à l'innovation, et que les récompenses et des incitations nécessaires existent peu. Le partage des connaissances est essentiel, surtout lorsqu'il s'agit de projets clients externes. Les risques sont perçus comme très importants, en particulier ceux liés à la réputation des entreprises. Des pratiques solides sont mises en place pour les dissuader, en particulier les mesures informelles de protection de la propriété intellectuelle. Cette recherche démontre que les facteurs d'érosion ont une forte influence sur la nécessité d'accroître les pratiques d’IO, qui ont à leur tour un impact positif et significatif sur l'innovation et la performance financière des PSFs. Les résultats démontrent que cet impact est modéré par la culture organisationnelle et la gestion des risques. En général, ces résultats sont vrais à la fois pour la Firme ABC ainsi que pour le reste des entreprises sondées. L'échantillon externe semble cependant avoir une plus grande propension à l'ouverture et à la collaboration externe. Cela peut s'expliquer par le fait que la plupart des répondants de l'échantillon externe (79%) sont dans le Conseil, un sous-secteur généralement plus ouvert que les autres.

Le modèle conceptuel proposé, testé et validé à l’interne et à l’externe est donc la principale contribution théorique de cette recherche. La principale contribution pratique est de permettre aux gestionnaires dans les PSFs de comprendre où sont les principaux défis à résoudre pour permettre une plus grande ouverture. La recherche a toutefois ses limites, surtout en ce qui concerne le nombre limité d'entreprises qui sont représentées dans l'étude, ainsi que l'étendue des types de lignes de services couverts. Les recherches futures devraient se concentrer sur l'expansion de ces aspects, et de mieux comprendre les différences entre les lignes principales de services.

ABSTRACT

Open innovation (OI) has become a very popular topic both in academic and professional services. Peer-reviewed articles have proliferated, researchers have been increasingly studying OI, and the professional world has been investing in it. The interest is there and growing. From an academic perspective, most of the focus have thus far been on manufacturing and technology sectors, with less emphasis on services. Through an extensive review of the literature, a growing trend of focus on services in open innovation is observed, with an increasing amount of empirical studies conducted in recent years. However, professional services firms (PSFs e.g. accounting, tax, consulting, deals, and engineering services) are very lightly covered thus far. They play an important role as integrators, intermediaries and catalysts of innovation in the ecosystem, making them theoretically more inclusive and open by nature. This makes them an interesting field of study for OI. Given this important gap, the objective of this thesis is to better understand open innovation in PSFs, its applications and impacts on performance.

To contribute in closing this gap, a conceptual model integrating all OI building blocks was developed based on the non-services literature review. This model was then expanded to account for the particularities of services and PSFs in particular. This was accomplished through another literature review and an exploratory research (20 interviews) in several PSFs and some of their clients in Canada. The revised model and propositions were then tested through a survey in one of the largest professional services firm in Canada (5,000-10,000 employees), with 345 respondents. In parallel, the survey was also opened to a larger set of companies in the sector to validate the findings externally, with another 55 external respondents. Finally, four leaders in the industry were interviewed to get their feedback and insights on the results.

On site observations confirmed that professional services apply several of the open innovation practices brought forward in the theory. Collaborating with external partners, sourcing knowledge and innovations from outside the firm boundaries, sharing internal knowledge and innovations openly with the public and the customers all key activities that professional services conduct regularly. The nature of their work, very geared towards value creation through knowledge creation and transfer to clients in particular, makes PSFs more inclined to engage in open innovation practices. The current research proved that Open innovation is applicable in professional services firms, with certain particularities. Outside-in is more important than inside-

out OI, but not all practices are applied. For instance, active spin-ins, spin-offs, and M&As were not found to be very important in PSFs OI practices. Coupled OI practices are also applied with some particularities. They are found to be more intense when innovating for clients, rather than internally for the firm. The firms' leaders are more open to external collaboration but have not translated this into allowing enough time to be spent on innovation, or in putting in place the rewards and incentives that are needed. Knowledge sharing is key, more so when it comes to external client projects then internal innovations. Risks are perceived as very important, especially the ones related to the firms' reputation. Strong practices are in place to deter these, especially informal IP protection ones. This research proves that erosion factors impact the need to increase open innovation practices, which in turn have positive and significant impact on the professional firms' innovation and financial performance. This impact is moderated by the organizational culture and risk management. In general, these findings are found to be true both for Firm ABC and for the rest of the companies. The external sample however seems to have a higher propensity to openness and external collaborations. This could be explained by the fact that most of the external sample respondents (79%) are in consulting, an area found to be in general more open than the other lines of services.

The conceptual model suggested, tested and validated internally and externally, is therefore the main theoretical contribution of this research. The main practical contribution is allowing managers in professional services firm to understand where are the main areas of focus and investment needed to allow for more openness. The research has limitations, especially in terms of the limited number of companies that are represented in the study, as well as the breadth of the types of lines of services covered. Future research should focus on expanding this further, and understand more the differences between the main lines of services.

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LIST OF SYMBOLS AND ABBREVIATIONS

KIBS	Knowledge-Intensive Business Services
KIBSF	Knowledge-intensive Business Services Firms
KM	Knowledge Management
KMS	Knowledge Management System
NIH	Not-Invented-Here
NSH	Not-Sold-Here
OI	Open Innovation
PS	Professional Service
PSF	Professional Services Firm
R&D	Research and Development
μ	Mean

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CHAPTER 1 INTRODUCTION

Open innovation has become a very popular topic both in academia and in industry. Peer-reviewed articles have proliferated, researchers have been increasingly spending time on it, and the professional word as well. Large companies like GE or GM have now hired what they call Head of Open Innovation. World renowned and leading academic journals have dedicated specific volumes to cover this topic. A simple search on Google scholar under open innovation reveals more than 3.45 million results. In a survey conducted by Chesbrough and Brunswicker (2013), 78% of firms in the sample of large US and EU firms reported practicing open innovation, as defined by Chesbrough (2003a). The interest is there and growing, and its application is being adopted by the industry and practitioners.

The term, first coined by Chesbrough in 2003, encompasses three major blocks: taking internally developed ideas and innovations to the market (inside-out), driving externally developed ones towards the inside of the firm's boundaries (outside-in), and collaborating in both inside-out and outside-in with partners in joint ventures or others (coupled). According to Chesbrough (2003a), what caused the open innovation to become a reality is a set of erosion factors in the environment that are considered catalysts. These erosion factors (e.g. mobility of resources, VC availability) led some companies to rethink their business model and approach, moving away from closed to more open innovation models.

The literature started through qualitative cases studies observed in a few companies in the high-tech industry in the US. Over time, the interest moved to different industries: manufacturing, telecommunications, banking, technology & software, and even the public sector. Along this, interest in open innovation in services started to emerge and a growing number of articles were published in the past 10 years. Academia is focusing increasingly on the sector in order to understand the difference of the application of open innovation principles to an environment that is different than product-based manufacturing and technology industries. A review of the literature reveals studies in transportation & logistics, education services, tourism, retail, procurement, and other sectors within the services industry. Research moved from mostly qualitative to a growing number of empirical and quantitative studies, with often large scale innovation surveys in different parts of the world.

Gap in the Literature

Despite this tremendous growth, the literature review revealed a gap in terms of the application and understanding of open innovation services sectors: the professional services (PS) sector or knowledge-intensive business services (KIBS) was, to the knowledge at the author and to date, not covered. Professional services, by definition highly knowledge intensive sectors (e.g. assurance/audit, tax, consulting, legal, deals, engineering consulting, marketing, recruitment services), have business models that are focused on clients, and mostly around creating and sharing knowledge, services, and expertise outside the boundaries of the firms.

With the industry dynamics rapidly changing driven by the internet and the availability of knowledge to anyone on the planet, the professional services sector becomes an interesting one to study. It is witnessing a wave of commoditization and disaggregation of its value chain, the entry of new players, an increasing mobility of resources, a more knowledgeable client base and suppliers, and hence a more competitive environment. These changing dynamics have eroded many of the traditional approaches and ways that these firms used to work towards more openness and inclusiveness. For instance, by looking at the top professional services firm in the World (The Big 4 Accounting Firms, the Tier-1 Management Consulting Firms, The top law firms), it is evident that a large amount of research and knowledge being shared with the public. Several of them are launching open innovation contests to gather ideas and solutions outside firms' boundaries. In fact, they are considered a highly innovative in nature with a strong tendency to cooperation with external partners (Hipp, Gallego & Rubalcaba, 2015), in general more than manufacturing (Asaikanen, 2015).

PS or KIBS Sectors

The term knowledge-intensive firms (KIF) was first coined by Starbuck (1992), and got more traction in the literature since (Alvesson, 2011). According to Doloreux and Laperrière (2014, p. 635): "*… KIBSs are a subsector of services that includes establishments whose activities are highly dependent of human capital, knowledge and professional skills… In doing so, they heavily rely on mobile and intangible resources that are embedded in their human capital*".

KIBS represent a growing share of the economy in Canada. In Quebec alone for instance, they represented 6.0% of the intermediate purchases in the economy in 2007, up from 4.2% in 1997 (Shearmur, Doloreux, & Laperrière, 2015). These services drive growth and innovation in the services sector (Ritala, Hyotyla, Blomqvist, & Kosonen, 2013), play a crucial role in technology, economy and society (Hua, Lin, & Chang (2013), especially as enablers (Asaikanen, 2015) and stimulators (Mas-Tur & Soriano, 2014) in the overall innovation system. They are considered a strategic player in generating innovation and transferring knowledge in the economy (Fernandes, Fereira and Marques, 2015) as “industry brains” (Hipp, Galego, & Rubalcaba, 2015). According to Mina *et al.* (2014, p. 855), the study of open innovation in KIBS may be of particular importance given *“… the highly interactive and relational nature of their economic activities”*.

Research Objectives

In this context, the main question for the research is the following:

Is open innovation applicable in professional services? If yes, how? And what is its impact on performance?

This thesis aims to achieve four main objectives to answer this overarching question. First is to identify whethere there is a gap in the literature regarding OI in PSFs. Second is to find if there is an interest in open innovation theory in the professional services sector in practice. Third is to understand how it is applied and propose a model based on the literature and on an exploratory study that summarizes this. Fourth is to test this conceptual model and refine it in one single large representative firm, that we name Firm ABC (for confidentiality purposes), as well as with a larger set of firms.

Research Methodology

To achieve those objectives, a multi-faceted methodology was proposed and followed. First, a review of the literature to identify the gaps in OI and propose a conceptual model synthesizing it. Second, an exploratory study in several professional services firms. Third, a survey in Firm ABC to test the different elements of the model. Fourth, an external survey sent to other professional services firms in the sector. Finally, interviews were conducted to present and get inputs on the results.

Thesis Outline

The current thesis is presented around six (6) main chapters:

Chapter 2 covers the open innovation literature as an evolution from the closed innovation literature and presents the building blocks of a conceptual model that synthesizes this literature.

Chapter 3 reviews the innovation literature in the services industry and introduces the professional services industry, its dynamics, trends and particularities pertaining to innovation in general and open innovation in particular.

Chapter 4 details the research framework and the methodology used to test and validate the propositions. This chapter outlines the propositions drawn from the conceptual model and that need to be tested in the internal and external surveys. This chapter presents the approach used to generate and analyze the results of the two surveys.

Chapter 5 presents the results of the exploratory study.

Chapter 6 presents the detailed results of the analysis of both internal and external surveys, based on the methodology explained in chapter 4.

Chapter 7 discusses the results of chapter 6 and their implications both in theory and in practice. This chapter also presents the limitations as well as the future research.

Research Contribution

The current research contributed to the open innovation theory in three main ways:

1. Identifying the gaps in the open innovation literature related to professional services
2. Building an overarching conceptual model that summarizes literature and that is grounded in empirical observations, validated through exploratory interviews
3. Validating empirically the model in details within one firm first, then with several firms in the sector based on multivariate data analysis and practitioners judgment.

CHAPTER 2 LITERATURE REVIEW: OPEN INNOVATION IN NON-SERVICES FIRMS

Innovation has been recognized as a key determinant of success for companies. This theory has evolved from the Schumpeterian view of innovation to the Porterian competitive advantage view, all the way to the more recent concept of open innovation as a new form of innovating and staying competitive in the market. The closed innovation approach, as well porter's fives forces, the resource based view, knowledge based view, and capability based view do not fully explain how some companies still succeed in the new era. Chesbrough (2003a) suggests that companies have started to shift their innovation paradigm to a rather more open and collaborative one to take advantage of the knowledge, resources, and innovations existing outside their boundaries.

Open innovation consists of a body of knowledge; the term emerged after Chesbrough coined it in 2003. The literature on this subject has grown significantly since then. Open innovation has been influential and appears to have been adopted by many organizations (Chesbrough & Crowther, 2006; Gassmann and Enkel, 2006). According to Belenzon and Schankerman (2014, p.2, p.6), open innovation has been covered in literature in two different ways: first as an innovation model that "*optimally integrates internal and external markets.*", and second as a model that is characterized by the *"proprietary nature of the intellectual property regime and the collectiveness of innovation."* The literature covers many industries: from high-tech to more traditional manufacturing companies, with less articles on services sectors. Research has so far focused on various types of services sectors, but, to the best of our knowledge, very little on professional services firms, also known as knowledge-intensive business services firms (KIBSFs) or professional services firms (PSFs). The main outputs of these firms are knowledge-based activities and not actual tangible products. These firms include the following areas: accounting, law, marketing, recruitment, tax, consulting, and technology advisory firms offering specialized services in these areas. In this chapter, a review of the open innovation literature is conducted:

1. The literature review methodology
2. The shift from closed to open innovation
3. The open innovation paradigm building blocks
4. The proposed conceptual model that summarizes this literature

2.1 Literature Review Methodology

The literature review was conducted in two main parts. The first covered previous theories to Open Innovation that led to the emergence of the term, as well as OI in non-services firms. The second covered innovation and OI in services and professional services firms.

Part I:

An extensive literature review on several databases has been conducted, in particular the following ones: WorldCat, OAlster, Web of Science, Taylor & Francis, SSRN, EBISCO, Wiley online library, Proquest, Emerald, Google Scholar. Using the terms "innovation", "open innovation", "collaboration", "co-creation", "partnership*", "alliance*". This review led to identify the relevant literature for the current chapter. On top of the previous theories and founding concepts of OI, a large number of articles have been identified since 2003. Since 2008, around 200 articles were identified that were considered directly related to open innovation (see Appendix A for the list of the 150 most interesting articles). Only one third of these articles (56 out of 150) are quantitative, the rest being qualitative or literature reviews as detailed in the appendix. Open innovation in general has had a tremendous growing interest in terms of number of articles published. However, it has mostly been focused on high-tech and manufacturing.

Part II:

The literature review has been extended in order to better understand the particularities of innovation in services in general, and professional services in particular, with a focus on co-creation and open innovation. A review of the same databases has been conducted. Using the terms "open innovation" and then "open innovation AND service*", "collaboration", "co-creation", "client innovation*", "knowledge", "service*", "KIBS", "PSF", "knowledge-intensive business services" and "professional services firms". In the past few years, interest has been picking up in the open innovation for services industries. Many types of service sectors have been covered: tourism, ICT & media, financial sector (chapter 3). However, to our knowledge, no study has yet covered open innovation in professional services or KIBS firms. There has been interest around co-creation as well as collaboration in these types of sectors, but little on the more holistic open innovation framework. Given this important gap in the literature, the focus of the second part of the literature review is therefore on services and on professional services in particular (part of the wider KIBS firms sector). What increases the interest in understanding Open innovation applicability in this sector is the fact that some of the complementary open innovation concepts are increasingly being covered in the services literature (e.g. co-creation, customer & supplier involvement, collaboration, knowledge sharing).

2.2 From Closed to Open Innovation

Building sustainable competitive advantage is the key driver of many organization. Academics have been interested in understanding what ensures this advantage over time. In this section, five main streams of research that tried to explain this are presented leading to Open Innovation as a new way of gaining sustainable competitive advantage.

2.2.1 Building Sustainable Competitive Advantage

Schumpeterian View

Transaction-based views based on a closed internal paradigm were dominant in the innovation and economics literature. The traditional view of the successful firm is that it does R&D and innovation internally and keeps it in their structure (Schumpeter, 1934). This closed innovation is no longer sufficient to cope with dynamic markets (Chesbrough, 2003).

Resource-Based View

The Porterian view was however criticized for being too market focused and disregarded hierarchy (Teece, Pisano, & Shuen, 1997). A new theory emerged based on these flaws called Resource-Based View (RBV) considering an internal look at the firm. It claims that internal ‘sticky’ resources, which represent core competencies, are the basis of sustainable competitive advantages (Barney, 1986; Hamel & Prahalad, 1990; Penrose, 1959).

Knowledge-Based View

However, some firms’ quick responses and reactiveness to create value and a sustainable competitive advantage make this theory unable to completely explain this aspect (Teece *et al.*, 1997). Employees leave companies on a regular basis, yet organizations remain competitive in most cases and keep their value-creation capabilities. As a result, RBV cannot explain alone the sustainable competitive advantage that firms have once these resources quit. An emerging outgrowth of these theories considers firms from a knowledge-based perspective (KBV) and states that the primary role of organizations is the application of knowledge rather than its creation (Grant, 1996). This is particularly true for knowledge-intensive business services industries in general, and professional services in particular.

Capability-Based View

Another theory that expands on KBV of the firm is the Capability-Based View of the Firm. Capabilities can be described as *"bundles of organizational processes, rooted in the company's path-dependent history, and constitute the basis of inter-organizational differences eventually determining how successful a particular firm is in its activities''* (Ritala, Hyotyla, Blomqvist, & Kosonen, 2013, p. 487). Several key capabilities are present in knowledge-intensive services, four in particular: 1) Knowledge management; 2) Service productisation; 3) Process management; and 4) Relationship orchestration (Ritala et al., 2013).

Innovation View

Another stream of research claims that innovation is the key determinant of building sustainable competitive advantage. As Coopers (2005, p. 4) says it well: "It's war: Innovate or die. The next section details the definitions of innovations.

2.2.2 Definitions of Innovation

2.2.2.1 **Different Innovation Definitions**

Innovation is a complex phenomenon however, and several authors have presented different definitions (Crossan & Apaydin, 2010), each emphasizing a different aspect of the term:

- "Industrial innovation includes the technical, design, manufacturing, management and commercial activities involved in the marketing of a new (or improved) product or the first commercial use of a new (or improved) process or equipment" (Freeman 1982)
- "Innovation is the specific tool of entrepreneurs, the means by which they exploit change as an opportunity for a different business or service." (Drucker 1985)
- 'A new way of doing things (termed an invention by some authors) that is commercialized' (Porter, 1990)
- "Successful innovation is the creation and implementation of new processes, products, services and methods of delivery which result in significant improvements in outcomes, efficiency, effectiveness or quality" (Albury 2005)

- Innovation is “the successful development, implementation and use of new or structurally improved products, processes, services or organisational forms” (Hartley, 2006).
- Innovation is “something new being realized with (hopefully) added value” (Jacobs and Snijders 2008).

The first definition of innovation was coined by Schumpeter in the late 1920s who stressed the novelty aspect. However, it is practically impossible to do things the same way (Crossan and Apaydin, 2010), which makes any change an innovation by definition. Although Schumpeter clearly positioned his definition of innovation within the domain of the firm and outlined its extent as product, process, and business model, there are continuing debates over various aspects of invention: its necessity and sufficiency, its intentionality, its beneficial nature, its successful implementation, and its diffusion to qualify as innovation. Crossan and Apaydin (2010, p. 1115) present a comprehensive definition of innovation, as follows:

> *Innovation is the production or adoption, assimilation, and exploitation of a value-added novelty in economic and social spheres; renewal and enlargement of products, services, and markets; development of new methods of production; and establishment of new management systems. It is both a process and an outcome.*

Innovation is also defined as the total set of activities leading to the introduction of something new, resulting in strengthening the defendable competitive advantage of a company (Van der Meer, 1996). Song, Song, and Di Benedetto (2009) define innovation as process of transforming the new ideas, new knowledge into new products and services.

According to the knowledge-based view of a firm, innovation can be better understood as a process in which the organization creates and defines problems and then actively develops new knowledge to solve them (Nonaka, 1994).

The dynamic category focuses less on firms and more on the properties of innovations themselves and their degree and rate of change. For example, product innovations typically precede process innovations, and firms shift their focus from product performance to cost as innovations mature (Abernathy & Utterback, 1978).

2.2.2.2 **The Innovation Value Chain**

The innovation process in general can be divided into three major phases according to the innovation value chain presented by Hansen and Birkinshaw (2007), as per Figure 2-1 below:

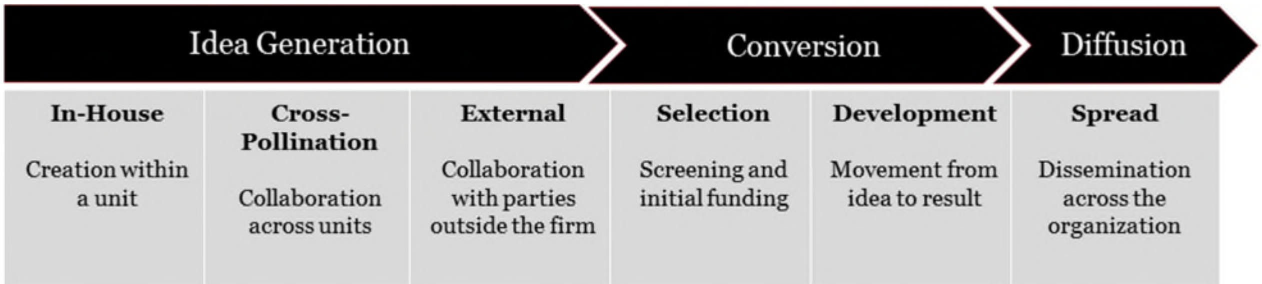

Figure 2-1: The innovation value chain (adapted from Hansen and Birkinshaw, 2007)

Scholars in open innovation have presented similar phases (Chesbrough, 2003; Van der Meer, 2007). The innovation process is therefore conceptualized as three interlinked stages of knowledge creation and convergence.

2.2.2.3 Degree of novelty

A distinction is made and based on service or product degree of novelty. Kohler, Sofka and Grimpe (2008) consider an incremental innovation as only new to the firm, while radical is new to the market. Miller, Olleros and Molinié (2008) define innovation levels based on market evolution in two stages: market-creation and market-maintenance, equivalent to radical and incremental innovation.

2.2.2.4 **Types of innovation**

According to Schumpeter (1934), innovation is reflected in novel outputs: a new good or a new quality of a good; a new method of production; a new market; a new source of supply; or a new organizational structure, which can be summarized as "doing things differently".

When talking about innovation many people think of product or process innovation, both of which are tangible types of innovation. In recent years, more focus has been directed towards intangible innovation such as business model, networking and brand innovation (Gassmann & Enkel, 2004).

Tidd et al. (2005) argue that there are four types of innovation; consequently the innovator has four pathways to investigate when searching for good ideas: Product Innovation - new products or improvements on products, Process Innovation - where some part of the process is improved to bring benefit, Positioning Innovation and finally the Paradigm Innovation - where major shifts in thinking cause change.

From Closed to Open Views

These theories are mostly geared towards a closed view of innovation, focused mainly on the inside of the firm. These traditional transaction cost economics theories claim that competitive advantage is mostly about allocating the activities between the firm and the markets (Belenzon & Schankerman, 2014). They do not explain the success of open source innovations and other innovations realized outside the boundaries of a firm (Chesbrough, 2003). In fact, traditional views are based upon ownership and control as key levers in achieving strategic success (Chesbrough & Appleyard, 2007). Focus remains within a firm or within the value chain in which the firm is embedded. None take much notice of the potential value of external resources that are not owned by the firm in question, but may nonetheless create value for the firm. These external resources, such as volunteer contributors, innovation communities and ecosystems, and surrounding networks represent growing sources of value creation and capture (Chesbrough and Appleyard, 2007), and can explain improved recent successes such as Linux, YouTube, IBM, etc. (Chesbrough, 2003). A newly emerging shift in paradigm prioritizes integrating firms and markets as opposed to optimizing between both (Belenzon and Schankerman, 2014).

2.2.3 Previous Theories and Critics

Open innovation did not get introduced out of thin air by Chesbrough in 2003. Several previous theories viewed the subject through different lenses, the culmination of which led to open innovation (Kovács, Van Looy, & Cassiman, 2015; Tidd, 2013). The concept overlaps with many other existing theories, as shown in Table 2-1:

Table 2-1: Overview of Authors by Theory

Previous Theory	Some Authors
Collaboration	Mattesich and Monsey (1992); Roschelle and Teasley (1995); Dillenbourg (1999)
Partnerships and alliances	Das and Teng (1999); Koschatzky (2001); Hagedoorn and Duysters (2002)
Outsourcing	Loh and Venkatraman (1992); Apte and Manson (1995)
Knowledge and R&D Spillovers	Romer (1986); Krugman (1991); Harhoff (1996); Zucker, Darby, and Armstrong (2002)
User generation and crowdsourcing (Distributed networks)	Gianiodis, Ellis, and Secchi (2010); Hossein (2013)
R&D externalization and environmental interaction	Huang and Rice (2013)
User innovation	Paasi et al. (2015)
Learning theory	Gianiodis, Ellis, and Secchi (2010)

West and Bogers (2014) identified an additional four related streams of open innovation research: (1) Obtaining external innovations; (2) Integrating external innovations; (3) Commercializing External Innovation Streams; (4) Interactions between local firm and its collaborators. This topic has attracted scholars from different disciplines such as finance, economics, marketing, and strategic management (Gianiodis, Ellis, and Secchi, 2010). The literature focuses on capabilities from four points of view: resource based view, organizational learning, knowledge-based, and dynamic capabilities (Caroll and Helfart, 2015). Thus, it is important to understand these previous and related theories in order to better capture the contribution and the added value of the open innovation concept in the literature. Despite the strong proliferation of the OI concept and its advocates, some academics have criticized the concept (Enkel & Lenz, 2009; Dahlander & Gann, 2010; Hossein, 2013; Huang & Rice, 2013; Huizingh, 2011; Trott & Hartmann, 2009; Trott & Hartmann, 2014) for different reasons. Mostly, skeptics claimed that OI had been present before Chesbrough coined the term but not necessary termed as such (Hossein, 2013). Some academics mention that it is ‘old wine in new bottles’ or ’in fancy tuxedos, not bringing anything new to the table (Trott & Hartmann, 2014), only repackaging of the old theories relating to R&D externalization and collaboration (Huang & Rice, 2013). These academics claim that it is based on previous theories in strategy, change management, and organization (Wikhamn and Wikhamn, 2013). Another criticism is that it is an OI open innovation slows down the speed of projects in organisations (Knudsen & Mortensen, 2011). Despite these critics, the novelty of the open innovation concept is that firms can create adapted organizational models and processes to integrate several traditional collaborative innovation practices (Trott & Hartmann, 2014), and that it is an ecosystem view rather than a simple firm's view (Wikhamn & Wikhamn, 2013).

2.2.4 The Emergence of Open Innovation in Non-Services Firms

As defined by Chesbrough in his acclaimed book (Chesbrough, 2003a), the new paradigm for realizing innovation essential for profitable growth is open innovation, which is: *''a paradigm that assumes that firms should use external ideas as well as internal ideas, and internal and external paths to market, as the firms look to advance their technology''* (see Figutre 2-2 for an illustration). Chesbrough adds in his more academic oriented book (Chesbrough, Vanhaverbeke, & West, 2006), that *''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''*. He therefore suggests that *''valuable ideas can come from inside or outside the company and go to market from inside or outside the company''*. Many researchers have studied open and collaborative innovation practices in firms, and found that they tended to expand their boundaries to tap outside knowledge and to use the market as an extension of the firm (Chesbrough, 2003, 2006; Dahlander & Gann, 2010; Elmquist *et al.,* 2009; Enkel *et al.,* 2009).

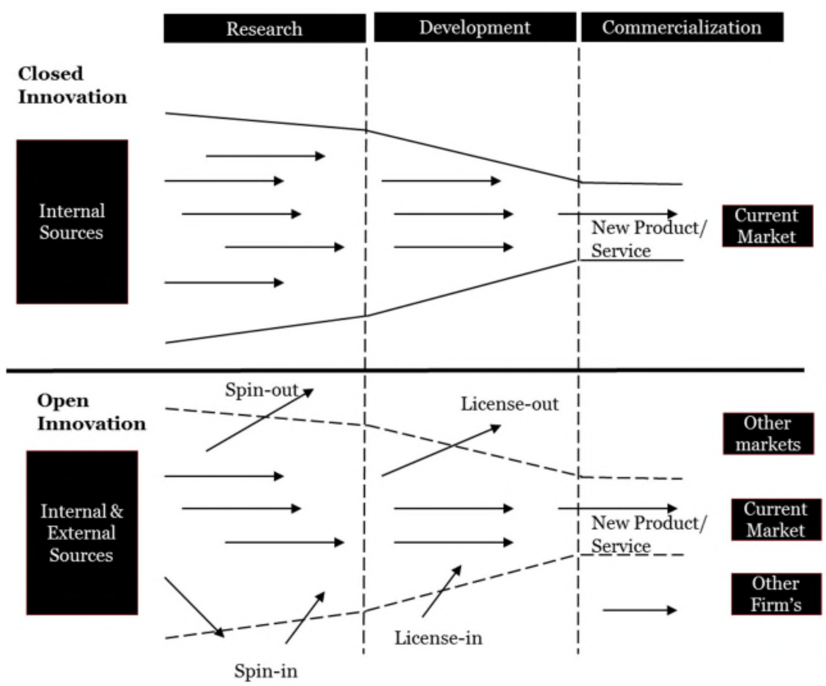

Figure 2-2: Closed versus open innovation approaches (adapted from Chesbrough, 2003a)

Since its early definitions, this concept has evolved and a new refined definition has emerged (Chesbrough & Bogers, 2014, p. 12) is:

> *… a distributed innovation process based on purposively managed knowledge flows across organizational boundaries, using pecuniary and non-pecuniary mechanisms in line with the organization's business model. These flows of knowledge may involve knowledge inflows to the focal organization (leveraging external knowledge sources through internal processes), knowledge outflows from a focal organization (leveraging internal knowledge through external commercialization processes) or both (coupling external knowledge sources and commercialization activities..*

This refined definition makes clarifies the difference between spillovers and Open Innovation: the former happens indirectly, in an unmanageable way. However, the latter is purposely managed, with processes, mechanisms and channels put in place to facilitate the transfer. The business model, describing both value creation and capture, puts this concept into the organizational domain (Chesbrough & Bogers, 2014). In general, the literature on open innovation has mostly covered high-tech and manufacturing companies, with some increasing trends towards more services (Aas & Pedersen, 2012). Some academics have also covered the literature by examining firm size as a key indicator: SME (Small Medium Enterprise), MNE (Multinational Enterprise), and large firms have all been researched with an open innovation lens. Services sectors were also covered as a whole or as a grouping of different sub-sectors, with little literature segmenting them separately by sub-sector. This section highlights the different sectors covered by the literature that were the instigators of the open innovation theory. Open innovation literature has started and covered extensively several non-services sectors or companies. Table 2-2 summarizing the literature on all non-services sectors covered in the literature is presented below (see Appendix B for the detailed table):

Table 2-2: Summary of Non-Services Sectors Covered in Literature

Sectors	Main Authors
High-Tech	Hagadoorn and Zobel (2015); Chesbrough, (2003a); Mitkova, (2014); Christensen *et al.* (2005)
PC	Hossain and Islam (2015)
Space Exploration	Gustetic, Crusan, and Ortega, (2015); Richard and Davis, (2014); Richard and Keeton (2015)
Video Games	Parmentier and Gandia, (2013)
Software Development	Harisona and Koski, (2010); (Belenzon & Schankerman, 2014)
Utilities	Arnold & Barth, (2012)
Healthcare	Rass, Adamczyk, Moslein, and Sohn, (2012); Kirschbaum, (2006); Salge, Farchi, Barrett, and Dopson (2013)
Consumer Packaged Goods	Chesbrough, (2003a); Cooper (2008); Moskowitz, Saguy, and Jacobs, (2013)

Table 2-2: Summary of Non-Services Sectors Covered in Literature (cont'd)

Sectors	Main Authors
Pharmaceuticals	Chesbrough, (2003a); Kirschbaum, (2005); Tidd, (2013); Bianchi, Cavaliere, Chiaroni, Frattini, & Chiesa, (2011); Andrews *et al.*, (2015); Deloitte, (2015)
Public sector	Almiralla, Lee, and Majchrzaka, (2014); Lee, Hwang, and Choi, (2012); Louis, (2013); Chaston, (2012); Paskaleva, (2011)
Construction	Buganza, Chiaroni, Colombo, and Frattini (2014)
Manufacturing	Buganza, Chiaroni, Colombo, and Frattini (2014); Eduardo & Sati (2014); Chiaroni *et al.* (2011); Westergreen (2011); Love, Roper, and Vahter (2014); Kafouros & Forsans (2012); Remneland-Wikhamn, and Knights (2012); Lichtenthaler (2007); Lichtenthaler (2013); Verbano, Crema, and Venturin (2015); Paasi, Rantala, Lappalainen, and Pikkarainen (2014)
Telecommunications	Chesbrough, (2003a); Susha, Gronlund, and Janssen (2015); Koen and Geert (2007); Miguel Dávila, López, and Heredero (2012); Hossein 2012); Rohrbeck *et al.* (2009); Sato and Eduardo (2014); Susha, Gronlund, and Janssen, (2015); Dávila, López, and De Pablos Heredero (2012)
Aerospace	Witzeman *et al.* (2007); Armellini, Kaminski, and Beaudry (2014); Armellini, Kaminski, and Beaudry (2012)
Large firms	Vanhavarbeke, Du, and von Zedtwitz, (2013); Chesbrough and Brunswicker (2013)

A particular Case: Open Innovation in SMEs

Early open innovation literature has focused mostly on large organizations, with very little interest in small firms (van de Vrande *et al*., 2009; Vanhaverbeke, 2012; Zhang & Chen, 2014). Academics have increasingly looked at small- to medium-sized enterprises to understand their application of open innovation, with the largest focus on high-tech firms ones (Hossein, 2015). Vanhaverbeke (2012) studied innovation in 11 small firms. Lee, Park, Yoon, and Park (2010) surveyed more than 2,400 SMEs in Korea and found support for the potential of open innovation applicability, with networking as a key catalyst. Some authors have found that open innovation is even more important for SMEs than for larger firms (Lee *et al.* 2010; Hossein, 2013). It improves their overall performance and especially for their continuous growth in high-tech industries in particular (Hossein, 2015). Colombo *et al*. (2014, p. 7) argued that SMEs *"largely depend on the resources of their open innovation partners to implement their strategies"*. Collaboration for these firms is however more important in the later stages of commercialization than during the early stages of ideation or R&D (Hemert *et al.* 2013; Theyel 2013; van de Vrande *et al.* 2009). Hutter, Hautz, Repke, and Matzer (2013) studied small and micro enterprises open innovation practices. The combination of inside-out and outside-in approaches had a significantly positive impact on innovation and growth in SMEs (Brink, 2014). In fact, openness is not a binary concept (open vs. closed) but entails an important amount of interactions (Brunswicker & Vanhaverbeke, 2015). In openness, exploitative learning and knowledge-sharing capabilities positively affect radical innovation in SMEs (Maes & Sels, 2014). Collaboration with partners have also an important positive impact on product development performance of SMEs, in particular when they partner with laboratories and research institutes (Lasagni, 2012).

Other academics studied new ventures and found that *"ecosystem collaboration, user involvement and an open environment"* impact their success in creating value, a direct link to the importance of open innovation in these types of firms (Eftekhari & Bogers, 2015, p. 574). Verbano, Crema, and Venturini (2015) surveyed 105 Italian manufacturing SMEs and found three different open Innovation profiles: selective low open, unselective open upstream, and mid-partners integrated open. As a result, size seems to be less of a defining factor in the application of open innovation. However, focus has been mostly on high-tech and manufacturing SMEs, with little emphasis on services SMEs (Hossein, 2015).

Typologies of Open Innovation

Open innovation is not a clear-cut concept. A literature review by Tidd (2014) concluded that a *"simple dichotomy between open and closed approaches is unhelpful and not realistic."* Open innovation comes in many forms and tastes, which adds to the richness of the concept but hinders theory development (Huizingh, 2010). Some authors find that a combination of both closed and open approaches could yield better results than either of the two extremes of the spectrum of openness (Huang & Rice, 2013; Wikhamn & Wikhamn, 2013). As a result, there exists different levels of openness, and companies can adopt various strategies for different products, markets, and business models. Four examples of typologies are presented below (Tables 2-3 to 2-6):

Table 2-3: Ex. 1 - Open innovation process vs. open innovation outcome (Huizingh, 2011)

		Innovation outcome	
		Closed	**Open**
Innovation process	**Closed**	1. closed innovation	3. public innovation
	Open	2. private open innovation	4. open source innovation

Table 2-4: Ex. 2 - Structures of the different forms of openness (Dahlander & Gann, 2010)

	Inbound innovation	Outbound innovation
Pecuniary	Acquiring	Selling
Non-pecuniary	Sourcing	Revealing

Table 2-5: Ex. 3 -The ‘types’ of Open Innovation (Sloane, 2011)

	Relatively Few Invitations	Everyone Invited
Directed	Directed, Invitational	Directed, Participated
No Directions	Suggestive, Invitational	Suggestive, Participative

Table 2-6: Ex. 4 - Four modes of Open Innovation (Lazzarotti and Manzini, 2014)

	Low Partner Variety	High Partner Variety
High Innovation Funnel Openess	Integrated Collaborators	Open Innovators
Low Innovation Funnel Openess	Closed Innovators	Specialised Collaborators

Several authors have therefore concluded that it is not possible to limit the difference to either closed or open innovation. Depending on the case, it not necessary true that the more openness the better, as it can be costly and difficult to have a high degree of openness (Lazzarotti & Manzini, 2014). Implementing open innovation in companies is not an easy approach. It happens over a lengthy period of time given the transformational aspects that it implies in the organization. In fact, open innovation is best implemented in three stages of first unfreezing, then moving, and finally institutionalizing (Chiaroni, Chiesa, & Frattini, 2011).

Non-services firms and SMEs were the main focus areas for understanding the application of open innovation. The next section presents the building blocks summarizing the entire body of knowledge and literature around open innovation. Both main and complementary views/blocks of the literature are presented leading to a synthesized conceptual model.

2.3 Open Innovation Building Blocks

The literature has witnessed a tremendous increase and proliferation of articles and research, and special issues in management journals have made their way through in the past decade (Hossein & Anees-ur-Rehman, 2016; Kovacs, Van Looy, & Cassiman, 2015). Crowdsourcing for innovation is not a new concept, but the focus on open innovation as a main strategic competitive advantage is a novelty that has led mostly to this recent interest in academia (Majchrzak & Malhorta, 2013). This is coupled with the results of studies showing that a diverse and independent resources perform better on certain types of challenges than a small number of experts (Brabham, 2013). Based on this limitation of the previous theories, the concept of Open Innovation is further introduced in details in this section. Based on the non-services literature related to open innovation, the building blocks of a conceptual model have been identified. A building block is considered a main component of a model that is based on its corresponding stream of research in the literature. These blocks are presented in each of the next sections.

2.3.1 Overview of all Building Blocks

This first sections of the literature review has confirmed that open innovation is a topic that is increasingly a subject of interest to academics, focused mainly on non-services industries. This literature review covered the building blocks that have led to the emergence of the open innovation concept in general, starting by the need to gain competitive advantage. Innovation management and its components have been covered in all industries and in services in particular. The literature therefore points towards eight main streams related to open innovation (Fig. 2-3):

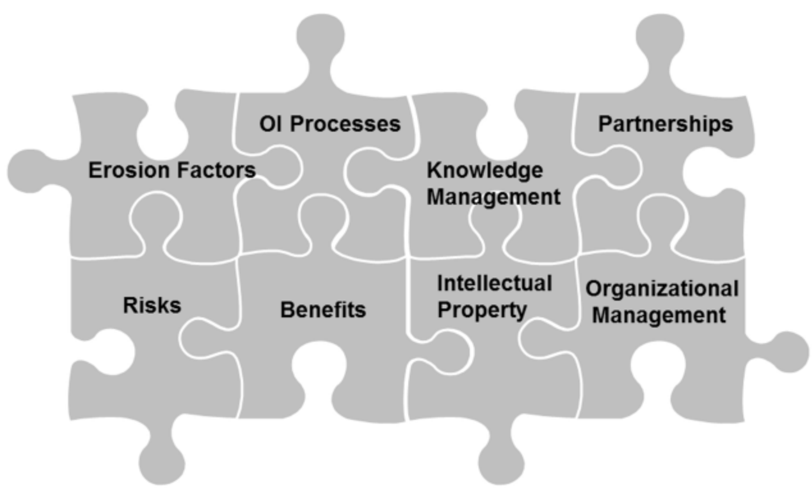

Figure 2-3: Open Innovation Streams based on Non-Services Literature

These eight streams are grouped into five building blocks that are each detailed in the next sub-sections:

1. **Erosion factors** in the industry that erode the closed model of innovation.
2. The OI concept encompasses three main processes that improve performance:

a. The **inside-out process** (outbound), where the locus of innovation is within the boundaries of the firm

b. The **outside-in process** (inbound), where the locus of innovation is outside the boundaries of the firm

c. The **coupled process**, where collaboration, **partnerships**, and exchange happens in both directions, inbound and outbound, simultaneously.

3. For these processes to function accurately, **organizational factors** must play an important role in the cultural, **knowledge-management**, leadership support, IT systems, human resources management, and rewards/incentives systems in place

4. **Risk management** is important, especially **IPR,** making the implementation challenging.

5. **Impacts** of open innovation adoption on the performance of the firms.

2.3.2 Building Block 1: Erosion Factors

Erosion factors are external trends or industry dynamics that impact the companies' strategy. Chesbrough (2002; 2003a) and other authors in the field describes several erosion factors that compel companies to transform their innovation strategies into a more flexible OI approach:

- Skilled workers' increasing mobility
- Burgeoning amount of college and post-college training: knowledge spill-out of the corporate central research labs to companies of all sizes
- External suppliers' increasing capability
- External options available for unused ideas
- Increasing globalisation of knowledge
- Increasing fast time to market for products and services
- Increasing cost of doing research inside the firms
- Venture capital markets creating new opportunities for companies.

Open innovation strategy is supported by the lack of answers that the dominant traditional strategic and innovation views present to explain the sustainable competitive advantage many firms present. Many researchers have studied the open innovation and collaborative innovation practices of firms and found that they have started to open their boundaries to tap knowledge from the outside and use the market as an extension of the firm (Chesbrough, 2003, 2006; Dahlander & Gann, 2010; Elmquist *et al.*, 2009; Enkel *et al.*, 2009). Open innovation has found a large interest in recent literature and in practice as a new forms of conducting innovation due mostly to shorter innovation cycles, industrial research, and developmental escalating costs, as well as because of the dearth of resources (Gassmann & Enkel, 2004).

Architecture Modularity and Openness

As part of the erosion factors happening in the industry, architecture modularity is a key one related to OI. Starr (1965) defined *'modular'* or *'combinatorial'* production capacities in a manufacturing context as those required to design and manufacture components that can be combined in different and several ways. Ulrich (1995), in same context, stated that: "*In a modular architecture, interfaces between components are decoupled and there is a one-to-one mapping between physical components and functional elements"*. The *'loose coupling'* of different standardized components permits interchanging or 'mix and matching' that corresponds most to the end user or customer preferences. Reviewing more than 100 journal articles, Salvador (2007) identified the most commonly used perspectives of product modularity as *'component commonality', 'component combinability', 'function binding', 'interface standardization',* and *'loose coupling'*. Modularity of products, processes, or services are important factors that allow open innovation to occur. Companies active in modularized types of industries "*can increase their innovativeness by opening up their innovation process"*, while those active in industries with low modularity have limited advantages to applying OI (Gassmann & Enkel, 2004).

According to Starr (2010), *".. generic modularity is easy substitution of one thing for another; services built into goods can be viewed in the same light as modular parts."* Modularity is considered by some authors as a way of enhancing *'mass customization'* (Rajahonka, 2013). Organizational outsourcing is a means to achieve modularity, hence the interest of considering it in the services industry (Schilling & Steensma, 2001). In fact, product and organizational modularity are strongly linked. The concept aims at balancing efficiency of creating and effectiveness of delivering, and then capturing that value from a customer perspective. In the case of services, modularity is closer to processes than products, which makes it more complex to manage and study (Rajahonka, 2013). The interfaces between the different modules are considered *'soft'* in the services industry, based on human relationships and knowledge, making interchangeability difficult. Rahikka *et al.* (2011) studied modularity in professional services firms (engineering, project management). They considered three aspects of modularity: service offering, which helps the customer assess service outcomes; processes that influence expectations from the customer regarding quality expectations; and organizational, which helps project implementation. As a result, the concept of modularity is still better defined and clearer in a product-oriented context than in a service-oriented one. Service particularities make it harder to implement. Sectors that witness these erosion factors are more prone to be relevant for the application of OI.

2.3.3 Building Block 2: Open Innovation Processes

A key component of open innovation strategy is to open up the business model by connecting a more open internal network with an ever-growing, rich, and diverse external network, reviewing the structure of the innovation management processes and value creation and capture channels, and allowing for an effective IP protection strategy (Chesbrough, 2003a; 2006; 2007a; 2007b; Chesbrough, Vanhaverbeke, & West, 2006). Innovation might generate new value in an industry through six forms in the business model: 1) value proposition; 2) target market; 3) value chain; 4) revenue mechanism; 5) value network or ecosystem; and 6) competitive strategy (Chesbrough, 2007a; Chesbrough & Rosenbloom, 2002).

2.3.3.1 The Three Main Open Innovation Processes

According to Gassmann and Enkel (2004), and based on an empirical database of 124 companies, three core processes are key in defining the Open Innovation paradigm as per Figure 2-4 below:

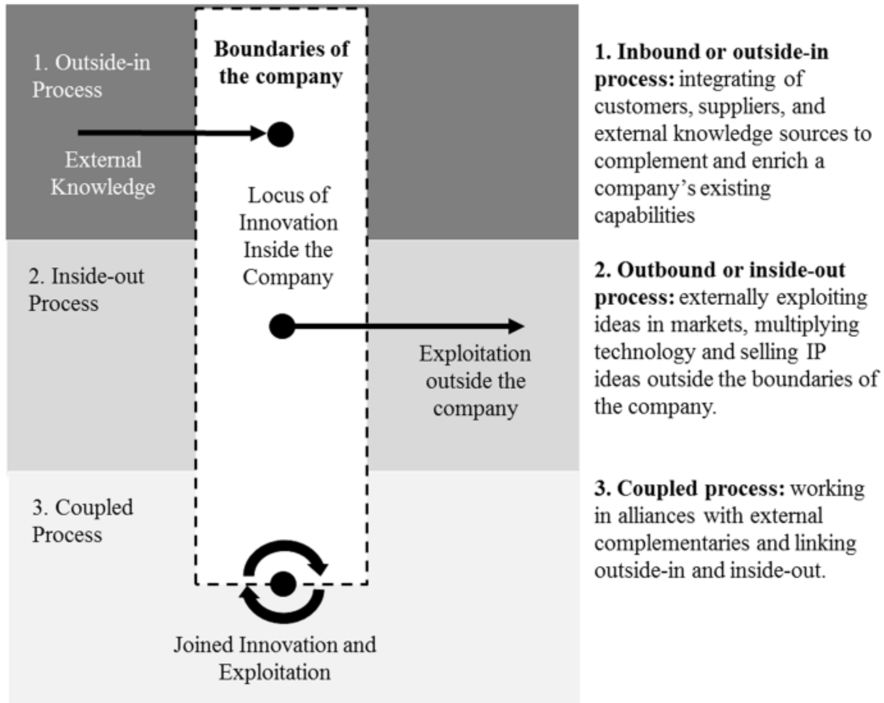

Figure 2-4: Open Innovation Processes – © Gassmann & Enkel (2004, p. 7)

In fact, these authors define the meaning of the paradigm shift as follows (Gassmann & Enkel, 2004, p. 2):

> *Open innovation means that the company needs to open up its solid boundaries to let valuable knowledge flow in from the outside in order to create opportunities for co-operative innovation processes with partners, customers and/or suppliers. It also includes the exploitation of ideas and IP in order to bring them to market faster than competitors can.*

This model is key to current research, as it will be the main area tested through the propositions and analysis in the next sections. Open innovation research covers three main themes: 1) Technology; 2) Business models and value appropriation; and 3) Users and communities. The literature has mostly focused on technology (Randhawa, Wilden, & Hohberger, 2014). However, the open innovation paradigm is not simply an approach that relies on external technologies for innovation. There remains a critical role for internal R&D in this approach: the definition of architecture to organize the many parts of a new system. Product or service architecture, defined as a hierarchy of connections between disparate functions within a system, joins the technologies into a useful overall system (Chesbrough, 2003).

2.3.3.2 **Partnerships**

Another important research stream in the OI theory is to understand networks as partnerships as a key component of innovating with the market. This section reviews the literature on networks and alliances as important concepts in the open innovation paradigm. Collaboration is defined as "… *a situation in which two or more people learn or attempt to learn something together*" (Dillenbourg, 1999, p. 1). Other authors like Roschelle and Teasley (1995, p. 70) define collaboration as "… *a coordinated, synchronous activity that is the result of a continued attempt to construct and maintain a shared conception of a problem*". In this context, strategic partnerships are interfirm cooperative agreements aimed at achieving competitive advantage for the partners (Das & Teng, 1999; Hagedoorn & Duysters, 2002). These alliances have become a source of innovation capability building for firms (Hagedoorn & Duysters, 2002); hence their importance in the context of open innovation. Globally, the number of corporate alliances continues to rise and some of them create good value to its participants (Das, 1995; Wilson & Tuttle, 2008). Open innovation requires collaborating with external network to create and capture value (Chesbrough, 2003). According to Chesbrough and Schwartz (2007), co-development partnerships are increasingly important in open innovation models. This is in line with Chiaromonte (2006), who argues that the difference between open innovation and traditional outsourcing of innovative capacity is that outside partners are not seen as suppliers but as peers. Chesbrough and Schwartz (2007) point out that the use of partners can create business models that reduce R & D expenses, expand innovation output, and open new markets. Companies are therefore called on to innovate through a network of partnerships and alliances with clients, universities, R&D firms, collaborators, niche-players, and even competitors. Open innovation generally involves a no-arm's-length relationship with partners and in most cases, an intense exchange of knowledge. Strategic alliances are a key competitive advantage (Borges, 2011; Koschatzky, 2001). Koschatzky (2001, p. 6) found that "… *firms which do not cooperate and which do not exchange knowledge reduce their knowledge base on a long-term basis and lose the ability to enter into exchange relations with other firms and organizations*".

Open innovation requires collaborating with external networks to create and capture value (Chesbrough, 2003a). In fact, open innovation requires non-arm's-length collaboration (Chesbrough, Vanherbeke, & West, 2006). There are a number of reasons why firms choose to cooperate on their innovation activities and in many cases, close interactions may be a necessity to facilitate the transfer of knowledge. Among these are gaining access to proprietary technology, access to skills, know-how and other tacit knowledge, cost and risk sharing, and specialization (Herstad, Bloch, Ebersberger & van de Velde, 2008). These reasons can be regrouped into three main views explaining the need for OI and thus, collaboration with partners: transaction-cost, resource-based, and knowledge-based views (Kale, Singh & Perlmutter, 2000).

Earlier research on partnerships and alliances focused primarily on cost-savings and transaction cost economies; however, recent research in OI focuses on how these inter-organizational relationships enhance value creation (Enkel, 2010). Bianchi *et al.* (2010) found that among various inbound and outbound activities, alliances are most frequently applied, without however mentioning whether alliances also are the most effective way of conducting OI. Learning types of alliances, in which partners strive to learn or internalize critical information and capabilities from each other, constitute an important class of such alliances (Hamel, 1991; Khanna, Gulati, & Nohria, 1998; Prahalad & Hamel, 1990). Since open innovation collaborations are intended to internalize external knowledge (tacit or explicit) and externalize internal knowledge (whether tacit or explicit), they can be considered, in some cases, as learning alliances.

In the new paradigm of open innovation, firms collaborate with universities, customers, suppliers, and other partners to develop new products or services, penetrate new markets, etc. Some early adopters of open innovation have also created their own ecosystems (Chesbrough, 2003). IBM developed a fully-fledged '*open ecosystem*' of semiconductor chip R&D with nine partner companies, including very diverse companies such as Micro Devices, a university research center, and others. IBM network members contribute state-of-the art knowledge by exchanging and collaborating with IBM's scientists and engineers. This has led to the development of new semiconductor designs that have posted favorable results (Wilson and Tuttel, 2008; Chesbrough, 2003). Firms have begun opening their boundaries to tap into outside knowledge and to use the market as an extension of the firm (Chesbrough, 2003, 2006; Dahlander and Gann, 2010; Elmquist *et al.*, 2009; Enkel *et al.*, 2009). As a particular application of this strategy, firms increasingly enter into collaborative agreements with other organizations. Collaborative efforts are therefore becoming increasingly important to a firm's competitive advantage and the value of such collaborations is increasing. Strategic alliances are risky (Das & Teng, 1999), and hence the level of cooperation required to succeed is probably not usually acceptable at the beginning; partners tend to shy away from such intense cooperation. To succeed, alliances thus have to go through a series of transitions as they move from learning, re-evaluation, and readjustment cycles to the next (Doz, 1996). Negotiating alliances is a prolonged process; specifically, the aspects that cover alliance governance structures and intellectual property rights.

Alliances in open innovation also raise an interesting dilemma, as a firm that uses them also risks losing its own core proprietary capabilities to its partners, especially when these partners behave opportunistically (Das, 2005). On one hand, alliances can help a firm absorb and learn critical information and capabilities from its partner. On the other, they also increase the likelihood of unilaterally or disproportionately losing one's own core capability or skill to the partner. Harrigan (1986, p.148) asserts that "*… managers can be as crafty as they please in writing clauses to protect their firm's technology rights, but the joint venture's success depends on trust*."

The main tension that makes open innovation alliances more difficult and unique is the tension between *teachability* and *imitability*. In order to openly share knowledge, an appropriate atmosphere is required based on establishing a trust-based relationship (Bogers, 2011; Gulati, 1995). Mutual commitment and trust, together with other relational and environmental characteristics, can deal with the uncertainty that open innovation brings.

Partnerships in open innovation are complicated and learning through collaboration and strategic alliances depends on what Hamel (1991) calls the collaborative membrane and exchange, where knowledge is traded on an on-going process; hence making it complex to manage. Contractor, Woodley and Pepenbrink (2011) conducted a study to evaluate partner interactions beyond simple governance and structure by asking the following question: *"How tight or loose a relationship do we wish to have with our partners?"* On one hand, interaction is necessary for improved operations coordination, effective tacit knowledge transfer, and maximizing joint synergistic value. On the other, increased interaction between allies results in higher coordination costs and a chance of unintended leakage. The authors found that one-time transfer alliances can lead to few interactions between the partners, especially when the knowledge is codified or explicit. When there is anticipation of future exchanges or when tacit knowledge predominates, a more significant interaction between partners becomes desirable.

Conclusion: Partnerships are key building block in open innovation, whether with core ecosystem players or with adjacent ones, in order to exchange and develop knowledge and innovations in alliances.

2.3.4 Building Block 3: Organisational Support

To support Open Innovation, companies need to adjust their organizational structures in place. A recurring theme in the literature on innovation is the important role of organizational structures and management processes; considered major determinants of innovative activity outcomes (Medina, Lavado, & Cabrer, 2005; Mitkova, 2014). They strongly influence the development of innovations (Mitkova, 2014). Dombrowski et al. (2007). This section covers four research streams that are related to organizational management: Culture & Structure, People, Technology and Knowledge management.

2.3.4.1 **Organizational Culture & Structure for Open Innovation**

Implementing open innovation in firms and professional services in particular requires an effective change management approach. Implementing open innovation signifies organizational change (Chiaroni *et al.,* 2010). An important cultural change is needed to move from closed to open innovation (Dodgson, Gann, & Salter, 2006; Herzog, & Leker, 2010). Previous research presents eight elements of organizational innovative culture: 1) innovative mission and vision statements; 2) democratic communication; 3) safe spaces; 4) flexibility; 5) collaboration; 6) boundary spanning;7) incentives and 8) leadership. The organizational flexibility, formalization of internal communications processes, and significant collaboration agreements with other entities are among the mechanisms that are in place in innovative organizations that facilitate innovation (Medina, Lavado, & Cabrer, 2005). For open innovation in knowledge-intensive services, managing externally-acquired knowledge requires the development of complementary internal organisational support (Mitkova, 2014).

The journey from closed to OI involves four main dimensions of the firm's organization: 1) inter-organizational networks; 2) organizational structures; 3) evaluation processes; and 4) knowledge management systems, along which change should be managed and stimulated (Chiaroni, Chiesa & Frattini, 2010). Herzog and Leker (2010) identified three underlying differences in the cultures between open and closed innovation oriented firms through an empirical study of an overall sample of 109 respondents: 1) The not-invented-here syndrome (NIH) that has also been identified by Chesbrough (2003a) as a key cultural barrier along with the not-sold-here syndrome (NSH); 2) A risk-taking attitude and 3); management support to OI initiatives. A key organizational and cultural barrier in this context involves the *unwillingness* of employees undertaking extra-organizational knowledge transactions (Chesbrough & Crowther, 2006, Lichtenthaler & Ernst, 2006). Negative attitudes against the utilization of external knowledge (i.e., the NIH syndrome), as well as against the external commercialization of knowledge assets, for example via licensing (i.e., the NSH syndrome), have been identified in the literature as important elements of resistance to these activities (Lichtenthaler *et al.*, 2010). These negative attitudes can create a misalignment between the intentions of top management and the behavior of involved employees, thereby rendering the implementation less probable and knowledge management a deep issue. Gassmann, Enkel, and Chesbrough (2010) stressed the importance of creating a culture that values outside competence and know-how as crucial for open innovation practice. This culture is influenced by many factors: besides being influenced by the values of the company, it is also influenced by concrete artefacts such as incentive systems, management information systems, communication platforms, project decision criteria, supplier evaluation lists, its handling, and so on. Organizational challenges are important for an advantageous knowledge management strategy in open innovation context. Open innovation in fact requires a change in culture; after all, it is a paradigm shift according to Chesbrough (2003a). Aligning organizations around innovation is not only about structure but also about people, management processes, activities, and internal environments by assigning people accountable for innovation facilitation, making innovation a part of everybody's job, tracking measures of innovation inputs, and opening up for ideas from outside (Andrew & Sikrin, 2008). Knowledge sharing alone is not enough and does not lead automatically to organizational learning. No new innovation in professional services firms can take place without the consent of the partners and managers of a firm (Taminiau, Smit, & de Lange, 2009).

Conclusion: Organizational culture and firms' overall assets influence the impact of openness on the performance.

2.3.4.2 **People Management for Open innovation**

The people side of open innovation (i.e., the underlying innovation culture) has been neglected so far in the literature (Da Mota Pedrosa, Välling, & Boyd, 2013; du Chatenier, Verstegen, Biemans, Mulder & Omta, 2010; Herzog & Leker, 2010). Research have found that the personal characteristics of key decision-makers such as CEOs and senior management team, significantly affect the strategic choices of firms (Chaganti & Sambharya, 1987). Employees in open innovation contexts should be more adaptive than their counterparts in closed innovation organizations (Herzog & Leker, 2010). In OI, units are less infected by the NIH syndrome and are more aggressive in risk-taking than in closed innovation ones (Herzog & Leker, 2010). Studying manager characteristics and practices of absorbing and using external knowledge in OI in manufacturing and services firms, Pedrosa, Välling, and Boyd (2013, p. 254) found that *"… the exploration, transformation, and exploitation of external knowledge are associated with a distinct set of managers' characteristics and practices that capture the dominant pattern of processing external knowledge in open innovation."* Being socially competent, committing to innovation success, being open to change, and brokering solutions are also important attributes for OI professional profiles (du Chatenier, Verstegen, Biemans, Mulder & Omta, 2010). The diversity in the backgrounds of resources working on OI is important, although this factor can be a source of social and communicative dilemmas as well, which can result in conflicts and project failures (du Chatenier, Verstegen, Biemans, Mulder & Omta, 2010). PSFs face this reality since their employees are often from diverse background ranging from engineering, accounting, human resources, to arts and healthcare or others. Based on Teece's notion of dynamic capabilities (1997), Lichtenhaler (2011) introduced a conceptual capability-based framework for organization, project and individual level. It defines these capabilities based on the 3 major phases of the open innovation as per Table 2-7 below:

Table 2-7: Capabilities-based framework for OI (Lichtenhaler, 2011)

	Level of analysis	Knowledge exploration	Knowledge retention	Knowledge Exploitation
Internal	Organizational level	Inventive capacity	Transformative capacity	Innovative capacity
	Project level	Make decision	Integrate decision	Keep decision
	Individual level	**Not-invented-here attitude**	Not-connected-here attitude	**Not-sold-here attitude**
External	Organizational level	Absorptive capacity	Connective capacity	Desorptive capacity
	Project level	Buy decision	Relate decision	Sell decisions
	Individual level	**Buy-in attitude**	Relate-out attitude	**Sell-out attitude**

In fact, employees have both intrinsic (self-enjoyment) and extrinsic (monetary rewards) motivations that drives them to contribute to open innovation (Frey, Luthje, & Haag, 2011), a key determinant of the success of its implementation.

Conclusion: Individual level capabilities and preferences are another main element for an open innovation conceptual model.

2.3.4.3 **Technology Management for Open innovation**

Open innovation involves, in many cases, online crowdsourcing platforms designed to allow remotely-located individuals and organisations to collaborate during new product or service developments. The proliferation of these platforms supporting innovation contests has increased significantly in the past decade (Adamczyk, Bullinger, & Möslein, 2012). Companies like Starbucks (My Starbucks Idea), Dell (Dell IdeadStorm), P&G, Cisco, Sony, and others have launched online crowdsourcing platforms to obtain contributions from new innovators outside their boundaries (Chesbrough, 2003a; Del Rocio Martinez-Torres, Hossein & Islam, 2015, 2015b; Martínez-Torres, 2013; Ramaswamy & Gouillart, 2010; Rodriguez-Pinero, & Toral, 2015; Westerski *et al.*, 2013). A main factor for its increase is that consumers, for instance, do not need specific subject matter expertise to be able to contribute (Füller, Matzler, Hutter, & Hautz, 2012). Some authors refer to this type of collaboration in companies as *'Enterprise 2.0'* (Carbonera, Contrerasb, Hernandezc, & Gomez-Pereza, 2012). These tools are not designed only for developing new products but in many cases, for promoting sustainability as well (Adamczyk, Bullinger, & Möslein, 2012).

These platforms, despite their positive impacts on business and society, also have their limitations. For instance, Hossein and Islam (2015) found when examining the Dell IdeaStorm platform, that only a small portion of submitted ideas are implementable. To improve the accuracy and impact of their contests, new specialized companies are emerging. Firms take in charge the organization of the contest according to best practices they have learned through prior experience, some of them being non-profit organizations such as the X Prize Foundation (Hossein & Kauranen, 2014). This involvement is made increasingly possible by information systems (IS) that play an important role in crowdsourcing; however, the literature has not covered IS in a context open innovation in depth. IS is, however, *"… not just an enabler but rather can be a shaper that optimizes open innovation in general and crowdsourcing in particular"* (Majchrzak & Malhotra, 2013, p. 257). Open innovation platform providers usually offer a portfolio of different services beyond the simple platform itself, such as workshops, contests, market search and technical search. The 2013 RWTH open innovation accelerator survey shed the light on some of these services. Some of the main platform providers have been scanned and the Figure 2-5 below highlights some of them, an indication of their proliferation.

Figure 2-5: Examples of online crowdsourcing platform service providers by category

Conclusion: Technology management is another main block for an OI conceptual model.

2.3.4.4 **Knowledge Management**

Knowledge management is a key concept in the literature on open innovation in non-services firms. This section outlines two main axes to better understanding the importance of KM: (1) Key aspects that define KM are presented, (2) Knowledge Management Systems (KMS).

2.3.4.4.1 *Key Aspects of Knowledge Management*

Knowledge is a complex theory and is still subject to debate (Grant, 1996). Brown and Duguid (1998) consider organizations as complex knowledge developers and a medium to circulate it. Managing knowledge in organizations is therefore a fundamental aspect at the strategic level of the firm, thus affecting all functions in order to create a sustainable competitive advantage. Some important components are necessary to identify in the literature in order to understand knowledge in firms, a key determinant for sustainable competitive advantage through innovation and more recently, OI. Table 2-8 summarizes the main componets needed for a KM definition:

Table 2-8: Components of knowledge management definition

Component	Dimension
Properties of knowledge	o Tacit o Explicit
Units of analysis	o Individual o Group

Table 2-8: Components of knowledge management definition (cont'd)

Component	Dimension
	o Organization o Inter-Organization
Type of relationship between units	o Structural or formal o Social or informal
Locus of the knowledge	o External (acquisition) o Internal :New Combinations vs. Existing o Co-creation with partner
Knowledge processes	o Exploration o Interpretation o Transformation o Exploitation

It is important first to differentiate between knowledge, information, and data. Kogut and Zander (1992) present an interesting concept where knowledge is the sum of *know-how* (accumulated practical skill) and *information:* organizations know more than what they can say. Relying on the definition presented by Nonaka (1994), information is defined as ''*a flow of messages*'' and knowledge as relating to a human action and being ''*created and organized by the very flow of information, anchored on the commitment and beliefs of its holder*''. Data are facts, raw numbers (Alavi & Leidner, 2001).

Types of knowledge

Literature differentiates between two major types of knowledge, tacit and explicit knowledge, as highlighted in Table 2-9 below presenting a brief description of each:

Table 2-9: Tacit vs. Explicit Knowledge

Type of Knowledge	Description
Tacit knowledge (Nonaka, 1994) or know-how (Grant (1996), Doloreux and Laperrière (2014)	Mostly personal and intangible knowledge, which takes the form of individual expertise obtained through interpersonal networks (Haas & Hansen, 2005). *Tacit* knowledge resides in the heads of individual professionals and cannot be easily codified (Van den Bosch *et al.*, 2005), shared through training, or gained by personal experiences (Doloreux & Laperrière, 2014) with the necessity for direct interaction (Klaesson & Norman, 2015).
Explicit knowledge (Nonaka, 1994) or know-about (Grant, 1996)	Codified in written documents and information is saved in electronic databases and knowledge management systems (Haas & Hansen, 2005; Van den Bosch *et al.*, 2005). Explicit knowledge is revealed through its communication (Grant, 1996).

Units of analysis of knowledge

This knowledge takes place at the individual, group, organizational, or inter-organizational level (Kogut & Zander, 1992; Nonaka, 1994). Knowledge has a dynamic nature that amplifies individual knowledge into groups and then organizational knowledge (Kogut & Zander, 1992; Nonaka, 1994). Alavi and Leidner (2001, p. 123) define this process as the development of new content or the replacing of existing content with new tacit and explicit knowledge. According to these authors, "*knowledge management consists of a dynamic and continuous set of processes and practices embedded in individuals, as well as in groups and physical structures*". Knowledge needed for innovation is increasingly distributed both within organizations (e.g., across functions and geographically dislocated business units) and across organizations (e.g., consultants and user firms). This presents new challenges to creating, sharing, and managing the knowledge and expertise needed for innovation. This is because the communication of tacit knowledge requires some shared system of meaning so that it can be understood and applied (Hislop, 2002; Nonaka, 1994). Interactive innovation, however, involves disparate social communities, which can have very different systems of meaning.

Types of relationships between units

The knowledge in firms can be transferred either in a formal or informal way:

1. **Formal knowledge** is comprised of all forms of knowledge sharing that are institutionalized by management such as tools, methods, and cases (Werr & Sjernberg, 2003).
2. **Informal knowledge refers** to informal networks and communications, which are an important source of knowledge. Relationships with friends, exchanges with colleagues, trust, and openness (Werr & Sjernberg, 2003) are important determinants for knowledge transfer.

Locus of knowledge

Knowledge in firms can have different loci: either external (clients, networks, communities of practice); internal (practices, partners, knowledge management systems and databases); or in-between when it is co-created with partners. The latter is very prevalent in PSFs and is key to opening innovation success. In fact, use of external knowledge sources results in a more varied set of ideas to draw from, and ultimately increases innovative performance (Wagner, Hoisl, & Thoma, 2014). However, Denicolai, Ramirez, and Tidd (2014) found that knowledge intensity and externally acquired knowledge affect firm performance but through an inverted U-shaped function. This means that the benefits reach an optimal point of balance.

Knowledge management strategies and processes

The significant human side in knowledge management makes it very complicated to manage, since it is affected by factors such as beliefs, goals, politics, and perception (Draft & Weik, 1984). For different situations, different knowledge management strategies can be applied or combined. Hansen *et al.* (1999) discuss two main strategies: *personalization* and *codification*. *Personalization* means that the strategy focuses on a ‘’person-to-person’’ approach with the human interaction and exchange as the founding principle; particularly effective for tacit knowledge transfer (social or informal type of relationship). *Codification* strategy focuses rather on a “people-to-document” approach by using systems to codify, store, and disseminate explicit knowledge for reuse (formal or structural type of relationship). As advanced by Hansen *et al.* (1999), a company should choose a strategy or a combination of strategies according to its competitive strategy. A firm focused on highly customized services for unique problems such as professional services should foster a personalization strategy, while those dealing with similar problems and producing similar outputs should focus on codification strategies to be able to use stored information. A combination of both is the most dominant strategy in firms adopting a knowledge management system with the personalization strategies being more effective in boosting performance (Mangiarotti, 2010).

2.3.4.4.2 *Knowledge Management Systems*

Open innovation requires the use of knowledge management systems that are capable of supporting the diffusion, sharing, and transfer of knowledge within the firm and with the external environment (Chiaroni *et al.*, 2010). Even though technology is identified as a key determinant of successful open innovation implementation in organizations (Chesbrough, 2003a), the literature is still scarce on the subject (Dodgson, Gann, & Salter, 2006). These authors studied the role of technology in open innovation and found that information and communications technologies enable the exchange of distributed sources of information in the open innovation process. At Procter & Gamble for instance, a new set of ‘’*innovation technologies*’’ has been developed to support open innovation. Companies such as InnoCentive develop technological platforms to support open innovation processes from ideation to commercialization (Chesbrough, 2003).

Information systems are not just enablers but rather also shapers that optimize open innovation in general and crowdsourcing in particular (Majchrzak & Malhotra, 2013).

The tools needed to manage knowledge in PSFs (e.g., KMS) are expensive and it is hard to assess the real tangible benefits, especially in the case of knowledge-intensive service providers such as consulting (Sarvary, 1999). Measuring outcomes and putting in place metrics systems in services is more difficult than in other fields (Ettlie & Rosenthal, 2011). As a result, another challenge affects the possibility of measuring the real effects on performance of KMS's to justify the additional investment and monitoring needed for open innovation. Indeed, Brown and Duguid (1998) discuss the *''productivity paradox''*: the increasing investment in new technology is not yet translated in increased productivity. A similar paradox in practice is recognized, especially in service firms where the bulk of knowledge is tacit (Gallouj & Weinstein, 1997).

Knowledge capture and retention through information systems have become a central piece in knowledge management for storage and retrieval known as organizational memory (Alavi & Leidner, 2001). Specialized knowledge management systems (KMS) have been developed to support and augment organizational knowledge through the different processes presented above (Alavi & Leidner, 2001; Brown & Duguid, 1998). This process takes place in parallel to other processes, since at every other process, looking for existing knowledge or contributing to the body of knowledge are key activities. This KMS can be very useful in professional services firms, especially if centralized (Savary, 1999). In fact, Yang *et al.* (2014) found that such systems helped reduce time in crucial activities in an engineering consulting firm. They noted an increase in the use of KMSs as means to enhance their services.

Alavi and Leidner (2001, p. 119) used the example of McKinsey's practice development network in observing the knowledge management strategies of management consulting firms. They stated that, by drawing on KMS technologies, *'…most consulting firms have created semantic memories by developing vast repositories of knowledge about customers, projects, competition, and the industries they serve'.* Long-term relationships with clients are a key business driver to the management of consulting firms. However, the industry is witnessing a high mobility of resources, a balancing in individual career and business performance, which Kasper, Mühlbacher, and Müller (2008) define as 'co-evolution'. They combined web access to knowledge and databases with learning-by-doing and training on-the-job, which resulted in an effective KMS.

The systems in place are used to trace back this individual expertise within the organizational network (Kasper et al., 2008). A centralized IT-system doesn't always satisfy the context-specific knowledge sharing needs of different practices within a management consulting firm (Michailova & Gupta, 2005). KMS failures can be attributed to an over-emphasis on technologies and insufficient acknowledgement of the ''*humanness*'' of knowledge. More recent work in KM is placing increasing emphasis on knowledge management through organizational cultures, structures and systems that facilitate the flow of knowledge among people, with structures and systems supported by technologies; yet ironically, this has resulted in increasing confusion in how best to manage KM initiatives (Alavi & Leidner, 2001).

Conclusion: Knowledge management is a key Concept for open innovation. For OI to succeed, effective knowledge management strategies, capabilities and systems need to be in place.

2.3.5 Building Block 4: Risk Management

With an increase in partnerships, external collaborations and intensive exchanges, open innovation drives new types of risks to the organization, especially those related to the management of intellectual property rights between the different involved parties. Intellectual property protection is not necessarily always formal. In many cases, the type of protection varies from formal (e.g. patent, utility model, design right) to semi-formal (e.g. secrecy, publishing, restricted access to information), to informal protection approaches (e.g. division of duties, circulation of staff between tasks) (Päällysahoa & Kuusistob, 2011).

2.3.5.1 ***Risks of Open Innovation***

Despite all its benefits, openness can be costly (Laursen & Salter, 2006a). Open innovation and business models relating to it are changing practice and creating strategic positions that hitherto had not been clearly articulated (Chesbrough & Appleyard, 2007). The success of open innovation can differ across technologies and industries (Christensen *et al.,* 2005). The literature on open innovation has mostly focused on the benefits of the concept and little on the risks and challenges (Paasi *et al.,* 2015). Given the very nature of the open innovation paradigm, several risks can be identified accordingly as synthesized in the Table 2-10 below:

Table 2-10: Key Risks of OI Identified in Literature

Risk Category	Description and Authors
Lack of Efficiency	Caused by collaboration and exchanges (Suh & Kim, 2012)
Partner's Deceitful Behavior	Das (2005); Hagedoorn and Zobel (2015)
Leakage of internal knowledge and resources	Risk of losing part of the firm's know-how (Fredberg, Elmquist, & Ollila, 2008; Hagedoorn & Zobel, 2015; Wenjuan & Lei, 2010).
Loss of Corporate Crown Jewels	Loss of key innovations (Chesbrough, 2003; Wenjuan & Lei, 2010).
Strategic competitive risks	Exposing one's innovation to competition, which can lead to challenges of quick imitation of new services by competitors (Kohler, Sofka, & Grimpe, 2008).
Confidentiality and intellectual property rights	Firms would be required need to share parts of their innovation outside of the actual boundaries (Arrow, 1962; Chesbrough, Paasi *et al.*, 2015; Vanhaverbeke & West, 2006; Wenjuan & Lei, 2010).
Declining marginal return	Openness can eventually lead time to a decrease in the returns measured by innovation performance (Huang & Rice, 2013).
Lengthy and time consuming	As in Fujitsu's case when trying to ensure a successful OI collaboration (Edmondson & Harvey, 2016). This can be easily underestimated.
An inappropriate governance structure	Either results in bad decision-making processes or reduced revenue streams due to sharing of profit (Eisendhardt & Schooven, 1996; Das & Teng, 2001; Harrigan, 1988; Killing, 1988; Hagedoorn & Zobel, 2015) thereby feeding the risk of **small or unequal pay-offs**.
Management Priority	OI entails a significant risk of distraction from core activities by the management team (Kohler, Sofka, & Grimpe, 2009). Laursen & Salter (2006) argued that firms can 'over-search'. An important risk element related to this category, is the balance between value creation and value capture (Chesbrough & Appleyard, 2007).
Lack of resources	Open innovation might require resources to concentrate on developing relationships with external partners (Chaminade & Edquist, 2006; Jong, Vanhaverbeke, Kalvet, & Chesbrough, 2008)
Development risks	That regroup the technological, commercial, and R&D risks that open innovation can result in (Brokhoff, 1992; Das & Teng, 2001)
Appropriability risks	Limit the capability to capture the benefits of OI (Suh & Kim, 2012)
Imitation risks	Can impact all phases of the innovation process (Veer *et al.*, 2013).
Higher costs of transactions	Caused by coordination, management, and control (Christensen *et al.*, 2005; Hagedoorn & Zobel, 2015).
Slower product development and time-to-market	**Longer cycle if a large number of internal and external** (Hsieha & Tidd, 2012; Knudsen & Mortensen, 2011).
Attention issues	As a result of the many sources of knowledge and innovations (Paasi *et al.*, 2015; Veer, Lorenz, & Blind, 2013).

Very few studies evaluate empirically the impact of risk management on open innovation. These risks limit the impact expected from OI; firms have to closely manage them.

Conclusion: Risk management is a main concept in the open innovation literature given all the changes to the business models and innovation processes that the paradigm shift entails.

2.3.5.2 **IP Management**

2.3.5.2.1 *IP management and the Closed Innovation Paradigm*

IP management with regards to new services development is not that important in professional business services for following reasons: 1) Tacit knowledge is what really matters; 2) Services depend on people and 3); Ideas can easily be copied. However, it takes finding the right people and having the experience in delivering the services for a company to gain the trust of the client. The capture of value in the conventional model relies on strong intellectual property protection, especially patents that confer a temporary monopoly. However, in most competitive arenas, patents are often entry tickets to cross-licensing rounds. Value capture tends to be achieved not through intellectual property protection but on the basis of competitive advantages arising from economies of scale, reputation, and marketing muscle (Miller *et al*., 2008). In traditional or closed Innovation, patents have been considered as barriers to entry and means to protect the competitive advantage of firms through strong vertical integration with the knowledge transfer occurring only as specialised features (Chesbrough, 2003a; 2003b). However, Henkel (2006) argues that companies should rethink their practices regarding IP and show a more positive attitude towards revealing the results of research so as to better share the benefits of OI.

2.3.5.2.2 *IP Management and the Open Innovation Paradigm*

Business models become a key element of a strong IP management strategy in open innovation and a basic attribute for creating and capturing value in this new paradigm (Chesbrough, 2006; 2007a; 2007b). In the new paradigm, IP should be connected to business models and not isolated by legal departments that have no real knowledge of the business aspects of the new idea or technology (Chesbrough, 2006). In fact, Bogers (2011) recognized the presence of an inherent paradox based on the natural tension between knowledge sharing and protection in open innovation. He called it the *‘’open innovation paradox’’*. It identifies a major issue regarding how firms can create and capture value from this paradigm while managing their knowledge effectively. Instead of managing IP to exclude rivals, the open innovation paradigm calls for managing IP to profit from others’ use of it. In a world of abundant knowledge, companies should be active buyers, and active sellers, of IP (Chesbrough, 2003; 2003a). IP management in an open innovation context is more complex, since the number of players are greater, especially in professional services where innovation is mostly based on knowledge and ideas; hence the difficulty of drawing a line between a client and a professional's contribution. With the increased mobility induced by open innovation, the risks are greater (Wenjuan, & Lei, 2010). Strategic alliances and partnerships, crowdsourcing, massive collaboration, and globalisation are also sources of risk in IP in the context of open innovation (OI). Firms active in open innovation are known to have strong preferences for governance of relationships with other entities through formal contracts (Hagedoorn & Zobel, 2015), despite the open nature of OI. This limits the risk on their innovation capabilities. Reed, Storrud-Barnes, and Jessup (2012, p. 59) considered IP as a key determinant of the types of innovations: *"Open-innovation takes three main forms: firm controlled, third-party controlled, and community controlled."* OI involves capturing value through buying and selling IP outside the boundaries of the firm. This can be a very lucrative endeavor: for example, IBM gained $1.9 billion in royalty fees for its IP in 2001 (Chesbrough, 2003a). Selling IP also means that the risk level of competitors being able to copy one's product or service is greater. The need to clearly define an IPR management strategy that protects the firm becomes a key issue in open innovation (Bogers, 2011). Along with knowledge management, IP management has moved into the business model (Chesbrough, 2007). In a study of 154 industrial firms, Lichtenthaler (2010) showed a strong positive relation between patent quality and successful innovation exploitation, both internally and externally. A high-quality patent portfolio positively affects the performance of a firm in external and internal technology exploitation.

2.3.5.2.3 *IP Management Strategies*

Different IP management strategies are proposed in the literature to reduce risks in open innovation endeavors. Chesbrough (2003a) focuses on the importance of adapting the business model of firms to allow for improved IP management in an OI context, based mostly on the flexibility of the system and its capacity to adapt to different types of innovations and ecosystems. Therefore, constructing a business model for a better IP management is one way of protecting intellectual property. The literature presents other strategies: exploring the tools and means of the evaluation of the value of IP; fostering the IP rights trading market; strengthening the protection of core technologies in enterprise by establishing a sound system of protection and safeguard; strengthening the technical protection awareness of the technology alliance participants; and insuring the flexibility in the system. However, given the nature of the product of professional services firms, IP management is a greater challenge. There is an inherent paradox caused by the natural tension between knowledge sharing and protection, which has been minimally exploited in the literature to date (Bogers, 2011). Bogers found that companies can cope with this tension by implementing a knowledge exchange strategy. Even more so in professional services firms, since the key competitive advantage and product is knowledge, protection of IP is challenging and difficult to define, and evaluation of costs of transactions are not easily completed. It might be more effective to strengthen the risk control, and most importantly create an open innovation culture based on fostering partnerships and mutual trust. Hagerdoorn and Zobel (2015, p. 1058) study the role of contracts and intellectual property rights in open innovation. They find that “the more open firms are, in terms of their external knowledge exchange, the higher their preference for IPR”.

Conclusion: Risks in general, and those related to IP management in particular, are an important aspect of Open Innovation in general, since it changes the way companies used to operate and innovate, breaking down the boundaries and traditional silos. They have an influence on the impact that openness and innovation have on the companies’ performance.

2.3.6 Building Block 5: Impacts of Open Innovation

Any change in an industry or company has its own benefits from a competitive advantage perspective, but also generates risks. This section outlines the main risks and benefits of implementing open innovation, according to the literature. Literature has widely studied the effect of OI on performance of companies in different industries. Most of these studies have identified positive performance effects from incorporating external knowledge and networks (Chaston, 2013; Gemünden *et al.,* 1992; Laursen & Salter, 2006; Love & Roper, 2004) and better financial and innovation performance from increased openness (Hemphälä & Magnusson, 2012; Temel, Mention, & Torkkeli, 2013; Wagner, 2013). Some authors find that “*basic open innovation approaches, such as inter-organizational collaboration, technology acquisition and R&D contracting-out*” have positive effect on innovation performance (Huang & Rice, 2013). In fact, open innovation can result in increased propensity to innovate and reductions in time-to-market (Enkel, Gassmann & Chesbrough, 2009; Zhao, Sun, & Xu, 2015). Some authors found that in new services development, increased openness resulted in more diverse and rich innovations (Hsieha & Tidd, 2012). Avoiding false positives and negatives through an inappropriate procedure is also a positive side of open innovation (Chesbrough, 2003a). Since in some cases, innovation can be performed outside the boundaries of the firm, the new paradigm can result in less time spent managing innovation processes and improved communication at all levels of the organisation, since new lines of communication are now opened with external resources (Huizingh, 2010). With different stakeholders and departments involved in open innovation, this approach can result in faster corrective action taken in under-performing areas, in an improved understanding of where and how ideas originate, and in faster and more focused targeting of resources on profitable innovations. Cooperation with industry partners and sourcing of information from the market have in fact a positive effect on both innovation intensity and output (Mention & Asikainen, 2012). Therefore, open innovation can lead to an overall reduction in both risk and time-to-market for key innovations (Chesbrough, 2003a; 2006, 2007; Gassmann & Enkel, 2004). Based on the literature, innovation performance is positively impacted by the "existence of a network of different types of external partners around a firm (Verbano, Crema, & Venturini, 2013). Empirical research shows the positive impact on market, financial, overall performance and innovation capacity of firms (Cheng & Huizingh, 2014; Enkel, Gassmann & Chesbrough, 2009; Kafouros & Forans, 2012; Mahr, Lievens, & Blazevic, 2014; Verbano, Crema, & Venturini, 2013; Zhao, Sun, & Xu, 2015). Details on OI key success factors needed to achieve those benefits are presented in Appendix C.

Conclusion: OI processes impact directly and positively the performance of the firms adopting them through increased innovation propensity, financial, reputational, and relational performance.

2.4 Conclusion: Open Innovation Conceptual Model

The five building blocks constitute the main foundations of the conceptual model that is developed throughout this research. By grouping the main eight blocks identified in the literature, five main ones emerged:

(1) Erosion factors;

(2) OI processes, with coupled processes including partnerships;

(3) Organizational management with knowledge management;

(4) Risk management with IPR, and

(5) Impacts/Benefits.

As a conclusion, the following conceptual model is suggested and presented in Figure 2-6:

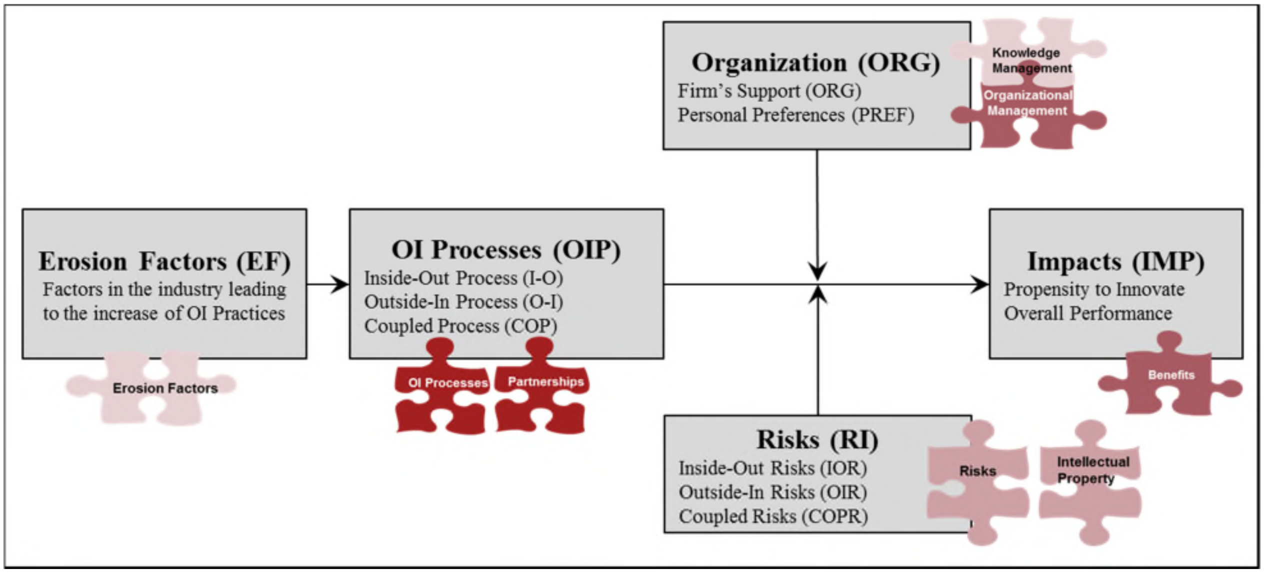

Figure 2-6: OI Conceptual Model

This conceptual model is used as the basis for the research and will evolve as the next sections advance to be adapted and adjusted for the services industry in general, and professional services in particular. It allowed the identification of the following key research questions:

- Is there an interest from a literature review perspective to consider OI in PSFs?
- Is there an interest from a practical angle in the professional services firms?
- What are the particularities of OI in services in general and PSFs in particular?
- What erosion factors mentioned by Chesbrough (2003) do we observe in PSFs?
- What determinants of the three processes (Gassmann & Enkel, 2004) that define open innovation do we observe in the professional services firms:
    - Outside-in process – acquisition? External innovation use internally? Spin/License-in?
    - Inside-out process – spin-off? Internal innovation brought out to market? License-out?
    - Coupled process - partnerships and joint innovation and exploitation?
- What organizational factors influence the dynamics of Open Innovation?
- What risk management factors influence this dynamic?
- What impacts are observed on the performance of professional services firms?

The next chapters aim at better understanding the innovation services in general, and professional services in particular.

CHAPTER 3 INNOVATION AND OPEN INNOVATION IN SERVICES AND PROFESSIONAL SERVICES

In this chapter, the literature review focuses on better understanding the professional services industry, its dynamics, trends, evolution, challenges, and players in order to better position the research in its practical context. It is complemented by some of the interviews results as well in order to confirm or not the findings. This chapter is divided into the following four sections:

1. Service Innovation and Open Innovation Literature
2. Professional Services Industry Overview
3. Innovation in Professional Services Firms
4. Main Trends and Challenges Impacting PSFs
5. Conclusion.

3.1 Services Innovation & Open Innovation Literature

Companies in non-services sectors, especially in manufacturing and technology, face the risk of falling in what Chesbrough (2011) calls *"The Commodity Trap"*, caused by the following business realities:

- Product and process knowledge are widely distributed
- Products are moving to low cost countries
- Shrinking product life cycle

To avoid this trap of product innovation, services are rising as new sources of growth (Chesbrough, 2011; Sawhney *et al.*, 2004). Given this new reality, this section's the objective is to present the literature on innovation and open innovation beyond non-services sectors. The goal is to assess whether there is an interest in extending the conceptual model developed for non-services firms into services sectors. The services sectors covered by the innovation & open innovation literature since 2003 is reviewed and presented. The objective was to investigate whether professional services have been covered already, and if so, through which lenses. We found that the literature on services in general has increased, with different studies on some of sub-sectors. Professional services, as of the date of publication of this document and to the best of our knowledge, have not been covered yet in literature reviews.

This section covers the following main themes:

1. Innovation in Services Overview
2. Typologies of Innovation in Services
3. Open Innovation in Services.

3.1.1 Innovation in Services

A service is defined as *“the application of competences such as knowledge and skills by one party for the benefit of another”* (Westergren, 2011). Service science, an interdisciplinary umbrella for diverse disciplines, has witnessed an explosive growth in the literature, aiming to better understand the complexity of services (Caroll & Helfert, 2015). However, few studies have focused only on innovation in services (Janeiro, Proença, & Da Conceição Gonçalves, 2013). In fact, innovation in services is difficult to pinpoint and is often co-produced with the customers; it has experienced an increasing interest (Djellal & Gallouj, 2010; Gallouj, 2002a; Love *et al.* 2011) but is still less understood than in manufacturing or high-tech industries (Hogan, Soutar, McConnell-Kennedy, & Sweeney, 2011). Innovation in the services sector is different from the rest since services and processes are hardly separable compared to products (Love *et al.*, 2011). The use of external sources of knowledge is important for innovation success and, this through customers and suppliers, in particular for services innovations (Love *et al.*, 2011). Internal openness is also a key success factor for innovation success: team work is a key concept for knowledge integration and information exchange, and hence innovation performance along with trust and cross-functional teams.

Innovation in services is different than manufacturing, according to the literature (Mention & Asikainen, 2012), and studies on the former have lagged behind (Lilis *et al*, 2015). In the former, innovation does not follow a technological trajectory but rather *'service-professional trajectories'* (that is, a certain number of ideas on management, banking, etc.) in which technologies are only one vector among several (Gallouj, 2002a). One of the fundamental characteristics of service activities, particularly *'knowledge-intensive'* ones, is client participation (in various forms) in the production of the service (Gallouj & Weinstein, 1997). It is difficult to distinguish between product and process in services innovation since most of the time, the service is a process itself. Two main research streams have emerged in the literature on innovation in services: 1) structured, systemic, and sequential processes and 2) ad hoc innovation [the interactive (social) construction of a solution to a particular problem posed by a given client], an important form of innovation in professional services, where the available knowledge and experience accumulated over time are harnessed and put to work synergistically to create fresh solutions, and that new knowledge in turn changes the client's situation in a positive and original way (Gallouj & Weinstein, 1997; Skalen, Gummerus, von Koskull, & Magnusson, 2015). Studies have shown that innovation in services is, most of the time, a 'bottom-up process resulting from the employees' actions rather than a structured top-down approach" (Lillis *et al.*, 2015).

Ettlie and Rosenthal (2011) stated that services are more likely to convert novelty into success then manufacturing sectors. Services are more likely to have a shorter testing process and to exploit internally sourced ideas about new offerings as an alternative to formal innovation structures. However, both manufacturing and services show similar preferences to exploiting externally sources ideas from customers for new offerings.

Since the barriers to entry are usually low, except for services that require high-capital such as banking (Ettlie & Rosenthal, 2011), it is difficult to protect a firms' IP through patenting innovation; as a result, knowledge and innovation transfer to partners are difficult (Chesbrough, 2011). Another issue in service innovation, measuring, remains a challenge to practitioners and scholars alike (Gallouj, 2002b; Castro *et al.*, 2011) since metrics are variant (Ettlie & Rosenthal, 2011). In the case of service development, business models are central to creating and capturing value from open innovation (Chesbrough, 2011), and more specifically, in integrating technology, in particular ICT, into the process for greater efficiency. The business model also allows for services bundling and integration, a particularity of open innovation in the service development domain. Service and process innovations are strongly inter-related (Love *et al.*, 2011), even entangled (Ettlie & Rosenthal, 2011). Love *et al* (2011) conceptualized a framework of knowledge management according to the innovation value chain in an OI context in business services in three phases: knowledge sourcing; transformation; and exploitation.

Services output evaluation and study are challenging because of the immateriality of the outcomes produced that are not embodied in anything that is physically quantifiable (Gallouj & Savona, 2008). The authors define services as a process, a sequence of operations, a formula, a protocol, a problem solution. The real problem lies therefore in the measurement of the output. Coombs and Miles (2000) proposed three different approaches that are applicable to the study of innovation in services. The first, called the *'assimilation approach'*, is the most traditional and widely-known, and regards services and innovation in services as similar issues to manufacturing and innovation in manufacturing. The second, the *'demarcation approach'*, argues that service innovation is distinctively different from innovation in manufacturing, following dynamics and displaying features that require new theories and instruments. Finally, the *'synthesis approach'* suggests that services and manufacturers do not follow entirely different approaches to innovation, but that studies of services and their innovation activities bring to the forefront neglected aspects of the innovation process, which, although most prominent in services, are increasingly widely-distributed throughout the economy (Castro *et al.*, 2011). Castro *et al.* also found while studying a sample of 11,330 companies in Spain, that companies in the services industry were more likely to innovate in their relationships with other companies.

In services, innovation requires more involvement from customers in the process in order to offer more meaningful experiences (Mention & Asikainen, 2012). In this case, the service itself and the process to develop and deliver it are hardly separable (Love *et al.*, 2011). Innovation takes an intangible form, making IP protection more challenging (Mention & Asikainen, 2012). Innovations are mostly suppliers and clients oriented with strong interactions during the process. In fact, Loof and Heshmati (2006) confirmed the positive effect of supplier and market information on innovation output in service firms. However, despite differences between manufacturing and services, or products and services innovations, the literature also shows that these types of innovations share many similar aspects. In fact, service and process innovations are strongly inter-related (Love, Roper, & Bryson, 2011), even entangled (Ettlie & Rosenthal, 2011). Findings on product-focused innovation can be applied to service innovation (Guile *et al.,* 1988), and Barras (1986, 1990) even describes the service as a *'reverse product cycle'*. Nijssen *et al.* (2006) found compelling evidence that *'new service development'* and *'new product development'* can be considered to have the same underlying dimensions of innovation.

3.1.2 Typologies of Innovation in Services

The literature has witnessed recent interest in innovation in the services sector (Castro *et al*. 2011; Gallouj & Weinstein, 1997). Several authors have attempted to define a typology of innovation in services, and differentiate it from the non-services industries. This section presents the main ones from the literature.

High-tech vs. Manufacturing vs. Services

Scholars have attempted to identify the differences between the service and manufacturing industries (Castro *et al.,* 2011; Gallouj & Savona, 2009; Nijssen *et al*., 2006). The major differences found are related to the nature of the services. Hertog (2000) found that, unlike manufacturing firms, service firms gain competitive advantage primarily through their ability to make use of their knowledge and rely less on the product. Castro *et al.* (2011) find similar results: manufacturing firms innovate mostly in product and process innovation, while companies in the services sector rely mostly on innovating the relationships they have with other firms, sales, and distribution methods. Services, therefore, build their competitiveness through innovations that are mostly intangible, perishable, co-produced with the client, simultaneous, heterogeneous (Nijssen *et al.,* 2006), and non-standardized (Ettlie & Rosenthal, 2011). One of the main features of service activities is that the technologies used take the shape of knowledge and skills embodied in individuals and implemented directly when the transaction occurs (Gallouj & Weinsten, 1997).

Services also exhibit a greater willingness to cannibalize organizational routines that play a more important role in the propensity for innovation than product innovation (Nijssen *et al*., 2006). However, Nijssen *et al.* concluded that there was compelling evidence that *'new service development'* & '*new product development'* can have similar underlying innovation dimensions. Tether and Tajar (2008) proposed a different typology of three types of innovations in all firms: a product-research mode; a process-technologies mode; and an organisational-cooperation mode. The first is considered to be most prominent in high-tech firms; the second, in low-tech manufacturers; and the third is dominant in the services sector. The latter involves changes to the supply-chain rather than technological-based innovations. In the services sector, the main innovation is not necessary a new or significantly-improved product. Rather, it entails *"…complex changes related to distribution methods and networks, client cooperation & interaction, or quality control and assurance, as well as technological options."* (Asaikanen, 2015).

Services in General

Some academics have attempted to develop a typology for service innovations. Through an empirical study of eight service companies, four types of innovations in services were defined as per the following Table 3-1 by Skålén, Gummerus, von Koskull, & Magnusson (2015):

Table 3-1: Typology of service innovation (Skålén *et al.*, 2015)

	Resources	
Practices	Existing (slightly modified)	New
Existing (slightly modified)	1. Adaptation	2. Resource-based innovation
New	3. Practice-based innovation	4. Combinative combination

Business Services

When looking closer into business services, Love *et al.* (2011) identified three forms of innovation: developing new or significantly improved services, developing new or significantly improved service production methods or process innovation, and changes in organizational structure or organizational innovation.

Knowledge-Intensive Business Services

Den Hertog and Bilderbeek (1998) put forward a model of innovation in knowledge intensive business services that considers the following four dimensions in Figure 3-1:

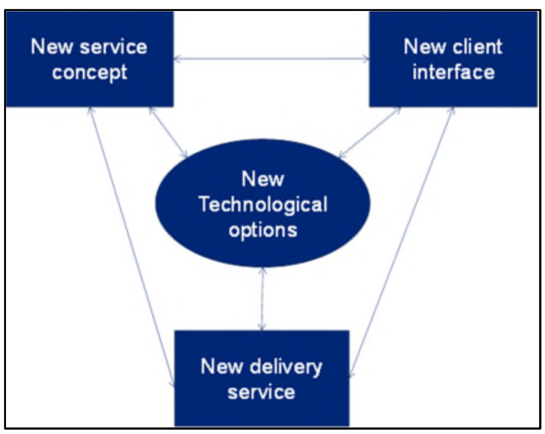

Figure 3-1: Model of innovation in KIBS, adapted from Den Hertog and Bilderbeek (1998)

Searches Typology in Services

Kohler, Sofka, and Grimpe (2008) stated that search strategies are key to defining knowledge sources outside a firm's boundaries in an OI context. Sources are divided into three major categories:

- Market searches involving customers and competitors
- Supply searches involving suppliers, exhibitions and fairs, and professional exchanges
- Scientific search strategies involving public research institutes and universities.

The authors' research proves that, for the services industry, the market-oriented search strategy is dominant. Recently, other academics claim that two main trends have impacted the services sector: 'servitization; and 'openness' (Caroll & Helfert, 2015). These trends support the concept of open innovation in this sector.

Conclusion:

As a conclusion, the literature review points to the fact that firms in the services sectors can't only rely on internal resources but must open up in a way that makes internal and external capabilities complementary and not substitutes (Battisti *et al.*, 2015). This makes services industry an interesting field for studying open innovation.

3.1.3 Open Innovation in Services

Chesbrough (2011) introduced the concept of open services innovation. However, his focus and the cases he presented were those of manufacturing firms. Chesbrough presented cases of companies that are exploring the transition to offering products bundled with services (servitization) and not pure services firms (Eduardo & Sako, 2014). These manufacturing firms have realized that future growth to gain competitive advantages is through services, hence moving to a service value web (Caroll & Helfert, 2015; Mina *et al*, 2014).

Services capabilities are shifting from being traditionally an internal resource to becoming an external opportunity with the open innovation concept (Caroll & Helfert, 2015). The inbound process of open innovation is the most prevalent in the literature for all industries in general (Rubera, Chandrasekaran & Ordanini, 2015) and for services in particular (Helge Aas & Pedersen, 2012), where it is more feasible, especially when it is non-pecuniary.

When analyzing open innovation in services, it is difficult to have a simple dichotomy between open and closed services development (Foroughi *et al.*, 2015). It is rather the quality and intensity of the external relationships that make a difference, along with their capacity to influence the outcomes of projects (Tidd & Hsieh, 2013). This increases with the novelty of the project (Hsieh & Tidd, 2012), firm size, and R&D expenditures (Mina *et al.*, 2014).

Westergreen (2011) found that five environmental factors define the success or failure of OI in services: "*value creation, co-operation, competence, complexity and control*". Studying Korean service industries, Moon (2011) found that having highly-educated employees and being a start-up seemed to be more influential factors for a firm's openness; while Mension and Asikainen

(2012) found that cooperation and information sourcing from competitors have a significant and positive effect on innovation performance. In the case of KIBS, the supplier and customer's knowledge have a strong dependency, especially with increased specialization, knowledge intensiveness, and technological complexity (Aarikka-Stenroos & Jaakkola, 2012). This makes KIBS an interesting field for open innovation research. In these firms, mature relationships play a key role in supporting high performance (Sczertzer, Schertzer, & Dwyer, 2013).

Despite an increase in open innovation literature in services, empirical studies have not always found positive relationship effects of open innovation on performance (Czarnitzki & Thorwarth, 2012; Knudsen & Mortensen, 2011). Given the heterogeneity of the services sector and the diversity of the types of services, other authors have found that the traditional closed innovation model is still prevalent in R&D-intensive services sectors using IPR in the cases of radical innovation development (Battisti *et al.*, 2015). Beyond the sector effect itself on the success or failure of open innovation, the type of cooperation and source of information play an important factor. Mension and Asikainen (2012) found that cooperation and information sourcing from the market have a negative impact in the short term.

As a result, open innovation presents many advantages for services development: better use of external knowledge and bundling of different services; greater flexibility, incorporation of *'best practices'* coupled with a deeper understanding of customers' needs and the entry of small players creating innovative new offerings. It also creates challenges regarding IP protection and measurement of performance, since very little R&D is observed in services development. Case studies in the literature show, however, an interesting future for the paradigm in services development, although it is far from claiming that it is a universal panacea. The field of study in that domain is still at its very early stages, especially when compared with what has been researched in regards to product innovation. The literature has been slow to express interest in open innovation in services in general compared to high-tech or manufacturing (Amir, Buang, Senik, Hajmirsadeghi, & Bagheri, 2015; Foroughi, 2015; Mina *et al.,* 2014; Randhawa, Wilden, & Hohberger, 2014; Tidd & Hsieh, 2013; Tor & Egil, 2012), but have started to improve in the past few years. Authors have covered several sub-sectors of the services industry. The literature review conducted is summarized in the Table 3-2 below, highlighting the main sub-sectors covered:

Table 3-2: Summary of the OI Literature Review Findings by Services Sub-Sector

Sub-sectors	Main findings and authors
1. General services industry	• Kohler, Sofka, and Grimpe (2008) investigated the search strategies in open innovation for services compared to manufacturing firms and found that market-driven strategies based on competitors and customers were dominant in the service firms. • Kohler *et al.* (2010) studied the difference between services- and non-services firms' application of radical versus incremental open innovation. • In services, the main focus has been on business model innovation (Chesbrough, 2011a, 2011b). • Mina, Bascavusoglu-Moreau, and Hughes (2014) studied a sample of 12,000 UK manufacturing (65%) and business services (35%) firms and found that: *"engagement in open innovation increases with firm size and R&D expenditure; Business services are more active open innovators than manufacturers"*. • After an extensive literature review of open innovation, the authors found that what was missing was to: *"Enhance service focus and conceptualize "open service innovation"*. (Randhawa, Wilden, and Hohberger, 2014). • Cheng and Huizingh (2014) surveyed 223 Asian services firms to investigate the effect of open innovation on their innovation performance. The authors found that engaging in open innovation processes had a positive impact on the four aspects of innovation performance: new services innovativeness, new services success, customer performance, and financial performance. • Janeiro, Proença, and Da Conceição Gonçalves (2013) studied the links between 967 Portuguese services firms and universities. They found that firms with higher relationship intensities with universities had a higher level of innovation success. More importantly, KIBS had a greater tendency to use universities. • Mention (2011) studied a diverse set of services firms for open innovation. The author found that those collaborating more and integrating further external sources of knowledge had a greater degree of innovation success. Cooperation and coopetition as open innovation practices in the service sector. • Moon (2011) studied the Korean services industries to identify key success factors of OI implementation. • Open new service development was studied by Hsieh and Tidd (2012) • Knudsen and Mortensen (2011) studied 17 services sectors in 18 European countries; a survey of 110 respondents showed that traditional innovation strategies has better impacts than open ones on a firm's NPD performance.

Table 3-2: Summary of the OI Literature Review Findings by Services Sub-Sector (cont'd)

Sub-Sectors	Main findings and authors
2. KIBS and Incubators	Transaction costs of knowledge transfer, which is mostly tacit, is the main challenge of open innovation in KIBS (Karlsson & Norman, 2013). Innovation and openness was studied in 1,100 UK KIBS, showing the importance of external openness in the initial phases of the process and on the diversity of ideas (Love et *al.*, 2011). A case study including five Italian incubators considered as innovation intermediaries, studied the mechanisms that shape the exchange of knowledge (Macchi, Rizzo, and Ramaciotti, 2014). A survey of 225 business incubators around the world with a focus on two in Spain. Most services were are in an open innovation context with a focus on KIBS (Fernández, Jiménez, & Roura, 2015).
3. IT and Software services	Fujitsu (Edmonson & Harvey, 2016) *"emphasizes the human side of inter-organizational collaboration by highlighting leadership activities".* IT Cloud-computing-driven services were studied for the applicability of their capability maturity models within an open innovation context (Caroll & Helfert, 2015). The authors found a significant gap in the literature. Software services performance is positively impacted by R&D collaboration (Suh & Kim, 2012).
4. Food	*"… two major types of OI practices: development-centric OI (which occurs in the development stage) and commercialization-centric OI (which occurs in the commercialization stage"*. (Rubera, Chandrasekaran, & Ordanini, 2015).
5. Retail	A study of new services development in a chain of convenience stores in Taiwan found that a binary distinction between open and closed was not sufficient. In fact, the intensity of the relationship with partners and suppliers was more determinant than openness itself (Hsieh & Tidd, 2012). Hossein & Islam (2015b) reviewed open innovation at Starbucks through their open idea online platform. Del Rocio Martinez-Torres, Rodriguez-Pinero, & Toral (2015) focused their research on open innovation at Starbucks as well.
6. Apparel	Sports Goods industry (Piller & Walcher, 2006). Apparel (Jacobides & Billinger, 2006). NPD service providers studied footwear, appliance, and vending machine services sectors. For success of the implementation of open innovation, standard approaches related to process and organizational variables were necessary (Colombo, Dell'Era, & Frattini, 2011).

Table 3-2: Summary of the OI Literature Review Findings by Services Sub-Sector (cont'd)

Sub-Sectors	Main findings and authors
7. Experience Firms	Limits of application of open innovation have been studied in Danish firms and showed that they are more dependent on other entities than average. The authors covered innovation in four types of experience firms: 1) tourism, 2) arts and culture, 3) entertainment and leisure; and 4) design, image, and branding. (Fuglsang, Sundbo & Sørensen, 2011). The authors studied 346 travel agencies and found that open services innovation had a positive impact on business performance and increased with competition (Foroughi, Buang, Senik, Hajmirsadeghi, & Bagheri, 2015). Examined application of open innovation practices in experiential tourism was studied. The author found that they used both inbound and outbound practices when developing services (Helge, 2012).
8. Financial Institutions	Two global banks' open innovation practices were studied. The authors found a strong impact on revenues and profits following implementation of open innovation (Gianiodis *et al.*, 2014). Chesbrough (2011:129) showed the importance of the involvement of different players beyond customers during the innovation process. This was done through case studies in the financial services sector with a focus on Merril-Lynch offering third-party mutual funds and shifting from a brokerage model to an *"asset management model"*. Schueffle and Vadana (2015) conducted a global literature review on open innovation in the financial services sector. They found few applications of the concepts of open innovation due to various organizational and monetary factors. Martovoy, Mention, and Torkkeli (2015) found that financial institutions benefit form cooperation for innovation with external partners in several ways: *"increase in customer satisfaction, developed new skills of employees, new technologies, access to knowledge and expertise, decreased costs, and finding a new approach to solve a problem.''* Chaston (2013) studied open innovation for independent financial advisors and found that IFA involvement in networks and OI had a positive impact on their performance. Suh and Kim (2012) cover in their research of SMEs in the financial services industry found that R&D collaboration had a positive impact on performance. Mention and Asikainen (2012) studied openness effects on services in this sector.
9. Education	Allen, Pearson, Fielding, and Bessant (2012) focused on the study of open innovation in 10 universities as a potential source of knowledge. Dory and Tilinger (2012) reviewed the role of universities in open innovation and found that

Table 3-2: Summary of the OI Literature Review Findings by Services Sub-Sector (cont'd)

Sub-Sectors	Main findings and authors
	educational institutions can play a more active role in initiate collaboration than they have to date. • Laine, Leino, and Pulkkinen (2015) found that universities are an important partner in open innovation, not only as an input but as an embedded player.
10. Communications	• Suh and Kim (2012) researched SMEs in the communications services industry and found that R&D collaboration had a positive impact on their performance.
11. R&D Services	• Suh and Kim (2012) found that collaboration in SMEs in the R&D services industry had positive impact on their performance.
12. Transportation and Logistics	• A Chesbrough (2011) case study on KLM orchestrating a full set of service experiences for customers relying on a network of services suppliers for ground transportation and other services. • Studying transportation and logistics services firms, Wagner (2013) found that customers, suppliers, and competitors (in descending order) had an impact on services improvement, while customers had the greatest impact on new services development. • Mention and Asikainen (2012) studied the openness effect on services in this sector.
13. Wholesale	• Mention and Asikainen (2012) studied the openness effect on services in this sector.
14. B2B Services	• Wagner (2013) covers open innovation in B2B services industry. • Mention and Asikainen (2012) studied the openness effect on services in this sector.
15. Technology and Engineering Consulting	• Hopkins and Nightingal (2014) studied the positive and negative dynamics of open innovation, with a focus on technology and engineering consulting.

This review revealed that there is very little to no literature on open innovation in professional services firms. A few very recent research studies have covered KIBS in general (Fernández et al., 2015; Janeiro et al., 2013; Karlsson & Norman, 2013; Love et al., 2011; Macchi et al., 2014).

Conclusion:

Despite the increase in the literature, a gap still exists for further understanding of services in general, PSFs in particular. There is potentially an opportunity to close part of this gap through the current research**.**

3.2 Professional Services Industry Overview

The Professional Services Firms subsector includes several disciplines according to the North American Industry Codes classification under code 54. Therefore, all subsectors listed in the Professional, Scientific and Technical Services document (NAICS 541) are considered KIBS (Doloreux & Laperrière, 2014) as described in the Table 3-3 below:

Table 3-3: NAICS codes classification for PSFs (Statistics Canada, 2012)

Code	Industry group
541	***Professional, scientific and technical services***
5411	Legal services
5412	Accounting, tax preparation, bookkeeping and payroll services
5413	Architectural, engineering and related services
5414	Specialized design services
5415	Computer systems design and related services
5416	Management, scientific and technical consulting services
5417	Scientific research and development services

According to Mina et al. (2014), professional services firms are very important elements of the service economy, trade knowledge inputs intensively, leverage human capital as opposed to physical capital to add value, and record the highest innovation activity amongst services firms.

Professional services firms offer knowledge-intensive business services to clients. The professional services industry has few barriers to entry and has been witnessing a wave of new entrants, especially from companies that have expert knowledge in some areas and have the opportunity for cross-selling. IT firms have shown the way (e.g., IBM), banks can consult in a financial advisory role with their existing clients, and telecommunication giants can do the same with their corporate clients. The industry has no regulations except for audit, tax and legal services which makes entry barriers even lower (Rassam, 1998). Rassam identified many key success factors in the professional services industry, most importantly: knowledge and knowledge management, innovation, reputation/quality of work, and networking/alliances, especially for smaller players that need to create awareness. Professional services providers work with different clients in different industries and in diversified types of assignments. As a result, they are knowledge and technology brokers (O'Mahoney. 2010; Hargadon & Sutton, 1996). *"The impact* *they have had on clients, their employees, and society at large cannot be denied"* (O'Mahoney, 2010). PSFs gain their competitive advantage primarily from their ability to create and sustain knowledge resources (Werr & Stjernberg, 2003) and institutional capital based on legitimacy, reputation, and client relationships (Reihlen, Smets, & Veit, 2010).

3.2.1 *Industry Organization and Key Attributes*

The professional services industry is amazingly rich in its diversity yet highly fragmented. Single-person practices compete alongside multinational firms offering clients dozens of different services. Internal services have become major players; there are many managers who are, in fact, working as consultants, internal legal advisors, tax specialists (that is, tackling value-added investigative studies on behalf of an internal client) without even realizing it (Law, 2009).

Professional services are viewed as an innovation-enabler industry, allowing clients to access a large pool of expertise and knowledge in order to help them adapt the best practices that will be a base for their innovation improvements. They can be viewed as an integrator of different fields and players (clients, communities, universities, suppliers, governments) that create value to the economy through knowledge creation, integration, and transfer (Lessem, Schieffer, & Moussavian, 2010). These firms assist clients in developing resources, dynamic capabilities, and competences; thereby challenging firms to apply these concepts to improve their position.

The dominant players in each market can also differ. For instance, large international consultancies, namely of American origin, have taken considerable market share in several domestic markets. Considering the scale and scope of their activities, they might have an advantage. However, there is also the fact that domestic markets are characterized by the presence and relevance of domestic consultancies, either large or small, some even one a one-shop man. They coexist with large international consultancies, and country specificity remains (Amorim, 2003). Previous researchers (Bennett & Robson, 1999) have argued that professionals' involvement at the implementation level significantly influences the outcomes of assignments. As a result, professional services firms seek strategic alliances, partnerships, and alternative delivery methods with external entities in order to offer clients larger bundled services and get involved in the implementation phases. In fact, Amorim (2003) expected a positive relation between degree of involvement, impact, and satisfaction with their services.

Nikolova, Reihlen, and Schlapfner (2009) identified three major practices that characterize client-professional services provider interaction: shaping impressions, problem-solving, and negotiating expectations. Innovation in professional services firms can be related to any of these three practices in order to gain competitive advantage in the industry.

3.2.2 Market in Key Professional Services Segments

Professional services often involve expert advice, but routine operations, transactions processing, design work, and project supervision are also included in the industry. Most work is project-oriented, although many legal and accounting services are delivered on a continuing basis. Firms consist mainly of staff of professionals with various levels of expertise, along with support personnel with technical and clerical skills. A typical customer project is supervised by senior staff and executed by a team of junior professionals and support staff. In some cases, a project team can include hundreds of individuals and require complex coordination. Some professional firms provide services that require special expertise but are needed only occasionally. Because of this intermittent, or single use, firms can make their expertise available to many customers and serve several customers at the same time. Many professional firms have large investments in computer and communications technology because a large amount of work is done outside the home office. Coordination among team members is also critical. Project management software is used extensively. Engineering, advertising, and architecture firms also use advanced CAD and video editing systems. Firms in the professional services sector provide accounting, advertising and marketing, architectural, consulting, engineering, IT, legal, and scientific research services. The US and the EU are the largest markets for professional services, although firms are expanding into emerging economies such as Brazil, Russia, India, and China.

3.2.2.1 **Global Industry Overview**

The three largest segments globally are legal, IT and architectural and engineering services, each of accounting for about 20% of the revenues in the market (IBISWORLD, 2015). According to the same research estimates by IBISWORLD (2015), accounting, consulting, and scientific research services each generate around 10% of the market revenues. Advertising and specialized design services are other smaller segments in the professional services market, as shown in Figure 3-2 below:

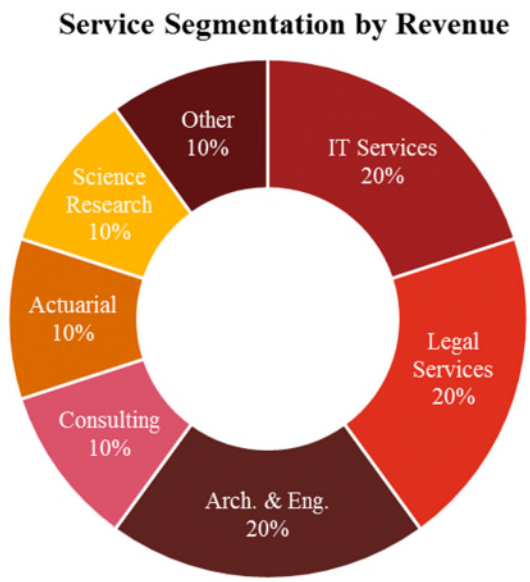

Figure 3-2: Segmentation of Global Professional Services Revenues (IBISWORLD, 2015)

These segments are very fragmented (for instance, the top accounting firms in the world only hold 27% of the market according to IBISWorld (2015)). The US and EU are among the largest markets for many professional services. However, many firms are targeting emerging economies to expand geographical reach and grow revenues. Brazil, Russia, India, and China are popular areas for expansion, as are other nations in South America and Africa. The global consulting services industry generates about $300 billion annually. Environmental consultants account for about $25 billion in annual revenue. Major international consulting firms include: Accenture (headquartered in Ireland); PA Consulting Group (UK); Roland Berger (Germany); Tata Strategic Management (India); and Booz Allen and Bain (US). Leading environmental consulting firms are Arcadis (The Netherlands), AMEC Earth & Environmental (Canada), and Environmental Resource Management (UK). Firms with international operations are subject to a host of risks in both developed markets and emerging markets. Regulatory requirements vary and integration of new operations can require significant resources. Challenges of operating in emerging markets include possible political unrest, poverty, and corruption. For large firms where international operations often account for nearly half of revenues, effectively managing foreign risk is critical.

Even in the US, consulting services represent the top-performing segment for each of the global accounting services industry's major players. Accounting firms such as PricewaterhouseCoopers are actively pursuing this high margin and growth field. In October 2013, PwC agreed to buy consulting firm Booz & Company, significantly boosting its advisory and consulting business. Additionally, in 2013, PwC announced that it plans to spend $1.0 billion to expand its assurance, cyber-security, and risk service offerings. Along these lines, in November 2013, major industry player KPMG launched a global investment fund, KPMG capital, to invest in data and analytics businesses serving the financial, healthcare, energy and communications markets. Additionally, in 2013 and 2014, KPMG has made several smaller scale acquisitions of firms that specialize in social network analysis, mobile technology and other areas of consulting.

3.2.2.2 Segments Market Size

Advertising and Marketing Services: Revenue for advertising and marketing services worldwide is about $486 billion, according to Magna (2015). Global ad spending is forecast to rise about 5% through 2014 according to Zenith Optimedia. Large international ad firms include WPP (headquartered in Ireland); Publicis (France); and Omnicom (US). Large populations and growing middle classes in BRIC nations (Brazil, Russia, India, and China) could offer significant growth opportunities for ad agencies.

Engineering Services: Annual global spending for engineering services is estimated at $750 billion. Worldwide spending is expected to reach $1 trillion by 2020, according to a joint report by NASSCOM and Booz Allen Hamilton. Top engineering companies include AMEC (UK), Fugro (Netherlands), SNC-Lavalin Group (Canada), and WorleyParsons (Australia). Global engineering consultancies often are managed regionally, which increases understanding of clients in different markets.

Accounting Services: The Big Four firms: Deloitte Touche Tohmatsu; Ernst & Young; KPMG; and PricewaterhouseCoopers are the largest players in the global accounting services sector. Sector revenue is expected to grow to about $270 billion by 2015 according to global industry analysts. The Big Four firms have expanded into many countries by buying local firms; in countries like China, they have affiliated with local firms.

Legal Services: The global legal services industry services market is forecast to generate about $750 billion by 2015 according to MarketLine (2015). Larger firms are expanding their international footprint to take advantage of rising demand for international law expertise. Amongst the world's 100 largest firms, about 80 are headquartered in the US and 15 are based in the UK. Leading firms in the UK include Clifford Chance and Linklaters. Other key markets in the global legal services industry include Australia, Canada, France, Spain, and the Netherlands.

3.2.2.3 **Professional Services Sector in Canada**

The Canadian professional services industry includes about 140,000 employer establishments with a combined annual revenue of about $120 billion (First Research, 2015). This industry is very fragmented, with 93% of companies having fewer than 20 employees (IBISWorld, 2015). Demand is driven by corporate profits and the overall health of the Canadian economy and the profitability is linked to having a regular flow of projects. Since most professional services can be postponed, economic downturn cause a decline in the need of companies. The industry has several strong sectors in Canada. The main ones are the following:

- IT consulting reached $40 billion in 2016, with a 2% growth rate since 2011.
- Engineering services generated around $30 billion in 2016 in Canada, with a 3% growth with top three players (Fluor Canada, SNC Lavalin, and AECOM) controlling less than 25% of the market in the country.
- Law firms reached around $27 billion in 2016 in Canada with a 2% growth, but a very fragmented market.
- Accounting services generated around $12 billion in revenues in 2016 in Canada, outpacing the economic growth of the country by reaching 3% yearly since 2011 (IBIS WORLD, 2016). This industry regroups more than 23,000 businesses led by Deloitte, KPMG, PwC, and Ernest & Young (The Big Four), representing around 50% of the market. Audit & assurance, tax, and consulting services represent 93% of revenues.

Conclusion:

Professional services are very large segments of the global and Canadian economies. They are witnessing strong growth and are investing heavily in M&As, diversification, acquisition of new knowledge. Despite the fact that they share many common characteristics, professional services group many sub-sectors within that have each their own particularities.

3.3 Innovation in Professional Services Firms

3.3.1 Particularities of Professional Services

Kuusito *et al.* (2011) identified four services categories based on two main dimensions (Fig 3-3):

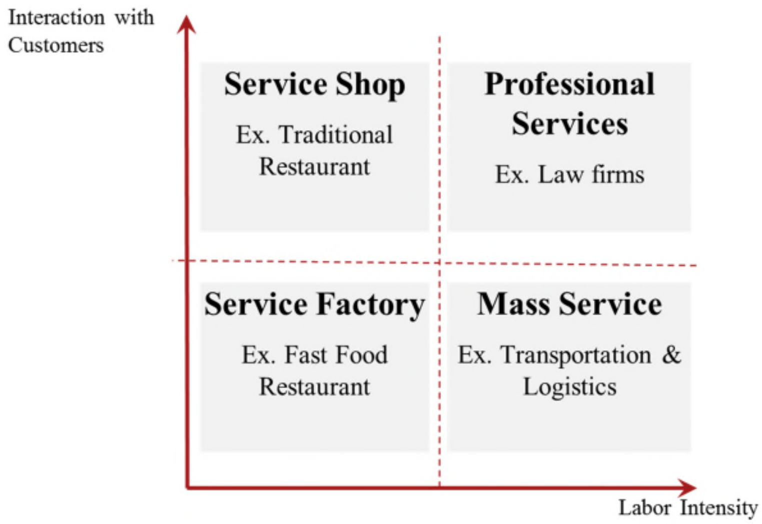

Figure 3-3: Typology of services (© Kuusito et al. (2011))

This typology shows professional services in a category on its own, given the high level of labor intensity and interaction with customers required to deliver the value. The nature of innovation in KIBS and PS firms has its own particularities that makes the research on the topic of important significance. These services, also known as KBIS, have four distinctive characteristics according to Ritala *et al.* (2013): intangibility, heterogeneity, perishability, and co-creation.

Knowledge Management

KIBS are defined as "(1) *innovative organisations*, (2) *sources of external information*, and (3) *facilitators, carriers or sources of knowledge" (*Doloreux & Laperrière, 2014, p. 638). These firms innovate by combining new and old knowledge which is considered the most important resource (Amara, Landry, & Doloreux, 2009). Strategic management of knowledge and a supporting organizational culture constitute the most important KM practice for service companies (Kianto & Andreeva, 2014). These characteristics allow KIBS to transform information and knowledge into customized solutions for their clients, and thereby play the role of innovation carriers between different entities (Shearmur, Doloreux, & Laperrière, 2015). These firms have four main functions in an innovation system: 1) Knowledge transfer in the form of expert know-how; 2) Exchange of best practices from different contexts; 3) Integration of different sources of knowledge and competencies; 4) adaptation of existing knowledge to client needs (Klaesson & Norman, 2015).

As a result, the core competency of KIBS is their ability to combine and transfer codified and tacit knowledge based on experience to help clients resolve problems (Amara, Landry, & Doloreux, 2009). In professional services firms, partners are expected to contribute internally with new ideas that may be helpful for other managers and partners in the marketplace, new processes for handling clients, and other ideas and knowledge that may be helpful for dealing with internal processes, innovative thinking, knowledge, and ideas that get them recognized in the market place with clients and other industry experts (Mors, 2010).

Client Relationship Management

Their main characteristic is their close relationships with clients, emphasizing their important cooperative nature in innovation behavior aimed at enriching their knowledge base (Hipp, Galego, & Rubalcaba, 2015). Users play a crucial role in the process, and clients are intimately involved in the new service development, determined more so by them and the tacit knowledge than by research. Some authors consider them *'catalysts'* that combine diverse internal and sector knowledge types (Fernandes, Fereira, & Marques, 2015).

In fact, the literature review confirms these findings. G. Battisti *et al.* (2015) find that radical service innovations can be found mainly in the professional services sectors. These authors find that *"… R&D for new service products is strongly tied to human capital in … knowledge-intensive businesses-to-business services (KIBS) such as legal and accountancy services, engineering and design, advertising, market research and management consultancy".* These firms use more external public information sources for innovation than companies in other type of sectors (Janeiro et al., 2013). Among these sources are universities, laboratories and public research institutes. Innovation in KIBS is mostly done for the purposes of benefiting the clients directly, not necessarily for internal use.

Human Resources Management

In professional services firms, where the core product is knowledge, firms rely on their employees for competitive advantage through knowledge-intensive innovations (Anand, Gardner,

& Morris, 2007) and especially their personal skills. As a consequence of the intangibility of the services rendered, a deep understanding of clients requirements — and the ability to provide solutions that anticipate desired benefit — play a more significant role in innovation success than the use of sophisticated technologies, which remain invisible to most clients (Van Riel, 2004).

Given the ownership structure and the dispersed power sharing and control in professional services firms (a large network of partners), the role of internal networks and relationship building, as well as a judicious exercise of power and influence, are important determinants of knowledge-based innovation (Anand, Gardner, & Morris, 2007). As a result, innovation in professional services is by the nature of its particularities, very close to open innovation in its involvement of clients and openness of the knowledge system to integrate new knowledge. One key difference that could impact the open innovation conceptual model developed for non-services firms is the importance of the differences between lines of services, geographies, number of years the practice is in activity, and the hierarchical level of the employees.

3.3.2 Innovation in Professional Services

Due to the nature of PSFs, it is difficult to separate between product, process, and organizational innovations in a service (Mention & Asikainen, 2012), and between internal teams and professional services providers'. In this unfolding knowledge-based economy, services innovation do matter (Hertog, 2000). Hertog claims that, unlike manufacturing firms that rely mostly on patented technologies or unique products, service firms gain competitive advantage primarily through their ability to collaborate in making use of their knowledge, what Kogut and Zander (1992) refer to as *'combinative capabilities'*. Gadrey *et al.* (1995) defined service innovation as follows:

> *To produce a service […] is to organize a solution to a problem (a treatment, an operation) which does not principally involve supplying a good. It is to place a bundle of capabilities and competences (human, technological, organizational) at the disposal of a client and to organize a solution, which may be given to varying degrees of precision.*

Therefore, service innovation requires not just technical but mainly social skills, social relationships with other firms or customers, and organizational capabilities to facilitate innovative activities (Chen, Chen, & Lee, 2008; Hertog, 2000). Hertog points to the significance of nontechnological factors in innovation as new service concepts, client interfaces, and service delivery systems that differentiate it from product- and process-oriented manufacturing firms. The centrality of the users and customers as co-producers is a key element in service innovation, particularly in the OI on paradigm. Love *et al.* (2011) argued that there is no distinction between the creation of a service offer (development phase) and the activity of production and/or commercialization (business phase). These social skills have increased the need for innovation in the communication and delivery approach of services to customers. Most KIBS rely therefore on highly-customizable services driven often by tacit knowledge. The following Table 3-4 summarizes some of the literature that examined the innovation characteristics of the industry.

Table 3-4: Summary of some innovation characteristics of professional services

Innovation Characteristics	Authors
Intangible, heterogeneous, simultaneous consumption and production, customized transactions, effects over a period of time	Memede, 2002; Gallouj & Weinstein, 1997; Gallouj, 1998a; Sundbo & Gallouj, 1998
Clients co-produce or co-create knowledge together with providers	Bettencourt, Ostrom, Brown, & Roundtree, 2002; Fosstenløkken, Løwendahl, & Revang, 2003; Hislop, 2002
Innovation in business services as '*the adoption of new practices, independently from how old they are to other organizations, and how many other institutions are already using them*'.	Amorim, 2003
Innovation as a *'generation of novel combinations from existing knowledge'*	Leiponen, 2006
Understanding that client requirements are more prominent than use of technologies	Van Riel, 2004
Outcome is often long-term, inherently intangible, and its effects not easy separate from other factors that can have an influence	Amorim, 2003
More open consumers of external innovations and knowledge than manufacturers	Mina et al., 2014
More multidimensional innovation than in manufacturing	Amara, Landry, Doloreux, 2009
Knowledge transfer takes longer because it is mostly intangible	Suh & Kim, 2012

Exploring innovation practices of 9,732 KIBS organisation within the EU's 27 member States, Hipp, Gallego, and Rubalcaba (2015) found that they had a greater innovative profile and important cooperative nature with external entities. The authors, however, found that the group was not homogeneous; hence the need for KIBS firms to be examined at a more molecular view to identify the particularities within. In professional services firms, business models, networking, processes, and service innovation are the dominant types of innovations.

New Service Development

New service development is one main area of innovation in professional services firms. It is a concept that is also attracting increasing literature interest from scholars. It is distinguished from new product development by its *"intangible nature, difficult standardization and impossibility to be stocked because service production and consumption are inseparable."* (Romero & Molina, 2011). Depending on the stage of a company, the business model has a different effect on service innovativeness: in early stages, the effect is U-shaped compared to an inverted U-shape during late stages (Shiu & Dawson, 2014). The service business model is defined as a mechanism to *"processes the design, delivery, and capture of the service value creation among transaction partners"* (Cheng, Shiu, & Dawson, 2014). In service companies, new service development that results in developing *"behavioural competencies in addition to technical operational competencies"* leads to developing an *"innovation capability that can help formulate business strategy"* (Lillis, Szwejczewski, & Goffin, 2015). Building these new capabilities for competitive advantages implies the *"design and development of the design and development of innovative experience environments supported by collaborative ICT infrastructures"* (Romero & Molina, 2011). In KIBS, specific capabilities are needed for this new service development to create value: knowledge management, service productization, process management, and relationship orchestration (Ritala *et al.*, 2013). Other authors have identified three categories of innovation capabilities in professional services firms: client-focused, market-focused, and technology-focused (Hogan *et al.*, 2011). A constant and intense contact with market or *"market sensing"* is required to develop new concepts and services, for instance in management consulting, both internally and externally (Heusinkveld, Benders, & Van den Berg, 2009). Open innovation research in services becomes interesting because of the nature of new service development, which requires the integration of several external actors into the process (Tidd & Hull, 2006). However, new services development requires more tacit knowledge to be successful (Nijseen *et al.*, 2006), which explains the tension between standardization for cost-effectiveness and customization (Chesbrough, 2011). Innovation in professional services firms is largely driven by knowledge management primarily. Taminiau, Smit, & de Lange (2009) stated that the exchange of knowledge and the development of a collective knowledge management system enhance organizational learning, which leads to innovation. The authors developed a framework for innovation in consultancy as shown in the Figure 3-4 below:

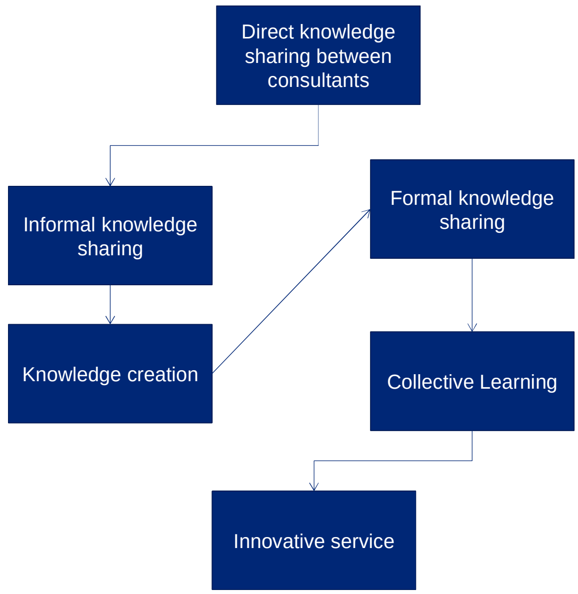

Figure 3-4: Route to innovation in consultancy (© Taminiau, Smit, & de Lange, 2009)

KIBS play an active role in the implementation of the innovation process at the user (or client) level, and not only as a simple source of information (Shearmur, Doloreux, & Laperrière, 2015). Interviewees also confirmed that as part of their open innovation practices, collaboration with external entities for both internal and external innovations are important, in a different way than non-services firms. They also collaborate with external entities in the different phases of the innovation process (idea generation, development and delivery), which is also not the same case for non-services innovation where upfront collaboration is more frequent.

Conclusion:

The fact that most innovations are made for clients and not necessary in internal projects constitutes a main difference compared to non-services firms. This becomes an addition to the basic conceptual model developed in the previous chapter.

3.3.3 Collaboration and Co-Creation

In a services value chain, there is no simple linear process of material inputs being transformed into outputs and then shipped off to the customer. Instead, there is an iterative process that involves the customer and results in a customer experience. The process begins by engaging the customer, either with an open-ended inquiry about his or her needs or by extending a particular service offering. New service development requires therefore the integration and collaboration between many external actors (Tidd & Hull, 2006). Most services firm innovations depend on external cooperation, outsourcing, and the use of several information sources, in particular in KIBS, where clients are an integral part of the innovation process (Asiaikanen, 2015). Academics consider co-creation of value core to successful collaborations in services (Westergreen, 2011). For the service to reach its maturity and true value, it has to go through a co-creation process involving the exchange of internal and external resources (Caroll & Helfert, 2015). Indeed, research has pointed out that clients co-produce or co-create knowledge together with professional services providers (Bettencourt, Ostrom, Brown, & Roundtree, 2002; Fosstenløkken, Løwendahl, & Revang, 2003; Hislop, 2002). In the context of OI, an organization' collaboration relationships expose them to networked capabilities and competencies (Caroll & Helfert, 2015). Some authors consider this to be an *"organisational-cooperation mode"*, particularly present in services (Tether & Tajar, 2008). Internal and external collaboration are important. Research into six global PSFs (Gardner, 2015) in the fields of law, consulting, and accounting showed that:

> *... as more practice groups work together on a client engagement, the average annual revenue from the client increases. And as professionals engage in more cross-specialty projects, the more work they will subsequently get and the more they'll be able to charge for it.*

Open collaboration has begun as a concept specific to open-source software, but has since evolved into a paradigm shift in several industries involving both on- and off-line communities (Levine and Prietula, 2014). Collaboration with customers, beyond traditional partnerships with other organizations, is an increasingly important strategy for large firms in particular (Hossain, 2015).

In this new knowledge economy, gaining competitive advantage in the more traditional and common ways (cost, quality, service) needs to be complemented with an effort towards value creation through experiences with customers and suppliers (Chesbrough, 2011a; Prahalad & Ramaswamy 2004; Mahr, Lievens & Blazevic, 2014). This leads to the creation of service systems where value is co-created through a *"configuration of people, technology, value propositions connecting internal and external service systems, and shared information"* (Westergren, 2011), with significant importance focused on the involvement of customers early on in the new service development process (Arrass, Hottum, Kohler, Straub, & Welter, 2013). However, partnerships, alliances, and collaboration structures to ensure higher value creation in open innovation are not well understood in the service sector (Tidd, 2014).

In a service-dominant logic, the value is *“co-created in interactions between producer and consumer, blurring roles and demanding reciprocity”* (Chesbrough, 2011a; Westergren, 2011). Large firms place great emphasis on involving their customers during idea generation (Chesbrough & Brunswicker, 2013). This is even more prevalent in knowledge-intensive than professional services. Their value proposition is realized through involvement of clients directly in order to integrate resources based on knowledge competencies (Skalen, Gummerus, von Koshkull, & Magnusson, 2015). This co-creation happens inside a wider service ecosystem (Gretzel *et al.,* 2015) and results in knowledge that is more relevant and at lower costs (Mahr, Lievens, & Blazevic, 2014); it also enhances the innovation process, thereby resulting in more value being co-created (Romeroa & Molina, 2011).

This is not an easy task: knowledge co-creation is considered more complex than simple knowledge transaction (Paasi *et al.,* 2015), with difficult patterns of activities and interactions (Perks, Gruber, & Edvardsson, 2012). Some authors find that involving customers in incremental innovation has positive effects on performance, but not in radical innovation, while it is positive in both cases when involving suppliers in design (Menguc, Auh, & Yannopoulo, 2014). For these relationships to work in B2B professional services firms, time and maturity are key (Sczertzer, Schertzer, & Dwyer, 2013). Services firm focus on both reactive and proactive customer integration in idea generation and implementation, but much less reactively during development (Da Mota Pedroza, 2012).

These characteristics make services an interesting open innovation research field, with co-creation of value being at the *“heart of a successful collaboration”* (Westergreen, 2011). Open and user innovation are two main concepts in the literature that are related to the concept of innovation with customers (Paasi *et al.,* 2014). In fact, some authors consider this ’open innovation with customers’, since the end-user is regarded as an equal stakeholder in the process (Schuurman, Baccarne, & Mechant, 2013).

In services, most of the knowledge created and transferred is of a tacit nature (Chesbrough, 2011a). KIBS in particular present a strong dependency between supplier and customer knowledge, caused mostly by increasing specialization, intensiveness, and complexity. In KIBS, knowledge processes include: “*diagnosing needs, designing solutions, organizing the process, managing conflicts, and implementation*” (Aarikka-Stenroos, & Jaakkola, 2012). The value-creation in KIBS involves frequent interactions and close co-operation between KIBS firms and users (Doloreux & Laperrière, 2014). Customers risk misbehaving by either under- or over-participating in the co-creation (Geer, 2015). In services that are high on co-creation, a failure can generate greater dissatisfaction with the expected outcome than the ones that are low on co-creation (Heidenreich, Wittkowski, Handrich, & Falk, 2015).

For co-creation with customers/users, important changes in innovation management is required: redefinition of the firm's boundaries, products and services, thereby being open to community inputs, with less focus on property rights and reshaping organization and product identities (Parmentier & Mangematin, 2014), as well as modularity, since it allows for different entities to work on developments in parallel and independently from one another (Baldwin & von Hippel, 2011). Baldwin and von Hippel (2011) claimed that, with a decrease of communication and design costs, the trend towards open-user and collaborative innovations will increase. Some authors consider that, when a user is considered an equal in co-creation of value, then this is considered open Innovation with customers (Schuurman, Baccarne, & Mechant, 2013).

Conclusion:

These changes and conditions support the relevance of the open innovation concept in professional services firms, where collaboration and co-creation are fundamental components of the innovation process. Collaboration with external entities at the different phases of the innovation process is also another key difference with non-services open innovation model.

3.3.4 Intermediaries in Open Innovation

These particularities of services industries lead to the fact that the use of intermediaries is an important concept in the literature on open innovation, and is therefore covered in this section. Professional Services Firms are considered as KIBS, and are normally described as 'carriers of knowledge' in their role as providers of intermediate inputs into the activities of their clients (Love *et al.* 2011).

In open innovation, intermediaries are technology or knowledge brokers. They play the role of agents and brokers of technology or knowledge from different sources, searching, sharing, and integrating on behalf of the end users (Chesbrough, 2003; Hossein, 2012b; Lichtenthaler, 2013). They are in many cases KIBS or professional services firms that have access to knowledge from different industries and companies, given current trends towards a more knowledge-intensive economy (Hipp et al., 2015). These firms are known to be very active in innovation and cooperative activities; companies use their support to help open up their internal innovation process (Abbate, Coppolino, & Schiavone (2013).

One key advantage of collaborating with intermediaries is the reduction of transaction costs in technology markets (Lichtenthaler, 2013). For companies to keep their competitive advantage while dealing with intermediaries, they need to consider them as complementaries and not substitutes to internal capabilities (absorptive and desorptive capacities). Innovation intermediaries organize the matching process as external service-providers, where the collaboration is considered an *'economic resource allocation process'* (Holzmanna, Sailer & Katzy, 2014). By definition, KIBS play the role of *"intermediaries between their clients' tacit knowledge base and their pool of codified knowledge, which leads to exchanges of different types of knowledge"* (Doloreux & Laperrière, 2014). They are considered key innovation intermediaries or 'brokers', connecting ideas from diverse individuals and organisations (Mina et al, 2014). These intermediaries are growing and playing a more important role in impacting the technology market; however, the literature has only briefly covered this topic (Hossein, 2012b).

Conclusion:

Professional services firm play an important role of intermediaries in the open innovation dynamics, which was not the case in the non-services industries. Hence, most innovations are made for clients and not necessary in internal projects. This constitutes an additional element to the conceptual model.

3.3.5 Intellectual Property in Professional Services Firms

The characteristics of the knowledge shared, and especially its level of tacitness (Nonaka, 1994), greatly affect the way collaborations are negotiated and IPR management strategies adopted (Bogers, 2011). PSFs have a high level of tacit knowledge, and innovation is mostly knowledge-based and conceptualized in the form of new practice areas. This makes patenting of innovation limited in the professional services sector, but mostly IP protection takes shape through trademarks or copyrights on brand innovation, new models, and business documents.

Since barriers to entry in services or professional services are usually low (except services that require high-capital such as banking) (Ettlie & Rosenthal, 2011), it is complicated to protect a firm's IP through patenting innovation, and thus, knowledge or innovation transfer to partners is difficult (Chesbrough, 2011). In professional services firms, given the importance of knowledge transfer as a means of innovation, there is a significant risk of these firms being unable to appropriate all the information and knowledge because of their predominantly tacit nature (Shearmur, Doloreux, & Laperrière, 2015).

Given these risks and limitation that are specific to this type of firms, some authors present the importance of informal IP protection rather than only formal manners, especially in services firms (Päällysahoa & Kuusistob, 2011). These authors find that very little services firm use formal IP protection methods, patent in particular is not common. Trademarks are the most common. Therefore, IPR are different in services in general and professional services firms in particular.

3.4 Main Trends and Challenges Impacting PSFs

In this section, the main trends observed in professional services firms are presented based on literature and complemented with interviews results.

Professional services industry globally and in Canada have been witnessing important changes to their structure. The main ones that, in a way or another, are related to open innovation, are the following:

1. Commoditization
2. Standardization, Modularity, and Disintegration of the Value Chain
3. Increased Client Knowledge
4. Increased Integration and Brokerage Role of PSF
5. New Emerging Players

The PSFs industry's structure is going through an important change. Mina, Bascavusoglu-Moreau, and Hughes (2014) found that vertical disintegration pressures, modularisation, outsourcing, and specialisation are key drivers for firms to rely on external knowledge for innovation. Researchers found that the industry is on the *'cusp of disruption'*, the unbundling of the consulting and legal industry being one example (Christensen, Wang, & van Bever, 2013).

This section presents the main literature on these topics and links them to the open innovation context, especially as they relate to erosion factors that Chesbrough (2003a) observed when he first coined the term.

3.4.1 Commoditization

Commoditization of some areas of professional services is becoming a common trend studied by academics from different backgrounds (Kubr, 2005). Methods and systems are increasingly commoditized and available to the public, with the proliferation of online knowledge, university courses, thought leadership, and conferences.

Audit are a professional services sector that haves witnessed a major tendency towards commoditization in the past 20 years (Knechel, 2007). This has driven downward price pressure from clients and a proliferation of new smaller players that have seen the lowering of the barriers to entry. This commoditization has pushed audit firms to diversify into new consulting areas and to increase the formalization of their processes to obtain consistency and improved cost control (Imhoff, 2003). Researchers in some industries found that traditional commoditized work activities decreased from a 60-70% share to around 20% compared to more added-value non-commoditized services (Christensen, Wang, & van Bever, 2013).

This formalization resulted in an increased standardization of some professional services areas, a key erosion factor of the traditional closed innovation model. This is an indication of an increased commoditization of some the parts of the business. This trend resulted in an increased standardization of some professional services areas, a key erosion factor of the traditional closed innovation model.

3.4.2 Disintegration, Modularity, and Standardization of the Value Chain

Service companies are disintegrating the vertical silos into horizontal modular service architecture, allowing small companies to offer services that used to be integrated and powered by low entry barriers (Ettlie & Rosenthal, 2011) for some complementary types of services that might require mostly good software (i.e., Skype, Paypal) (Rohrbeck, Holzle, & Gemunden, 2009). These changes have been at the base of the proliferation of the so-called *Business Process Outsourcing* companies. Rohrbeck, Holzle, and Gemunden (2009) considered that there is a growing need for service innovation to open-up to other companies in order to co-evolve capabilities and incorporate new innovations. The nature of service innovations makes it easier to build what Chesbrough and Appleyard (2007) call the *network effect*, where users beget more users (e.g., Wikipedia, Linux, YouTube), resulting *de facto* in an open innovation service.

Modularity, defined as the way by which a system can be broken down into individual independent modules (parts) that are ultimately combined, is a key determinant of disintegration of the services value chain. The complexity of the service is split between specialized teams in one organization or across different ones (Sanchez & Mahoney 1996). Few studies have been conducted on modularity in the services industry, with most of the focus on product modularity (Rajahonka, Bask, & Lipponen 2013).

The main impact of modularity on KIBS is the change from a tight client-provider interaction with commoditized services to a rather inter-organizational decoupling with standard services (Cabigiosu, Campagnolo, Furlan, & Costa, 2015). Hence, modularity is quite different in the case of KIBS, where information can be loosely coupled between supplier and client, but not knowledge sharing according to the same authors that studying the outsourcing of logistics functions to a KIBS provider. Procedures (back office) are standardized but interfaces (front office) are customized.

The legal services sector is a very good example of this disintegration. India is leading the outsourcing of legal work market, handling the routine tasks from more costly countries (ABA Journal; USA Today). A shift, however, is taking place towards higher value-added services outsourced, leading to a large disintegration of the value chain led by GE (Gupta, Amar, Sreecharana, & Kreyling, 2008). Companies like DuPont, for instance, have hired lawyers in the Philippines to ensure a 24h service (Engardio, 2006). This trend towards disintegration, which aligns with erosion factors observed by Chesbrough (2003) in other industries, is emphasized by the introduction of new technologies (e.g., advanced document scanning, reading and digitization). Most law firms are now able to breakdown their activities and outsource the low value ones to offshore low cost locations. This led to the emergence of LPO (Legal Process Outsourcing) firms around the world, providing evidence of this increasing disintegration.

Standardization of the legal process is a key factor leading this observed outsourcing and disaggregation of the sector (Regan & Heenan, 2010).

Law firms are trending towards more openness with clients given these trends. Clients are now capable of doing large pieces of the work themselves in-house, outsource part of it to lower cost countries, rely on a network, and hence only needing law firms for strategic and more complicated advice, as claimed by RioTinto (Regan & Heenan, 2010). Unbundling of the service is the result, a more modular value chain where clients integrate themselves different pieces of work from diverse law firms or partners (Gupta *et al.*, 2008).

The information technology services sector is also witnessing similar trends towards increased outsourcing and disaggregation (Apte & Mason, 1995). An increase of *codifiability*, *standardizability*, and *modularizability* is the result in IT services according to the same authors, driven by information intensity made possible by technology adaptation in service development and delivery.

Strategy consulting is another professional services sub-sector, where new business models are emerging geared towards the disaggregation of the value chain (Campi, 2007). A client's increased knowledge and skills is reducing the gap with the strategy consulting provider. The instant availability of global information has precipitated an erosion of the competitive advantage of integrated players running internal research and knowledge building capacities.

Research activities, benchmarking, documentation, large scale technology mapping are some of the types of services that are increasingly being executed from the low cost countries, and validated by specialists in the more expensive offices.

Observations made in these professional services sectors are similar to erosion factors presented by Chesbrough (2003) as the main drivers behind the paradigm shift from closed to open innovation.

3.4.3 More Knowledgeable and Involved Clients

Another important erosion factor that is affecting the professional services industry is the increased competition from in-house services within multinational corporations (IBISWORLD, 2015). This gives companies a more in-depth knowledge that is better adapted to the need of the organizations. Companies have therefore developed stronger internal teams that can deliver professional services projects. They are taking an increasing amount of activities in-house, focused on the ones that traditionally used to be managed by professional services providers. This trend has impacted negatively on the growth potential of some areas of the professional services sector. Sharing and transferring knowledge to clients have become a key component of value proposition that professional services have, especially in Consulting (Ciampi, 2007). This has resulted in the following main changes to the client-consultant relationship:

- Clients are increasingly in-housing critical areas of the value proposition with high knowledge creation potential
- They prefer more involvement of consultants in the solutions implementations with a *’success fee’* model for compensation
- They are requiring greater involvement in different early phases of projects with consultants, phases that were traditionally under the consultant’s sole responsibility, in order to better appropriate, validate, and learn from the approach.

The increase in data management and use (Big Data) has brought new sources of growth to different areas of professional services, technology and analytics consulting in particular.

Some major corporations have also moved into offering professional services themselves: IBM, Walt Disney, Ritz-Carlton, etc., while technology OEMs (software and hardware) are also moving away from offering services (Oracle, IBM, etc.) (Plunkett, 2007). These changes have resulted in a need to increase specialization of the professional services providers in order to remain competitive and relevant, beyond offering standardized traditional services. This trend supports the erosion factors observed by Chesbrough (2003) in other industries.

3.4.4 Knowledge Integration and Brokerage Role of PSFs

The increased role that professional services play as knowledge integrators and brokers is an important trend (Di Maria, Grandinetti, & Di Bernardo, 2012; Hua, Lin & Chang, 2013). KIBS are viewed as the center of interactive learning systems, creating, transferring and applying knowledge between firms and industries (Amara, Landry, & Doloreux, 2009). They act as *’knowledge transmitters’* (Asikainen, 2015) and large *’users, originators, and transfer agents’* of innovations (Hipp et al., 2015), and enablers and client innovation supporters (Hua, Lin, & Chang, 2013). They hold a certain specialty that they integrate with other specialties from different service providers.

As a result, KIBS have moved away from being the sole owners of knowledge and innovations to becoming brokers and integrators in an innovation ecosystem that goes beyond the boundaries of their firms. This again is an important factor leading to a more open innovation model in KIBS/professional services

3.4.5 Emerging Players with Different Value Propositions

The professional services industry is going through an important wave of change, with new players entering the market geared with new business models. Especially in the more weakly regulated and open professional fields such as consulting and recruitment, firms enter from outside the industry (Kipping & Kirkpatrick, 2013). This is less prevalent in more regulated segments of professional services such as audit and tax, and in some extent, the legal services industry as well. Beyond the traditional firms (McKinsey, Boston Consulting Group, Bain & Co., Accenture), examples of new business models have emerged that support the concept of open innovation in professional services firms. Table 3-5 presents some notable examples of new professional services entrants with an open business model, different than incumbent large or boutique firms. These type of firms are gaining market share and play a bigger role in the sector.

Conclusion:

Professional services sectors are going through major changes and the industry dynamics is changing. These changes are main erosion factors that are present in professional services, and hence confirm further the fact that this concept is applied in this sector as well. The details of these findings allow for the elaboration of the survey questionnaire used in the next chapters.

Table 3-5: Examples of new entrants in professional services with an open innovation business model

Sector	Firm	Services/Model Description
Consulting	10EQS	10EQS orchestrates web-based solutions to management issues that clients are going through by providing an expert network and a collaborative team using an online collaborative tool. With 15 offices around the world, they offer hands-on **subject matter expert**ise, from c-suite to shop floor, in order to match the most relevant resources with the project needs. From market assessment to benchmarks and cost structure analysis to deal due diligence, 10EQS offers consulting services to companies in very diverse set of industries.
	Imagination 4 people	An online collaboration network that offers crowd-based solutions to social entrepreneurs and engaged communities in order to develop ideas and projects that lead to a more collaborative and responsible world.
All professional services	Maven	**Maven Research** *manages a global network of industry professionals, thought leaders, and experts who connect and share their knowledge with others via our Global Knowledge Marketplace.* *Micro Consulting: Short bursts of knowledge, perspective, insight, and opinion that help others make better decisions.* **Maven's Global Consultant Network:** *Maven's global consultant network is comprised of thousands of professionals from virtually every conceivable background in over 150 countries worldwide. Our consultant network includes:* Physicians, attorneys, engineers, accountants, race car drivers, social media experts, publishers, schoolteachers, gold miners, motorcycle mechanics, polymer scientists, and many more...
	GLG	GLG is an olive platform connecting clients with specific experts needed to solve business issues using a rigorous compliance framework. The main purpose is to help professionals learn about strategic and operational challenges and share their knowledge with clients. GLG has more than 425,000 members and help clients, whether companies or professional services providers, connect with needed expertise.
	Wengo	A French subsidiary of Vivendi, Wengo offers a network of more than 2,500 experts in the legal, business, health, information technology, psychology, wellness, and astronomy areas. Services are first offered by phone on a minute rate, where the online platform connects the clients with the right expertise.
Legal	Axiom	A new business model of low-cost legal services that has reached around $200M USD in 2015 with more than 1,500 employees. Axiom operates 17 offices in three continents today and is in fast growth mode. With *’nomadic lawyers’*, the firm relies heavily on 1) advanced and customized technology to accelerate service delivery, 2) strong and efficient processes, and 3) low overhead with no partners and several office locations in low cost areas, away from expensive downtown areas. This allows clients to reduce legal services overhead costs by allowing them to outsource a large portion of their work.
	Cognition	A Canadian firm out of Toronto that has a similar model as Axiom. The latter acquired the general counsel arm of Cognition in 2016, forming Axiom Cognition, a firm aiming at disrupting the traditional legal services industry in Canada.
	Lawyers on demand	This UK-based law firm offers lawyers on demand for in-house client legal teams and for law firms looking to boost their teams temporarily or without the burden of a full employment.
	SkyLaw	A Toronto based legal firm with a new innovative business model founded in 2010. The firm relies on a sophisticated online platform to offer its services cost-effectively with no compromise on quality.

3.4.6 Professional Services New Emerging Business Models

New emerging business practices point towards more openness in the field, impacting the business model of the professional services firms. An online search on the leading professional services firms in the world, PwC and Deloitte, point towards the same trend. Both firms employ more than 200,000 people globally, and are active in many professional services areas. Given their size and the breadth of the services that they cover, they represent good examples of the industry. They employ several practices that are related to open innovation. Table 3-6 below summarizes some of these practices that are publicly available:

Table 3-6: Examples of Open Innovation Practices at Deloitte and PwC

OI Practice	Examples from Deloitte (Source: Deloitte Website)	Examples from PwC (Source: PwC Website)
Open Innovation Challenge	Launched an open innovation challenge internally and externally	Launched a Global Innovation challenge and its open University
OI services	Offers open innovation services called: Connect and Innovate Together	Launched *PwC's Open Innovation Platform*
Open Labs for Clients	Newly launch in Montreal	PwC Digital Services in Toronto and New York
Thought Leadership	Available online and shared Books shared with public Host conferences and share knowledge	Available online and shared Strategy+business business magazine Host conferences and share knowledge
Benchmark	Global Benchmarking Center offering online services	Industry 4.0 benchmark tool free and online Working Capital benchmark tool free and online
Mergers and Acquisitions to acquire new capabilities	Monitor, Heat, Integrity-Paahi Solutions Inc., SwiftRadius, Casey Quirk, etc.	Robichaud Conseil, Biond, Westmonroe, Booz & co., Diamond, PRTM, Saratoga, etc.
Partnerships and collaboration	With IBM	With Google

Academics are not the only ones with increased interest in open innovation. Chesbrough and Brunswicker (2013) conducted a survey on large firms in Europe and the US inquiring about the application of open innovation practices. The results showed an increase in these practices, with the inbound ones being more common than the outbound ones. An increase in open innovation services offered in the market is a proof of the practical application of the theory. In fact, the market for this type of services is growing at a strong pace (RWTH, 2013), as per Figure 3-5:

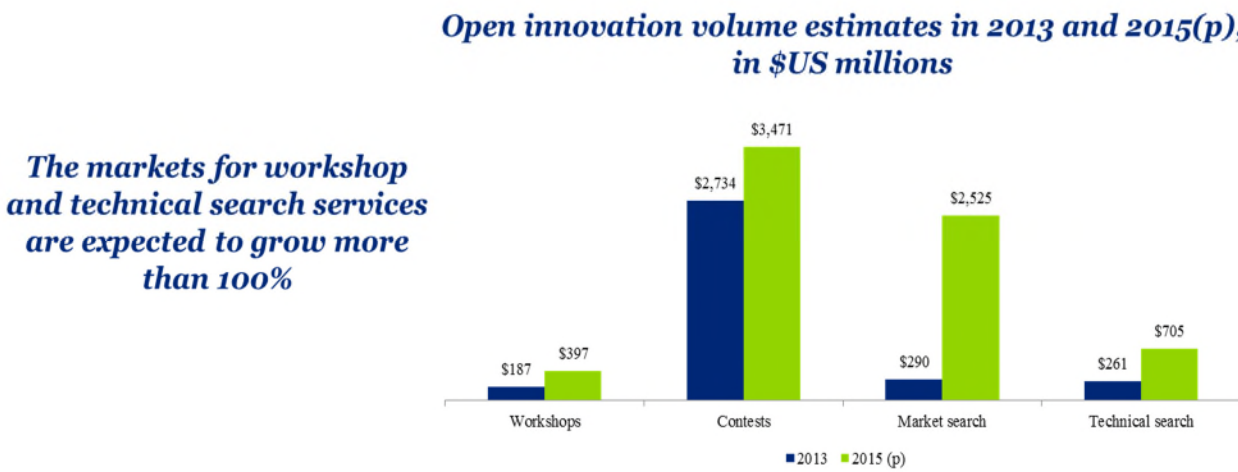

Figure 3-5: Evolution of the market for Open Innovation

Even the largest PSFs in the world, the Big Four accounting firms, offer this type of services.

Conclusion:

Erosion factors and trends in the industry are also impacting the closed innovation model in professional services, towards potentially a more open one.

3.5 Conclusion: Literature Gaps

The literature began with qualitative case studies observed in a few companies of the high-tech industry in the United States. Over time, interest has shifted to different industries, especially services recently. Researchers are increasingly focusing on this sector to understand the difference in applying the principles of open innovation in an environment that is different from that of manufacturing and technology. The review of the literature reveals the emergence of studies on several sectors of the service industry: transport and logistics, education, tourism, retail and shopping especially. This review also shows a move towards more empirical and quantitative studies, with innovation surveys in different regions of the world. However, a very important sector of the service industry is only covered lightly: knowledge-intensive services, or simply professional services.

Studying the professional services sectors, several recent trends were found to be shaping the need for more open innovation research:

- A growing market for knowledge brokers
- Growing OI solutions sales around the globe
- A growing number of platforms and solution providers
- Commoditisation of some areas of the professional services sector
- Disintegration and standardization of the value chain in professional services
- More knowledgeable and involved clients due to increased availability of information
- New players entering the market with new business models.

These trends are similar to the concept of erosion factors observed by Chesbrough in non-services firms, as they erode the closed innovation concept and push firms to reinvent their business model into increased openness. Through a literature review, it was found that open innovation has increasingly covered the services industry in the past few years. Despite this increase, professional services firms or KIBS are only covered by a few authors and articles. This is an important gap in the literature that the current research aims to contribute to. The next chapter takes therefore the conceptual model developed and presents the methodology adapted to test it in the professional services firms. Findings from the current chapter 3 are used as inputs to the exploratory study and to developing the survey instrument.

CHAPTER 4 METHODOLOGY

In this chapter, the methodology for testing the propositions is outlined in details. This is an exploratory study given the scarcity of the literature on open innovation in professional services. To the extent of the knowledge of the researcher, very few studies have been conducted on open innovation in professional services (see chapters 2 and 3). An extensive literature review was used in the first two chapters to build the open innovation conceptual model that is being tested in the next chapters, in four main steps:

1. Conducting an exploratory study through 20 interviews with professional services firms and some of their clients.
2. Using a survey within a single large Canadian professional services firm (called Firm ABC for purposes of anonymity) to test for internal validity.
3. Extending this survey externally to other professional services firms in Canada to test for external validity.
4. Conducting a few validation interviews with some experts to give a more qualitative assessment to the results.

This chapter details the methodology in the following sections:

1. Exploratory Study
2. Outline of the five proposition
3. Data Collection Methodology for Firm ABC
4. Choice of Measures and Research Instrument for Firm ABC
5. Data Analysis Methodology for Firm ABC
6. Validation Approach with External sample and Experts.

4.1 Exploratory Study of Innovation & Open Innovation in Professional Services

The purpose of this chapter is to investigate whether there is an interest in OI in practice and what are the particularities of the theory in PSFs. The methodology to get there is presented in this section and it followed the grounded theory approach of constructing iteratively using both theoretical and empirical results (Eisendhart, 1989; Yin, 1994). It is an iterative approach between on-site interviews and literature to confirm and enrich the theoretical findings with practical ones. Given that OI in PSF is rather an exploratory study and hence this is a case of theory building rather than theory testing, qualitative research such as interviews can be an appropriate choice (Alam & Perry, 2002; Eisendhart, 1989; Yin, 1984). Therefore, in order to validate the main themes to cover and confirm the interest of practitioners in OI, a series of qualitative interviews was conducted. This step became an input into building the survey questionnaire: *"The qualitative interviews facilitate our survey research and provide background information as well as richer details on the role of contracts and IPR in OI"* (Hagedoorn & Zobel, 2015, p.1052).

Eisenhardt and Graebnert state that "…*interviews are a highly efficient way to gather rich, empirical data, especially when the phenomenon of interest is highly episodic and infrequent*" (Eisenhardt & Graebner, 2007, p. 28). These authors suggest the use of several interviews with informed subjects in case study research to avoid impression management and retrospective sense-making biases. Interviews and cases have been used throughout academic history in different fields to build very strong theory in strategy, organization, innovation. It is also a methodology recommended by very highly recognized scholars (e.g. Mintzberg & Waters, 1982, Chandler, 1962). These interviews and case studies serve as a complementary extension to an emerging theory (Yin, 1994). It is the approach followed in this chapter where the literature review results are linked to interviews and real-world examples observed and discussed on site. This puts theory and literature into a broader and more practical perspective.

A total of 20 exploratory interviews were conducted in 2015-2016 with three groups of industry leaders: (1) 8 within the main Firm ABC where the survey will take place; (2) 9 with other professional services firms; and (3) with clients of these firms.

These 17 professional services leaders were split between 11 small, medium, and large professional services firms covering the following 8 sectors within the industry, as per Table 4-1:

Table 4-1: List of the 17 Interviewees for Exploratory Study

Sector of Professional Services	Company	Position	Location
Audit	Big Four (One of the four largest accounting firms) – Firm ABC	Quebec Market Audit Leader	Montreal
Tax	Big Four – Firm ABC	Tax Partner	Montreal
Human Resource Consulting	SME	Founder	Montreal
Management Consulting	Big Four – Firm ABC	National Consulting Leader	Calgary
Pension Fund Services	Leading Services Provider	Partner	Montreal
Management Consulting	Big Four – Firm ABC	Quebec Market Leader	Montreal
Deals	Big Four – Firm ABC	Partner	Montreal
Deals	Big Four – Firm ABC	Partner	Montreal
Project Management	Start-up	Founder	Montreal
Technology Consulting	Big Four – Firm ABC	Partner	Toronto
Marketing	Digital Marketing Services Firm	Co-Founder	Montreal
HR and Recruitment	SME – Headhunting firm	Founder	Montreal
Engineering Consulting	Leading Engineering Consulting Firm 1	SVP Hydro & Power	Montreal
Engineering Consulting	Leading Engineering Consulting Firm 2	Sr Director – Major Projects	Montreal
Engineering Consulting	Leading Engineering Consulting Firm 3	VP Hydro	Montreal
Engineering Consulting	Leading Engineering Consulting Firm 4	Sr Global Director – Hydro	Montreal
Consulting	Big Four – Firm ABC	Head of Innovation	Toronto

Another set of three (3) clients of these firms were interviewed. Clients were large companies in three different industries selected according to the references of the professionals interviewed:

1. Agriculture & Agri-food major Canadian player (Vice-President Strategy, Montreal)
2. Aerospace major Canadian Player (Vice-President Strategy, Montreal)
3. Telecommunication large Canadian player (Vice-President Strategy, Oakville).

The criteria for selecting the interviewees were the following:

1. Manager, Director, Managing Director, or Partner level (or equivalent)

2. Represent the main two regions of Canada (East and West) with cities like Montreal, Quebec City, Toronto, Oakville, and Calgary all covered
3. Represent different types of professional services: audit, tax, deals, consulting, engineering services, recruitment services, business process outsourcing services.
4. Clients that have worked with different types of professional services firms.
5. Contacts available within the network of the researchers and that accepted the invitation.

All these 20 interviews took place in 2015 and 2016 and were semi-directed. Interviews lasted between 45 and 60 minutes each, either in person or by phone. All interviews were recorded with the consent of the interviewees. The research instrument is in Appendix J: one for professional services respondents, and another one for clients of these firms. The covered themes aimed to:

1. Better understanding if the different building blocks identified in the literature were observed and valid in practice,
2. Validating the interest of doing the research in this industry,
3. Designing the survey for the detailed study of Firm ABC and the external sample.

This approach was also used in previous open innovation studies (Love *et al.,* 2011). Through these interviews, examples of projects and situations that are relevant to the OI concept were explained and presented by the interviewees. Four relevant ones were documented to highlight and help understand how some of these PSFs operate. The four cases studies were selected because of the completeness of the information that was given by the interviewees.

4.2 Research Framework: Propositions

The previous chapters showed the interest that the literature has given to the open innovation in non-services industries, as well as in the services more recently. The gap in the literature related to professional services firms was the main reason for the interest in focusing on the sector. With the results of the literature review of the previous chapters, a conceptual model grouping the building blocks of OI was developed and presented.

Five building blocks resulted from literature:

1. Erosion Factors in the external environment

2. Open Innovation Processes including partnerships
3. Organizational management including knowledge management
4. Risk Management including IPR management
5. Beneficial Impacts on Performance

In addition to the five building blocks identified in the literature, control variables have been added to account for external factors that could influence the innovation dynamic in general, and OI in particular (further detailed in section 4.2.5). As a result, the following model (Figure 4-1) summarizing the building blocks that will be statistically tested in our research emerged:

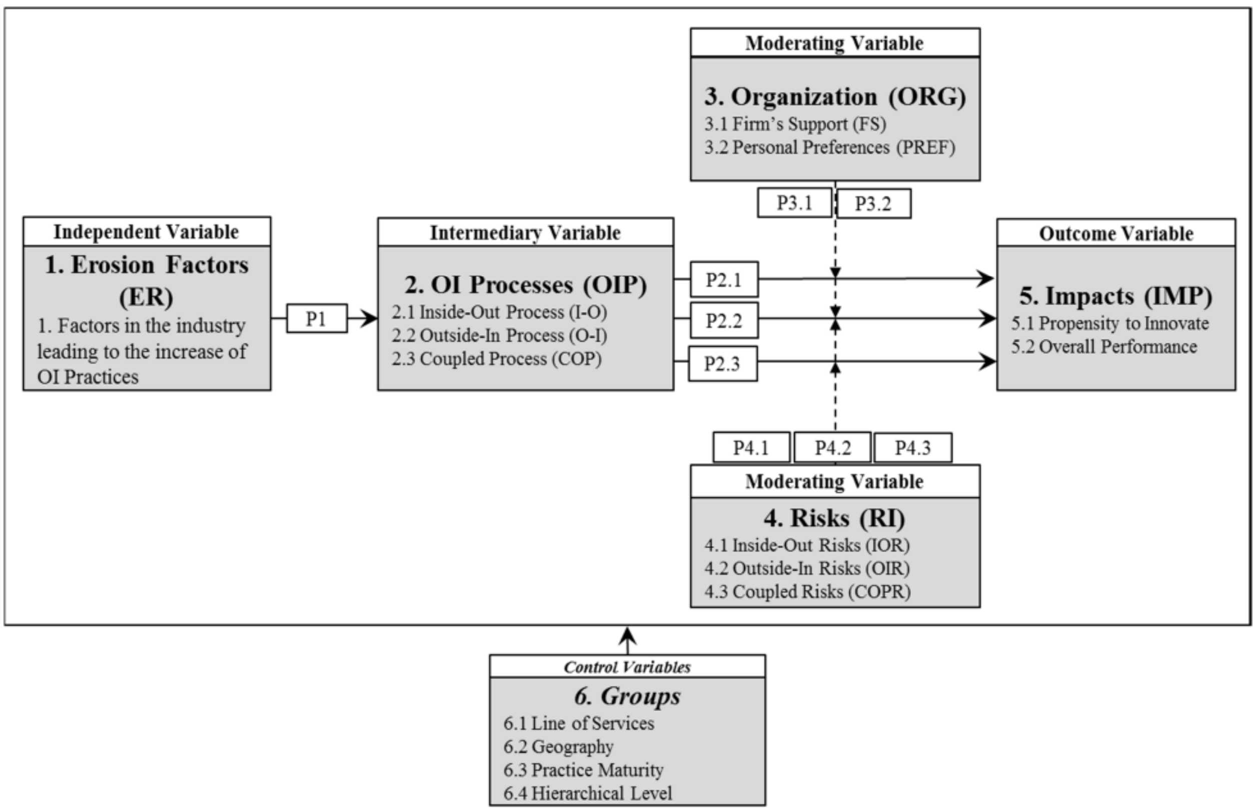

Figure 4-1: OI in Professional Services - Conceptual Model with Propositions

Research Question: Is Open innovation applicable in the professional services firms? How? What impact on performance?

As a first step to answering this question, this chapter details the propositions covered by the research and the types of relationships that exist in the model. These propositions are based on the literature review findings. Three levels of propositions are tested: level 1, level 2, and level 3. Each level 1 proposition has a set of level 2 propositions that are related to it. Each level 2 proposition has also a set of level 3 propositions underlying it. A total of four (4) main propositions were identified in the conceptual model. The detailed outline of the level 1 and 2 ones is presented in the sections below, for simplicity (total of 154 relations).

Several authors have covered the modes of open innovation. Our propositions focus on a few empirical research that encompass different aspects, in particular:

- Chesbrough (2003a) on erosion factors and open innovation practices
- Christensen and Raynor (2003) on modularity and architecture industry evolution,
- Gassmann and Enkel (2004) on the three core OI processes,
- Lichtenhaler (2011) on organizational and individual capabilities.

4.2.1 P1: Direct Effect of Erosion Factors on OI Processes

Erosion factors in the industry are considered important elements influencing the need for more open innovation. Open innovation has become an increasing need due to these main erosion factors (Chesbrough, 2003a):

- Growing mobility of highly experienced and skilled people
- Burgeoning amount of college and post-college training: knowledge spill-out of the corporate central research labs to companies of all sizes
- Increasingly knowledgeable customers and suppliers
- Increasing globalization of knowledge
- Growing presence of VC
- Increasing fast time to market for products and services
- Increasing cost of doing research inside the company.

Other industry changes are important given their impact on the need to do more open innovation. One of the most critical erosion factors is the evolution of professional services firms into an increasingly modular architecture (Rahikka et al., 2011). The concept of modularity of services leads to an increasing integration/brokerage role, a key factor explaining the new open innovation concept in professional services (Abbate, Coppolino, & Schiavone, 2013; Hipp, Gallego, & Rubalcaba, 2015). Knowledge proliferation is another critical erosion factor in the sector.

These erosion factors (independent variables) lead to an increase in the professional services adoption of open innovation processes (intermediary variables): inside-out, outside-in, client-focused innovations, coupled processes, and external collaboration per innovation type and phase. This results in the following level 1 proposition and the five underlying level 2 propositions:

- ***Proposition 1 (P1):*** *Erosion factors in professional services firms have a positive effect on the overall open innovation practices adoption*
    - *Proposition 1.2.1 (P1.2.1): Erosion factors in professional services firms have a positive effect on inside-out open innovation practices adoption*
    - *Proposition 1.2.2 (P1.2.2): Erosion factors in professional services firms have a positive effect on outside-in open innovation practices adoption*
    - *Proposition 1.2.3 (P1.2.3): Erosion factors in professional services firms have a positive effect on coupled open innovation practices adoption*

4.2.2 P2: Direct Effect of OI Processes on Performance

The impact that Open Innovation processes' adoption has on performance is important in order to show the benefits or lack-of on firms. Authors like Kafouros and Forans, (2012), Cheng and Huizingh (2014), Mahr, Lievens, and Blazevic (2014) have demonstrated the positive effect of open innovation adoption on the firms' performance. Some authors claim that Open Innovation results in increased innovation and financial performance (Enkel, Gassmann & Chesbrough, 2009; Verbano, Crema, & Venturini, 2013; Zhao, Sun, & Xu, 2015). Cooperation with industry partners and sourcing of information from the market have therefore a positive effect on both innovation intensity and output (Mention & Asikainen, 2012). OI processes are the intermediary variables and the impacts on performance the outcome/criterion variables. Therefore, the following level 1 and 2 propositions are presented:

- ***Proposition 2 (H2):*** *OI Processes have a positive impact on the practice's performance*
    - *Proposition 2.1 (H2.1): Inside-out processes have a positive impact on performance*
    - *Proposition 2.2 (H2.2): Outside-in processes have a positive impact on performance*
    - *Proposition 2.3 (H2.3): Coupled processes have a positive impact on performance*

The propositions are limited to the level 2 only at that stage for simplicity only. In the detailed results, all three levels of the propositions are tested. For instance, practice's performance is split into two variables: innovation and financial performance. This level is not shown here.

4.2.3 P3: Moderating Effect of Organization Culture on OI Impacts

The context and environment within the firm plays a key moderating role in the success of open innovation. The contextual factors are defined as moderating variables that influence the relationship between OI Processes and Performance. This leads to the following proposition:

- ***Proposition 3:*** *Organizational culture has a moderating effect on the impact of open innovation on performance.*

This proposition is split into two level 2 propositions: Organizational Support (P3.1) and Personal Preferences (P3.2), presented below.

4.2.3.1 P3.1: Moderating Effect of Organizational Support on Open Innovation Impacts

Several organizational key success factors for open innovation are presented in the literature (Tidd, 2014). In particular, alignment and support between employees and organization is crucial (Anand, Gardner, & Morris, 2007), culture and leadership (Duncan, 1972; Salge, Bohme, Farchi & Pienning, 2014; Zhao, Sun, & Xu, 2015), and knowledge exchange (Van Riel, 2004). Firm's support, which regroups all of these underlying variables, is expected to have a moderating effect on the impact of open innovation adoption on the practice's performance. Therefore, the following level 2 proposition emerges:

- *Proposition 3.1 (P3.1): Firm's support level has a moderating effect on the impact of open innovation on performance.*

4.2.3.2 P3.2: Moderating Effect of Individuals' Preferences on Open Innovation Impacts

Not-invented-here, Not-sold-here, Buy-in attitude and Sell-out attitude are all individual preferences that affect open innovation adoption (Chesbrough, 2003a; Lichtenhaler, 2011) and hence its impact on performance. The individual's acceptance of sharing outside the firm, of learning from outside partners and of internalizing external knowledge are key determinants of the success of open innovation implementation. Therefore, the individual employee's personal preferences have a moderating effect on the impact of open innovation on the performance. Therefore, the following level 2 proposition emerges from this literature:

- *Proposition 3.2 (P3.2): Personal preferences have a moderating effect on the impact of open innovation on performance*

4.2.4 P4: Moderating Effect of Risks Management on OI Processes Impact

Risk management is a key topic in open innovation that affects the OI practices' impact. Several type of risks and risk practices need to be considered as per the literature (Arrow, 1962; Chesbrough, 2003a; 2006; 2007a; 2007b; Chesbrough et al., 2006; Fredberg, Elmquist, & Ollila, 2008; Wenjuan & Lei, 2010; Hagedoorn & Zobel, 2015; Paasi *et al.*, 2015; Shearmur et al., 2015; Veer *et al.*, 2013; Veer, Lorenz, & Blind, 2013). These risks and the way they are managed can moderate the impact that open innovation has on performance. Therefore, the following level 1 and level 2 propositions emerge:

- *Proposition 4 (P4): Risk management has a moderating effect on the level of impact of open innovation on performance*
    - *Proposition 4.1 (P4.1): Inside-out risk management has a moderating effect on the level of impact of open innovation on performance*
    - *Proposition 4.2 (P4.2): Outside-in risk management has a moderating effect on the level of impact of open innovation on performance*
    - *Proposition 4.3 (P4.3): Coupled risk management has a moderating effect on the level of impact of open innovation on performance*

4.2.5 Line of Service, Geography, Maturity and Hierarchical Level

In order to account for extraneous factors that can influence open innovation dynamics presented thus far, control variables are identified and summarized. The literature has covered much less this type of variables in open innovation studies than the rest of the themes. Type of professional services (Line of Service), geography, maturity of the practice or firm, and hierarchical levels are not aspect that open innovation literature have covered extensively (if any) so far, to the extent of the researcher's knowledge. In other fields of innovation and management, these are control variables that have been applied, hence the logic of choosing them in the context of OI in PSFs.

Type of Professional Services

Different types of professional services firms have different realities, driven by different market conditions. Maturity of the industry plays an important role in adopting open innovation. Not all markets of professional services segments are at the same level of maturity. Literature showed differences in results between the different sectors, and hence this difference can be potentially found also within the professional services sectors.

Geography

Literature on location and geography impact on innovative capacity is abundant when it comes to general industries (Boschma, 2010; Feldman, 2002; Krugman, 1991; Love & Roper, 2000). But it is less available for open innovation and services in particular. Geography differences within Canada could play an important role on the application of open innovation. Literature has not covered this aspect in the past with this angle. Some authors (Armellini, Kaminski, & Beaudry, 2012) found differences in the application of open innovation between Canadian and Brazilian aerospace clusters but did not study differences within each country. However, some authors find little impact of geography on the KIBS service offering (INRS, 2014), on knowledge management (Kianto & Andreeva, 2014) or on the quality of their service (Hua, Lin & Chang, 2013). Given the ambiguity in this variable, it is kept as a control variable to avoid any potential difference due to location of respondents. Professional services firms are in most cases locally rooted and different offices serve mostly local clients. Hence, the dynamics are adapted according to the local market, which renders this control variable interesting.

Stage of Practice Maturity

The stage of a company or practice’s maturity has an effect on service innovativeness in the context of open innovation (Shiu, & Dawson, 2014). Some authors found that a *“… start-up is less open than an established firm”* (Moon, 2011, p. 185). The more mature practices adopt further open innovation practices and witness a different impact on performance than the less mature (early stage) practices. This maturity is measured in the current research as the number of years of existence of a certain practice or firm.

Impact of the Hierarchical Level on Open Innovation Adoption

Literature shows that success rates of openness increases with the leaders' experience (Salge, Farchi, Barrett, & Dopson, 2013). The higher an individual is in the organization, the more open he/she is towards OI. Therefore, it is kept as a control variable in the conceptual model.

Conclusion

These control variables are used in the overall model to control for exogenous factors that could have an impact on the overall open innovation model presented.

The next section presents the methodology used for testing the conceptual model.

4.3 Data Collection Methodology for Firm ABC

This first section details the data collection methodology conducted in *Firm ABC.*

Objectives

The main objective of our methodology is to test the variables of the open innovation model proposed in the previous sections with precision, and to validate the relationships between the different variables in the model based on the outlined propositions in the previous chapter (Thietrat, 2014). With little to no literature on OI in PSFs as per the literature review results, this research is exploratory by nature. The purpose is hence to:

- Explore if and how open innovation practices are adapted in professional services firms
- Identify the model that best fits professional services application of open innovation
- Assess the most relevant variables and their importance in the model
- Propose a description that best explains the OI concept in PSFs
- Identify how erosion factors impact the open innovation practices of the firm
- Understand how OI practices impact the performance of the practices in the firm
- Understand how these practices differ from one type of practice, geography, hierarchical level, and practice maturity level to another
- Identify the influence risk management and organizational environment have on the impact of the open innovation practices on the practices' performance.

The validity of the overall methodology used in the current research is supported by several authors (Babbie & Roberts, 2013; Venkatraman, 1989).

Firm ABC

Firm ABC has five lines of services (Assurance, Tax, Consulting, Deals, and Internal Firm Services) that cover major areas of the wider professional services sector in Canada. It employs between 5,000-10,000 professionals in several offices across the country. Given its size and the diversity of its practices, the firm chosen is considered a representative example of the industry.

Survey Instrument

The survey questions were built based on the exploratory interviews conducted and the resulting conceptual model. The validity of these constructs was verified first based on the literature since the main variables were covered in previous studies on open innovation, and hence already validated as measures (see next section). Once the survey designed, it was launched for a pre-test inside and outside of Firm ABC with 15 practitioners. This allowed for validation and collection of comments and feedback in order to improve the quality and clarity of the survey questions. The average length was 15 mins. The questionnaire got then trimmed down to less than 8 to 10 minutes to allow for a higher response rate as discussed with respondents, while keeping all the main themes needed for the conceptual model to be validated.

After adjusting the survey questionnaire, it was launched across the country inside Firm ABC. In parallel, the same survey was launched externally to other professional services firms for external validity analysis. The survey instrument was only available in an online version in English, anonymously, using *Qualtrix* tool. The reason is that it was diffused in several provinces in Canada, and that the Firm ABC had its head office in Toronto. This online anonymous surveying approach was privileged as it reduces the bias due to the pressure of being present in person (Blais, 1992). An introductory message and a consent form were used to present the research and objectives of the survey (see Appendices H and I). The first section starts with the introductory questions that are dummy variables (used as control variables) and aim to profile the respondent by line of service, location, maturity of practice he belongs to, and hierarchical level. No information on their names or email addresses were asked for, in order to protect anonymity.

Measures & Questions in the Survey

The choice of measures and hence questions in the survey linked to these measures is based on previous literature that has already been conducted (see Appendix J for the detailed survey instrument). To avoid biases, the term “Open Innovation” was not used in the survey or interviews. Most of the questions asked are perceptual and based on a Likert scale of 7 levels instead of 5, as suggested by some authors who found that the answers reliability could potentially increase with when respondents have more options to choose from (Lozano, Garcia-Cueto, & Muniz, 2008). No middle point in the Likert-scale was offered to participant in order to limit the respondents’ temptation to choose it as a natural reflex. In fact, some authors find that having a neutral answer increases the instances where respondents choose it even though they can answer otherwise (Bishop, 1987; Kalton, Roberts, & Holt, 1980; Krosnick et al., 2002). The Ethics Certificate was presented and approved by École Polytechnique Ethics Committee before launching the survey (see Appendix G for the certificate).

Survey Launch and Data Collection

With the approval received from the École Polytechnique Ethics Committee, the survey was launched in the participating *Firm ABC* across Canada. It was sent to 2,600 managers, directors and partners in Firm ABC’s offices across Canada. Two weeks after the first solicitation, a reminder was sent, as suggested by Dillman (2000). A total 600 answers from the firm were received, out of which only 345 were considered complete and retained for the analysis. In total, 255 answers were not considered in the analysis for the following reasons:

- 42 respondents clicked on the link but did not start the survey, stopping at the introductory message only (possible reasons: lack of interest, opened the link and then were busy and never got to it, etc.) (total at 558)
- 19 respondents decided not to continue after reading the informed consent form (total at 539)
- 10 abandoned right after accepting the consent form, before answering questions (total at 529)
- 1 abandoned by the end of this section (total now at 528)
- 69 abandoned after completing the first section and before starting the second section (total now at 459)

- 9 dropped after completing the second section (total now at 450)
- 3 dropped before starting the third section (total now at 447)
- 5 dropped by the end of the third section (total now at 442)
- 27 dropped before starting the fourth section (total now at 415)
- 2 dropped by the end of the fourth section (total now at 413)
- 16 dropped before starting the fifth section (total now at 397)
- 3 dropped by the end of the fifth section (total now at 394)
- 45 dropped before starting the sixth section (total now at 349)
- 4 dropped by the end of the sixth section (total of final sample at $N_{\text{Firm ABC}} = 345$).

When following up with some of the respondents that did not continue, they claimed that they either didn't have time to continue, got distracted by something else, or that they found it quite long and decided to abandon. The retained sample of respondents that went to the end of the questionnaire is $N_{\text{FIRM ABC}} = 345$. That doesn't mean that all 345 respondents answered absolutely all the sub-questions asked, but that they have reached the end of the survey while answering a very high majority of the sub-questions. Given the large number of non-respondents, there might be a bias in the respondents that is considered a limitation in the current study. All the answers were downloaded on an Excel File (.CSV) and then transferred to the SPSS software tool for statistical analysis. The exploratory interviews conducted led to the identification of some themes and areas of interest for the research. Given the exploratory nature of the research, one company has been chosen for a deep-dive survey. The current thesis aims to verify, through the analysis of the survey results, whether open innovation practices are applied in the firm, their relationship with erosion factors, and their impact on the firm's innovation and financial performance, as well as the moderating effect of risk management and organizational culture.

4.3.1 Unit of Analysis

Since our research is about Open Innovation in Professional Services firms, our unit of analysis is the professional services firm. However, given that in most professional services firms, especially larger ones, each line of service and practice is independent from the rest (i.e. each has its own

P&L – profit and loss statement), the focus of the analysis for our research is both the practice and the line of service within the professional services firm. Lines of services are made of several practices. Each practice is led by a partner, one or two managing directors or directors, and two to four managers that focus on hiring resources, selling, and delivering projects to clients. They use shared services for their IT, finance, accounting, legal, and marketing needs, all under what is called *Internal Firm Services* in Firm ABC. Since some of the propositions stated in the previous chapter rely on individual resources opinions, the individual manager, director, managing director, or partner are considered the individual units of analysis.

4.3.2 Population and Sampling

The sampling technique of choosing one company that is considered representative of the entire sector is that of convenience (Thierat, 2014). Yin (2003) suggests that it reasonable to rely on one case if it is well representative of the population. In the case of this research, the large professional services firm (*Firm ABC*) in Canada with around 5,000 to 10,000 employees and offices around the country is considered representative of the industry. The sampling choice was made based on the fact that the Firm ABC offers a large breadth and depth of services, allowing the research to cover several of the professional services sub-sectors: Tax, Assurance (or Audit), Consulting, and Deals. The company has several offices in Canada from East to West, and hence covers the main economic regions in the country. This allows for a better geographical representation of the findings. Babbie and Benaquisto (2002, p. 165) confirm that: « *Sometimes it's appropriate for you to select your sample on the basis of your own knowledge of the population and the purpose of the study. This type of sampling is called purposive or judgmental sampling* ». Several other researchers in social sciences defend this approach (Beaud, 1992; Churchill, 1995). Therefore, our research being of exploratory nature, the sampling technique of choosing one firm is justified.

4.3.2.1 **Firm ABC Population Overview**

Within the selected firm, the survey targeted all managers, directors, managing directors and partners in Canada. The selection criterion was based on the need to have respondents with enough experience and relation with clients, as well as other practices, to be able to better answer and judge. Typically, managers, directors, managing directors, and partners have at least 6 to 7 years of experience and more. This ensures a more accurate view over time and more experienced opinions. These resources are also very client-facing, while lower levels aren't always exposed to clients and to the external relationships and partners. This group represents a population of 2,741 resources, divided as follows by level, by region and by line of service (see Figure 4-2 below):

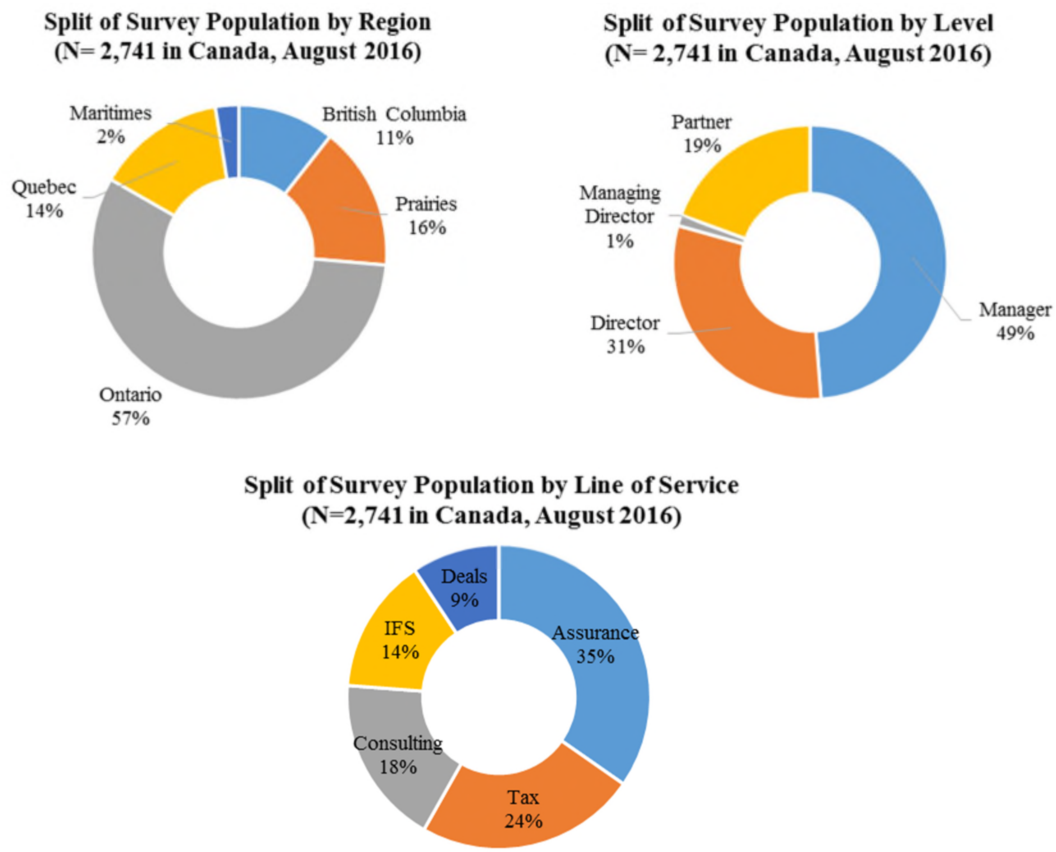

Figure 4-2: Survey Population Split by Region, Level, and Line of Service (N= 2,741)

4.3.2.2 Respondents Sample Overview and Representation

The survey was available online only, administered between July 2016 and September 2016, in partnership with the Firm ABC's innovation team and supported by the national innovation leader. The final internal sample is 345 respondents, which represents a final response rate of 13% of the total 2,741 population. This is considered higher than the target minimum of 10%. With this size, the sample has a 95% confidence level and around 5% margin of error. By region, the respondents were split in a similar way than the population, hence the respondents are representative. The same observation is true when comparing the respondents split by line of service vs. the population, as per Figure 4-3 below:

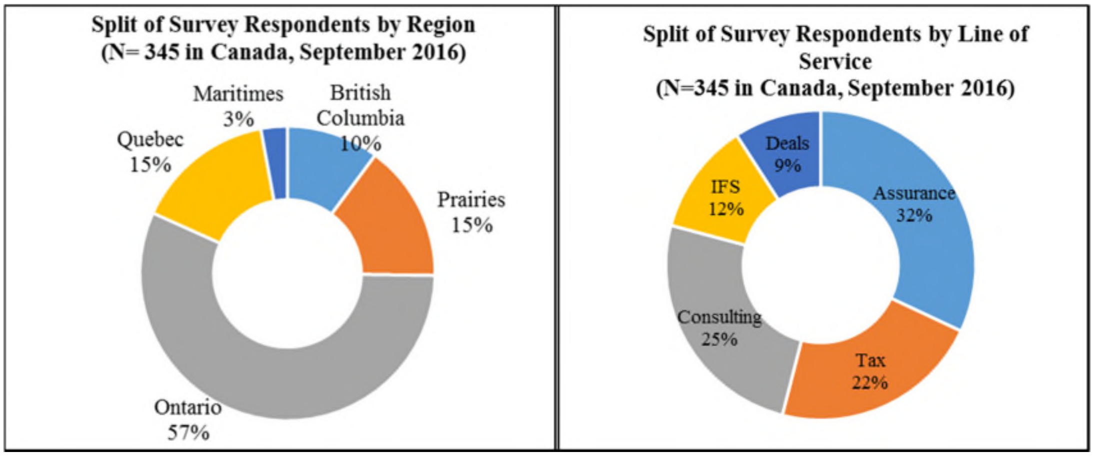

Figure 4-3: Split of Firm ABC Survey Respondents (N = 345) by Region and Line of Service

When comparing from a hierarchical level, respondents are representative with the exception of the partners being under represented. On the other hand, Figure 4-4 highlights that the large majority of respondents belonged to practices that exist for more than five years:

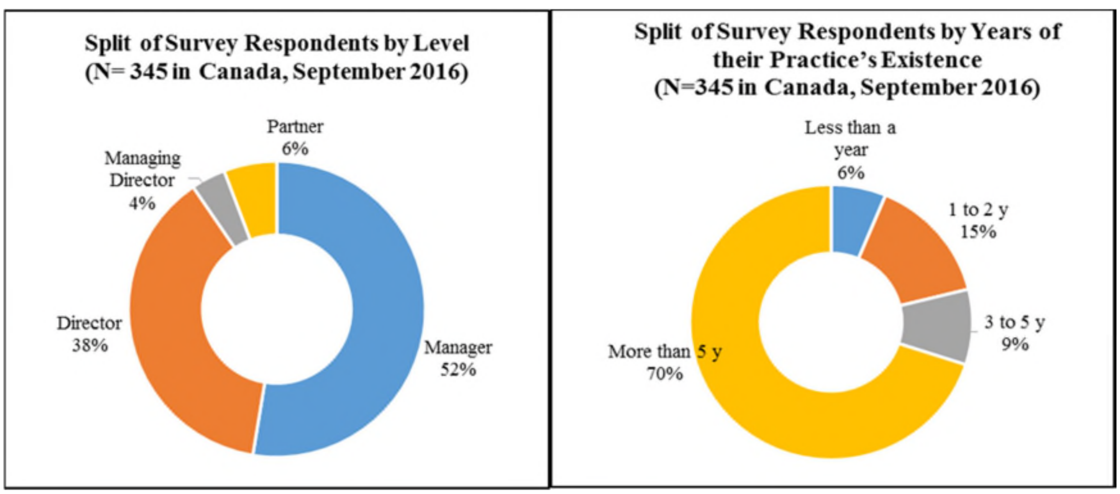

Figure 4-4: Split of Firm ABC Survey Respondents (N= 345) by Level & Practice Maturity

Internally, the sample is representative of the population of Firm ABC. As for the representation of Firm ABC of the rest of the industry, this is has not been validated. The objective was to give an overview within one firm and extend it to the extent possible, as an addition, to other firms. Since the current research is an exploratory one, and the industry being very diverse and large, it was deemed not necessary to validate the representation of the sample beyond the Firm ABC. This is a limitation in the current exploratory research that is assumed, and future work should analyse further if the current sample is representative of the entire industry.

4.4 Choice of Measures and Research Instrument for Firm ABC

Given the large number of questions and sub-questions (see Appendix G for the survey instrument), there was a need to simplify by grouping these questions/variables into groups for ease of analysis. To do so, reliable measures had to be identified within the building blocks of the conceptual model. By testing through these overarching measures, the results apply to the underlying items within each group. The choice of the measures for open innovation are based on two levels of analysis:

1. Theoretical (section 6.1.2): existing literature review was the initiator of the choice of the measures
2. Statistical (section 6.1.3): the measures from the literature are tested statistically through the survey results to ensure the goodness of measure of each variable. This was validate using two criteria, reliability and validity, then refined in order to ensure an alpha-Cronbach reliability ≥ 0.7 (or 0.6 for exploratory research) as suggested by Hair, Black, Babin and Anderson (2010).

The first level of analysis - the theoretical results - is presented in Appendix E by relying on existing literature review. Measures of open innovation have been identified and mapped into the conceptual model that was built based on the literature in the previous sections. These measures were translated into a survey instrument containing 19 questions divided into 79 sub-questions. The literature review conducted are the main sources of identification of the potential measures used in the model. These measures have already been researched and empirically tested by other authors. The measures identified were related to five types of variables (see below), with the different measures linked to these variables (detailed literature and reliability measures in Appendix K).

1. Independent variables

Independent variables are considered the ones that drive or explain the open innovation processes. In the case of the conceptual open innovation model for professional services firms, and according to literature, erosion factors are the key catalysts behind the need of companies to move from a closed to a more open strategy (Chesbrough, 2003a).

2. Intermediary variables

Intermediary variables are the ones explained by the independent variables. They predict the outcome variables. In this case, open innovation processes are considered the intermediary variables. According to Hagadoorn and Zobel (2015), open innovation processes or *Openness* have a positive impact on performance (financial, product development and innovation capacity). Overall openness of firms is defined as "… *the degree to which OI firms exchange their knowledge with a range of partners (i.e. suppliers, customers, competitors, universities/research institutes ...)*" (Hagedoorn & Zobel, 2015, p. 1060).

3. Moderating Variables

Organizational Culture:

Successful open innovation depends on strategic leadership and organizational structures and processes that are appropriate to the type of innovation adopted (Roberts & Berry, 1985). It depends also on the organization's values, decision-making style, culture, and rewards/incentives (Duncan, 1972; Kianto & Andreeva, 2014; Salge et al., 2014; Zhao, Sun, & Xu, 2015). In fact:

> *When used in combination with each other, three practices—intraorganizational learning, interorganizational partnering, and an open organization culture, i.e., a learning capability—will have a positive impact on innovation ambidexterity.* (Lin; McDonough; Lin; Lin; et al, 2013, p. 267).

Risk Management:

On the other hand, risk management plays an important role in open innovation, IPR in particular. As stated by Hagedoorn and Zobel (2015, p. 1062):

> *The more open these OI firms are in terms of their external knowledge exchange, which does create a risk of unintended knowledge leakage, and the more legally formal their attitude, which expresses their preference for controlling their collaboration with others through contracts, the more relevant these firms perceive IPR as means to protect their knowledge exchange.*

Therefore, organizational culture, driven by leadership culture and personal employees' preferences, along with Risk management are two main moderating variables that influence the relationship between Open Innovation Processes and their impact on the Firm's performance.

4. Dependent/Outcome Variables

Dependent or Outcome variables are the ones explained or predicted by all the intermediary ones, Open Innovation processes in this case. Raisch and Birkinshaw (2008) claim that studies using one indicator of firm performance *"… run the risk of producing biased estimations of organizational ambidexterity's contributions to the firm's overall success"*. To avoid this risk, the main impacts are measured based on two factors: (1) the propensity to innovate in the past few years, and (2) the financial performance and client relationships.

Literature found that open innovation practices have a positive impact on:

- Market and financial success (Mahr et al., 2014),
- New product development (Menguc et al., 2014),
- Propensity to innovate (Temel et al., 2013; Wagner, 2013),
- Financial performance (Foroughi et al., 2015; Kafouros & Forans, 2012),
- Degree of incremental and radical innovation (Hemphälä & Magnusson, 2012),
- Open service innovation, customer retention, and reputation (Foroughi et al. , 2015).

Control Variables

Control variables are factors external to the model but that could have an influence on the different relationships within the conceptual model: Line of Service, Geography, Practice Maturity (or Years of Existence), and Hierarchical Level. Therefore, measures and variables made it into the research instrument that was sent as a survey within the Firm ABC.

Conclusion:

Based on this analysis, the items used are validated and considered reliable from a literature point of view. The conceptual model has therefore reliable items that can be used to build the research instrument. The detailed mapping of the research instrument's different sections and questions based on the theoretical measures can be found in Appendix M.

Research Instrument

The main research instrument was based on these measures chosen in the previous sections. The survey regrouped 19 questions (79 sub-questions) that were aimed at testing the propositions above, organized around seven main themes:

1. **Introduction:** understanding and identification of the respondent

2. **Overall industry evolution:** investigating respondent's view on the evolution of the professional services industry the company belongs to

3. **Coupled Innovation:** investigating the importance of collaboration between the firm and external parties

4. **Outbound Innovation:** understanding the firm's practices in driving internal ideas, innovations and services out to the market

5. **Inbound Innovation:** understanding the firm's practices in taking external ideas, products & services, and innovations from the market and using them to complement internal innovation practices

6. **Organization:** investigating the firm's internal organizational practices to support innovation & collaboration

7. **Results:** understanding the practice's performance and client's impacts.

The detailed questionnaire in Appendix J. The research instrument has therefore reliable items that are based on literature review and adjusted through the exploratory interviews. Questions were inspired by the items and variables identified in the previous section.

4.5 Data Analysis Methodology for Firm ABC Survey

In this section, the methodology for analyzing the Firm ABC survey results is presented. The ultimate goal is to conduct regression analyses to test the relationships in the conceptual model using techniques proposed by several authors, notably Hair et al. (2010) and Byrne (1994):

1. **Principal Component Analysis -** This technique allows the reduction of the large number of variables (questions) into grouping of related and reliable constructs. Reliability and validity tests using PCA with *varimax* rotation were made to identify factors and validate goodness of measure, as well as a minimum correlation required to be able to advance.
2. **Correlation -** Correlation analysis to ensure independence of all variables
3. **ANOVA -** Univariate Analysis of Variance "*… to determine, on the basis of one dependent measure, whether samples are from populations with equal means*" (Hair et al., 2010, p. 3).
4. **Regressions** - Given the size of the sample and the ratio compared to the number of variables, regression analysis was deemed appropriate to explore the relationships in the OI model between dependent and independent variables, as well as the moderating variables effect on the OI dynamics.

These analyses were conducted using SPSS software. The detailed results of the analyses are presented in the Results chapter.

4.5.1.1 Principal Component Analysis

Once the survey data gathered and transferred to SPSS, a multivariate analysis was conducted using an exploratory factor analysis to uncover the structure of the large existing set of variables. In general, each variable groups a set of components, who in turn group each a set of questions from the survey. PCA helps identify which questions go under which component within each variable.

Factor Loading

Convergent validity was tested by measuring the average variance extracted (AVE), composite reliability and factor loadings. The results for each factor and item are presented in the sections below. An orthogonal varimax rotation is made "… *in order to reduce the number of variables* *from the questionnaire to create construct for further analysis"* (Verbano, Crema, & Venturini, 2013, p. 1061).

As a result, the factor loading of each question was calculated to assess the goodness of measure. This rotation helps improving the analysis of the correlation between components and variables, as a condition for conducting regression analysis. The convergent and discriminant validity was measured for each question. Questions that had a loading factor of more than +0.5 (correlation between Question and factor) and loaded on one component only were grouped and kept. The ones that either had a factor loading of less than 0.5 or loaded on several components were removed from the factor (Hair et al., 2010).

Bartlett Sphericity

A Bartlett sphericity significance test is also conducted to ensure there is enough correlation between the variables to proceed. If the significance is <0.05, then this indicates that the analysis can move forward as it is relevant to look for items/components for the variable.

Reliability (α-Cronbach)

The large sample was used to validate statistically that the resulting factors are reliable by measuring the α-Cronbach (more than 0.7 or 0.6 for exploratory studies). This allows for the refinement and selection of the factors that are the most reliable.

Consistency and Adequacy (KMO)

The different components of the model were analyzed for consistency and adequacy using Kaiser–Meyer–Olkin (KMO > 0.6 recommended) and correlations to make sure that they are fit for factorial analysis using the SPSS software (Cheng & Huizingh, 2014).

The objective was to identify relationships between the different measured variables in order to reduce them to factors, and measure the Factor Loadings, as well as their Eigenvalues to assess how much of the variance is explained by each factor. Some of the factors have been normalized (Z scores) since the scales of the different measures that constitute them were not standard. This allows the assessment of whether any data outliers exist in the set, a key condition for conducting regression analyses. As an outcome of the PCA, the reliable factors were retained for the next step.

4.5.1.2 **Correlations**

In parallel to measuring the KMO, correlation tests were made between the different items within the variables to make sure that they were uncorrelated. Control, independent and dependent variables were all tested. Linear dependence between the different items within each variable was measured using Pearson correlations to make sure all are between -0.5 and + 0.5. A correlation matrix between all variables in the model was completed to test for multicollinearity amongst them.

Some of factors were normalized to standardize their measure. We checked for Skeweness and Kurtosis to validate the normality of the measures. In our analysis, we verified that there is no correlations between control variables and each of the blocks of variables. Then verified that independent variables together (3, 4, 5, and 6) and built a matrix to check every two together for bi-variate analysis.

The results show that all Pearson correlation measures are within -0.5 and +0.5, and hence, there no strong correlations within the variables in the model (see Appendix N for the results). This is a key condition for conducting regression analyses going forward.

4.5.1.3 **ANOVA**

Once correlations were verified, validation of whether different groups have statistically significant differences in their means is conducted. The objective was to understand what explains the variance *within* each of the groups and *between* the different groups. Since there are more than two groups, a ***t-test*** is not enough and an ANOVA was needed.

Going back to the real averages (not normalized) of each independent, moderating, dependent, and intermediary variable, ANOVA (Analysis of Variance) tests were conducted on each of the three control variables (Maturity is excluded since it is a continuous variable) to measure the differences between the group means. Three ANOVA tests were conducted on the three control variables (Line of Service, Geography, and Hierarchy Level). These tests returned the means and standard deviations for each group on each variable, as well as results for K-W and M-W. No ANOVA was done on the control variable: Years of Existence of Practice, since it is a continuous variable. In these tests, two measures were made:

- Krustal-Wallis (K-W) for the global test to understand the statistical significance of the overall differences between all the groups
- Mann-Whitney (M-W) for testing two groups at a time.

4.5.1.4 Regression

The key conditions needed to run regression tests on the data sets are first verified:

i) Linearity of the data (assumed)

ii) Lack of multi-collinearity (VIF ≤ 3 or 5)

iii) Lack of autocorrelations

iv) Independence of errors

v) Constant variance around the set of data, or what is called Homoscedasticity

vi) Normality of error distribution.

In order to analyze the relationships between the different variables that constitute our propositions, linear and logit regression analyses were conducted, one proposition at a time. Regressions were also made on the interactions between the moderating variables and the direct effect of OI processes on performance. A three-stage least regression technique was employed (Luo, Rindfleish, & Tse, 1997) with four models, since this approach reduces the concerns of endogeneity (Menguc et al., 2014). The objective of the regressions made is to test whether the propositions on the relationships between different variables are supported or not. We use the control variables in each to control for factors outside the open innovation core model.

For each control variable, a reference group is fixed in order to compare against:

- **Q1 – Line of Service:** Assurance is chosen since this is the main service offering the firm studied has. It is the largest group in the firm and constitutes a good reference to compare the other groups against.
- **Q2 – Geography:** Ontario is chosen as the reference since the firm's head office is in Toronto and that the largest portion of the firm's employees work in Ontarian offices
- **Q3 – Years of Existence of Practice:** this is not applicable because it is a continuous variable in our model

- **Q4 – Hierarchical Level:** Partners and Managing Directors are chosen as the reference group. They constitute the leadership team of the firm and appropriate to test against.

For each proposition, descriptive statistics were gathered, along with results on Pearson correlations between the different variables measured, the R and the coefficient of determination R^2 as well as ANOVA and Coefficients (t, significance, collinearity statistics – Tolerance and VIF). Working on the common N to all, regression tests were conducted on the responses. In the cases where the dependent variable is categorical and not quantitative/continuous, logistic regression (or logit regression) was done. Based on the framework provided by Sharma, Durand, and Gur-Arie (1981), moderating variables are tested to identify whether they are: homologizers, pure moderators, quasi-moderators, or predictors.

Regressions are conducted in order to test the following:

- Are erosion factors predictors of Open Innovation processes?
- Are Open Innovation processes predictors of practices' performance?
- Is Organizational Culture a moderator of the relationship between Open innovation processes and their impact on the performance? Are they also predictors?
- Is Risk Management a moderator of the relationship between Open innovation processes and their impact on the performance? Are they also predictors?

Given that the outcome variable Q18 (number of variables) was transformed into a binary one, a logistic regression is applied to it.

Logistic Regression

In the logistic regression made on the outcome variable Q18 (propensity to innovate), the following measures were collected from the SPSS results:

(1) Omnibus Test (significance)

(2) Nagelkerke R Square

(3) Hosmer and Lemeshow Test (Significance).

Moderating Effect

To identify whether there is a moderating effect, the approach recommended by Sharma (1981) is the one below. For each relationship, four models are analyzed, where x is the predictor, y the criterion (or outcome), z the moderator and Ɛ the error variable, with a, b, c, and d as constants. The Figure 4-5 below presents an extract from Sharma et al.'s article (1981) highlighting the four models that will be used and presented in the results section for the moderating effects:

Model 1. This model represents the case in which there is no moderating effect. The specific relationship between the variables is given by

$$Y = a + bx + \varepsilon.$$

Model 2. The second model is the case in which the moderator variable is affecting the criterion variable through the error term and conforms to the moderator termed "homologizer." The

$$y = a + bx + cz + dxz + \varepsilon.$$

relationship used to generate the data is given by

$$y = a + bx + z\varepsilon.$$

Model 3. In the third model, the hypothesized moderator is a predictor variable and enters the equation through an interaction term. It represents the quasi moderator variable and can be expressed as

Model 4. In this model, the moderator variable is assumed to affect the criterion variable through an interaction with the predictor variable and represents the pure moderator form. The relationship used to generate the data is given by:

$$y = a + bx + dxz + \varepsilon.$$

Figure 4-5: Moderator relationship identification methodology (Taken Integrally from Sharma et al., 1981, p. 297-298)

Multicollinearity

Given that multicollinearity increases by using different models in the linear regression, improvement measures are taken to overcome this problem by modifying the method of least squares (Neter, Wasserman, & Kutner, 1989, p. 411):

> *In polynomial regression models, expressing the independent variable(s) in the form of deviation from the mean serves to reduce substantially the multicollinearity among the first-order, second-order, and higher-order terms for any given independent variable.*

Hence, grand mean centered variables are created for the cross-products (interaction effect) to lessen multicollinearity (Aiken & West, 1991) and the variance inflation factor was measured to validate that multicollinearity was not a concern (VIF <10, Neter et al., 1985).

4.5.2 Summary

The figure 4-6 below summarizes visually the steps followed in the methodology:

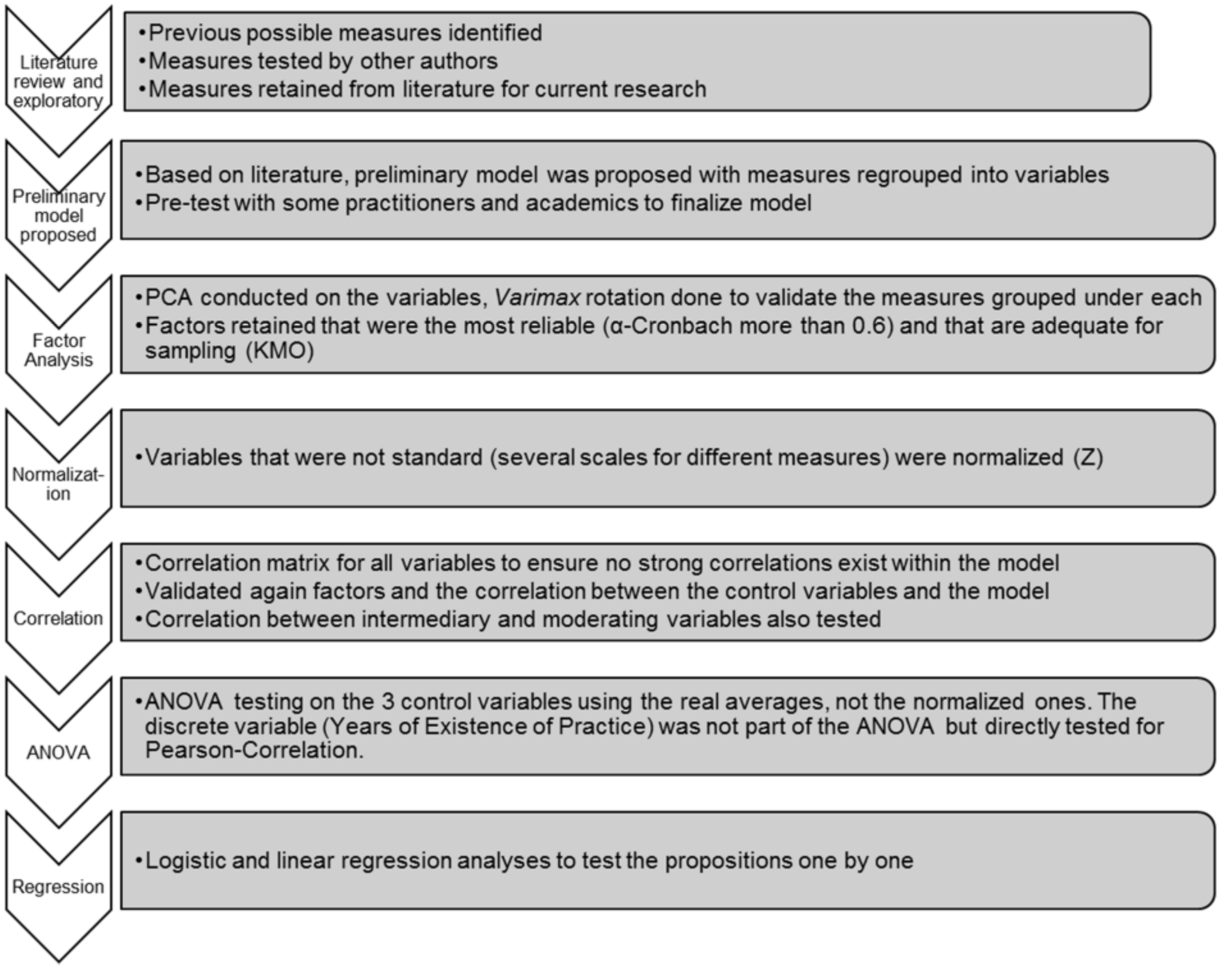

Figure 4-6: Summary of the overall methodology

4.6 Validation Approach

To validate further the findings from the survey in the firm, two main techniques were used:

(1) Extension of survey externally for validity but not in order to generalize the findings,

(2) Interviews with some experts in professional services firms to get their feedback on the surveys results.

4.6.1 External Validity

In parallel to the Firm ABC survey, the same survey was launched to other professional services firms in the Canadian industry. The objective was to gather further inputs on whether the Firm ABC findings are unique to it, or that other firms in the industry have similar results. The objective therefore was not to generalize the findings. Social media and professional networks were used to disseminate the message. In total, 78 answers were received from outside the Firm ABC, out of which only 55 were deemed complete and fit for analysis. The external validation survey was conducted between August and September 2016. The 23 answers not considered were mainly caused by:

1. 11 respondents opening the linking by not starting the survey (possible reasons: lack of interest, opened the link and then were busy and never got to it, etc.)
2. 2 respondents started the survey and did not continue because are not located in Canada
3. 10 dropped during the completion of the survey (total of 55 at the end).

The same respondents selection criteria used for Firm ABC were applied in that case as well. First, the respondents had to be working in Canada. Second, they had to be Managers, Directors, Managing Directors, and Partners only. Third, they had to be client facing. As per Figure 4-7, the respondents were very concentrated in consulting (79% of respondents) as compared to the Firm ABC (18%), and there is much higher proportion of partners in the respondents (39% of the respondents) vs. less in Firm ABC (19%). These main differences might have an impact on the results, which is a limitation of the study.

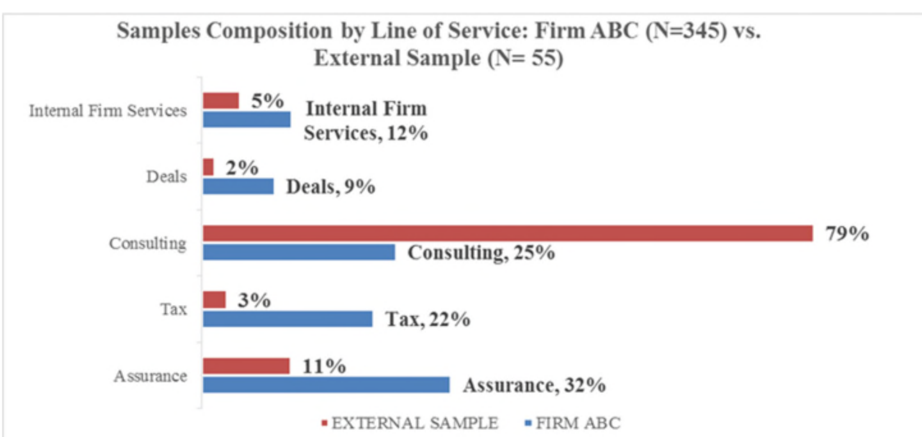

Figure 4-7: External Sample Composition Compared to Firm ABC - Line of Service

Figure 4-8 below details the external sample composition by geography, years of practice existence, and hierarchical level.

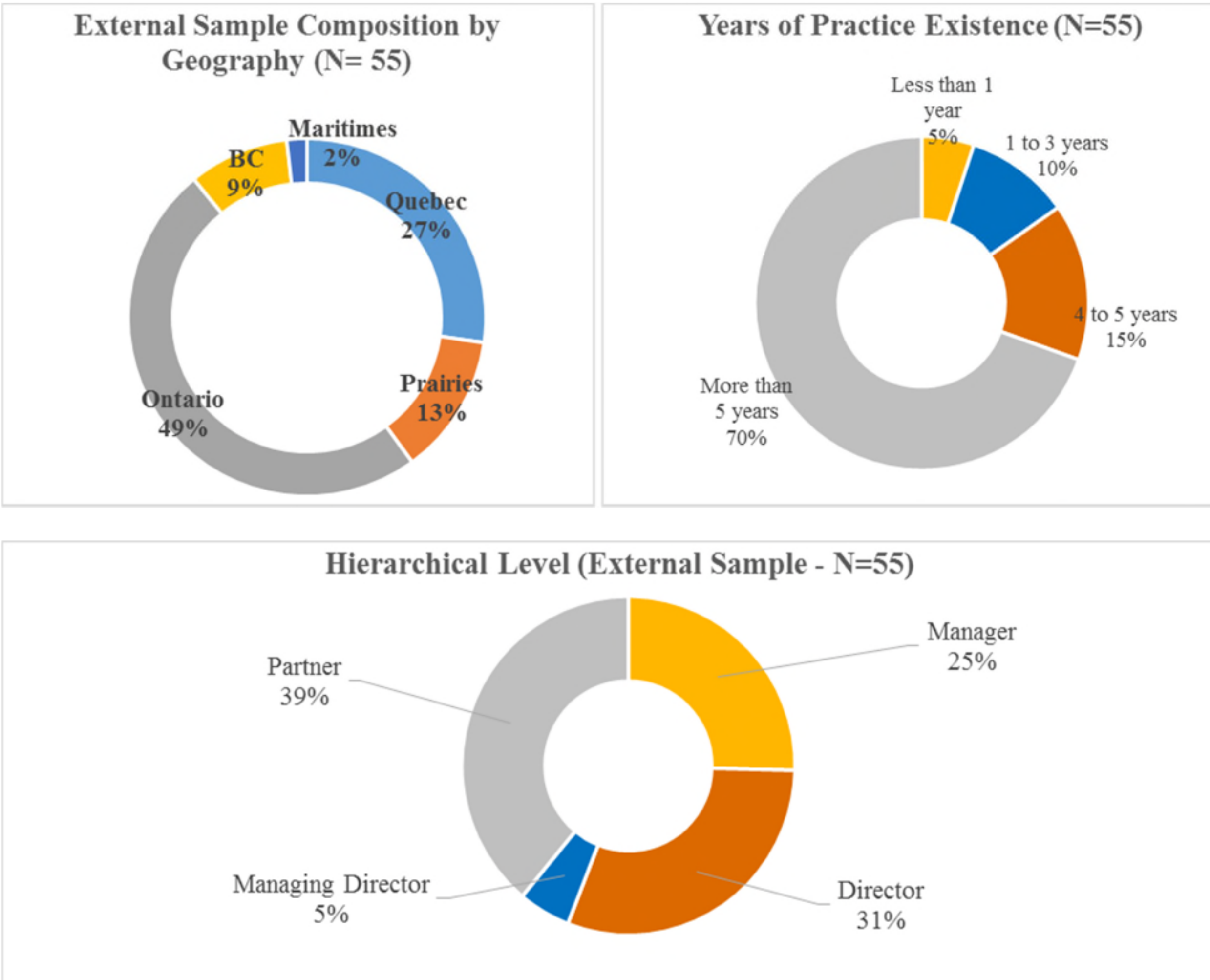

Figure 4-8: External Sample Composition by Geography, Years of Practice Existence, and Hierarchical Level of Respondents

Using similar statistical techniques then the ones described in the previous sections, results were analyzed in order to investigate for external validity. In summary, the following two main tests were made: (1) Principal Component Analysis, and (2) Linear and Logistic Regressions.

Only the common N to both sample (respondents that have answered to absolutely all sub-questions) was used to ensure robustness of the test, dropping the sample size from N=345 to N=276. The new Firm ABC sample composition that was used for the external validity tests is summarized in table 4-2 below (for full detailed breakdown see Appendix S):

Table 4-2: External Validity - Firm ABC Remaining Sample (N=276)

Sample composition	QUEBEC	PRAIRIES	ONTARIO	BC	MARITIMES	Total	**Percentage**
ASSURANCE	22	16	38	14	2	92	**33%**
TAX	10	11	33	8	1	63	**23%**
CONSULTING	9	6	47	7	1	70	**25%**
DEALS	5	2	13	3	1	24	**9%**
IFS	1	2	23	0	1	27	**10%**
Total	47	37	154	32	6	276	
In percentage:	**17%**	**13%**	**56%**	**12%**	**2%**		

PCA was conducted to identify the factors that can be used to combined questions together in order to simplify the representation of the conceptual model and its analysis. A Mann-Whitney U t-test was also made to compare the difference between the two groups means ($N_{\text{Firm ABC}}$ = 276 vs. N_{External} = 55, N_{Total}= 331). To limit multicollinearity, a Grand Means Centered was conducted.

A regression was then made on the direct relationships only (P1 and P4) without considering the moderators, as these direct relationships are the core of the model. We tested whether the projected values from regressions give a relation in the external sample that is similar to the one predicted in the Firm ABC sample. Additional regression test was conducted for the external validity comparing the two samples. To do so, Firm ABC was considered as a control variable that interacted with the main independent variables. This aimed to see if there is a difference between the two groups on the effect on the dependent variables. The relationships for the two cases were plotted graphically for the ones that showed significant coefficient difference when Firm ABC control variable interacted with the independent variable.

4.6.2 Expert Validation

Finally, in order to complement the findings, five interviews were conducted with experts in professional services: three leaders inside the same Firm ABC studied, one with a client of the firm, and one with another leader in a different professional services firm. These interviews were only aimed at validating the results of the survey in practice with leaders in the industry, and better understand the context around the findings.

CHAPTER 5 EXPLORATORY STUDY RESULTS

The literature review chapters showed the increasing interest in open innovation in different industries, and most recently in services. When reviewing the literature on services, it was revealed that professional services firms are still not covered but very thinly by academia.

In this chapter, an exploratory study is conducted focused on innovation in professional services in particular. The literature led to identify different trends and interesting industry dynamics that were used as an input to conduct an exploratory research. This research was completed through interviews and some on-site observations, following the grounded theory approach (Eisendhart, 1989). The questions that this section aims to answer are the following:

- Is there an interest from a practical angle in professional services?
- What are the particularities in terms innovation and open innovation in services in general and professional services in particular?

The objective is therefore to explore whether there is an interest in pursuing open innovation research in the field.

5.1 Results from Interviews

In this section, the results from the interviews are presented organized in two sections:

1. Innovation in PSFs
2. Trends and Challenges in PSFs

Main notes from the interviews are highlighted to give an overview of the practitioners' point of views as related to different themes in the research. These themes are the same covered in the corresponding sections of the literature review (3.3 and 3.4).

5.1.1 Innovation in Professional Services Firms

This first section presents the main findings from the interviews on innovation in professional services firms. In order to keep the original meaning of the interviewees' points, the verbatim is presented in this section on each of the themes covered in sections 3.3 in order to compare findings from the literature with the results from the interviews.

5.1.1.1 Theme 1: Particularities of PSFs

In line with the literature review findings (Mors, 2010; Ritala et al., 2013), interviewees confirm the increasing use and development of knowledge management and networking systems:

> *"We have a particular group which does KM led by an SVP at Corporate, a knowledge-based community formed by discipline (mechanical, electrical, etc.) … Mostly web-based with repositories of innovations and ideas. When starting we have an A-Team that works with the main team that will then continue beyond the A-Team. They are experienced engineers SMEs and make sure that right off the bat we have the right conditions to succeed"*. (SVP at Large Canadian Engineering Services Firm).

The particularities related to innovation in PSFs are also expressed by the practitioners and can be summarized as follows based on a key interview with the Head of Innovation at one of the Big Four Audit firms:

> "*Innovations are knowledge-based and mostly based on client needs and requirements"*
>
> *"Clients play an important role in the co-production of the innovation"*
>
> *"Innovations are mostly market-oriented"*
>
> *"The outside network plays an important role in building higher dynamic capabilities"*
>
> *"Human resources are the key innovation sources"*.

A partner in one of the leading pension funds services companies confirms that: *"Today, we look mostly at resources that can better understand and deal with our clients"*

5.1.1.2 Theme 2: Innovation in PSFs

Innovation in PSFs differs from manufacturing and technology firms, given the particularities of the industry. Interviews confirmed what literature claimed (Gadrey et al., 1995; Hertog, 2000; Mention & Asikainen, 2012). In PSFs, innovation is less about the product or technology:

> *"Innovations are about building practices with specific expertise and added-value services, enhancing the internal and external network, building thought leadership and solutions for clients"*. (Head of People & Organization Consulting for a major professional services firm in Canada).

> *"Innovation in our firms are much less about the tools and methodology, but more about bringing specific expertise that the client doesn't have and an integrated end-to-end solution"* (Head of People & Organization Consulting for a major professional services firm in Canada).

> "*Innovation in KIBS is about how to bring value-added knowledge and services quickly & simply to our customers who are becoming very knowledgeable and informed"* (Tax Partner, Big Four).

In fact, partnerships and networks have become very important in KIBS innovation process:

> *"It is all about the network of the firm"* (Consulting Partner, Big Four).

> *"Our main advantage is our network, especially globally. We bring our M&A teams from Spain, UK, China, India, US, Mexico together on global opportunities to add value to our clients. Hence the network for us is crucial"* (Deals Partner in a Large Professional Services Firm in Canada).

> *"In very large-scale engineering projects, we partner with other large companies… So we share knowledge in these partnerships. We innovate and learn from others."* (SVP at a Large Canadian Engineering Services Firm).

Social skills, more than technical ones, are key in innovation in PSFs (Chen, Chen, & Lee, 2008; Hertog, 2000). As confirmed by a Tax Partner in one of the Big Four Audit firms that was interviewed as part of the exploratory research: *"Communicating with clients is perhaps the area where we have innovated the most in the past 10 years, especially in our very complex type of services"*.

In the firms where interviews were conducted, new service development was geared around intensifying solutions that are brought from different industries, benchmarking, offering free access to thought leadership, experiences done elsewhere, and integrating technology and analytics into the service offering. In fact:

> *"Clients don't care about what you know anymore, but more about where have our firm solved this same problem in the past. Hence, new service development for us is about bringing these experiences and building practices around them for our clients"* (Partner in Operations Consulting for the Telecommunications Industry in Toronto, Big Four).

"With the increasing automation of some aspects of our traditional tax work (like documents scanning and reading, tax assessment, fiscal conformity, tax claims), we are developing new services around planning, tax dispute resolution, international transfer pricing, etc." (Tax Partner in one of the Big Four Audit Firms).

"We innovate and develop new services sometimes by doing targeted acquisitions like some of the specialised boutique firms that have developed specific tools that we acquired either in data analytics, benchmarking, pricing tools, etc." (Analytics Partner in a Large Consulting Firm in Canada).

"We innovate by being more specialised. We used to be generalists, but now we have practices developed that specialise in Post-Merger Integrations, Valuations, Business Modelling, Negotiation, Litigations, etc. We have added new services like forensics and business staging as clients' needs evolved" (Deals Partner in a Large Consulting Firm).

"In consulting, main innovation are improving processes. We constantly change our business models, and launch new products. Assurance is by nature more risk averse and try to protect the status Quo." (Operations Consulting Leader in Canada for Large Professional Services Firm).

5.1.1.3 **Theme 3: Collaboration and Co-Creation**

Literature points towards the importance of collaboration and co-creation in PSFs (Asiaikanen, 2015; Hislop, 2012; Westergreen, 2011). In fact, several interviewees point to the fact that sharing knowledge, external collaboration and building thought leadership are their main ways of open innovation. They find that their practices and services are increasingly collaborative and co-created with external partners:

"*Our approach has become much more collaborative, especially in advisory services, because our clients are much more knowledgeable about the services we offer."* (Lead Audit Partner for Retail & Consumer in Quebec for a Large Professional Services Firm).

"*We expect our service providers to be more collaborative, more open to share, to have a more humble approach to including us in the process"* (VP in charge of a Division at a Major Canadian Agri-Food and Agriculture Company located in Montreal).

“*We are more and more involved in the process of development and delivery of the solution*” (VP Strategy of a Large Canada Telecommunication Company, located in Toronto).

“*Some of our engineering clients in Utilities do most of the conceptual design and in-house and go out to market for detailed design”* (VP Engineering at a Global Canadian Engineering Consulting Firm).

Collaboration and co-creation is more prevalent for firms in the service industry where client interactions and role in value creation and capture are fundamental (Caroll & Helfert, 2015). Interviewees converge as well on that point:

“Clients are asking for more weekly meetings, reports more frequently, both for status updates but also for understanding the technical side of the solution, which was not the case in the past” (Director of large hydroelectric engineering projects at global engineering consulting leader).

“Clients don’t want to purely outsource anymore, they want to understand and be part of the decision and solution development and get the knowledge transferred in-house” (Tax Partner in one of the Big Four Audit firms).

5.1.1.4 **Theme 4: Intermediaries in OI**

Interviews also were in line with the literature about the role of PSFs as knowledge and technology intermediaries in an open innovation context (Doloreux & Laperrière, 2014; Shearmur et al., 2015). As stated by the interview, this role is becoming very important for PSFs in the market:

“We play an increasing role of integrators of knowledge, it is the future for us”. (The lead Consulting Partner for Quebec in one of the Big Four).

‘’We are way more in tune with technology providers, specialised service and contractors. At different levels: partners and sr managers are more connected to the ecosystem as intermediaries’’ (Partner, Operations in one of the Big Four).

‘*’One of the Big Four is soliciting us often to us their innovation lab”* (VP Strategy, Major Telecommunication Company).

5.1.1.5 **Theme 5: Intellectual Property in PSFs**

Intellectual property is one of the key research streams in the OI literature (Chesbrough, 2003a), especially with the low barriers to entry in PSFs (Ettlie & Rosenthal, 2011). With clients asking for an increase in knowledge transfer from their professional services providers, IPR management is key to PSFs. Practitioners and clients interviewed agree: *"Firms are more open to sharing their processes and method vs. only giving away the products in a black box."* (VP Strategy, Major Telecommunication Company in Canada)

Given this increasing reality, risk management in general and intellectual property in particular is an important aspect in open innovation for professional services firms. The difference between creating the value for the customers and capturing it while remaining relevant is a key risk in an OI context (Appleyard & Chesbrough, 2007). Quebec Deals leader at one of the Big Four mentions that, in both thought leadership and engagements, IP management is important:

> *''In giving away free thought leadership, we don't give a solution but a point of view. So we protect our Intellectual property this way. There is therefore no real risk about divulging. Loss of knowledge possible but we always try to bring in a new expertise international, industry-SMEs, speed of delivery, etc. to stay ahead of the game.*
>
> *We protect a lot our engagements not to share anything beyond what is needed''*

According to the national leader of operations consulting at one of the Big Four, this risk management culture of the audit heritage is a hindrance to innovation in general and open innovation in particular: *''It is a limitation to our innovation capacity. As consulting practice, we are not risk averse but limited by the firm's rules."*

However risk management can differ between the different types of PSFs. As noted by the head of innovation at one of the Big Four: *''Main differences in our network compared to a McKinsey is our desire to limit liability, which hinders moving innovation around the network''.*

5.1.1.6 **Conclusion**

Interviewees confirm that their firms are becoming increasingly interested in open innovation as an evolution of their traditional closed innovation approach. Their people, processes and technologies are being adapted to allow for increased openness, in line with what was found in the literature in the previous chapters.

5.1.2 Main Trends and Challenges in Professional Services Firms

Several trends and challenges in PSFs industry are pushing these companies to move towards increased vertical disintegration, modularisation, outsourcing, and specialisation (Mina, Bascavusoglu-Moreau, & Hughes, 2014). The main comments from the interviews on challenges and trends in professional services firms point towards a similar finding. In order to keep the original meaning of the interviewees' points, the verbatim is presented in this section on each of the themes covered in sections 3.3 in order to compare findings from the literature with the results from the interviews.

5.1.2.1 **Commoditization**

Interviewees were aligned with literature finding on the increasing commoditization of professional services firms (Imhoff, 2003; Knechel, 2007; Kubr, 2005). The head of Financial Performance Consulting at a Big Four mentions that *"our industry is becoming mature, much more competitive and difficult to sell with increased commoditization, so we try to bundle it in a more added-value solution"*.

As a result, firms are investing in innovations to avoid the commodity trap:

> *"Our firm invested $700M globally for the audit practice to develop new ways of doing business, new tools, analytics, knowledge-sharing platform, increasing insights and controls in audit engagements that bring higher value-added as a response to the increase in commoditisation"* (Lead Audit Partner for Retail & Consumer sector of a Large Accounting Firm).

The head of an executive search services firm claims that:

> *"Finding the people is not the hardest part of the job anymore, it's mostly the conversations. The easier part (analytical and intellectual perspectives) of the job has been automated or taken in-house".*

A partner at one of the largest professional services firm in the world, located in Montreal, confirms that this commoditization *"… led our clients to rely on us for more complex problems, rather than these commoditized traditional services that they are able to do in-house"*. For instance, *“outsourcing the payroll processes has become a commodity, however integrating the payrolls on an international level while aligning all the companies’ processes is not”* he adds.

As mentioned by a partner in one of the assurance practices of Firm ABC: *“Our industry is evolving and changing rapidly with technology and proliferation of knowledge and talent”.* Another partner, leading the Quebec consulting practice of Firm ABC, confirms that *“we are becoming a commodity with all these changes happening, and that is why we are working on reinventing our business to remain relevant”.*

Other statements summarizing the commoditization issue well are noted here:

> *“With the proliferation of the knowledge on the internet, clients need less the information from our involvement but rather the lessons learnt from having done this in different industries and at multiple clients”* (Head of Quebec Consulting Office of a Big Four in Quebec).

> *“Some of the fields that we are active in for several years are becoming a commodity like operations management (field operations, call centers, core technologies). The value-add we expect from professional services is in the new emerging needs and new functions like ePMO, process improvement, product development, and strategic planning”* (VP Strategy of Large Canadian Telecommunications Company in Canada).

5.1.2.2 **Disintegration, Modularity and Standardization of the Value Chain**

Literature points as well towards an increase in disintegration, modularity and standardization (Apte & Mason, 1995; Ettlie & Rosenthal, 2011; Rajahonka, Bask, & Lipponen, 2013) Based on the interviews, these trends are forcing PSFs to increase their openness.

The Quebec Audit Leader of a large professional services firm states that: *“Some low end parts of our business have become a commodity and hence standardized, outsourced to lower cost countries or smaller competitors”.* With this increased disintegration, modularity and standardization *“… most professional services firms have outsourced the lower end of their services to low cost service centers either in India, Philippines or South America to reduce cost and stay competitive”* (Senior Tax Partner at one of the Big Four Audit Firms).

The exploratory interviews confirmed these trends as noted here:

> *"Sometimes our clients split the solution: they ask us for the engineering idea and then give it to the contractor to build, which reduces the overall prices"* (Director of large hydroelectric engineering projects at global engineering consulting leader).

> *"Recently, they even did the preliminary study for the hydroelectric plant internally and only hired us for the validation and quality assurance of the concept"*.

> *"Our audit client used to be also tax clients. Today, they go to different tax services providers depending on the issue at hand, given the increase in specialization needed"* (Lead Audit Partner of Retail & Consumer Practice in a Large Professional Services Firm in Canada).

5.1.2.3 **Knowledgeable and Involved Clients**

Clients are asking to become more involved in service production and delivery. Their knowledge is increasing as the build internal teams that can do an important part of what PSFs traditionally offer (IBISWORLD, 2015). Interviews confirmed these trends highlighted in the literature, as stated below:

> *"We always try to focus on knowledge transfer during engagement with professional services providers, so we can become autonomous"* (VP Strategy of large telecommunications company in Canada).

> *"Clients have been hiring a lot of ex-employees from the large professional services firms internally"* (Head of Financial Performance for a Big Four in Quebec).

> *"Knowledge transfer from our service providers is increasingly important. For instance, some of the tools that our consultants used for engagements become internalised*" (VP of a division at a major agri-food and agriculture Firm in Canada).

> *"Our clients are much more knowledgeable today, they are capable of managing their own pension plans… They have become more demanding*". Senior Director of Account Management in a Financial Services Firm in Toronto. "

> *"Clients try to do more of the work themselves by hiring more specialized resources by tapping into the free or nearly free source of data*" (Head of an executive search services firm in Canada).

In fact, some practitioners confirm that: *"Our main competitors are often our client's internal teams except in services where external advisory is required because of the nature of the task (e.g. independence needed)"* (Deals Partner in a Large Professional Services Firm in Canada). For instance, a marketing services company focused on social media services started in 2010 has witnessed a tremendous growth with the proliferation of social media. However:

"Given how critical social media was to many of our large clients, they started developing in-house capabilities in order to become a more autonomous. This caused us to trim down our operations as most of our clients followed the same course." Co-founder of the firm mentioned.

As a partner at a risk consulting practice mentioned: *"… interactions with clients are becoming more and more intense with collaboration and openness of our process at an all-time high".* The head and founder of the project management consulting company claimed that *"… senior management and Boards are now more involved in our work"*, pointing towards the increase in client involvement in the development and delivery of professional services to clients. Co-creation with clients was an approach never heard of in the past, *"today clients are increasingly asking us to work with them on a white board and collaborating"* confirm the Head of Analytics Consulting in Canada for one of the Big Four.

All these factors are leading to what the founder of the executives' search firm claims: *"… Cycle time reduction expectation has increased… the fee pressure is increasing". "Our industry is going through a renaissance: the data has doubled in the past 2 years compared to all mankind history. This proliferation of data at clients' needs to be captured, analyzed, organized in order to understand the story. Moving from delivering reports to focusing on insights"* confirms an Analytics Partner at a Large Consulting Services Firm.

5.1.2.4 **Knowledge Integration and Brokerage Role of PSFs**

Several authors found that PSFs play an important knowledge integration and brokerage role in the economy (Di Maria et al., 2012; Hua et al., 2013). With this increased role, specialized knowledge is becoming very important for PSFs: *"Specialization is increasing in our industry, way more than before"* (Head and founder of project management consulting firm). Along with this specialization, firms have started to diversify their offerings to remain relevant and competitive in the market. In fact:

> "*We used to be a grouping of specialized resources in specific areas, now we became integrators of different competencies*" (Head of HR Consulting at a major Pension Planning Firm).
>
> "*Our role has evolved from owning the technical engineering competence, to being able to integrate the technology and project management aspects as well in order to remain competitive*" (VP Hydroelectric Engineering of a Large Engineering Consulting Firm in Quebec), and is seconded by the director of major hydroelectric projects at the largest engineering consulting firm in the world who confirms the importance of owning new technologies along with the expertise to remain relevant. "*Our clients look increasingly for integrated high-added value solutions*" he claims.

To do so, some professional services firms have diversified the profiles of their hires: *"We don't hire only accountants like we used to do for our Deals practice. We now look for engineers, chemists, finance experts... to be able to cover larger areas and specialties"* (Deals Partner in a Large Professional Services Firm in Canada).

5.1.2.5 **New Emerging Business Models**

Given the little regulation governing some of the PSs sectors, new entrants are entering the market from outside the traditional ecosystem (Kipping & Kirkpatrick, 2013). Industry leaders confirm that new emerging players with different value propositions then incumbents are playing an increasing role in the industry. The head and founder of a project management consulting firm confirms that *"there is an increase in peddlers, independent contractors, and retired employees who are becoming consultants"*. Another Senior Manager in a large Professional Services firm assures that "*lots of ex-employees of large technology firms are going on their own and competing against us"*. *"There is an explosion in the number of players in the industry"*, confirms the Head of the Quebec office of one of the Big Four. An analytics partner at a large consulting firm in Canada supports this view as well: "*We're going to see more and more of the D&B, Neilson, IHM, etc. that will take lots of data and information and give insights to clients*".

These new emerging but smaller players control an important share of the market, "*close to 50% of our market is under their control"* assures the head partner of consulting in one of the Big

Four. This is accentuated by the fact that: "*The brand doesn't mean much to the client anymore. It's the experience and the insightful conversations with a competitive price that matter*" (Consulting Partner at Big Four in Toronto). A client of the firm in the agri-food and agriculture industry confirms that: *"I didn't see a major differentiator in the approach between the three consulting firms we worked with on a large portfolio of projects".*

The head of engineering at one of the largest engineering consulting services firm confirms that "*there is an increase in consolidation through a series of acquisitions that the larger firms are doing as a result*". And finally, a Consulting Partner in the Calgary office stated that: "*Some of these players are growing and offering similar services but cheaper than the Big Four. So it resonates with the clients, especially the smaller ones. They are starting to go after the medium to large sized ones as well*".

5.1.2.6 **Conclusion**

According to the interviews, business models are changing in PSFs to adapt to an increase in openness: "*We are more open than ever, and we even offer open innovation services to our clients"* (Head of Innovation at one of the Big Four Accounting firms). According to the interviewees, all erosion factors presented by Chesbrough (2003a) are also observed in the professional services industry. A partner in the Tax line of service of one the leading professional services firm confirms: "*Yes, resources are very mobile, clients more knowledgeable, knowledge is widely available".* Suppliers are less important however in the professional services firms: *"Except some technology providers, we don't deal a lot with suppliers"* (Management Operations Consulting Lead Partner, Big Four). Therefore, interviewees confirm that the trends and challenges presented in the literature are actually applicable to their daily life. The closed innovation model is indeed being eroded.

5.2 Examples of Open Innovation Projects in Professional Services

In this section, four examples based on the conducted interviews from the industry are presented. These examples highlight what Open Innovation means in professional services. The four examples are projects led by a large professional services provider in Canada with four different clients. These four examples are presented in summary in the Table 5-1 below:

Table 5-1: Four Examples in professional services sector

Client	Project	Teams Involved	Open Innovation Practices
A leading Canadian agriculture and agri-food cooperative	Portfolio strategy and network transformation	Deals, consulting (strategy and P&O), France and Canada involved	- Co-creation of service started at the proposal level with client's early interactions to better fit the potential approach and solution proposed Independent contractors very involved with sector expertise and content - Partnership with a supplier to do part of the project, and working as part of the team in the delivery - Main service provider playing role of integrator of different services offered by two other service providers risk management and a network operational strategy
A grouping of the 6 major VC and PE financial institutions	Mapping of investments in Canadian Province	Deals and Consulting	- Inbound: ideas and meetings with clients, market experts, and internal experts - Outbound: shared all with clients, and results with media - Coupled: partnership between 8 companies in the sector to agree on solution - Client very involved in day to day in the meeting, worked on their data analysis as part of overall - Supplier: databases providers involved in the process, research teams involved in the research - Partnership with data base service provider to share information and knowledge, exchange databases
A Canadian cluster	Creation and launch of industry cluster	Audit, consulting (strategy and P&O), deals, IFS (communication and marketing)	- Inbound: ideas and meetings with other clusters and internal experts - Outbound: shared all with client and funders, results with media - Coupled: partnership between 15 companies in the sector to agree on solution - Client very involved in day to day in the meeting. One resources was dedicated - Suppliers very involved in creation of solution: technology, artistic, and graphics
A major Canadian Bank	Transformation strategy for the Bank	Consulting (strategy and P&O), financial risk. Montreal and Toronto	- Client leading the PM side with 5 internal units very involved, day-to-day. - Client had a team of five executives dedicated for 6 months on the project, working daily with the service provider - Independent contractors very involved with sector expertise and content - Service provider playing role of integrator of different components.

5.3 Conclusion

These four examples highlight the application of open innovation in a professional services firm observed. Managers, directors, and partners were interviewed for data collection. The main conclusion is that in all of the four cases, clients were very involved in the co-creation of the solution. As summarized well by one of the new solutions developed by this firm:

> *"To be successful we need to co-create, we believe a lot in this. So we came up with a methodology called: "Agile Analytics" where we work closely with business & data analysts from clients on data visualisation. The client formulates a set of questions that they want to get answers on, we work in a very agile manner with them to present back to them the insights. It is a closed loop with the client, we do a discovery with the client, iteratively, in order to create harmony with him… We uncover quickly with them what are the best and right questions..."* (Analytics Partner in a Large Consulting Firm in Canada).

Internally to the firm, the solution was not delivered by one practice, but rather by a team of cross lines of services with different and specific expertise. The generalist approach is something that doesn't work that well anymore, according to most interviewees and the cases observed. Involving external partners in the development of the solutions to the client is also a common theme observed. In all four cases, the client was looking for knowledge and expertise transfer as part of the engagement terms. The innovation that the professional services firm brought was geared towards having the specific expertise that has done this type of work before, having the network of experts in different industries and geographies in the world to add value and insights based on their knowledge. In general, findings in the non-services and services industry, also apply to professional services firms. Given the results of the exploratory study, the interest for Open Innovation in professional services firms is real. Based on the results from the exploratory research, the questionnaire (Appendix J) was built to account for all the trends and erosion factors that are specific to the professional services industry. The focus is geared more towards the intangible aspects that are specific to the sector; and knowledge management is at the core. In the next chapters, the conceptual model constructed for open innovation in professional services firms is tested empirically in a single Firm ABC through a survey. This same survey was done with a sample of external firms with other professional services firm for validity testing.

CHAPTER 6 SURVEY RESULTS

This chapter details the results of the surveys and is organized in two main sub-sections: 1. Firm ABC Survey Results, 2. External Survey Results.

6.1 Firm ABC Survey

This section presents the Firm ABC survey results in 4 sub-sections. **Section 6.1.1** highlights of descriptive results based on the questions (not the factors) of the Firm ABC survey (N= 345). **Section 6.1.2** identifies the variables and factors that resulted from the PCA conducted. As a result of the PCA, different factors emerged then the ones presented in the conceptual model. This allowed the revision of the proposed conceptual model to align it with the PCA results. **Section 6.1.3** outlines the descriptive results covering the Firm ABC sample based on the identified factors from section 6.1.2. **Section 6.1.4** presents the multivariate analysis results for testing the revised conceptual model propositions. The relationships between the independent, intermediary and dependent variables are analyzed. In this same section, a testing of all the propositions on the moderating role of risk and organization on the open innovation dynamics, as well as the impact of the processes on performance are conducted inside Firm ABC.

6.1.1 Descriptive Statistics based on Survey Questions

Based on the research framework identified in the previous chapter, propositions and variables were identified. The variables were then used to develop the research instrument that was used for conducting the survey. This section aims to present some descriptive statistics based on the survey, before starting the factor analysis (i.e. grouping questions into valid/reliable constructs). The detailed results are in Appendix L. The neutral choice in the questions asked was removed, the scale reads as per Table 6-1:

Table 6-1: Survey Scale Interpretation

Scale Result	Agreement	Importance
1	Total Disagree	Not at all important
2	Disagree	Very slightly important
3	Somewhat Disagree	Slightly important
4	Somewhat Agree	Moderately important
5	Agree	Very important
6	Totally Agree	Extremely important

6.1.1.1 **Overall Industry and Practice Evolution: Erosion Factors**

In this first section of the survey, respondents were asked to assess their level of agreement with nine statements that summarize the main erosion factors that have been presented in the literature review. In general, more than 60% of the respondents at least somewhat agreed to the fact that the different erosion factors stated are observed in their industry. Cost of doing research increase, VCs, availability of knowledge in universities and research centers, as well and external options for unused internal ideas scored the lowest with more than 30% of respondents not agreeing. More than 80% however of respondents agree that clients and suppliers are becoming more knowledgeable, skilled workers are more mobile, knowledge is increasingly available outside traditional firms, and that the role of the firm is becoming more of an integrator. The figure 6-1 below presents the means of some of the questions, and the detailed ones are outlined in Appendix L. Therefore, erosion factors seem to be well observed and present in the industry.

Figure 6-1: Q1 - Level of agreement to the statements below on Erosion Factors (Means)

6.1.1.2 **Inside-Out Open Innovation Processes**

In this second section of the survey, outbound (inside-out) innovation practices were targeted. Respondents were asked to answer some questions related to inside-out practices. More than 60% of respondents at least somewhat agree that their practices constantly seek new applications for internal innovations in the market, and that their innovations are mostly client-focused. However, less than 50% agree that internal innovations are actually shared externally. This could be explained by the interest of the Firm ABC to channel its internal knowledge and especially out to customers as this is their core product. The picture is different in terms of the other outbound open innovation processes. Selling or licensing out and spin-offs don't seem to be common in the Firm with more than 63% and 72% of the respondents respectively somewhat disagreeing at least. Therefore, inside-out OI processes don't seem be all applicable in Firm ABC, as shown in Figure 6-2 below.

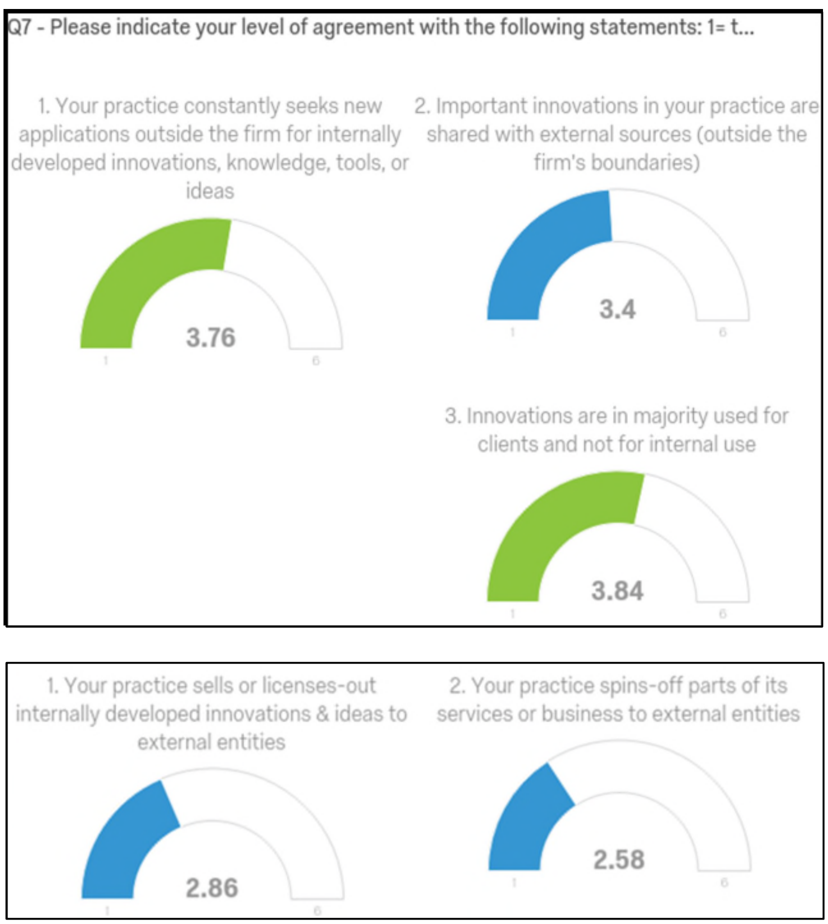

Figure 6-2: Q7 & Q8 - Level of Agreement to the Statements on Inside-Out OI (Means)

6.1.1.3 **Outside-In Open Innovation Processes**

In this third section of the survey, inbound (outside-in) innovation practices were targeted. Respondents were asked to answer some questions related to outside-in practices.

More than 60% of all respondents at least somewhat agree that their practice scans innovations developed externally and use them for clients' purposes, not for internal use. However, only 53% agree that the ideas in the practice and on clients' engagements end up being used. Even less agree to the fact that their practices buy or license-in external innovations (50.9%) or do M&A (40%). In general, outside-in seem to be applied more than inside-out practices based on the survey.

Figure 6-3: Q9 & Q10 - Level of agreement to the statements on Outside-In OI (Means)

6.1.1.4 **Coupled Open Innovation Processes**

In this fourth section of the survey, the coupled open innovation processes are covered. Questions about joint ventures, partnerships, collaborations with external entities are asked.

More than 68% believe it is important for their practice's strategy to constantly look for partnerships with external entities for joint innovation. On the other hand, around 75% claim that it is important to coordinate and integrate exchange of external knowledge between different entities (see Appendix L for the detailed answers to all questions related to the Coupled Open Innovation Processes). These collaborations take place more frequently for client engagements than for internal project as shown in the figure 6-4 below. This can be explained by the nature of the sector that is mostly geared towards investing in time and effort more when it comes to clients, more than for internal projects. These partnerships seem to be more frequent in early stages of the innovation process than in the later ones. Earlier stages of an innovation are normally where there is the more fuzziness and hence the need for alliances and collaborations. These are also the stages with the lowest risks.

In terms of types of partners, more than 80% agree that clients, industry associations, and suppliers are important to collaborate with in innovations. The least important ones are communities, VCs, and competitors. This can be explained by the fact that the first three are within the core ecosystem of the professional services firms, and that the others are not.

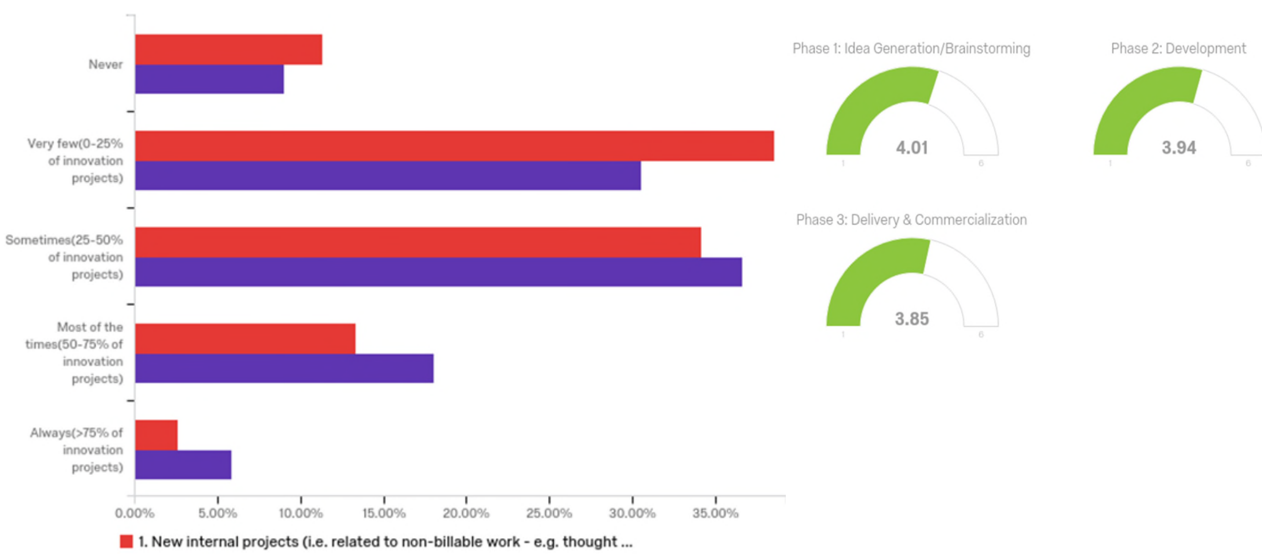

Figure 6-4: Q11 & Q12 - Frequency and Importance of External Collaboration for Internal and Client Projects and at Different Phases of the Innovation Process

6.1.1.5 **Organization**

In this section of the survey, respondents were asked to assess their level of agreement with four statements that summarize the main organizational management aspects that have been presented in the literature review: support, culture, knowledge management & incentives/rewards.

The majority of the respondents (Figure 6-5 and 6-6) claimed that they are not given enough time to work on innovation projects (61.6%) and that the firm is not increasing the rewards and incentives for external collaboration (70.5%). On the other hand, they do recognize that there is an increased openness from the leadership team (65.6%) and an increase in the knowledge management processes (55.9%) to allow for external collaborations. The firm has therefore become more open for collaborating and sharing knowledge externally but the actions haven't yet translated into tangible outcomes. The firm still prioritizes billable hours' projects and focuses its rewards & incentives on those activities, rather than on innovation projects.

Figure 6-5: Q6 - Level of Agreement to the Statements below on Org. Management (Means)

Figure 6-6: Q8.3 & Q10.3 - Level of Agreement on the Statements on Personal Preferences

6.1.1.6 **Risk Management**

In this section of the survey, respondents were asked to assess their level of agreement with 21 statements that summarize the main risk management aspects that have been presented in the literature review: IPR protection, NSH, NIH, risks.

Firm ABC has put in place clear and risk management practices when it comes to inside-out (73% somewhat agree) and outside-in open innovation (70.9%). Despite these practices and the fact that the majority support inbound and outbound OI processes, they still see high risks in taking internally developed ideas & innovations externally (NSH – 66.4% at least somewhat agree). Only 37.5% however prefer to use internal knowledge rather than what is available externally (NIH).

Therefore, employees seem to be more open for outside-in compared to inside-out open innovation.

Figure 6-7: Q7.4 Risk Inside-Out

Figure 6-8: Q9.4 Risk Outside-In

Figure 6-9: Q10.4 Not-Invented-Here Risk

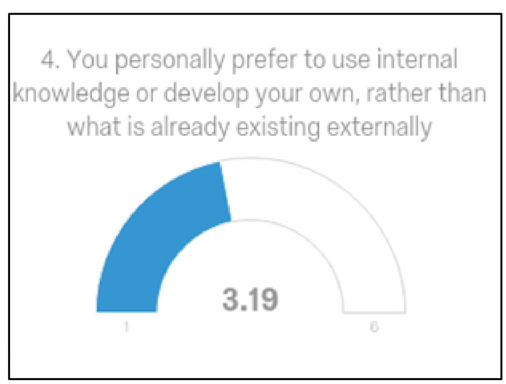

Figure 6-10: Q8.4 Not-Sold-Here Risk

IP Risk Management

Respondents were asked to assess the importance of different formal and informal IP protection measures during open innovation. The results show that all these measures are important (more than 69% find them at least moderately important). Contractual agreement seem to be the most important of these measures, followed by less formal measures such as restricting access to information, secrecy and informal IP protection. Patents are relatively less important than the others (see Appendix L for the detailed answers).

When asked about the importance of certain risks when collaborating with external parties, the majority (>65%) considered all them at least moderately important. In particular, reputation (μ=4.97), knowledge leakage (μ=4.67), and difficulty in protecting IP (μ=4.49) were considered the most important (see Appendix L for the detailed answers).

Therefore, IP protection measures and risks seem all important and can have an impact on open innovation performance.

6.1.1.7 Impact on Performance

In this seventh and last section of the survey, participants were asked to assess the performance of their practice in terms of propensity to innovate and overall performance (financial, client satisfaction and market reputation). They were also asked about their most common type of innovations.

Services innovation is what contributed most to the growth of the practices. Given the nature of the business and the Firm, this result is predictable. Technologies is second and followed by processes innovation. Technologies seem surprising given the fact that it is a knowledge-intensive firm. This can be explained by the new tools and software's that have been introduced to the business in the past few years. These technologies have contributed to improving delivery capability and innovation capacity of the firm.

In terms of performance, most of the practices have had at least one innovation launched in the past three years, with almost have of them launching more than one per year at least. A minimum of 74% claim that their practices have improved their reputation in the marketplace, increased client loyalty, delivered on the financial targets, and became more innovative.

6.1.1.8 **Synthesis**

Based on the survey results, several observations can be made in the synthesis. First, most of the erosion factors are observed in the Firm ABC. Second, in terms of inside-out OI, most of the Firm ABC teams try to find new applications in the market for internal innovations, and focus their innovations mostly on clients. However, not all practices of outbound OI are supported, in particular the sharing of important innovations externally, spin-offs and licensing out of innovations.

When it comes to outside-in OI, Firm ABC teams apply more of it than the inside-out processes, in line with the literature in other sectors. Most teams scan innovations existing outside their boundaries, and internalize them. However, not all practices are as prevalent, especially spin-ins and M&As to acquire innovations.

Coupled OI processes are applied more in client projects and at earlier stages of the innovation process, when compared to internal projects and later stages of the process. Partnerships are more important with entities that are more traditionally close to the core ecosystem of the professional services firms (i.e. clients, industry associations, and suppliers).

From an organizational perspective, it seems that leadership teams are becoming more open for external collaboration and increasing knowledge-sharing activities. However, this did not translate into allowing enough time for innovation projects, nor having incentives in place to collaborate. From a risk management perspective, clear practices are put in place to manage the risks of inbound and outbound open innovation. Despite the openness of employees to using external knowledge if available, rather than develop it in-house, they still see the risk in taking internal ideas out to the market. All IP management strategies and risks seem to be important, especially contractual agreements and the less formal ones. Reputation, knowledge loss, and difficulty in IP protection however seem to be the most important risks. Most practices have generated several innovations and are realizing a positive performance.

Conclusion:

Given the number of questions and the complexity of analyzing the results and the model accordingly, the next section aims at grouping through a PCA these questions into components (factors) that will become the variables of the model to be tested afterwards. The PCA is conducted based on the survey results.

6.1.2 Variables Identification in Firm ABC

The survey grouped a list of 19 questions which were made of a total of 79 sub-questions (or choices). Given the large number of questions, a principal component analysis was conducted on the independent, intermediary, moderating, and outcome variables to reduce their number by identifying which questions (or items) can be grouped together under factors. Questions were assigned under a component. Each component constitute a factor that will become the basis of the analysis going forward, instead of the survey questions. This section presents the results of the variables identification that reduced their number from 79 down to 21 only that are detailed in this section. The 21 are split as 2 independent under Erosion Factors, 7 as intermediary under OI processes, 3 moderating under organization, another 6 moderating under risk management, and 3 outcome under impacts. The mapping of the factors to survey questions and their detailed explanation can be found in Appendix M. The following table 6-2 summarizes the rules of thumb adopted for data analysis, and that academics are most in agreement with (Hair *et al.*, 2010):

Table 6-2: Rules of Thumbs for Measures

Measure	Brief Explanation	Rule of Thumb
Factor loading for each PCA item	Measures the correlation between the original items and the factors	≥ 0.5
Variance explained by the PCA	Amount of variance explained by the factor	≥ 0.6
Bartlett's test of sphericity	Measures the overall significance of all the correlations within a correlation matrix	≤ 0.05
Kaiser-Meyer-Olkin	Measures how suited the data is for a factor analysis, whether the sample is adequate	≥ 0.5
α Cronbach	Measures the reliability of the variable, the extent to which it is consistent with what it is intended to measure	≥ 0.7, but 0.6 is also acceptable for exploratory studies

Based on the exploratory study and the PCA results, the non-services conceptual model was expanded by adding 6 factors: erosion factors was split in two, innovation for clients were added under inside-out processes, external collaboration per innovation type and phase, as well as partnerships with core players and with adjacent ones were added to OI processes, individual preferences under organization were split in two. Risk management was rearranged around four factors: firm's risk practices inside-out and outside-in, individual risk perception, and overall risks. Control variables are now added as well to account for important factors that could impact the open innovation dynamics. Line of service, geography, practice maturity, and hierarchical levels are all bundled under the new control variables block. Section 4.2.5 covered these variables. These factors become the new variables of the model. The following Figure 6-11 details the resulting model after the identification of the variables conducted by PCA (see Appendix M for the mapping of the factors in the model with the survey questions):

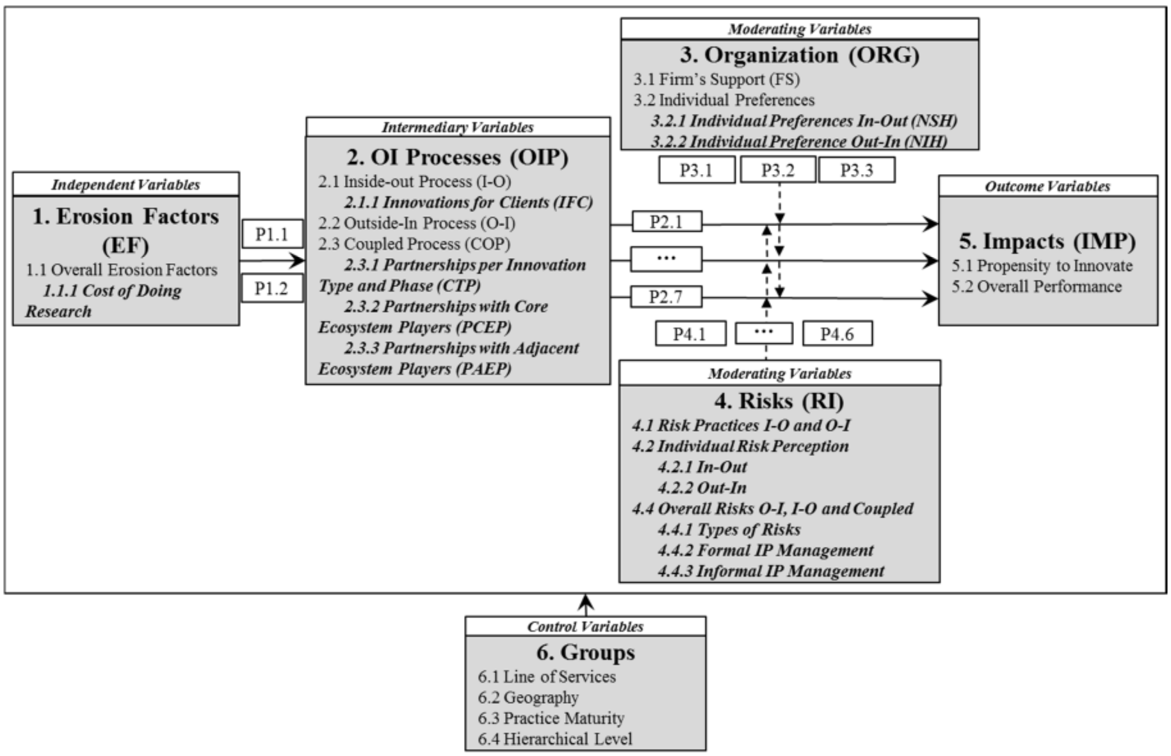

Figure 6-11: Model Resulting from Factor Analysis - Firm ABC

This model has therefore a total of 154 one-to-one relationships (which represent all the level 3 propositions that are being tested) between the factors as summarized in the table 6-3 below:

Table 6-3: One to One Relationships in the Model

	OI Processes (7)	Impacts (2)	Risks (6)	Organization (3)
Erosion Factors (2)	14	-	-	-
OI Processes (7)	-	14	-	-
OI Processes * Impacts (14)			84	42
Total	154			

In the next sections, this model is analyzed using SPSS in order to conduct three main steps:

1. Descriptive results based on these factors (now the new variables)
2. ANOVA analyses to identify the differences between the different groups based on the control variables
3. Linear and logistic regression analyses to test the relationships as stated by the propositions.

6.1.3 Descriptive Statistics based on Factors in Firm ABC

In this section, the factors identified in the previous section are analysed through descriptive statistics first, then comparisons between the different control groups using ANOVA are conducted.

6.1.3.1 **Overall Factors Descriptive Statistics**

The descriptive statistics of the main factors taken into account in the model are identified: Mean, Median, Standard Deviation, Skewness (coefficient of asymmetry around the mean), Kurtosis (degree of *peakedness* of a distribution), Minimum and Maximum values of each variable. Table 6-4 presents the main descriptive statistics resulting from the analysis of the factors:

Table 6-4: Main Descriptive Statistics Results

Code	Variables	N		Mean	Med.	Std. Dev.	Skew.	Kurt.	Min.	Max.
		Valid	Missing							
EF	Main Erosion Factors	350	3	5.10	**5.11**	0.83	-0.63	1.32	1.00	7.00
ECR	Cost of Doing Research	349	4	4.64	**5.00**	1.51	-0.43	-0.94	1.00	7.00
CIO	Inside-Out OI Processes	348	5	3.60	3.50	1.30	0.11	-0.67	1.00	7.00
COI	Outside-In OI Processes	348	5	3.97	4.00	1.22	-0.09	-0.40	1.00	7.00
CC	Client-Focused Innovations	345	8	4.43	**4.50**	1.42	-0.18	-0.76	1.00	7.00
CCP	Coupled OI Processes	346	7	4.94	**5.00**	1.17	-0.68	0.22	1.00	7.00
CTP1	- External collaboration in internal projects	348	5	28.13	25.00	21.42	0.72	-0.13	0.00	87.50
CTP2	- External collaboration in client engagements	347	6	33.86	37.50	23.68	0.51	-0.50	0.00	87.50

Table 6-4: Main Descriptive Statistics Results (cont'd)

Code	Variables	N		Mean	Med.	Std. Dev.	Skew.	Kurt.	Min.	Max.
		Valid	Missing							
CTP3	- External collaboration during Idea Generation/ Brainstorming	346	7	4.70	**5.00**	1.82	-0.54	-0.90	1.00	7.00
CTP4	- External collaboration during Development	345	8	4.63	**5.00**	1.66	-0.58	-0.68	1.00	7.00
CTP5	- External collaboration during Delivery & Commercialization	345	8	4.48	**5.00**	1.81	-0.34	-1.10	1.00	7.00
CPC	Collaboration with core partners	342	11	5.11	**5.40**	1.17	-0.89	0.67	1.00	7.00
CPA	Collaboration with adjacent partners	342	11	3.96	4.00	1.42	-0.02	-0.85	1.00	7.00
OS	Firm's Support	347	6	3.82	4.00	1.27	-0.03	-0.62	1.00	7.00
POI	Individual's Inside-Out Preference	351	2	5.11	**5.00**	1.50	-0.76	-0.12	1.00	7.00
POI	Individual's Outside-In Preference	351	2	5.41	**6.00**	1.24	-1.08	1.05	1.00	7.00
RP	Risk Practices	346	7	4.91	**5.00**	1.42	-0.44	-0.58	1.00	7.00
NSH	Personal Risk Perception Inside-Out	350	3	5.10	**5.11**	0.83	-0.63	1.32	1.00	7.00
NIH	Personal Risk Perception Outside-In	349	4	4.64	**5.00**	1.51	-0.43	-0.94	1.00	7.00
RMT	Types of Risks	343	10	3.60	3.50	1.30	0.11	-0.67	2.00	7.00
IPF	Formal IP protection	337	16	3.97	4.00	1.22	-0.09	-0.40	1.00	7.00
IPI	Informal IP protection	337	16	4.43	**4.50**	1.42	-0.18	-0.76	1.00	7.00
Q18_5	Five innovations and more generated	335	18	22%	NA	0.42	1.331	-0.230	0	1
Q19.1	Increased client loyalty	342	11	4.37	4.00	1.079	-0.950	0.501	1.00	7.00
Q19.2	Attracted new clients	340	13	4.30	4.00	1.104	-0.891	0.232	1.00	7.00
Q19.3	Met financial objectives	340	13	4.14	4.00	1.246	-0.767	-0.337	1.00	7.00
Q19.4	Became more innovative in market	342	11	4.11	4.00	1.179	-0.661	-0.373	1.00	7.00
Q19.5	Improved reputation of firm	341	12	4.48	**5.00**	1.108	-1.209	1.404	1.00	7.00

Most of the variables have a median or average between 3 and 5, which fall in the middle of the scale, with a standard deviation of around 1 for all. All variables are in favor of normality (all variables are distributed) which allows us to conduct a solid statistical analysis going forward: both the Skewness as well Kurtosis measure of all variables are within the acceptable range (Respectively: -1.0 to +1.0, and -2 and +2 as a rule of thumb according to George & Mallery (2010)). Several OI factors seem to be supported by these results.

Erosion Factors: First, erosion factors are well observed in the industry. Respondents agree that erosion factors are applicable in their industry, in particular the increasing 1) role of PSF to be integrators, 2) mobility of skilled workers, 3) external suppliers and clients' knowledge, and 4) availability of external knowledge. Inside-out processes are not well supported (μ=3.6).

Open Innovation Processes: Outside-in processes are more present than inside-out (μ=3.97) but still not strong enough. Client-focused innovations are observed (μ=4.43). Coupled OI processes are observed more strongly (with μ>5.0 in most cases). These practices are more prevalent than inside-out or outside in ones. On average, practices collaborate with external entities (37.5% of projects) during client engagements more than in new internal projects (25% of projects). This collaboration is higher in earlier stages of the innovation process (Idea Generation) compared to the later ones (Delivery). External entities that the practices collaborate most with are the ones that are closer to the core business (i.e. supplier, industry associations, clients, public sector and conferences), compared to the ones that are considered adjacent (i.e. academic institutions, communities, Venture Capitals, and competitors). External collaboration at all phases of the innovation process is strong (μ=5 for the three phases). However, external collaboration in internal and external projects is not very frequent (less than 37.5% of the times). Collaboration with core partners is more important (μ=5.40) than the collaboration with adjacent partners that doesn't seem to be very present (μ=4.0).

Organizational Management: In terms of organizational management, firm's support for collaboration is not very strong as opposed to individuals' preferences for inside-out processes (μ=5.0), and especially outside-in OI (μ=6.0). Respondents somewhat disagree with the fact that the organizational support for innovation (i.e. time dedicated, openness from leadership, rewards/incentives, knowledge-sharing systems) is adequate. Even though, from their personal perspective, they personally believe that openness is important, more so for driving outside knowledge and innovations inside the firm, then the opposite direction.

Risk Management: In terms of risk management, all risk variables are strongly supported except risk types and formal IP protection that seem to have less support. Despite their openness in general to open innovation practices, respondents still see some risk in doing so, especially because of reputation and knowledge leakage. They agree that risk management practices are in place to manage this aspect. IP protection is more important through informal manners (i.e. secrecy, complexity of service offering, restricted access to information, informal IP protection, publishing), then through formal official media (i.e. Patents, Trademarks, Registration of Service).

Conclusion: In summary, erosion factors are validated, inside-out and outside-in only partially, coupled processes are validated, some of the risk and organizational management are also supported. There are however exceptions within each of these variables.

To verify that the variables are not redundant, a correlation matrix is measured (see Appendix N). No value for the Pearson Correlation is less than -0.5 or more than 0.5, indicating a good set of variables for further analysis.

6.1.3.2 Firm ABC Groups' Comparison

In order to compare the differences between the different groups constituting the sample and better understand it, ANOVA tests were conducted on three of the four control variables: Line of Service, Geography and Hierarchical Level. A Mann-Whitney test on the differences between each sub-group respectively was made to identify the effects of the different groups on the results. The detailed findings are presented in the next sections.

6.1.3.2.1 *Control Variable 1: Line of Service*

For the control variable "Line of Service", the highlighted factors (Gray lines) in Table 6-5 below are selected for showcasing the differences between the different groups (only for simplicity, the detailed results are presented in Appendix O).

Table 6-5: ANOVA Test Results for *Line of Service*

Legend:

* = 0,05 < p <= 0,1
** = 0,01 < p <= 0,05
*** = 0,001 < p <= 0,01
**** = p <= 0,001

	Control Variable: Line of Service																					
	1. ASSURANCE		2. TAX		3. CONSULTING		4. DEALS		5. IFS		Tous		M-W									
	N_1=113		N_2=78		N_3=88		N_4=33		N_5=41		N_T=353		p-value Two-tail									
	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	1 vs 2	1 vs 3	1 vs 4	1 vs 5	2 vs 3	2 vs 4	2 vs 5	3 vs 4	3 vs 5	4 vs 5
Main Erosion Factors	5.024	0.865	5.205	0.797	5.082	0.857	4.899	0.829	5.276	0.677	5.096	0.828										
Cost of Doing Research	4.696	1.407	4.974	1.450	4.326	1.627	4.576	1.437	4.600	1.630	4.645	1.510					***					
Inside-Out OI Processes	3.811	1.248	3.901	1.276	3.477	1.275	2.789	1.148	3.375	1.356	3.603	1.299			****		**	****		***		
Outside-In OI Processes	3.988	1.179	4.010	1.074	4.124	1.283	3.656	1.293	3.779	1.354	3.972	1.216										
Client-Focused Innovations	4.176	1.284	4.675	1.169	5.112	1.357	3.969	1.295	3.575	1.678	4.429	1.415	***	****		**	**	**	****	****	****	
Coupled OI Processes	4.960	1.178	4.995	1.072	5.298	1.039	4.121	1.154	4.654	1.285	4.935	1.173		**	****		**	****		****	***	
External Collaboration per Type and Pha	0.008	0.728	0.068	0.754	0.159	0.684	-0.423	0.722	-0.152	0.834	-0.001	0.750			***			***		****		
External Collaboration in Internal projects	31.307	22.089	27.564	19.878	26.149	20.850	16.667	13.858	34.146	25.160	28.125	21.423			****			***		**		***
External Collaboraion during Client Engagements	34.886	24.130	35.256	22.680	40.698	23.809	26.894	17.433	19.375	21.917	33.862	23.679				****			****	***	****	**
Collaboration during Idea Generation	4.495	1.725	4.808	1.817	5.267	1.669	3.969	2.040	4.439	1.898	4.702	1.816		****						***	***	
Collaboration during Development	4.495	1.585	4.692	1.622	5.082	1.482	3.875	1.773	4.512	1.938	4.629	1.657		**				**		****		
Collaboration during Delivery	4.477	1.725	4.859	1.704	4.647	1.723	3.656	2.010	4.049	2.037	4.478	1.811			**			***	**	**		
Collaboration with core partners	5.068	1.100	5.219	1.133	5.353	1.076	4.879	1.230	4.712	1.433	5.112	1.170		**						**	**	
Collaboration with adjacent partners	4.175	1.341	3.934	1.538	3.910	1.498	3.477	1.122	3.917	1.421	3.957	1.423			**							
Firm's Support	3.808	1.140	3.958	1.335	3.696	1.326	3.435	1.363	4.119	1.275	3.816	1.274										
Individual's Inside-Out Preference	5.239	1.358	5.218	1.447	5.310	1.425	4.273	1.790	4.800	1.713	5.111	1.505			***			***		***		
Individual's Outside-In Preference	5.239	1.152	5.423	1.146	5.724	1.300	5.273	1.376	5.325	1.328	5.413	1.239		****			**			**	**	
Risk Practices	4.811	1.382	5.224	1.283	4.529	1.535	4.922	1.368	5.423	1.365	4.913	1.422	**			**	***				***	
Personal Risk Perception Inside-Out	4.451	1.506	5.141	1.483	4.322	1.895	4.719	1.689	4.200	1.728	4.569	1.672	****				***		***			
Personal Risk Perception Outside-In	3.866	1.602	3.679	1.632	3.184	1.681	3.455	1.660	3.487	1.652	3.573	1.652		***			**					
Types of Risks	5.150	1.028	5.399	0.927	5.042	1.168	5.086	1.028	5.370	1.163	5.198	1.064										
Formal IP protection	5.009	1.472	4.651	1.748	4.762	1.700	4.370	1.751	5.338	1.742	4.846	1.664							**			**
Informal IP protection	5.378	1.155	5.343	1.197	5.197	1.197	5.175	1.156	5.595	1.337	5.332	1.197									**	
Five innovations and more generated	26%	44%	22%	42%	16%	37%	10%	30%	37%	49%	22%	0.417									**	***
Financial Performance	5.040	1.054	5.062	1.230	5.234	1.125	4.963	1.185	4.933	1.522	5.076	1.181										

Interpretation

Based on these results, the focus is on the M-W tests that are significant. In summary, the Tax line of service is the most active in inside-out open innovation processes, especially when compared to Consulting and Deals.

Consulting is the most active in couple open innovation processes compared to all the four other lines of services, especially compared to Deals and IFS. It is also the line of service that collaborates the most frequently with external entities during client engagements and during internal innovation projects. It collaborates the most with core partners, especially compared to Assurance, Deals, or IFS. It does more innovations for clients then for internal use when compared to the other lines of services.

This could be explained by the nature of the consulting services that are more collaborative and involves more partners. Assurance and Deals for instance are more secretive type of lines of services and have less then benefit of being able to partner and share externally.

IFS applies the most risk management practices, especially compared to Assurance and Consulting. It also gives the highest importance to protecting the firm’s IP, in particular compared to Tax and Deals. In terms of propensity to innovate, IFS practices generated more often five innovations or more in the past few years, when compared to Consulting and Deals.

IFS has a key role of implementing risk management practices and ensuring the firm retains its independence and protects its reputation. This can explain the results related to IFS.

The tests therefore show that there are significant differences between the different lines of services.

6.1.3.2.2 *Control Variable 2: Geography*

The offices of the Firm ABC have been grouped into five region from West to East: British Columbia (BC), Prairies, Ontario, Quebec, and Maritimes. For the control variable “Geography”, the highlighted variables below in Table 6-6 are selected for showcasing the differences between the different groups (only for simplicity sake, details are presented in Appendix O).

Table 6-6: ANOVA Test Results for *Geography*

Legend:

* = 0,05 < p <= 0,1
** = 0,01 < p <= 0,05
*** = 0,001 < p <= 0,01
**** = p <= 0,001

Control Variable: GEOGRAPHY	1. QUEBEC		2. PRAIRIES		3. ONTARIO		4. BC		5. MARITIMES		Tous		M-W p-value Two-tail									
	N_1=55		N_2=54		N_3=197		N_4=36		N_5=9		N_T=350											
	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	1 vs 2	1 vs 3	1 vs 4	1 vs 5	2 vs 3	2 vs 4	2 vs 5	3 vs 4	3 vs 5	4 vs 5
Main Erosion Factors	5.243	0.787	5.158	0.766	5.092	0.835	4.863	0.840	4.809	1.148	5.096	0.828			**							
Cost of Doing Research	4.800	1.366	4.792	1.335	4.538	1.586	4.722	1.597	4.875	1.356	4.645	1.510										
Inside-Out OI Processes	3.864	1.459	3.877	1.239	3.605	1.226	3.146	1.253	2.031	1.030	3.603	1.299			**	***		***	****	**	***	**
Outside-In OI Processes	3.979	1.420	4.118	0.971	4.034	1.231	3.729	0.988	2.531	0.839	3.972	1.216				***			****		***	***
Client-Focused Innovations	4.340	1.393	4.340	1.315	4.554	1.429	4.292	1.278	3.188	1.999	4.429	1.415									**	
Coupled OI Processes	4.893	1.255	5.059	1.058	4.913	1.189	4.956	1.138	4.889	1.277	4.935	1.173										
External Collaboration per Type and Phase*	0.151	0.758	0.137	0.670	-0.042	0.782	-0.184	0.662	-0.132	0.628	-0.001	0.750			**			**				
External Collaboration in Internal projects	32.045	22.148	29.567	19.652	27.870	22.048	23.958	18.987	18.056	19.874	28.125	21.423										
External Collaboraion during Client Engagements	40.455	25.226	36.792	21.430	32.692	23.949	27.083	22.854	28.125	12.939	33.862	23.679		**	**			**				
Collaboration during Idea Generation	4.836	1.813	4.887	1.601	4.637	1.883	4.500	1.844	5.000	1.658	4.702	1.816										
Collaboration during Development	4.800	1.532	5.019	1.366	4.505	1.763	4.472	1.630	4.556	1.590	4.629	1.657										
Collaboration during Delivery	4.691	1.835	4.755	1.616	4.432	1.844	4.056	1.866	4.222	1.787	4.478	1.811										
Collaboration with core partners	5.218	1.069	5.136	1.093	5.046	1.269	5.244	0.888	5.178	1.146	5.112	1.170										
Collaboration with adjacent partners	4.205	1.475	4.044	1.407	3.888	1.453	3.826	1.113	3.917	1.759	3.957	1.423										
Firm's Support	4.042	1.106	3.880	1.183	3.881	1.317	3.292	1.128	2.594	1.506	3.816	1.274			***	***		**	**	**	**	
Individual's Inside-Out Preference	5.255	1.566	5.352	1.376	5.010	1.525	5.278	1.301	4.250	2.053	5.111	1.505										
Individual's Outside-In Preference	5.655	1.126	5.444	1.022	5.365	1.324	5.278	1.233	5.333	1.225	5.413	1.239										
Risk Practices	5.136	1.234	4.906	1.397	5.010	1.396	4.417	1.481	3.313	1.963	4.913	1.422			**	**			**	**	**	
Personal Risk Perception Inside-Out	3.982	1.800	4.722	1.595	4.741	1.613	4.472	1.715	3.750	1.753	4.569	1.672	**	***								
Personal Risk Perception Outside-In	3.296	1.449	3.407	1.421	3.746	1.752	3.417	1.628	3.000	1.773	3.573	1.652										
Types of Risks	5.105	0.976	5.159	0.989	5.264	1.128	5.155	0.915	4.792	1.250	5.198	1.064										
Formal IP protection	4.698	1.615	5.038	1.382	4.865	1.717	4.557	1.898	5.333	1.369	4.846	1.664										
Informal IP protection	5.229	1.200	5.321	1.204	5.360	1.219	5.329	1.134	5.422	1.142	5.332	1.197										
Five innovations and more generated	0.283	0.455	0.176	0.385	0.231	0.423	0.194	0.401	0.111	0.333	0.224	0.417										
Financial Performance	5.447	0.870	5.219	1.056	5.026	1.240	4.657	1.211	4.661	1.548	5.076	1.181		**	***			**				

Interpretation

Based on these results, the focus is on the M-W tests that are significant. The Prairies are the most active provinces in inside-out open innovation processes, especially compared to British Columbia and the Maritimes. They are also the most active provinces in outside-in open innovation processes, especially compared to the Maritimes, who are the least active compared to all the other regions.

Quebec collaborates the most with external entities during client engagements, especially compared to Ontario and BC. Quebec leadership is the one that supports the most the innovation efforts and external collaboration, in particular when compared to BC and Maritimes. The province is also the region that has the most risk management practices in place, especially compared to BC and Maritimes. Its practices are the ones that have the best performance, in particular when compared to BC and the Maritimes

The tests therefore show that there are significant differences between some of the geographies. However, this control variable seems to have less effect than the Line of Service.

6.1.3.2.3 *Control Variable 3: Hierarchical Level*

For the control variable “Hierarchical Level”, the highlighted variables below in Table 6-7 are selected for showcasing the differences between the different groups (only for simplicity sake, details are presented in Appendix O).

Table 6-7: ANOVA Test Results for *Hierarchical Level*

Legend:	Control Variable: HIERARCHICAL LEVEL										
* = 0,05 < p <= 0,1	1. MANAGER		2. DIRECTOR		3. MANAGING DIRECTOR & PARTNER		TOTAL		M-W		
** = 0,01 < p <= 0,05 *** = 0,001 < p <= 0,01	N_1=183		N_2=132		N_3=34		N_4=349		p-value Two-tail		
**** = p <= 0,001	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	1 vs 2	1 vs 3	2 vs 3
Main Erosion Factors	5.113	0.831	5.050	0.840	5.220	0.804	5.100	0.831			
Cost of Doing Research	4.742	1.420	4.512	1.645	4.529	1.502	4.635	1.515			
Inside-Out OI Processes	3.762	1.334	3.390	1.206	3.561	1.424	3.602	1.304	***		
Outside-In OI Processes	3.973	1.222	3.930	1.178	4.152	1.352	3.974	1.216			
Client-Focused Innovations	4.335	1.371	4.425	1.467	4.848	1.439	4.418	1.417			
Coupled OI Processes	4.904	1.186	4.974	1.161	4.982	1.168	4.939	1.172			
External Collaboration per Type and Ph	0.052	0.747	-0.052	0.736	-0.065	0.791	0.002	0.747			
External Collaboration in Internal projects	29.306	21.522	27.115	20.890	25.735	22.810	28.125	21.391			
External Collaboraion during Client Engagements	35.208	23.983	31.880	23.643	33.824	22.090	33.819	23.660			
Collaboration during Idea Generation	4.739	1.810	4.734	1.846	4.500	1.745	4.713	1.814			
Collaboration during Development	4.698	1.624	4.586	1.695	4.500	1.710	4.636	1.656			
Collaboration during Delivery	4.637	1.785	4.281	1.865	4.441	1.727	4.484	1.813			
Collaboration with core partners	5.033	1.211	5.253	1.049	5.030	1.360	5.117	1.169			
Collaboration with adjacent partners	4.121	1.437	3.820	1.331	3.662	1.659	3.961	1.427			
Firm's Support	3.862	1.321	3.735	1.188	3.970	1.277	3.825	1.267			
Individual's Inside-Out Preference	5.033	1.437	5.183	1.583	5.324	1.552	5.118	1.504			
Individual's Outside-In Preference	5.260	1.199	5.591	1.229	5.588	1.373	5.418	1.236	***		
Risk Practices	4.823	1.374	5.000	1.469	5.030	1.581	4.909	1.429			
Personal Risk Perception Inside-Out	4.621	1.532	4.634	1.824	4.091	1.756	4.575	1.672			
Personal Risk Perception Outside-In	3.830	1.614	3.318	1.668	3.000	1.497	3.557	1.647	***	***	
Types of Risks	5.244	1.087	5.121	1.051	5.245	0.971	5.197	1.062			
Formal IP protection	4.982	1.637	4.706	1.715	4.602	1.601	4.841	1.665			
Informal IP protection	5.403	1.226	5.271	1.187	5.189	1.072	5.332	1.196			
Five innovations and more generated	0.198	0.399	0.226	0.420	0.355	0.486	0.223	0.417			
Financial Performance	5.058	1.177	5.051	1.235	5.303	1.033	5.078	1.186			

Interpretation

Based on these results, the focus is on the M-W tests that are significant. Very few of these are significant, indicating little effect of the hierarchical level on the open innovation processes. Managers agree the most that inside-out open innovation processes are applied in their practices, especially compared to Directors. However, they see a higher risk in using external knowledge internally compared to Directors, Managing Directors and Partners, even though the risk is low in their opinion ($\mu < 4.000$). Managing Directors and Partners see the less risk in this practice ($\mu = 3.000$). In the same vein, they agree to the importance of using outside knowledge and innovations for internal purposes, but to a lesser degree than directors. The other highlighted factors show no significant difference between the groups. Compared to Lines of services especially, and in a way to the geography, this control variable seems to have less effect on the Open Innovation dynamics.

Summary

In summary, the main differences in the results are observed between the five Lines of Services, with 17 of the variables having significantly different results between two or more lines of services. The other two control variables have less significant differences between their underlying groups: differences between the different Geographies are present in 10 of the variables while Hierarchical level differences are only significant between the groups for three variables only. Hence, the line of service is the variable that makes the biggest difference in the results, followed by geography and finally hierarchical level.

6.1.4 Propositions Validation in Firm ABC

6.1.4.1 Main Relations Analysis

This section covers the linear regression analyses conducted in Firm ABC for the two main relations in the conceptual model: P1 – Erosion Factors Effect on OI Process and P2 – OI Processes Effect on Performance. The results of the regression analysis for each are presented.

6.1.4.1.1 *Erosion Factors effect on Open Innovation Processes (P1)*

The first direct relationship tested in the linear regression is the proposition P1:

P1	**Open innovation processes are positively and significantly impacted by erosion factors**

The tables 6-8 and 6-9 below present the results of the linear regression analysis conducted to test for P1 using Assurance, Ontario, and both Managing Directors & Partners as the reference groups for the control variables Line of Service, Geography and Level respectively. The following information is outlined in each of the tables in this section and next: the intercept value (Constant), the list of all control variables (Q1 Line of Service, Q2 Geography, Q3 Maturity Level, and Q4 Hierarchical Level) and the normalised (Z Score) of the independent variables (Erosion Factors and Cost of Doing Research) in the lines, all the normalised intermediary/dependent variables in columns with the result of the unstandardized regression coefficient β, the standard error on it and the probability (significance) of each. For each overall intermediary variable in the model, R^2 and adjusted R^2 and its probability (significance, and value of the Variance Inflation Factor (VIF) for measuring multicollinearity) are presented. Given that there are seven intermediary variables, the table is split in two.

Table 6-8: P1 - Linear Regression Results - Part 1

	VARIABLE 1: OPEN INNOVATION IN-OUT and OUT-IN PROCESSES					
	H1-2.1: Z_COL_IN_OUT_F1		H1-2.2: Z_COL_OUT_IN_F2		H1-2.3: Z_COL_CLIENT_F3	
VARIABLE	B	p-value[1]	B	p-value[1]	B	p-value[1]
	(Std. Error)		(Std. Error)		(Std. Error)	
(Constant)	0.656	***	0.478	*	0.411	*
	(0.248)		(0.256)		(0.000)	
Q1_TAX	-0.053	N.S.	-0.184	N.S.	0.290	*
	(0.152)		(0.157)		(0.000)	
Q1_CONS	-0.589	****	0.010	N.S.	0.545	****
	(0.157)		(0.162)		(0.000)	
Q1_DEALS	-0.748	****	-0.116	N.S.	-0.165	N.S.
	(0.217)		(0.225)		(0.000)	
Q1_IFS	-0.619	***	-0.205	N.S.	-0.695	****
	(0.213)		(0.220)		(0.000)	
Q2_PRAIRIES	0.209	N.S.	-0.135	N.S.	-0.138	N.S.
	(0.172)		(0.178)		(0.000)	
Q2_BC	-0.171	N.S.	-0.318	*	-0.066	N.S.
	(0.184)		(0.190)		(0.000)	
Q2_QUEBEC	0.235	N.S.	-0.276	*	-0.139	N.S.
	(0.159)		(0.164)		(0.000)	
Q2_MARITIMES	-0.622	N.S.	-0.983	**	-0.180	N.S.
	(0.389)		(0.402)		(0.000)	
Q3_CONT	-0.124	***	-0.043	N.S.	-0.084	**
	(0.043)		(0.044)		(0.000)	
Q4_MGR	0.169	N.S.	-0.123	N.S.	-0.184	N.S.
	(0.118)		(0.122)		(0.000)	
Z_EROSION_F1	0.237	****	0.124	**	0.175	***
	(0.061)		(0.063)		(0.000)	
Z_EROSION_COST_RESEARCH	-0.031	N.S.	0.165	***	-0.093	N.S.
	(0.059)		(0.061)		(0.000)	
R^2	20.6%		9.4%		20.6%	
R^2_{adj}	17.0%		5.2%		17.0%	
p-values	0.0000		0.0100		0.0000	
VIF_{max}	1.5124		1.5124		1.5124	
1. two-tail level of significance Coefficient test is bilateral (H0: B=0, H1: B different than 0)	Legend: * 0.05 < p <= 0.10; ** 0.01 < p <= 0.05; *** 0.001 < p <= 0.01; **** p <= 0.001					

Table 6-9: P1 - Linear Regression Results - Part 2

	VARIABLE 2: OPEN INNOVATION COUPLED PROCESSES							
	H1-2.4: Z_COL_COUPLE_PRACT_F1		H1-2.5: Z_COL_COUPLE_TYPE_PHASE_F2		H1-2.6: Z_COL_COUPLE_PARTNER_CORE_F1		H1-2.7: Z_COL_COUPLE_PARTNER_ADJ_F2	
VARIABLE	**B** (Std. Error)	**p-value[1]**	**B** (Std. Error)	**p-value[1]**	**B** (Std. Error)	**p-value[1]**	**B** (Std. Error)	**p-value[1]**
(Constant)	0.498	*	0.056	N.S.	0.142	N.S.	0.155	N.S.
	(0.256)		(0.258)		(0.000)		(0.000)	
Q1_TAX	-0.118	N.S.	0.043	N.S.	0.137	N.S.	-0.295	*
	(0.157)		(0.159)		(0.000)		(0.000)	
Q1_CONS	-0.016	N.S.	0.277	*	0.245	N.S.	-0.433	***
	(0.162)		(0.163)		(0.000)		(0.000)	
Q1_DEALS	-0.579	**	-0.282	N.S.	0.034	N.S.	-0.349	N.S.
	(0.225)		(0.227)		(0.000)		(0.000)	
Q1_IFS	-0.443	**	-0.374	*	-0.494	**	-0.104	N.S.
	(0.220)		(0.222)		(0.000)		(0.000)	
Q2_PRAIRIES	-0.037	N.S.	0.147	N.S.	0.169	N.S.	-0.263	N.S.
	(0.178)		(0.180)		(0.000)		(0.000)	
Q2_BC	0.139	N.S.	-0.270	N.S.	0.292	N.S.	-0.051	N.S.
	(0.190)		(0.192)		(0.000)		(0.000)	
Q2_QUEBEC	-0.219	N.S.	0.208	N.S.	0.110	N.S.	0.006	N.S.
	(0.164)		(0.165)		(0.000)		(0.000)	
Q2_MARITIMES	0.469	N.S.	-0.058	N.S.	0.749	*	0.385	N.S.
	(0.402)		(0.405)		(0.000)		(0.000)	
Q3_CONT	-0.059	N.S.	-0.055	N.S.	-0.027	N.S.	-0.018	N.S.
	(0.044)		(0.044)		(0.000)		(0.000)	
Q4_MGR	-0.170	N.S.	0.217	*	-0.230	*	0.292	**
	(0.122)		(0.123)		(0.000)		(0.000)	
Z_EROSION_F1	0.314	****	0.143	**	0.223	****	0.284	****
	(0.063)		(0.064)		(0.000)		(0.000)	
Z_EROSION_COST_RESEARCH	-0.034	N.S.	0.070	N.S.	-0.061	N.S.	0.098	N.S.
	(0.061)		(0.062)		(0.000)		(0.000)	
R^2	13.6%		10.6%		11.0%		17.0%	
R^2_{adj}	9.7%		6.5%		7.0%		13.3%	
p-values	0.0000		0.003		0.0020		0.0000	
VIF_{max}	1.5124		1.5124		1.5124		1.5124	
1. two-tail level of significance Coefficient test is bilateral (H0: B=0, H1: B different than 0)	**Legend:** * 0.05 < p <= 0.10; ** 0.01 < p <= 0.05; *** 0.001 < p <= 0.01; **** p <= 0.001							

Interpretation

The relationships between control, independent and dependent variables are analyzed in order to test the proposition P1, with the results presented below. In general, erosion factors is the only variable that has a significant impact on all of the variables of OI processes. Therefore, an increase in the erosion factors intensity leads to an increase in OI processes adoption, as predicted by the proposition P1. The cost of doing research however only has a significant impact on one of the OI processes variables. It has a positive and significant impact on outside-in OI processes. With increasing cost of doing research in-house, it becomes more important to use external knowledge, innovations, and ideas internally to cope with this cost increase. This is in line with the literature and the exploratory study that was conducted. Below, are the detailed results for the control and independent variables.

Control variables

The four control variables results are presented here, in each case, the comparison is made against the reference group that was chosen initially (see above).

a) Line of Service

IFS is the line of service that has the most significant differences in their effect when compared to Assurance, followed by Consulting. Deals and Tax have less differences, as this can be explained by the fact that these two lines of services hire very similar profiles to the Assurance practice (finance, accounting, and tax).

i. **Tax:** Compared to Assurance, Tax practices have a significantly positive (β= 0.290) impact on collaboration for clients but a significant negative (β= -0.295) impact on collaborations with adjacent partners that are not core/traditional.

ii. **Consulting:** Compared to Assurance, Consulting has a significantly negative (β= -0.589) explanatory impact on in-out collaboration practices and on adjacent partners (β= -0.433) that are not core/traditional. However, this line of service has significantly positive (β= 0.545) explanatory impact on collaboration and innovations for clients.

iii. **Deals:** Compared to Assurance, Deals has a significantly negative explanatory impact on inside-out (β= -0.748) and coupled open innovation practices (β= -0.579).

iv. **IFS:** IFS have a significantly negative explanatory impact on: i) inside-out (β= -0.619), ii) coupled open innovation process (β= -0.695), iii) innovations for clients (β= -0.443), and iv) collaboration with core partners of the practices (β= -0.494).

b) Geography

Compared to Lines of Services, different Geographies do not have many significant differences in terms of the relationships being tested.

i. **Prairies:** None of the relationships tested resulted in any significant explanatory impacts on the six different factors of Open Innovation Processes.

ii. **British Columbia:** Compared to Ontario, British Columbia has a significant explanatory impact (β= -0.318) on Outside-in Open Innovation Practices.

iii. **Quebec:** Compared to Ontario, Quebec has a significant explanatory impact (β= -0.276) on Outside-in Open Innovation Practices.

iv. **Maritimes:** The same observation made for British Columbia and Quebec is also made for the Maritimes but with less significance (β= -0.983). This region has a significant positive explanatory impact (β= 0.749) on collaboration with core partners.

c) Years of Practice Existence (Practice Maturity)

A significant explanatory impact is observed on inside-out collaboration (β= -0.124) and on collaboration with clients (β= -0.018).

d) Hierarchical Level

Compared to the other levels (directors, managing directors and partners), Managers have a significantly negative explanatory impact on collaboration with core partners (β= -0.230). They however have a positively significant explanatory impact on collaboration with adjacent partners (β= 0.292).

Independent variables (P1)

i. Main Erosion Factors (P1.1)

The linear regression analysis results show that industry and market erosion factors have a significant positive impact on open innovation processes. By looking at the underlying factors making this variable, the erosion factors have a positive and significant impact on the seven factors of OI processes in the following order of strength (value of the coefficient β only, without considering the significance):

1) Open Innovation Coupled Processes (β= 0.314)
2) Collaboration with Adjacent Partners (β= 0.284)
3) Inside-Out Open Innovation Processes (β= 0.237)
4) Collaboration with Core Partners (β= 0.223)
5) Collaboration for Clients (β= 0.175)
6) Collaboration with External Entities for Internal and Client-Focused Projects and during different Phases of the Innovation Process (β= 0.143)
7) Outside-In Open Innovation Processes (β= 0.124)

For the same amount of erosion factors increase, outside-in open innovation processes increase less than coupled OI processes. Firm ABC increases therefore more its tendency to do joint ventures, alliances and partnerships compared to its outside-in processes. This can be explained by the fact that outside-in is already more present in the Firm ABC then the other practices.

Based on these results, all the propositions underlying P1.1 are therefore validated, as per the table below. **This validates therefore the proposition P1.1: the main erosion factors have a positive impact on the application of open innovation processes in Firm ABC.**

Table 6-10: Validation of Main Erosion Factors Impact on OI Processes' Propositions

P1	**Erosion Factors Direct Positive Impact on Open Innovation Processes - Validated**	
P1.1	***Main Erosion Factors positive impact on OI Processes - Validated***	
P1.1-2.1	Erosion factors have a positive effect on inside-out open innovation processes	***Validated***
P1.1-2.2	Erosion factors have a positive effect on outside-in open innovation processes	***Validated***
P1.1-2.3	Erosion factors have a positive effect on the collaboration for client-focused innovations	***Validated***
P1.1-2.4	Erosion factors have a positive effect on coupled open innovation processes	***Validated***
P1.1-2.5.1	Erosion factors have a positive effect on the frequency of internal and client-focused innovations	***Validated***
P1.1-2.5.2	Erosion factors have a positive effect on the collaboration with external entities at all phases of the innovation process (Idea Generation, Development, Commercialisation)	***Validated***
P1.1-2.6	Erosion factors have a positive effect on the collaboration with partners within the core ecosystem	***Validated***
P1.1-2.7	Erosion factors have a positive effect on the collaboration with partners within the adjacent ecosystem	***Validated***

Note: For the sake of simplicity, the factor COL_COUPLED_TYPE_PHASE is split in two when presenting the propositions.

The next section covers the second component of the erosion factors variable, the cost of doing research (P1.2), following a similar approach.

ii. Cost of Doing Research (P1.2)

The same approach is followed for testing the proposition P1.2 concerning the impact of the cost of doing research on the open innovation processes. In this case, the cost of doing research significantly and positively impacts the outside-in open innovation processes only ($\beta = 0.165$), and not the other six factors. Since one of the underlying propositions is validated, this validates the proposition P1.2. The following table 6-11 summarizes the results of the propositions testing.

Table 6-11: Validation of Cost of Doing Research Impact on OI Processes' Propositions

P1	**Erosion Factors Direct Positive Impact on Open Innovation Processes - Validated**	
P1.2	***Cost of Doing Research positive impact on OI Processes - Validated***	
P1.2-2.1	Cost of doing research has a positive effect on inside-out open innovation processes	Not Validated
P1.2-2.2	Cost of doing research has a positive effect on outside-in open innovation processes	***Validated***
P1.2-2.3	Cost of doing research has a positive effect on the collaboration for client-focused innovations	Not Validated
P1.2-2.4	Cost of doing research has a positive effect on coupled open innovation processes	Not Validated
P1.2-2.5.1	Cost of doing research has a positive effect on the frequency of internal and client-focused innovations	Not Validated
P1.2-2.5.2	Cost of doing research has a positive effect on the collaboration with external entities at all phases of the innovation process (Idea Generation, Development, Commercialisation)	Not Validated
P1.2-2.6	Cost of doing research has a positive effect on the collaboration with partners within the core ecosystem	Not Validated
P1.2-2.7	Cost of doing research has a positive effect on the collaboration with partners within the adjacent ecosystem	Not Validated

Other considerations: In general, all the VIF (Variance Inflation Factor) are less than 3, indicating no strong multicollinearity (Kutner, Nachtsheim, & Neter 2004).

Conclusion

Proposition P1 is validated since both P1.1. and P1.2 are validated: erosion factors have therefore a direct and positive impact on the open innovation processes of the firm.

6.1.4.1.2 *Open Innovation Processes Effect on Performance (P2)*

The second relationship tested in linear regression is P2:

P2	**Open innovation processes positively impact the performance**

Since two different factors constitute the outcome variable performance: Practice's propensity to innovate (5.1) and overall performance (5.2), each of the 7 variables under OI processes is linked to each of these two performance variables. This results in a total of 14 relationships that are tested under the proposition P2. In this section, two different types of regressions are conducted since the two outcome variables are different: propensity to innovate is categorical (has a defined set of values that it could take), and the overall performance is continuous. The former requires a logistic regression, while the latter requires a linear type of regression analysis. The 14 relationships regression analyses results are presented in Appendix U (Outcome: Propensity to Innovate) and V (Outcome: Overall Performance) in details. Only an extract is highlighted in the next sections for simplicity of presentation.

6.1.4.1.2.1 Propensity to innovate (5.1)

For every regression, four models are ran as suggested by Sharma (1981) (see Figure 4-5 in the thesis): first with the control variables (Model 1), second adds the effect of the intermediary/predictor ones (Model 2, which variable x in the regression equation), third adds to them the effect of the moderating variable (Model 3, variable z), and the fourth adds the effect of the interactive variables (Model 4, variable xz). The results are presented in the two tables below, with the first showing the control variables and the second showing the intermediary ones. The detailed results are in Appendix U in order to better present the main outcomes in these sections.

Control Variables Effect

In the first table 6-12 below, Consulting, Deals and the Prairies are robust enough to stay significant but with negative coefficients for all three models of the regression. Hence, compared to Assurance, both Consulting and Deals have a weaker effect on the propensity to innovate. Compared to Ontario, Prairies has a weaker effect on the propensity to innovate. The maturity level is significant in the first two models before the interaction between the intermediary and outcome variables are added to the equation. In model 4 (see Appendix U for details), maturity level becomes non-significant (see Table 6-12). Understanding the reason behind this could be interesting in future research.

Table 6-12: Logistic Regression Results for Control Variables – Propensity to innovate

Control Variables	MODEL 1 β (Std. Err)	Sig
Constant (intercept)	-1.436 (0.725)	**
Q1_TAX	-0.434 (0.390)	
Q1_CONS	-1.096 (0.455)	**
Q1_DEALS	-1.658 (0.793)	**
Q1_IFS	0.291 (0.505)	
Q2_PRAIRIES	-0.752 (0.501)	*
Q2_BC	-0.696 (0.546)	
Q2_QUEBEC	-0.121 (0.411)	
Q2_MARITIMES	-20.314 (15946.941)	
Q3_CONT	0.200 (0.130)	*
Q4_MGR	-0.107 (0.320)	

Note:
Two-tail significance: * $0.05 < p \leq 0.10$; ** $0.01 < p \leq 0.05$; *** $0.001 < p \leq 0.01$; **** $p \leq 0.0011$.
Coefficient test is bilateral (H0: $\beta = 0$, H1: $\beta \neq 0$)
Goodness of fit results are in Appendix U.

Intermediary Variables Effect

In the second table 6-13 below, logistic regression results show that outside-in (β= 0.672***), inside-out OI practices (β= 0.427**) and external collaboration with core partners (β= 0.346*) have all significantly positive effect on the propensity to innovate, in decreasing order of strength. This validates their respective propositions level 3 in the model. External collaboration per type and phase (β= -0.387**) as well as collaboration with adjacent partners (β= -0.371**) have a significantly negative effect on the propensity to innovate. The remaining two variables are not significant (external collaboration for clients and coupled OI processes). This does not validate the related propositions to these four level 3 propositions. As expected from the literature and exploratory study, Firm ABC’s outside-in processes is the most significant and has the strongest effect on the propensity to innovate. An increase in collaboration with external partners in different types and at different stages and especially with partners not in the core of the ecosystem has a negative effect. This might be explained by the fact that it causes loss of focus and time spent at all stages, which results in less potential propensity to innovate.

Table 6-13: Logistic Regression Results for Main Relation P2 – Propensity to innovate

Intermediary Variables (all detailed results are in Appendix U)	MODEL 2 β (Std. Er.)	Sig.
(Constant) (intercept)	-2.008	**
	(0.803)	
Z_COL_IN_OUT_F1	0.427	**
	(0.185)	
Z_COL_OUT_IN_F2	0.672	****
	(0.199)	
Z_COL_for_CLIENT_F3	0.003	
	(0.184)	
Z_COL_COUPLE_PRACT_F1	-0.116	
	(0.204)	
Z_COL_COUPLE_TYPE_PHASE_F2	-0.387	**
	(0.193)	
Z_COL_COUPLE_PARTNER_CORE_F1	0.346	*
	(0.211)	
Z_COL_COUPLE_PARTNER_ADJ_F2	-0.371	**
	(0.185)	

Note:
Two-tail significance: * 0.05 < p <= 0.10; ** 0.01 < p <= 0.05; *** 0.001 < p <= 0.01; **** p <= 0.0011.
Coefficient test is bilateral (H0: $\beta = 0$, H1: $\beta \neq 0$)
Goodness of fit results are in Appendix U.

Propositions Validation:

Given that some of the underlying propositions are validated, the proposition P2-5.1is therefore also valid. In the Firm ABC, an increase in OI processes have a positive impact on the number of generated innovations. Since the level 2 proposition P2-5.1 is valid, then this renders proposition P2 also valid. The following table 6-14 summarizes the results of the propositions testing based on the findings above.

Table 6-14: Validation of OI Processes Impact on Propensity to Innovate Propositions

P2	**Open Innovation Processes Direct Positive Impact on Performance – Validated**	
P2-5.1	***Open Innovation Processes Positive Impact on the propensity to innovate - Validated***	
P2.1-5.1	Inside-out open innovation processes have a positive effect on the propensity to innovate	***Validated***
P2.2-5.1	Outside-in open innovation processes have a positive effect on the propensity to innovate	***Validated***
P2.3-5.1	Client-focused innovations have a positive effect on the propensity to innovate	Not Validated
P2.4-5.1	Coupled open innovation processes have a positive effect on the propensity to innovate	Not Validated
P2.5.1-5.1	Collaboration with external entities at all phases of the innovation process (Idea Generation, Development, Commercialisation) have positive effect on the propensity to innovate	Not Validated
P2.5.2-5.1	Frequency of collaboration with external entities in internal and client-focused innovations have positive effect on the propensity to innovate	Not Validated
P2.6-5.1	Partnerships with Core Ecosystem Players have positive effect on the propensity to innovate	***Validated***
P2.7-5.1	Partnerships with Adjacent Ecosystem Players have positive effect on the propensity to innovate	Not Validated

6.1.4.1.2.2 Practice's Performance (5.2)

The linear regression results are presented in the two tables below, with the first showing the control variables and the second showing the intermediary ones (with the only the relevant model of the regression shown, the completed detailed table is in Appendix V).

Control Variables Effect

In the first table 6-15, Quebec as a control variable is the only one that is robust enough to stay significant for all four models of the regression (see Appendix V). Hence, compared to Ontario, Quebec has a positive and significant effect that remains even after adding the interaction of the intermediary variables with the outcome ones. BC and maturity level are found to be significant in the first model before the additional intermediary variables are added to the equation, then they become non-significant. Understanding the reason behind could be interesting in future research.

Table 6-15: Linear Regression Results for Control Variables – Performance

Control Variables	MODEL 1	
	β (Std. Er.)	Sig.
(Constant) (intercept)	0.411 (0.262)	
Q1_TAX	-0.001 (0.161)	
Q1_CONS	0.159 (0.166)	
Q1_DEALS	-0.063 (0.230)	
Q1_IFS	-0.145 (0.224)	
Q2_PRAIRIES	0.155 (0.183)	
Q2_BC	-0.335 (0.194)	*
Q2_QUEBEC	0.291 (0.168)	*
Q2_MARITIMES	-0.144 (0.411)	
Q3_CONT	-0.095 (0.045)	**
Q4_MGR	-0.021 (0.125)	

Note:
Two-tail significance: * $0.05 < p \leq 0.10$; ** $0.01 < p \leq 0.05$; *** $0.001 < p \leq 0.01$; **** $p \leq 0.0011$.

Coefficient test is bilateral (H_0: $\beta = 0$, H_1: $\beta \neq 0$)

Goodness of fit results are in Appendix U.

Intermediary Variables Effect

In the second table 6-16 below, linear regression results show that outside-in (β= 0.262****), inside-out (β= 0.211***), client-focused innovations (β= 0.178***), coupled OI processes (β= 0.174***) and external collaboration with core partners (β= 0.145**) have all significantly positive effect on the propensity to innovate, in decreasing order of strength. The other two variables are not significant (external collaboration per type and phase and external collaboration with adjacent partners). The details for all the models are presented in Appendix V.

Table 6-16: Linear Regression Results for Main Relation P2 – Practice's Performance

Variables Independent	MODEL 2 β (Std. Dev.)	Sig.
For Control Variables, refer to previous tables		
Z_COL_IN_OUT_F1	0.211	****
	(0.058)	
Z_COL_OUT_IN_F2	0.262	****
	(0.058)	
Z_COL_for_CLIENT_F3	0.178	***
	(0.058)	
Z_COL_COUPLE_PRACT_F1	0.174	***
	(0.065)	
Z_COL_COUPLE_TYPE_PHASE_F2	-0.034	
	(0.061)	
Z_COL_COUPLE_PARTNER_CORE_F1	0.145	**
	(0.065)	
Z_COL_COUPLE_PARTNER_ADJ_F2	0.033	
	(0.059)	

Note:
Two-tail significance: * $0.05 < p \leq 0.10$; ** $0.01 < p \leq 0.05$; *** $0.001 < p \leq 0.01$; **** $p \leq 0.0011$.

Coefficient test is bilateral (H_0: $\beta = 0$, H_1: $\beta \neq 0$).

Goodness of fit results are in Appendix U.

Proposition Validation

Given that some of the level 3 propositions are validate, this renders the level 2 proposition P2-5.2 also valid, which in turn validates the level 1 proposition P2. The results support the fact that an increase in inside-out, outside-in, and coupled OI processes, as well as client-oriented innovations and collaboration with core partners contribute to a better performance of the practices. The following table 6-17 summarizes the results of the propositions testing.

Table 6-17: Validation of OI Processes Impact on Practice's Performance's Propositions

P2	**Open Innovation Processes Positive Direct Impacts on Performance - Validated**	
P2-5.2	***Open Innovation Processes Positive Impact on the Financial Performance of the Practice - Validated***	
P2.1-5.2	Inside-out open innovation processes have a positive effect on the financial performance of the practice	***Validated***
P2.2-5.2	Outside-in open innovation processes have a positive effect on the financial performance of the practice	***Validated***
P2.3-5.2	Client-focused innovations have a positive effect on the financial performance of the practice	***Validated***
P2.4-5.2	Coupled open innovation processes have a positive effect on the financial performance of the practice	***Validated***
P2.5.1-5.2	Collaboration with external entities at all phases of the innovation process (Idea Generation, Development, Commercialisation) have positive effect on the financial performance of the practice	Not Validated
P2.5.2-5.2	Frequency of internal and client-focused innovations have positive effect on the financial performance of the practice	Not Validated
P2.6-5.2	Partnerships with Core Ecosystem Players have positive effect on the financial performance of the practice	***Validated***
P2.7-5.2	Partnerships with Adjacent Ecosystem Players have positive effect on the financial performance of the practice	Not Validated

Conclusion

The only variables that impact significantly and robustly both number of innovation and performance are the outside-in and inside-out open innovation processes as well as the collaboration with core partners.

Proposition P2 is therefore validated: open innovation processes have a positive impact on the performance of practices in Firm ABC.

6.1.4.2 Moderating Relationships: Organizational Support & Risk Management (P3 and P4)

In this section, the results of the analysis of the moderating effect that organizational support and risk management have on the relationship between open innovation processes and performance is analyzed. Given that performance is made of one continuous variable and the other categorical (financial/client success respectively and propensity to innovate), both linear and logistic regressions analyses were made. This section covers the two moderating relationships:

1. Organizational Support effect on the relationship between open innovation processes and performance (P3→P2)

2. Risk management effect on the relationship between open innovation processes and performance (P4→P2).

To validate the approach of regression and logistic analyses on the moderating variables, the minimum number of valid subjects needed is 5 per factor. For the relationship between P2-P4, the result is 41 factors (10 for the Control Variables, 7 for Open Innovation Process, 3 for organizational support, and 21 (7*3) for the cross-products or interaction between Open Innovation processes and Organizational support). Hence, the minimum subjects should be 205 (41*5), which is a condition respected by the common sample size of 276.

However, for the relationship between P3-P4, the result if 65 factors (10 for the Control Variables, 7 for Open Innovation Process, 6 for Risk Management, and 42 (7*6) for the cross-products of Open Innovation processes and Risk Management). Hence, the minimum subjects should be 325 (65*5), which is less than the common sample size of 276. The researcher deemed this limitation acceptable given that the original sample size was 345 and got trimmed down to 276 responses that had answered fully to all the questions. Not all the detailed results are presented in this section, for the remaining tables that are relevant, refer to Appendices U and V.

6.1.4.2.1 *Moderating Effect of Organizational Support (P3)*

Using SSPS, both linear and logistic regressions are conducted. The first relationship tested is:

P3→P2	**Organizational support positively impacts the relationship between open innovation processes and practices' performance**

The sections below present the results of the linear and logistic regression analyses conducted. Only an extract of the results are presented for simplicity sake, with all complete details in Appendices U and V.

6.1.4.2.1.1 Logistic Regressions P3 → P2 (5.1 Propensity to innovate)

In this first part, given that the propensity to innovate (5.1) as an outcome variable is a categorical one, a logistic regression is made on the moderation effects of organizational support factors on the relationships between open innovation processes and performance. Organizational support is split between the three variables of Firm's support, Individual Preference for inside-out OI (NSH) and for outside-in OI (NIH).

3.1 Firm's Support Moderating Effect

The following table 6-18 summarises the regression analysis result for the moderating effect of firm's support. The details on control variables have been omitted for simplicity sake, and can be found in Appendix U. Results for the variables x (predictor), z (intermediary), and xz (interactive) are kept in the table.

Table 6-18: Logistic Regression P3 ORG_SUPPORT with P2 Propensity to innovate

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: ORGANIZATIONAL SUPPORT								
	MODEL 1		MODEL 2 (x)		MODEL 3 (z)		MODEL 4 (xz)	
	B Std. Error	Sig.	B Std. Error	Sig.	B Std. Error	Sig.	B Std. Error	Sig.
(Constant)	0.411		-0.034		-0.057		-0.092	
	(0.262)		(0.233)		(0.228)		(0.233)	
Z_COL_IN_OUT_F1			0.211	****	0.144	**	0.134	**
			(0.058)		(0.060)		(0.060)	
Z_COL_OUT_IN_F2			0.262	****	0.209	****	0.189	***
			(0.058)		(0.058)		(0.060)	
Z_COL_for_CLIENT_F3			0.178	***	0.153	***	0.150	**
			(0.058)		(0.057)		(0.058)	
Z_COL_COUPLE_PRACT_F1			0.174	***	0.151	**	0.129	*
			(0.065)		(0.064)		(0.070)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034		-0.050		-0.046	
			(0.061)		(0.060)		(0.061)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145	**	0.163	**	0.162	**
			(0.065)		(0.064)		(0.066)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033		0.019		0.043	
			(0.059)		(0.058)		(0.059)	
Z_ORG_SUPPORT_F1					0.218	****	0.208	****
					(0.061)		(0.061)	
Z_COL_IN_OUT_F1 x Z_ORG_SUPPORT_F1							0.000	****
							(0.000)	
Z_COL_OUT_IN_F2 x Z_ORG_SUPPORT_F1							0.000	****
							(0.000)	
Z_COL_for_CLIENT_F3 x Z_ORG_SUPPORT_F1							0.000	****
							(0.000)	
Z_COL_COUPLE_PRACT_F1 x Z_ORG_SUPPORT_F1							0.000	****
							(0.000)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_ORG_SUPPORT_F1							0.000	****
							(0.000)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_ORG_SUPPORT_F1							0.000	****
							(0.000)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_ORG_SUPPORT_F1							0.000	****
							(0.000)	
R^2	0.0568		0.3174		0.3496		0.3750	
R^2_{adj}	0.0212		0.2724		0.3040		0.3126	
p-values	0.1080		0.0000		0.0000		0.0000	
VIF_{max}	1.5023		1.7311		1.7428		2.3627	
delta R^2			0.2606		0.0322		0.0255	
p-values			0.0000		0.0004		0.1841	

Note:

Two-tail significance: * $0.05 < p \leq 0.10$; ** $0.01 < p \leq 0.05$; *** $0.001 < p \leq 0.01$; **** $p \leq 0.0011$.

Coefficient test is bilateral (H_0: $\beta = 0$, H_1: $\beta \neq 0$)

Propositions Validation

According to Sharma (1981), the first step is to look at the cross-product (interaction – Model 4) coefficients' significance in Model 4. If a cross-product coefficient is significant, then there is moderation effect. The second step is to look at Model 3 for the moderator and validate if the coefficient is significant. If it is, then the moderator variable is considered a *quasi-moderator*, hence both a moderator and a predictor. In this first logistic regression case, organizational support has a negative moderating effect:

1) Very significantly on the relationship between collaboration for client and propensity to innovate (β= -0.353)
2) And significantly on the relationship between coupled open innovation processes and propensity to innovate (β= -0.587).

Since organizational support coefficient is not significant in the Model 3, then this variable is considered a pure moderator on these two relationships. All the other cross-products' coefficients are not significant and hence have no moderating effect. The following table 6-19 summarizes the results of the propositions testing.

Table 6-19: Validation of the Moderating Effect of Firm's Support Propositions (Logistic)

P3-P2	**Moderating Effect of Organizational Culture on the Relationship between OI Processes and Performance**	
P3.1-P2-5.1	***Firm's Support moderating effect on the relationship between OI processes and Propensity to innovate - VALIDATED***	
P3.1-P2.1-5.1	Firm's support has a moderating effect on the relationship between inside-out OI processes and the propensity to innovate	Not Validated
P3.1-P2.2-5.1	Firm's support has a moderating effect on the relationship between outside-in OI processes and the propensity to innovate	Not Validated
P3.1-P2.3-5.1	Firm's support has a moderating effect on the relationship between innovations for Clients and the propensity to innovate	***Validated - Negative Pure Moderator***
P3.1-P2.4-5.1	Firm's support has a moderating effect on the relationship between coupled OI processes and the propensity to innovate	***Validated - Negative Pure Moderator***
P3.1-P2.5.1-5.1	Firm's support has a moderating effect on the relationship between frequency of external collaboration in internal and client-focused innovations and the propensity to innovate	Not Validated
P3.1-P2.5.2-5.1	Firm's support has a moderating effect on the relationship between collaboration with external entities at all phases of the innovation process (Ideation, Development, Commercialisation) & propensity to innovate	Not Validated
P3.1-P2.6-5.1	Firm's support has a moderating effect on the relationship between partnerships with Core Ecosystem Players and the propensity to innovate	Not Validated
P3.1-P2.7-5.1	Firm's support has a moderating effect on the relationship between partnerships with Adjacent Ecosystem Players and the propensity to innovate	Not Validated

3.2 Individuals' Preference for Inside-Out Moderating Effect

The following table 6-20 summarises the logistic regression analysis result for the moderating effect of the individual's preference for inside-out open innovation. For simplicity, the control variables removed as they are not part of the propositions testing. Intermediary variables are also removed as they are the same as in the table 6-19. All detailed results are in Appendix U.

Table 6-20: Logistic Regression P3 ORG_PREF_IN_OUT with P2 Propensity to innovate

Criterion: Propensity to innovate	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Moderator: ORG_PREF_IN_OUT	β (Std. Err.)	Sig	β (Std. Err.)	Sig.	β (Std. Err.)	Sig.	β (Std. Err.)	Sig
Constant	-1.721 (0.706)	**	-2.278 (0.773)	***	-2.342 (0.778)	***	-2.456 (0.812)	***
Z_ORG_PREF_IN_OUT					0.257 (0.188)		0.252 (0.222)	
Z_COL_IN_OUT_F1 x Z_ORG_PREF_IN_OUT							0.266 (0.191)	
Z_COL_OUT_IN_F2 x Z_ORG_PREF_IN_OUT							0.189 (0.197)	
Z_COL_for_CLIENT_F3 x Z_ORG_PREF_IN_OUT							0.035 (0.188)	
Z_COL_COUPLE_PRACT_F1 x Z_ORG_PREF_IN_OUT							-0.176 (0.183)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_ORG_PREF_IN_OUT							-0.140 (0.190)	
Z_COL_COUPLE_PARTNER_CORE_F1x Z_ORG_PREF_IN_OUT							0.174 (0.188)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_ORG_PREF_IN_OUT							0.085 (0.179)	
R^2	0.1073		0.2260		0.2341		0.2527	
R^2_{adj}	NA		NA		NA		NA	
p-values	2.9692		0.0001		0.0001		0.0004	
VIF_{max}	NA		NA		NA		NA	
delta R^2			0.1187		0.0081		0.0186	
p-values			0.0004		0.1665		0.7280	

Note:
Two-tail significance: * 0.05 < p ≤ 0.10; ** 0.01 < p ≤ 0.05; *** 0.001 < p ≤ 0.01; **** p ≤ 0.0011.
Coefficient test is bilateral (H_0: β =0, H_1: β ≠ 0)

Propositions Validation

In this second logistic regression case, personal preference for inside out sharing has no significant impact on any of relationships. Therefore, it has no moderating effect on any of the interactions. The following table 6-21 summarizes the results of the propositions testing.

Table 6-21: Validation of the Moderating Effect of Individuals' Preference for Inside-Out Processes' Propositions

P3-P2	**Moderating Effect of Individuals' Preference for Inside-Out on the Relationship between OI Processes and Propensity to innovate**	
P3.2-P2-5.1	***Personal Preference for Inside-Out Processes culture moderating effect on the relationship between OI processes and the propensity to innovate – NOT VALIDATED***	
P3.2-P2.1-5.1	Personal preference for inside-out processes has a moderating effect on the relationship between inside-out OI processes and the propensity to innovate	Not Validated
P3.2-P2.2-5.1	Personal preference for inside-out processes has a moderating effect on the relationship between outside-in OI processes and the propensity to innovate	Not Validated
P3.2-P2.3-5.1	Personal preference for inside-out processes has a moderating effect on the relationship between innovations for Clients and the propensity to innovate	Not Validated
P3.2-P2.4-5.1	Personal preference for inside-out processes has a moderating effect on the relationship between coupled OI processes and the propensity to innovate	Not Validated
P3.2-P2.5.1-5.1	Personal preference for inside-out processes has a moderating effect on the relationship between frequency of external collaboration in internal and client-focused innovations and the propensity to innovate	Not Validated
P3.2-P2.5.2-5.1	Personal preference for inside-out processes has a moderating effect on the relationship between collaboration with external entities at all phases of the innovation process (Idea Generation, Development, Commercialisation) and the propensity to innovate	Not Validated
P3.2-P2.6-5.1	Personal preference for inside-out processes has a moderating effect on the relationship between partnerships with Core Ecosystem Players and the propensity to innovate	Not Validated
P3.2-P2.7-5.1	Personal preference for inside-out processes has a moderating effect on the relationship between partnerships with Adjacent Ecosystem Players and the propensity to innovate	Not Validated

3.3 Individuals’ Preference for Outside-In Moderating Effect

The following table 6-22 summarises the logistic regression analysis result for the moderating effect of the individual’s preference for outside-in open innovation (see Appendix U for details on control and intermediary variables).

Table 6-22: Logistic Regression P3 ORG_PREF_OUT_IN with P2 Propensity to innovate

Criterion: Propensity to innovate Moderator: ORG_PREF_OUT_IN	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β Std. Err.	Sig	β Std. Err.	Sig	β Std. Err.	Sig	β Std. Err.	Sig.
Constant	-1.721 0.706	**	-2.278 (0.773)	***	-2.227 (0.773)	***	-2.496 (0.803)	***
Z_ORG_PREF_OUT_IN					0.191 (0.196)		0.303 (0.228)	
Z_COL_IN_OUT_F1 x Z_ORG_PREF_OUT_IN							0.216 (0.236)	
Z_COL_OUT_IN_F2 x Z_ORG_PREF_OUT_IN							-0.019 (0.197)	
Z_COL_for_CLIENT_F3 x Z_ORG_PREF_OUT_IN							0.244 (0.198)	
Z_COL_COUPLE_PRACT_F1 x Z_ORG_PREF_OUT_IN							-0.197 (0.210)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_ORG_PREF_OUT_IN							-0.365 (0.228)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_ORG_PREF_OUT_IN							0.199 (0.234)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_ORG_PREF_OUT_IN							0.282 (0.224)	
R^2	0.1073		0.2260		0.2301		0.2687	
R^2_{adj}	NA		NA		NA		NA	
p-values	0.0000		0.0001		0.0001		0.0001	
VIF_{max}	NA		NA		NA		NA	
delta R^2			0.1187		0.0041		0.0386	
p-values			0.0004		0.3230		0.2339	

Note:
Two-tail significance: * 0.05 < p ≤ 0.10; ** 0.01 < p ≤ 0.05; *** 0.001 < p ≤ 0.01; **** p ≤ 0.0011.

Coefficient test is bilateral (H_0: β =0, H_1: β ≠ 0)

Propositions Validation

In this third logistic regression case, personal preference for outside-in open innovation processes has no significant moderating effect on any of the relationships between the open innovation processes and the propensity to innovate. The following table 6-23 summarizes the results of the propositions testing.

Table 6-23: Validation of the Moderating Effect of Personal Preference for Outside-In Processes' Propositions

P3-P2	Moderating Effect of Organizational Culture on the Relationship between OI Processes and Performance	
P3.3-P2-5.2	***Personal preference for outside-in processes moderating effect on the relationship between OI processes and the financial performance of the practice – NOT VALIDATED***	
P3.3-P2.1-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between inside-out OI processes and the financial performance of the practice	Not Validated
P3.3-P2.2-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between outside-in OI processes and the financial performance of the practice	Not Validated
P3.3-P2.3-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between innovations for Clients and the financial performance of the practice	Not Validated
P3.3-P2.4-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between coupled OI processes and the financial performance of the practice	Not Validated
P3.3-P2.5.1-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between frequency of external collaboration in internal and client-focused innovations and the financial performance of the practice	Not Validated
P3.3-P2.5.2-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between collaboration with external entities at all phases of the innovation process (Idea Generation, Development, Commercialisation) and the financial performance of the practice	Not Validated
P3.3-P2.6-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between partnerships with Core Ecosystem Players and the financial performance of the practice	Not Validated
P3.3-P2.7-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between partnerships with Adjacent Ecosystem Players and the financial performance of the practice	Not Validated

6.1.4.2.1.2 Linear Regressions P3→ P2 (5.2 Practice's Performance)

In this second part, the outcome/criterion variable is the practice's performance (5.2). Since it is a continuous variable, linear regression is the appropriate type of regressions.

Firm's Support Moderating Effect

The detailed results for the moderating effect of the factor Firm's Support are presented in the table 6-24 below.

Table 6-24: Linear Regression P3 Firm Support with P2 Performance (cont'd)

Criterion: Performance Moderator: Firm's Support (ORG_SUPPORT)	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β Std. Err.	Sig.	β Std. Err.	Sig.	β Std. Err.	Sig.	β Std. Err.	Sig.
(Constant)	0.411		-0.034		-0.057		-0.092	
	(0.262)		(0.233)		(0.228)		(0.233)	
Q1_TAX	-0.001		-0.016		-0.023		-0.027	
	(0.161)		(0.141)		(0.138)		(0.140)	
Q1_CONS	0.159		0.159		0.203		0.240	
	(0.166)		(0.153)		(0.151)		(0.154)	
Q1_DEALS	-0.063		0.277		0.289		0.334	
	(0.230)		(0.207)		(0.202)		(0.204)	
Q1_IFS	-0.145		0.227		0.135		0.124	
	(0.224)		(0.200)		(0.197)		(0.199)	
Q2_PRAIRIES	0.155		0.173		0.190		0.232	
	(0.183)		(0.159)		(0.156)		(0.157)	
Q2_BC	-0.335	*	-0.220		-0.155		-0.148	
	(0.194)		(0.170)		(0.167)		(0.167)	
Q2_QUEBEC	0.291	*	0.350	**	0.344	**	0.396	***
	(0.168)		(0.147)		(0.144)		(0.145)	
Q2_MARITIMES	-0.144		0.111		0.199		0.092	
	(0.411)		(0.368)		(0.360)		(0.382)	
Q3_CONT	-0.095	**	-0.031		-0.028		-0.022	
	(0.045)		(0.040)		(0.039)		(0.040)	
Q4_MGR	-0.021		0.078		0.073		0.054	
	(0.125)		(0.112)		(0.109)		(0.110)	
Z_COL_IN_OUT_F1			0.211	****	0.144	**	0.134	**
			(0.058)		(0.060)		(0.060)	
Z_COL_OUT_IN_F2			0.262	****	0.209	****	0.189	***
			(0.058)		(0.058)		(0.060)	
Z_COL_for_CLIENT_F3			0.178	***	0.153	***	0.150	**
			(0.058)		(0.057)		(0.058)	
Z_COL_COUPLE_PRACT_F1			0.174	***	0.151	**	0.129	*
			(0.065)		(0.064)		(0.070)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034		-0.050		-0.046	
			(0.061)		(0.060)		(0.061)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145	**	0.163	**	0.162	**
			(0.065)		(0.064)		(0.066)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033		0.019		0.043	
			(0.059)		(0.058)		(0.059)	
Z_ORG_SUPPORT_F1					0.218	****	0.208	****
					(0.061)		(0.061)	
Z_COL_IN_OUT_F1 x Z_ORG_SUPPORT_F1							-0.047	
							(0.060)	
Z_COL_OUT_IN_F2 x Z_ORG_SUPPORT_F1							0.001	
							(0.062)	

Table 6-24: Linear Regression P3 Firm Support with P2 Performance (cont'd)

Criterion: Performance Moderator: Firm's Support (ORG_SUPPORT)	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β Std. Err.	Sig.	β Std. Err.	Sig.	β Std. Err.	Sig.	β Std. Err.	Sig.
Z_COL_for_CLIENT_F3 x Z_ORG_SUPPORT_F							0.041 (0.057)	
Z_COL_COUPLE_PRACT_F1 x Z_ORG_SUPPORT_F1							-0.076 (0.072)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_ORG_SUPPORT_F1							-0.015 (0.060)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_ORG_SUPPORT_F1							-0.063 (0.068)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_ORG_SUPPORT_F1							0.129 (0.058)	**
R^2	0.0568		0.3174		0.3496		0.3750	
R^2_{adj}	0.0212		0.2724		0.3040		0.3126	
p-values	0.1080		0.0000		0.0000		0.0000	
VIF_{max}	1.5023		1.7311		1.7428		2.3627	
delta R^2			0.2606		0.0322		0.0255	
p-values			0.0000		0.0004		0.1841	

Note:
Two-tail significance: * 0.05 < p ≤ 0.10; ** 0.01 < p ≤ 0.05; *** 0.001 < p ≤ 0.01; **** p ≤ 0.001.
Coefficient test is bilateral (H_0: β =0, H_1: β ≠ 0)

Propositions Validation:

In this first case, the only interaction (cross-product) that has a significant and positive coefficient is the firm's support and collaboration with adjacent partners (β=0.129). Hence, the Firm's support only moderates the relationship between collaboration with adjacent partners and practice performance. Since firm support's coefficient is very significant in the Model 3, then this variable is also a predictor, hence a quasi-moderator. Firm's support has no moderating effect on the other variables. The following table 6-25 summarizes the results of the propositions testing.

Table 6-25: Validation of the Moderating Effect of the Firm's Support Propositions

P3-P2	**Moderating Effect of Organizational Culture on the Relationship between OI Processes and Performance - VALIDATED**	
P3.1-P2-5.2	***Firm's Support moderating effect on the relationship between OI processes and the financial performance of the practice - VALIDATED***	
P3.1-P2.1-5.2	Firm's support has a moderating effect on the relationship between inside-out OI processes and the financial performance of the practice	Not Validated
P3.1-P2.2-5.2	Firm's support has a moderating effect on the relationship between outside-in OI processes and the financial performance of the practice	Not Validated
P3.1-P2.3-5.2	Firm's support has a moderating effect on the relationship between innovations for Clients and the financial performance of the practice	Not Validated
P3.1-P2.4-5.2	Firm's support has a moderating effect on the relationship between coupled OI processes and the financial performance of the practice	Not Validated
P3.1-P2.5.1-5.2	Firm's support has a moderating effect on the relationship between frequency of external collaboration in internal and client-focused innovations and the financial performance of the practice	Not Validated
P3.1-P2.5.2-5.2	Firm's support has a moderating effect on the relationship between collaboration with external entities at all phases of the innovation process (Idea Generation, Development, Commercialisation) and the financial performance of the practice	Not Validated
P3.1-P2.6-5.2	Firm's support has a moderating effect on the relationship between partnerships with Core Ecosystem Players and the financial performance of the practice	Not Validated
P3.1-P2.7-5.2	Firm's support has a moderating effect on the relationship between partnerships with Adjacent Ecosystem Players and the financial performance of the practice	***Validated - Quasi Moderator***

Individual's Preference for Inside-Out Collaboration Moderating Effect

The following table 6-26 summarises the regression analysis result for the moderating effect of individual's preference for inside-out collaboration on the relationship between OI processes and the Practice's Performance. Control variables are removed as they are repetitive with Table 6-24. Intermediary variables are also removed as they are the same as in the table 6-24. All detailed results are in Appendix V:

Table 6-26: Linear Regression P3 PREF_IN_OUT with P2 Performance

Criterion: Performance Moderator: PREF_IN_OUT	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β Std. Err.	Sig.	β Std. Err.	Sig.	β Std. Err.	Sig.	β Std. Err.	Sig.
(Constant)	0.411 (0.262)		-0.034 (0.233)		-0.036 (0.233)		-0.018 (0.236)	
Z_ORG_PREF_IN_OUT					0.009 (0.060)		0.026 (0.065)	
Z_COL_IN_OUT_F1 x Z_ORG_PREF_IN_OUT							0.088 (0.061)	
Z_COL_OUT_IN_F2 x Z_ORG_PREF_IN_OUT							0.011 (0.060)	
Z_COL_for_CLIENT_F3 x Z_ORG_PREF_IN_OUT							0.011 (0.057)	
Z_COL_COUPLE_PRACT_F1 x Z_ORG_PREF_IN_OUT							-0.046 (0.059)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_ORG_PREF_IN_OUT							0.058 (0.061)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_ORG_PREF_IN_OUT							-0.004 (0.060)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_ORG_PREF_IN_OUT							-0.117 (0.058)	**
R^2	0.0568		0.3174		0.3496		0.3750	
R^2_{adj}	0.0212		0.2724		0.3040		0.3126	
p-values	0.1080		0.0000		0.0000		0.0000	
VIF_{max}	1.5023		1.7311		1.7428		2.3627	
delta R^2			0.2606		0.0322		0.0255	
p-values			0.0000		0.0004		0.1841	

Note:
Two-tail significance: * 0.05 $< p \leq 0.10$; ** 0.01 $< p \leq 0.05$; *** 0.001 $< p \leq 0.01$; **** $p \leq 0.001$.
Coefficient test is bilateral (H_0: $\beta = 0$, H_1: $\beta \neq 0$)

Propositions Validation

In this second case, the only cross-product that has a significant but negative coefficient is personal preference for inside-out and collaboration with adjacent partners (β= -0.117**), hence it only moderates the relationship between collaboration with adjacent partners and practice performance. Since personal preference for inside-out collaboration coefficient is not significant in the Model 3, then it is a pure moderator. All the other cross-products’ coefficients are not significant and hence have no moderating effect. The following table 6-27 summarizes the results of the propositions testing.

Table 6-27: Validation of the Moderating Effect of the Personal Preference for Inside-Out's Propositions

P3-P2	**Moderating Effect of Organizational Culture on the Relationship between OI Processes and Performance - VALIDATED**	
P3.2-P2-5.2	***Personal preference for inside-out processes moderating effect on the relationship between OI processes and the performance of the practice - VALIDATED***	
P3.2-P2.1-5.2	Personal preference for inside-out processes has a moderating effect on the relationship between inside-out OI processes and the performance of the practice	Not Validated
P3.2-P2.2-5.2	Personal preference for inside-out processes has a moderating effect on the relationship between outside-in OI processes and the performance of the practice	Not Validated
P3.2-P2.3-5.2	Personal preference for inside-out processes has a moderating effect on the relationship between innovations for Clients and the performance of the practice	***Validated - Negative Pure Moderator***
P3.2-P2.4-5.2	Personal preference for inside-out processes has a moderating effect on the relationship between coupled OI processes & practice performance	Not Validated
P3.2-P2.5.1-5.2	Personal preference for inside-out processes has a moderating effect on the relationship between frequency of external collaboration in internal and client-focused innovations and the performance of the practice	Not Validated
P3.2-P2.5.2-5.2	Personal preference for inside-out processes has a moderating effect on the relationship between collaboration with external entities at all phases of the innovation process (Idea Generation, Development, Commercialisation) and the performance of the practice	Not Validated
P3.2-P2.6-5.2	Personal preference for inside-out processes has a moderating effect on the relationship between partnerships with Core Ecosystem Players and the performance of the practice	Not Validated
P3.2-P2.7-5.2	Personal preference for inside-out processes has a moderating effect on the relationship between partnerships with Adjacent Ecosystem Players and the performance of the practice	Not Validated

Individual's Preference for Outside-In Collaboration Moderating Effect

The following table 6-28 summarises the regression analysis result for the moderating effect of individual's preference for outside-in collaboration. Control variables are removed as they are repetitive with Table 6-24. Intermediary variables are also removed as they are the same as in the table 6-24. All detailed results are in Appendix V:

Table 6-28: Linear Regression P2 PREF_OUT_IN with P2 Performance

Criterion: Performance Moderator: PREF_OUT_IN	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β Std. Err.	Sig.	β Std. Err.	Sig.	β Std. Err.	Sig	β Std. Err.	Sig.
(Constant)	0.411 (0.262)		-0.034 (0.233)		-0.003 (0.234)		0.051 (0.235)	
Z_ORG_PREF_OUT_IN					0.071 (0.058)		0.130 (0.063)	
Z_COL_IN_OUT_F1 x Z_ORG_PREF_OUT_IN							0.062 (0.065)	
Z_COL_OUT_IN_F2 x Z_ORG_PREF_OUT_IN							0.141 (0.054)	
Z_COL_for_CLIENT_F3 x Z_ORG_PREF_OUT_IN							-0.092 (0.063)	
Z_COL_COUPLE_PRACT_F1 x Z_ORG_PREF_OUT_IN							-0.134 (0.066)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_ORG_PREF_OUT_IN							-0.045 (0.064)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_ORG_PREF_OUT_IN							0.034 (0.064)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_ORG_PREF_OUT_IN							-0.039 (0.064)	**
R^2	0.0568		0.3174		0.3214		0.3539	
R^2_{adj}	0.0212		0.2724		0.2739		0.2893	
p-values	0.108		0.0000		0.0000		0.0000	
VIF_{max}	1.5023		1.7311		1.7533		2.1181	
delta R^2			0.2606		0.0040		0.0325	
p-values			0.0000		0.2220		0.0881	

Note:
Two-tail significance: * 0.05 < p ≤ 0.10; ** 0.01 < p ≤ 0.05; *** 0.001 < p ≤ 0.01; **** p ≤ 0.001.
Coefficient test is bilateral (H_0: β =0, H_1: β ≠ 0)

Propositions Validation

In this third case, the only interaction (cross-product) that has a significant but negative coefficient is personal preference for outside-in and collaboration with adjacent partners (β= -0.039**), hence it only moderates the relationship between collaboration with adjacent partners and practice performance. Since personal preference for outside-in collaboration coefficient is not significant in the Model 3, then it is a pure moderator. All the other cross-products' coefficients are not significant and hence have no moderating effect, hence the following results:

Table 6-29: Validation of the Moderating Effect of Personal Preference for Outside-In

P3-P2	Moderating Effect of Organizational Culture on the Relationship between OI Processes and Performance- VALID	
P3.3-P2-5.2	***Personal preference for outside-in processes moderating effect on the relationship between OI processes and the performance of the practice - VALID***	
P3.3-P2.1-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between inside-out OI processes and the performance of the practice	Not Validated
P3.3-P2.2-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between outside-in OI processes and the performance of the practice	Not Validated
P3.3-P2.3-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between innovations for Clients and the performance of the practice	Not Validated
P3.3-P2.4-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between coupled OI processes and the performance of the practice	Not Validated
P3.3-P2.5.1-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between frequency of external collaboration in internal and client-focused innovations and the performance of the practice	Not Validated
P3.3-P2.5.2-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between collaboration with external entities at all phases of the innovation process (Idea Generation, Development, Commercialisation) and the performance of the practice	Not Validated
P3.3-P2.6-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between partnerships with Core Ecosystem Players and the performance of the practice	Not Validated
P3.3-P2.7-5.2	Personal preference for outside-in processes has a moderating effect on the relationship between partnerships with Adjacent Ecosystem Players and the financial performance of the practice	***Validated - Negative Pure Moderator***

6.1.4.2.1.3 Summary of the Results

Organization has a moderating effect on only five relationships. This is however enough to validate proposition P3: Organization has a moderating effect on the impact of OI processes on the practice’s performance. In most cases, this impact is negative, hence it reduces the impact of the relationship. The higher the organization support, the less impactful are some of the open innovation processes on the practices’ performance.

The following two figures (6-12 and 6-13) summarize the findings from this section, with blue boxes meaning a positive significant effect and red boxes meaning a negative significant effect on the relationship between predictor and criterion variables.

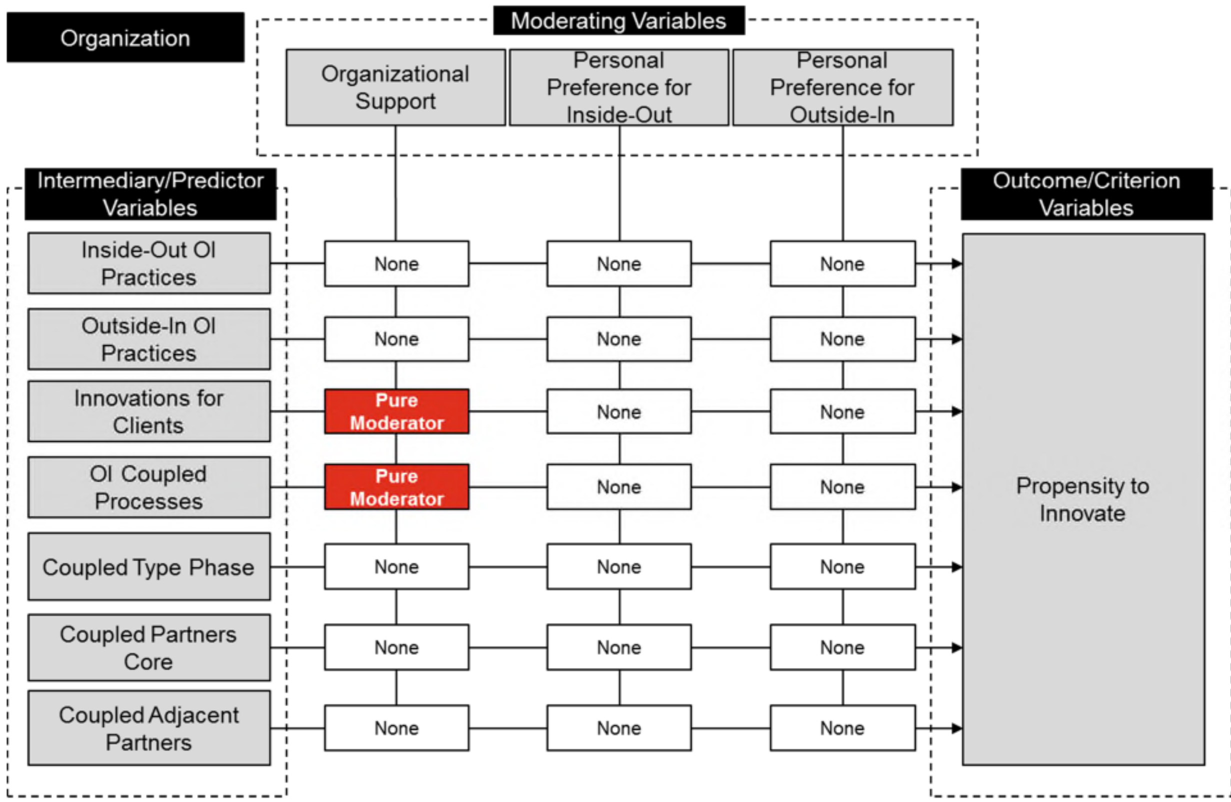

Figure 6-12: Summary of the Moderating Effects of Organization – Propensity to Innovate

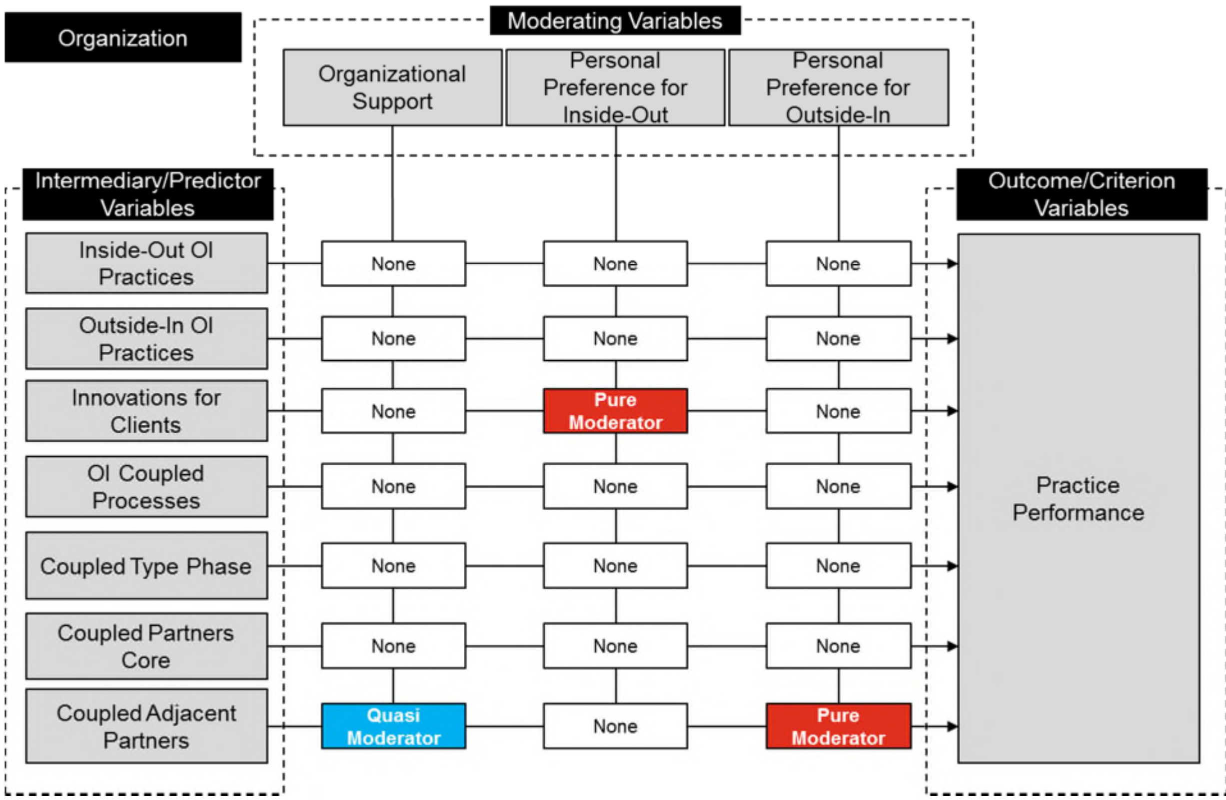

Figure 6-13: Summary of the Moderating Effects of Organization– Practice Performance

6.1.4.2.2 *Moderating Effect of Risk Management (P4)*

Using SSPS, both linear and logistic regressions are conducted. The second moderating relationship tested is:

P4→P2	**Risk Management negatively impacts the relationship between open innovation processes and practices' performance**

The same methodology used for analysing the moderating effect of organizational support is followed for risk management. Only an extract of the results are presented and the detailed regression analyses are all in the Appendix W and X.

6.1.4.2.2.1 Logistic Regression Results P4→ P2 – Propensity to innovate (5.1)

In this first part, the outcome/criterion variable is the propensity to innovate. Since it is a categorical variable, logistic regression is the appropriate type of regressions. The figure 6-14 below synthesizes the moderating effect of the different factors constituting Risk Management on the relationships between open innovation practices and the propensity to innovate. The detailed regression analyses are presented in Appendix W.

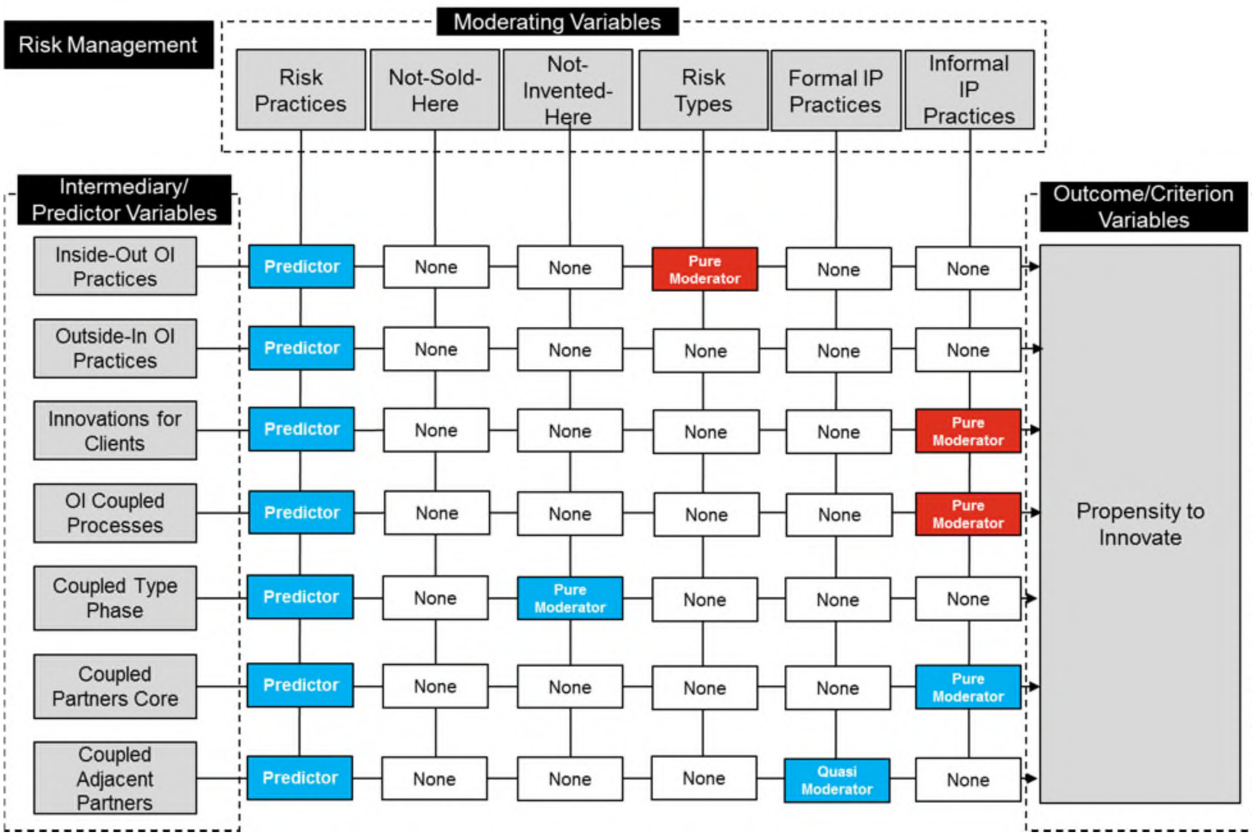

Figure 6-14: Summary of the Moderating Effects of Risk Management - Propensity to innovate – Logistic Regressions

Propositions Validation:

Given that some of the underlying propositions are validated as per the figures above, the conclusion is that the proposition of the moderating effect of risk management on the relationship between OI processes and the propensity to innovate is validated. However, not all factors within risk management have a moderating effect on this relationship. The impact is both positive in some cases (NIH on External Collaboration per type and phase, formal IP on collaboration with adjacent partners, and informal IP on core partners' collaboration), and negative in others (risk types on inside-out OI, and informal IP on client-focused innovations and coupled OI processes). Risk Practices is an exception as it has a positive predictor effect on the propensity to innovate, contradictory to the moderating effect proposition. The more risk practices are put in place, the more the propensity to innovate increase. Future research could be interested in better understanding this relationship.

6.1.4.2.2.2 Linear Regression Results P4→ P2 – Practice's Performance (5.2)

In this second part, the outcome/criterion variable is practice's performance. Since it is a continuous variable, linear regression is the appropriate type of regressions. The Figure 6-15 below summarizes the moderating effect of the different factors constituting Risk Management on the relationships between open innovation practices and practice's performance. The detailed regression analysis results are presented in Appendix X.

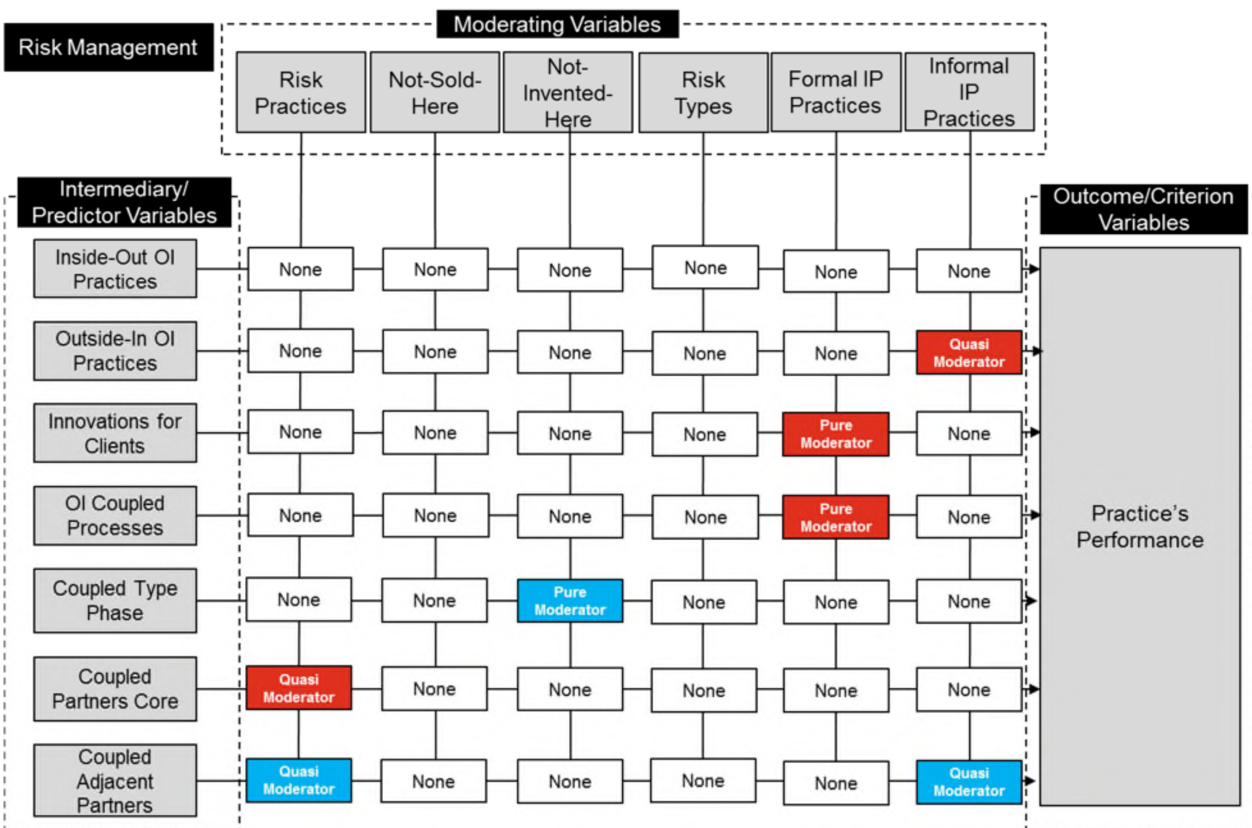

Figure 6-15: Summary of the Moderating Effects of Risk Management – Practice's Performance – Linear Regression

Propositions Validation

Given that some of the underlying propositions are validated as per the figure 6-15, the conclusion is that the proposition of the moderating effect of risk management on the relationship between OI processes and the practice's performance is validated. However, not all factors within risk management have a moderating effect on this relationship. The impact is both positive in some cases (risk practices on adjacent partners collaboration, NIH on External Collaboration per type and phase, and informal IP on adjacent partners' collaboration), and negative in others (risk types on core partners' collaboration, formal IP on client-focused innovations and coupled OI processes, informal IP on outside-in OI).

Conclusion P4→ P2 - Performance:

This sub-proposition is validated since some of the underlying factors have moderating impact on some of the individual relationships.

Not-Sold-Here feelings and the different types of risks are the only two variables that have no moderating effect on the relationships between any of the predicting variables of Open Innovation processes and the practice's performance as a criterion/dependent variable. The rest of the variables play a moderating effect on these relationship

Conclusion P4→ P2 - Propensity to innovate:

This sub-proposition is validated since some of the underlying factors have moderating impact on some of the individual relationships.

Not-Sold-Here feelings is the only variable that have no moderating effect on the relationships between any of the predicting variables of Open Innovation processes and the propensity to innovate as a criterion/dependent variable. The rest of the variables play a moderating effect on these relationships, except risk practices that are a predictor.

Hence, Not-Sold-Here is the only variable that have no moderating effect on none of the relationships between open innovation processes and performance or propensity to innovate

Overall Conclusion:

Since the sub-propositions are validated, then the overarching proposition P4 is also validated.

6.1.4.3 Key Propositions Findings

All four level 1 propositions have been validated through the results of the analysis, hence the conceptual model put forward is validated. Erosion factors impact positively the application of open innovation processes in Firm ABC. This in turn leads to a better innovation and financial performance for the practices. This last relationship is however moderated by both risk and organizational management. Hence, Open Innovation is applicable in Firm ABC, despite not having observed all of its processes. The model applies with some particularities for the Firm ABC (e.g. Outside-In is more prevalent, Core partners are important, not all coupled OI is applicable). Since these results are limited to only one firm, the next section aims to test the main propositions in other professional services firms in Canada. The purpose is to test for external validity of the conceptual model's main relationships.

In summary:

- All of the four main propositions (P1, P2, P3, and P4) have been validated.
- Out of the 22 second level propositions, 18 have been validated.
- Out of the 154 third level propositions, only 35 have been validated.

6.2 External Validity Results

The conceptual model has so far been tested and validated in Firm ABC only. In order to test for the external validity of this model, a survey was launched externally. Answers were received from 55 respondents within Canada. A partially similar approach then the one taken for the analysis in Firm ABC was followed on the external sample results. The main steps are the following:

1) Data reduction through identification and Validation of the Variables (PCA using *varimax* rotation) in order to make sure that the same factors are still valid with the new sample.
2) Comparison of the means of the two groups (Firm ABC and External Sample) through a Mann-Whitney Test to identify the differences between the two groups.
3) Comparison of the relationships between the main variables in the two groups through regression analyses to identify which ones are valid externally.

These analyses were also done using SPSS.

This section presents the analyses results done for external validity testing of the relationships, in order to validate if they are also applicable at a wider range within the industry. This section presents results for the survey with N= 55 professional services firms, as well as the multivariate analyses for the two main direct propositions (P1 and P2).

6.2.1 Factor Analysis

The factors analysis made with SPSS on the new sample of external firms resulted in a set of factors that is similar to the one identified for the Firm ABC. Only small changes in the ordering of the factors resulted from the analysis as shown below, but the factors are still the same. Which makes the overall conceptual model also valid for testing in the external sample.

The detailed results of the PCA analysis are in Appendix T. The results confirm that the same model variables/factors still hold beyond the Firm ABC, and can be used for external validity analysis purposes.

6.2.2 Comparison of the Two Samples

The purpose of this test was to compare the difference in the means of the two groups: internal firm vs. external firms. A Mann-Whitney (Student two-sample t-test) was conducted and the significance measured. The results showed that most variables have means that are significantly different between the two groups as shown in the table 6-30 below:

Table 6-30: Mann-Whitney (Student two-sample t-test) on New Sample

VARIABLE	FIRMABC N= 276 Mean	EXT. N=55 Mean	Sig.
EROSION = Erosion Factors	5.096	5.333	*
EROSION_COST_RESEARCH = Cost of Doing Research	4.645	5.034	**
COL_IN_OUT = Inside-Out OI Processes	3.603	4.632	****
COL_OUT_IN = Outside-In OI Process	3.972	5.158	****
COL_for_CLIENT = Client-focused Innovations	4.429	4.851	**
COL_COUPLE_PRACT = Coupled OI Processes	4.935	5.225	**
COL_COUPLE_TYPE_PHASE:			
Q11_1: COLLABORATION DURING INTERNAL INNOVATION PROJECTS	28.125	47.273	****
Q11_2: COLLABORATION DURING CLIENT ENGAGEMENT PROJECTS	33.862	47.727	****
Q12_1: IDEA GENERATION PHASE	4.702	5.291	**
Q12_2: DEVELOPMENT PHASE	4.629	5.436	****
Q12_3: DELIVERY PHASE	4.478	5.527	****
COL_COUPLE_PARTNER_CORE = Collaboration with core partners	5.112	5.207	
COL_COUPLE_PARTNER_ADJ = Collaboration with adjacent partners	3.957	4.305	
ORG_SUPPORT = Organizational support	3.816	5	****
ORG_PREF_IN_OUT = Individual's preference for inside-out OI	5.111	5.509	*
ORG_PREF_OUT_IN = Individual's preference for outside-in OI	5.413	5.754	**
RISK_PRACT = Risk Practices	4.913	5.421	***
RISK_PER_IN_OUT = Individual's Risk Perception in inbound OI	4.569	5.123	**
RISK_PER_OUT_IN = Individual's Risk Perception in outbound OI	3.573	4.561	****
RISK_TYPE = Types of Risks	5.198	5.427	
IP_FORMAL = Formal IP protection	4.846	5.055	
IP_INFORMAL = Informal IP protection	5.332	5.647	**
INNOV_PROCESS = Process Innovations	0.187	0.145	
INNOV_PRODUCT = Product/Service Innovations	0.371	0.364	
INNOV_ORG = Organizational Innovations	0.196	0.236	
INNOV_TECH = Technological Innovations	0.246	0.255	
INNOV_PERF_FIN = Financial Performance	5.076	5.716	****
Q18_5_ETPLUS = Number of generated innovations is equal or more than 5	0.224	0.2	

Conclusion:

The main conclusion when comparing the two groups is that Firm ABC seem to be lower on all the variables, and in many cases in a significant manner. Firm ABC, which applies several practices of Open Innovation, does it at a lesser extent than the rest of the external professional services companies. Firm ABC does more external collaborations in the early phases of the innovation process, contrary to the external sample that is more active downstream. The external sample seem to have stronger risk management processes, and higher individuals' preferences for external preferences. In terms of impacts, the external sample has a significantly better financial performance then the Firm ABC.

The type of line of service was found to have the highest effect on the results amongst the different control variables of the model. Consulting was found in the ANOVA results for Firm ABC to be in general the most open of the 5 business lines (see section 6.1.3.2). Therefore, the fact that the external sample is dominated by consulting types of services could explain the differences observed.

The next section takes the analysis further by identifying whether the relationships between the variables observed in Firm ABC are also applicable for the second sample of 55 external companies. Regression analyses are conducted on the two main relationships (P1 and P2).

6.2.3 External Validity Regression Analysis

The previous two sections have validated that the conceptual model's factors are still valid externally, and showed that the external sample is more prone to openness than the Firm ABC. In this section, the results for the external validity of the relationships observed in Firm ABC are presented. The tests conducted identified whether the relationships that were found in the Firm ABC subgroup were also present in the external subgroup of firms. For each relationship, the following function was tested:

- Equation for group 1: $Y_1 = \beta_0 + X_1 * \beta_1 + \varepsilon_1$ (where Y is the outcome variable, β_0 is the Y-intercept, X_1 is the first predictor variable, β_1 the first predictor variable coefficient, and ε_1 the residual error)
- Equation for group 2: $Y_2 = \beta_0 + X_2 * \beta_2 + \varepsilon_2$ (where Y is the outcome variable, β_0 is the Y-intercept, X_2 is the second predictor variable, β_2 the second predictor variable coefficient, and ε_2 the residual error)
- Equation for pooling all groups and variables: $Y = \beta_0 + d_1*(X_1 * \beta_1 + \varepsilon_1) + d_2*(X_2 * \beta_2 + \varepsilon_2) + \dots$ (where d is a variable that is equal to 1 to when the data is for FIRM ABC, and 0 otherwise).

Only individuals that have answered to the same total set of questions of the research instrument were kept as part of the analysis, resulting in: $N_{External}$ = 55 and $N_{Firm\ ABC}$ = 276, for a total sample size of N= 331. In the next sections, the relationships are tested and compared for two cases: while controlling for Firm ABC or not. The objective is therefore to test whether controlling with Firm ABC makes any significant difference on the relationship between the independent variables and the dependent variables, only for the two direct propositions P1 and P2. The other two propositions were omitted for simplicity and we suggest to explore them in future research. In the cases where significant differences in the relationships caused by controlling for Firm ABC are observed, the graphs comparing the results are shown. In the cases where the difference is not significant, the graphs are not presented.

6.2.3.1 **Proposition P1: Erosion Factors and OI Processes**

In the first proposition P1, the direct relationship between Erosion Factors and Open Innovation Processes was tested, one factor at a time. The results for each factor are presented below.

6.2.3.1.1 *Dependent Variable: COL_IN_OUT_F1 (Inside-Out Open Innovation Processes)*

The regression results made with SPSS are presented in Table 6-31 below in terms of coefficient, standard deviation, VIF, the minimum and maximum values for the variables:

Table 6-31: Results COL_IN_OUT_F1

Equation	Variables	Coefficients		Sig.	VIF	When d=1		
		β	Std. Err.			X_{Min}	X_{Med}	X_{Max}
β_0	(Constant)	1.089	0.256	0				
d	FIRM ABC	-0.67	0.149	0	1.283	1	1	1
X_1	Zscore: EROSION_F1	0.661	0.124	*0*	6.026	-3.429	0.032	1.97
X_2	Zscore: EROSION_COST_RESEARCH	-0.061	0.129	0.635	6.884	-2.415	0.016	1.501
$d*X_1$	Z_EROSION_F1_FIRM ABC	-0.414	0.137	*0.003*	5.712			
$d*X_2$	Z_EROSION_COST_RESEARC H_FIRM ABC	0.024	0.14	0.864	6.511			

The cross-product (interaction) Z_EROSION_F1_FIRM ABC is significant while Z_EROSION_COST_RESEARCH_FIRM ABC is not, hence the latter is externally valid. Exploring further the main erosion factors' significance difference (p-value = 0.003), the relationships between the independent variable EROSION_F1 and the dependent variable

COL_IN_OUT_F1 are compared for the two cases: when it is controlled by the Firm ABC (d= 1) vs. when it is not (d=0). The figure 6-16 below shows the difference in the relationships for these two cases.

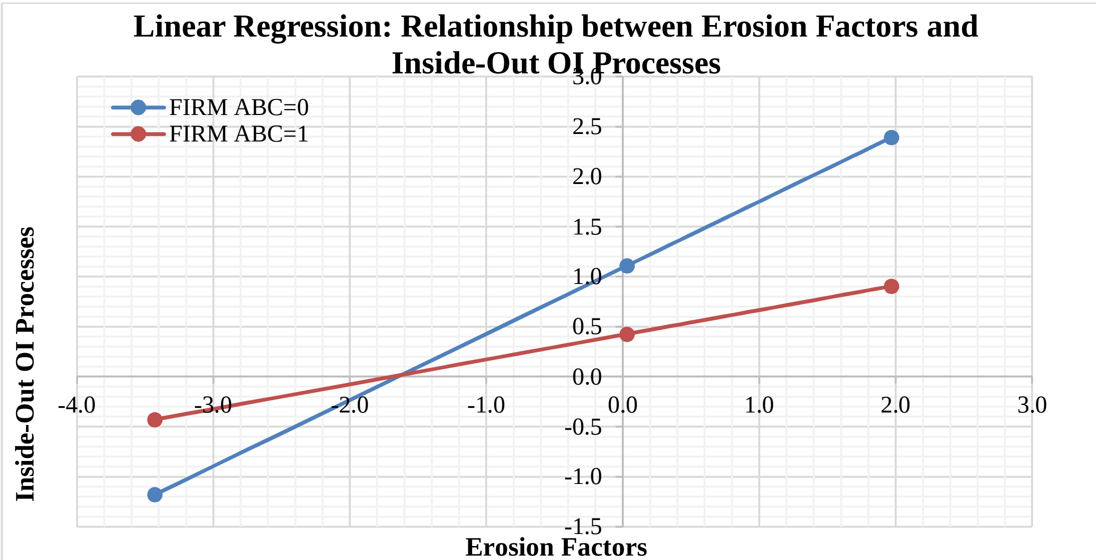

Figure 6-16: Results on the erosion factors' relationship with Inside-Out OI Processes

Interpretation:

Both groups have a positive relationship between erosion factors and inside-out OI processes, even though it is more intense in the external sample compared to Firm ABC (higher coefficient). The more erosion factors are intense, the more likely that both groups will do inside-out OI practices. Up to a certain level, Firm ABC uses inside-out OI practices more but then the other group becomes more intense (After intersection point on the graph). Hence, this relationship, despite a significant difference in the intensity, is still valid externally to Firm ABC.

Based on these results, the conclusion is that the relationships observed in the initial Firm ABC group can be externalized to the rest of the industry group for the erosion factor. Therefore, there is external validity to the conclusion made for this relationship.

6.2.3.1.2 *Dependent Variable: COL_OUT_IN_F2 (Outside-In Open Innovation Processes)*

The regression results made with SPSS are outlined in table 6-32 below:

Table 6-32: Regression Results COL_OUT_IN_F2

Equation	Variables	Coefficients		Sig.	VIF	When d=1		
		β	Std. Err.			X_{Min}	X_{Med}	X_{Max}
β_0	(Constant)	1.003	0.267	0.000				
d	FIRM ABC	-0.637	0.155	0.000	0.780	1.000	1.000	1.000
X_1	Zscore: EROSION_F1	-0.025	0.129	0.845	0.166	-3.429	0.016	1.970
X_2	Zscore: EROSION_COST_RESEARCH	0.162	0.134	0.228	0.145	-2.415	0.016	1.501
$d*X_1$	Z_EROSION_F1_FIRM ABC	0.117	0.143	0.416	0.175			
$d*X_2$	Z_EROSION_COST_RESEARCH _FIRM ABC	0.001	0.146	0.994	0.154			

Given that none of the cross-products (interactions) coefficients are significant (p-value= 0.228 and 0.416), both direct relationships between erosion factors and cost of doing research on hand and outside-in open innovation processes are valid externally.

6.2.3.1.3 *Dependent Variable: COL_FOR_CLIENT_F3 (Client-Focused Innovations)*

The regression results made with SPSS are outlined in Table 6-33:

Table 6-33: Regression Results COL_OUT_IN_F2

Equation	Variables	Coefficients		Sig.	VIF	When d=1		
		β	Std. Err.			X_{Min}	X_{Med}	X_{Max}
β_0	(Constant)	0.134	0.262	0.609	0.000			
d	FIRM ABC	0.306	0.152	0.045	0.780	1.000	1.000	1.000
X_1	Zscore: EROSION_F1	0.177	0.127	0.162	0.166	-3.429	0.032	1.970
X_2	Zscore: EROSION_COST_RESEARCH	0.340	0.131	***0.010***	0.145	-2.415	0.016	1.501
$d*X_1$	Z_EROSION_F1_FIRM ABC	-0.013	0.140	0.925	0.175	-3.429	0.032	1.970
$d*X_2$	Z_EROSION_COST_RESEARC H_FIRM ABC	-0.416	0.143	***0.004***	0.154	-2.415	0.016	1.501

The cross-product erosion factors and Firm ABC coefficient has no significant difference between the two cases (p-value = 0.925), hence the direct relationship validated in Firm ABC is also valid for the external sample.

The cross-product Cost of doing research and Firm ABC has a significant difference between the two cases (p-value = 0.004). Its values result in the graph 6-17 below for the independent variable (EROSION_COST_RESEARCH) relationship with the dependent variable (COL_for_CLIENT_F3).

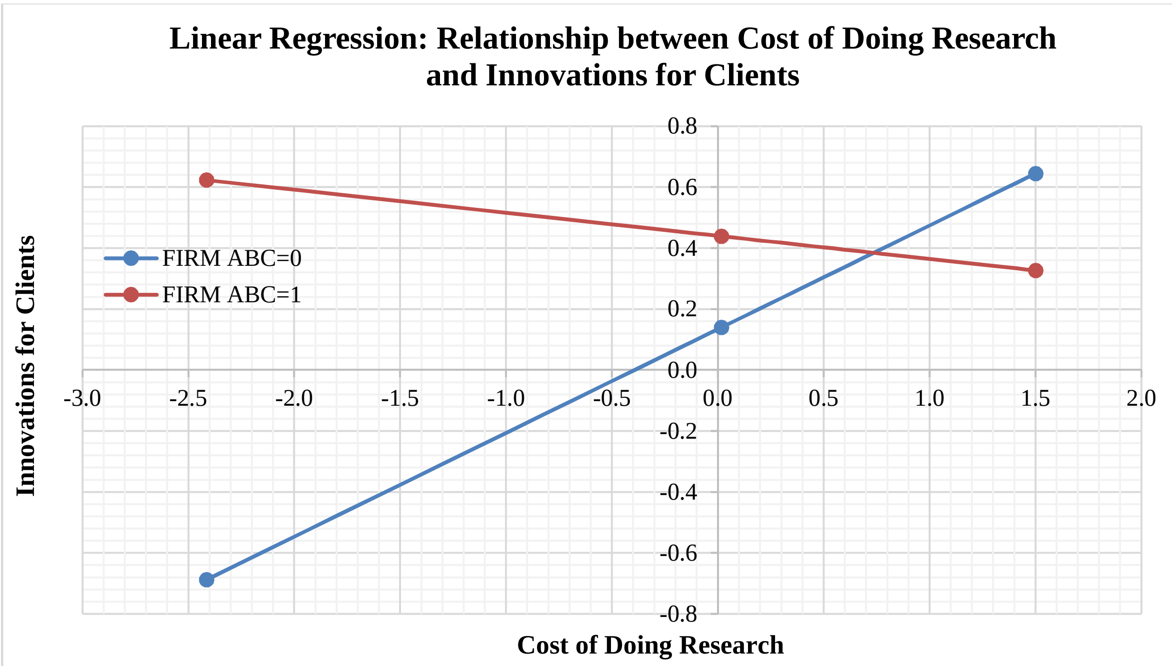

Figure 6-17: Test Results on Cost of Doing research relationship with Innovations for Clients

Interpretation:

The two samples behave differently when the cost of doing research increases: firm ABC decreases the level of innovations for clients, while the external group increases. For the cost of doing research, the relationship validated internally is not valid externally as demonstrated in the corresponding figure 6-17. With an increase of the cost of doing research, Firm ABC decreases the level of innovations made for clients, while the external group does the opposite.

6.2.3.1.4 *Dependent Variable: COL_COUPLE_PRACT_F1 (Coupled OI Practices)*

The regression results made with SPSS are presented in Table 6-34 below:

Table 6-34: Regression Results COL_COUPLE_PRACT_F1

Equation	Variables	Coefficients		Sig.	VIF	When d=1		
		β	Std. Err.			X_{Min}	X_{Med}	X_{Max}
β_0	(Constant)	0.099	0.268	0.711	0			
d	FIRM ABC	0.288	0.156	0.065	0.78	1	1	1
X_1	Zscore: EROSION_F1	0.602	0.129	*0*	0.166	-3.429	0.032	1.97
X_2	Zscore: EROSION_COST_RESEARCH	0.021	0.134	0.878	0.145	-2.415	0.032	1.501
$d{*}X_1$	Z_EROSION_F1_FIRM ABC	-0.286	0.143	*0.047*	0.175	-3.429	0.032	1.97
$d{*}X_2$	Z_EROSION_COST_RESEARCH _FIRM ABC	-0.056	0.146	0.703	0.154	-2.415	0.032	1.501

Cost of doing research effect on coupled practice can be externalized since the difference between the samples is not significant when looking at the cross product of cost of doing research with Firm ABC as a control variable (p-value = 0.703). Since the cross-product of Erosion factors and Firm ABC is significant (p-value= 0.047), the following graph 6-18 is plotted to show the difference in the relationship between the 2 variables on in 2 groups:

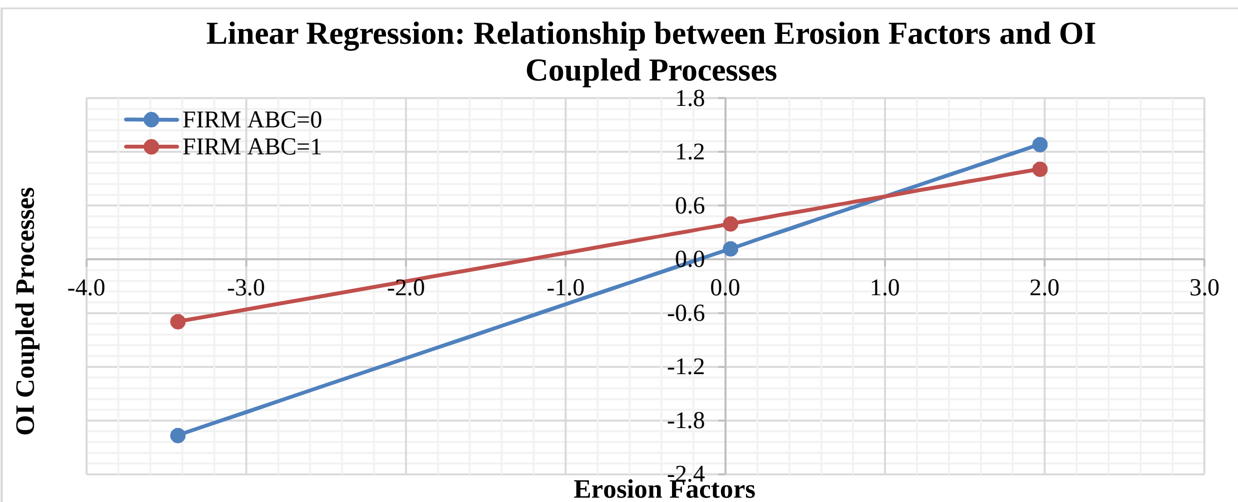

Figure 6-18: Results on the relationship between erosion factors and OI coupled processes

Interpretation:

Both groups have a positive relationship between erosion factors and coupled OI processes. The more erosion factors are intense, the more likely that both groups will do coupled OI practices.

Up to a certain level, Firm ABC uses inside-out OI practices more but then the other group becomes more intense (After intersection point on the graph).

Based on these results, the conclusion is that the positive and significant relationship between erosion factors and the OI coupled processes in the Firm ABC is also valid in the external industry sample, even though at different intensity levels.

6.2.3.1.5 *Dependent Variable: COL_COUPLE_TYPE_PHASE_F2 (External Collaboration per Type and Phase)*

The regression results made with SPSS are presented in Table 6-35 below:

Table 6-35: Regression Results COL_COUPLE_TYPE_PHASE_F2

Equation	Variables	Coefficients		Sig.	VIF	When d=1		
		β	Std. Err.			X_{Min}	X_{Med}	X_{Max}
β_0	**(Constant)**	0.644	0.269	0.017				
d	**FIRM ABC**	-0.642	0.156	0	1.283	1	1	1
X_1	**Zscore: EROSION_F1**	0.142	0.13	0.275	6.026	-3.429	0.032	1.97
X_2	**Zscore: EROSION_COST_RESEARCH**	0.129	0.135	0.341	6.884	-2.415	0.016	1.501
$d*X_1$	**Z_EROSION_F1_FIRM ABC**	-0.001	0.144	0.993	5.712			
$d*X_2$	**Z_EROSION_COST_RESEARCH _FIRM ABC**	-0.059	0.147	0.686	6.511			

None of the cross-products are significant (p-value= 0.993 and 0.686). Therefore, the positive relationship between the erosion factors and the cost of doing research on one hand and the collaboration with external entities for internal and client projects and at different phases of the innovation process are valid in both the Firm ABC and the external sample.

6.2.3.1.6 *Dependent Variable: COL_COUPLE_PARTNER_CORE_F1 (Collaboration with Core Partners)*

The regression results made with SPSS are presented in Table 6-36 below:

Table 6-36: Regression Results COL_COUPLE_PARTNER_CORE_F1

Equation	Variables	Coefficients β	Coefficients Std. Err.	Sig.	VIF	When d=1 X_{Min}	When d=1 X_{Mean}	When d=1 X_{Max}
β_0	(Constant)	-0.062	0.274	0.821	0			
d	FIRM ABC	0.193	0.159	0.227	0.78	1	1	1
X_1	Zscore: EROSION_F1	0.498	0.132	***0***	0.166	-3.429	0.032	1.97
X_2	Zscore: EROSION_COST_RESEARCH	-0.173	0.138	0.209	0.145	-2.415	0.016	1.501
d*X_1	Z_EROSION_F1_FIRM ABC	-0.274	0.147	***0.062***	0.175			
d*X_2	Z_EROSION_COST_RESEARCH _FIRM ABC	0.115	0.15	0.444	0.154			

The cross-product of cost of doing research and the Firm ABC is significant, hence the relationship between cost of doing research and collaboration between core partners validated in Firm ABC is also valid in the external sample. However, the cross-product of erosion factors and the Firm ABC is significant. The relationship is analyzed further to understand the nature of this difference. Its values result in the following graph 6-19 depicting the relationship between the erosion factors and the collaboration with partners that are close to the core (or more traditional) in the 2 cases (controlling with Firm ABC or not):

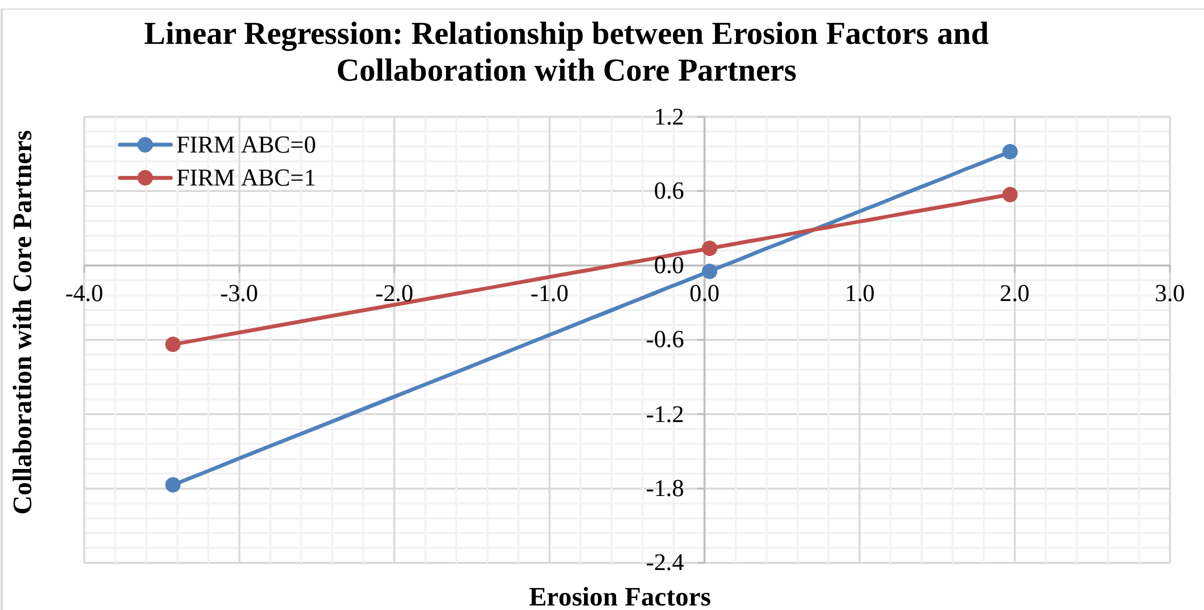

Figure 6-19: Test Results on the relationship between erosion factors and the collaboration with core partners

Interpretation:

Both groups have a positive relationship between the erosion factors and the collaboration with core partners. However, up to a certain level of erosion, Firm ABC collaborates more with core partners (before the intersection point). After that level, its openness to collaborate with core partners becomes less important than the external sample. Based on these results, the conclusion is that the direct and positive relationship observed in the initial Firm ABC are still valid in the external industry group.

6.2.3.1.7 *Dependent Variable: COL_COUPLE_PARTNER_ADJ_F2 (Collaboration with adjacent partners)*

The regression results made with SPSS are presented in Table 6-37 below:

Table 6-37: Regression Results COL_COUPLE_PARTNER_ADJ_F2

Equation	Variables	Coefficients		Sig.	VIF	When d=1		
		β	Std. Err.			X_{Min}	X_{Mean}	X_{Max}
β_0	**(Constant)**	0.457	0.269	0.09				
d	**FIRM ABC**	-0.23	0.156	0.141	0.78	1	1	1
X_1	**Zscore: EROSION_F1**	0.396	0.13	***0.002***	0.166	-3.429	0.032	1.97
X_2	**Zscore: EROSION_COST_RESEARCH**	0.193	0.135	0.153	0.145	-2.415	0.016	1.501
$d*X_1$	**Z_EROSION_F1_FIRM ABC**	-0.126	0.144	0.383	0.175	-3.429	0.032	1.97
$d*X_2$	**Z_EROSION_COST_RESEARCH_FIRM ABC**	-0.098	0.147	0.505	0.154	-2.415	0.016	1.501

None of the cross-products show any significant differences, and hence the positive relationships erosion factors and cost of doing research on one hand and the collaboration with adjacent partners on the other are both valid in the two samples.

6.2.3.1.8 *Summary of the External Validity Results for P1*

All relationships observed in Firm ABC are also valid in the external sample, except the effect of the cost of doing research on the collaboration for clients. Hence, proposition P1 is validated both in Firm ABC and externally. Both erosion factors and cost of doing research are validated. The following table 6-38 summarizes the findings from the external validity regression tests conducted between the independent variables and the dependent ones for the proposition P1:

Table 6-38: Summary Table for External Validity of the Propositions on the Direct Relationship between Erosion Factors and Open Innovation Processes (P1)

VARIABLE	EROSION_F1	EROSION_COST_RESEARCH
COL_IN_OUT_F1	Significant	Not Significant
	External Validity	External Validity
COL_OUT_IN_F2	Not Significant	Not Significant
	External Validity	External Validity
COL_for_CLIENT_F3	Not Significant	Significant
	External Validity	No External Validity
COL_COUPLE_PRACT_F1	Significant	Not Significant
	External Validity	External Validity
COL_COUPLE_TYPE_PHASE_F2	Not Significant	Not Significant
	External Validity	External Validity
COL_COUPLE_PARTNER_CORE_F1	Significant	Not Significant
	External Validity	External Validity
COL_COUPLE_PARTNER_ADJ_F2	Not Significant	Not Significant
	External Validity	External Validity

6.2.3.2 **Proposition P2: OI Processes and Performance**

In this section, the same approach was conducted on the second proposition P2 for the effect of *Open Innovation Processes* and *Performance.* The seven variables that constitute the *Open Innovation Processes* were tested in relation to the two main Performance variables: *Propensity to innovate* and Overall *Practice Performance*. A logistic regression was made on the propensity to innovate, and a linear regression on the overall practice performance.

6.2.3.2.1 *Dependent Variable: Propensity to innovate (Q18_5+) – Logistic Regression*

The unstandardized coefficients and significance results used for the logistic regression are presented below, highlighted are the significant cross-products.

Table 6-39: Logistic Regression Coefficients and Significance – Propensity to innovate

Variable	Unstandardized Coefficients β	Unstandardized Coefficients Std. Error	Sig.
(Constant)	-3.776	1.423	***
Q1_TAX	-0.222	0.384	
Q1_CONS	-0.699	0.443	
Q1_DEALS	-1.378	0.722	*
Q1_IFS	0.563	0.507	
Q2_PRAIRIES	-0.564	0.453	
Q2_BC	-0.251	0.500	
Q2_QUEBEC	-0.238	0.438	
Q2_MARITIMES	-19.330	12479.239	
Q3_CONT	0.301	0.127	**
Q4_MGR	-0.037	0.315	
FIRM ABC	1.531	1.221	
Zscore: COL_IN_OUT_F1	-2.188	1.062	**
Zscore: COL_OUT_IN_F2	-0.059	0.714	
Zscore: COL_for_CLIENT_F3	-0.740	0.588	
Zscore: COL_COUPLE_PRACT_F1	-4.148	1.910	**
Zscore: COL_COUPLE_TYPE_PHASE_F2	-1.169	0.955	
Zscore: COL_COUPLE_PARTNER_CORE_F1	6.259	2.355	***
Zscore: COL_COUPLE_PARTNER_ADJ_F2	4.837	2.097	**
Cross Products (Interactions)			
Z_COL_IN_OUT_F1_FIRM ABC	2.741	1.080	**
Z_COL_OUT_IN_F2_FIRM ABC	0.692	0.740	
Z_COL_for_CLIENT_F3_FIRM ABC	0.610	0.608	
Z_COL_COUPLE_PRACT_F1_FIRM ABC	4.053	1.923	**
Z_COL_COUPLE_TYPE_PHASE_F2_FIRM ABC	0.854	0.973	
Z_COL_COUPLE_PARTNER_CORE_F1_FIRM ABC	-5.946	2.367	**
Z_COL_COUPLE_PARTNER_ADJ_F2_FIRM ABC	-5.168	2.106	**

Outside-In open innovation processes, innovations for clients, and collaboration with external entities for internal and client projects as well as at different phases of the innovation process have no significant differences when controlled by Firm ABC (respective cross-products). Hence, the effects of these variables on the capability of generating new innovations found in Firm ABC are also valid in the external sample.

Inside-Out (**) and Coupled Open Innovation Processes (**), as well as collaborations with core (**) and with adjacent partners (**) have a significant difference when controlled by Firm ABC (cross-products). To better understand the significant difference observed for these four cross-products, the relationships between each independent variable and the number of generated innovations were plotted below. To do so, the following formulas were applied for the logistic regressions on these four cross-products:

$$Y = p / (1-p) = e^{\beta 0+ \beta 1*X1 + \beta 2*X2}$$

$$A= \ln (Y) = \ln (p/ (1-p)) = \beta_0+ \beta_1*X_1 + \beta_2*X_2$$

Hence, p= Exp (A) / (1+ Exp (A))

Using SPSS, the results were generated and used to test the relationships between the different variables as shown in the four graphs below.

- **Interpretation:**

The collaboration with core partners' positive effect on the number of generated innovations is the only relationship that is valid for both samples since the relationship is positive in both cases (see figure 6-22 below).

Inside-Out, Coupled OI processes, and collaboration with adjacent partners' effect on the number of generated innovations is not valid in the external sample as shown on the figures 6-20, 6-21 and 6-23 respectively: their slopes are in opposite directions.

Given that four relationships out of seven were validated externally, the 2nd level proposition of the positive effect of the open innovation processes on the number of generated innovations is also validated externally.

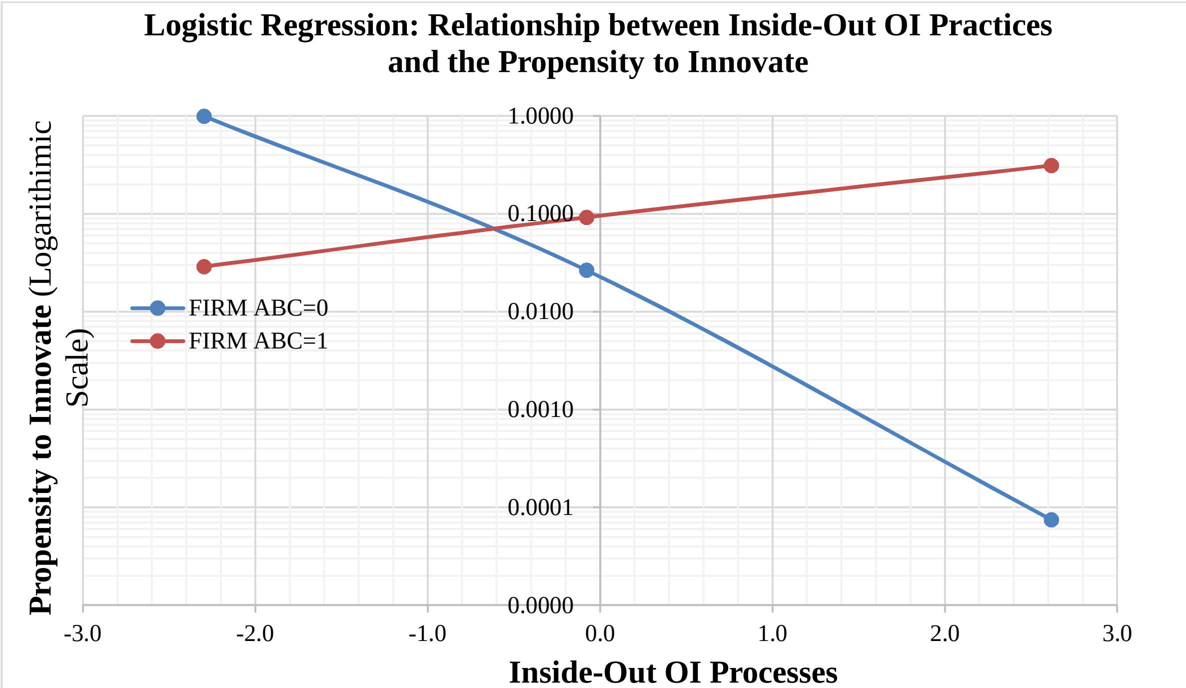

Figure 6-20: Results of External Validity Test of the effect of Inside-Out OI Processes on the Propensity to innovate

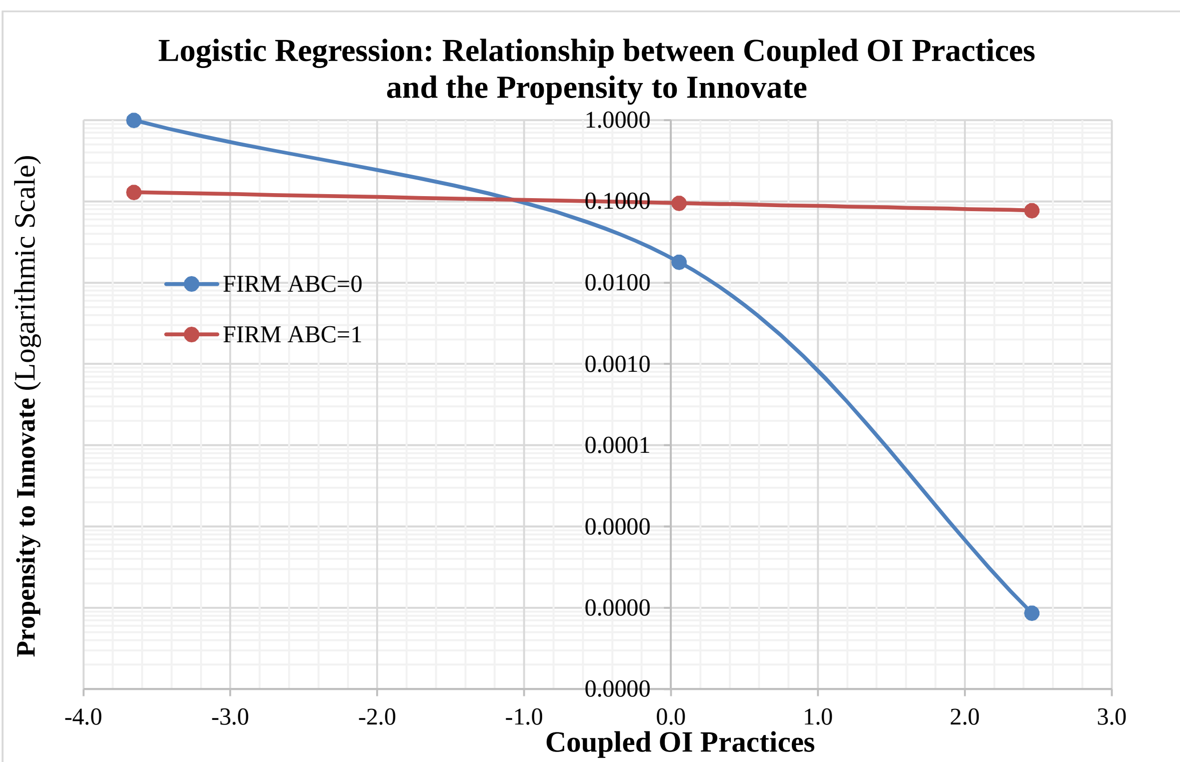

Figure 6-21: Coupled OI Processes Effect on Propensity to innovate

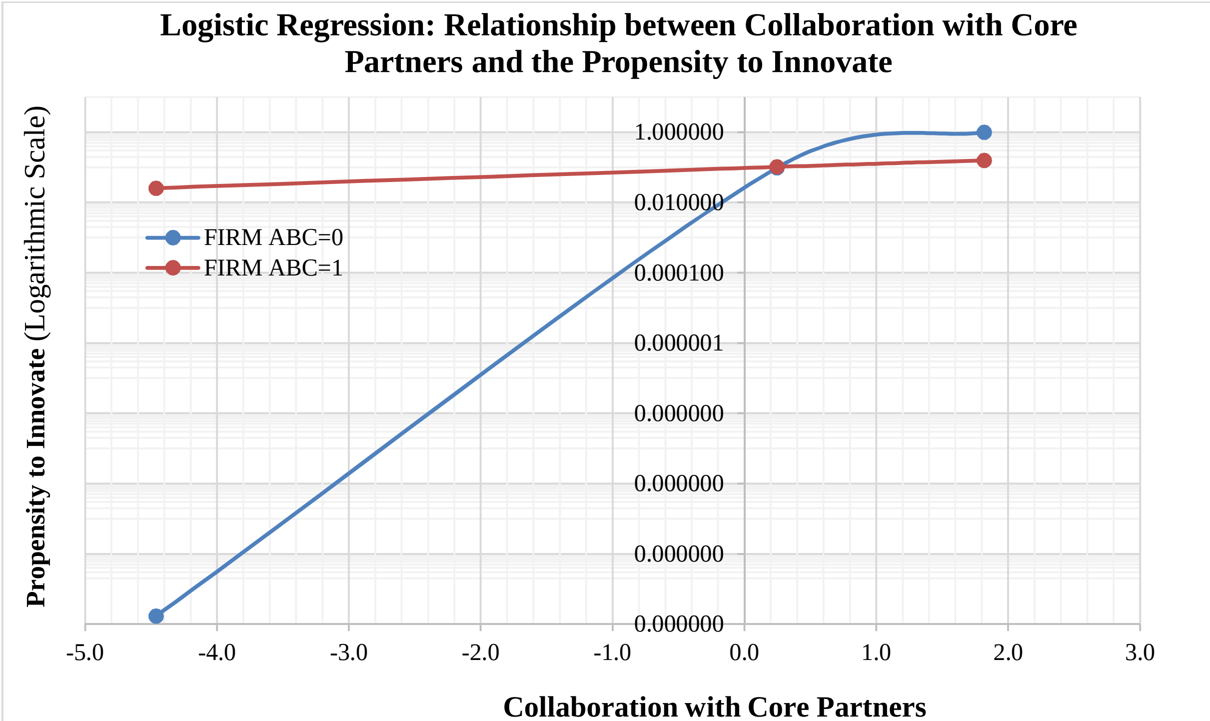

Figure 6-22: Collaboration with Core Partners' Effect on Propensity to innovate

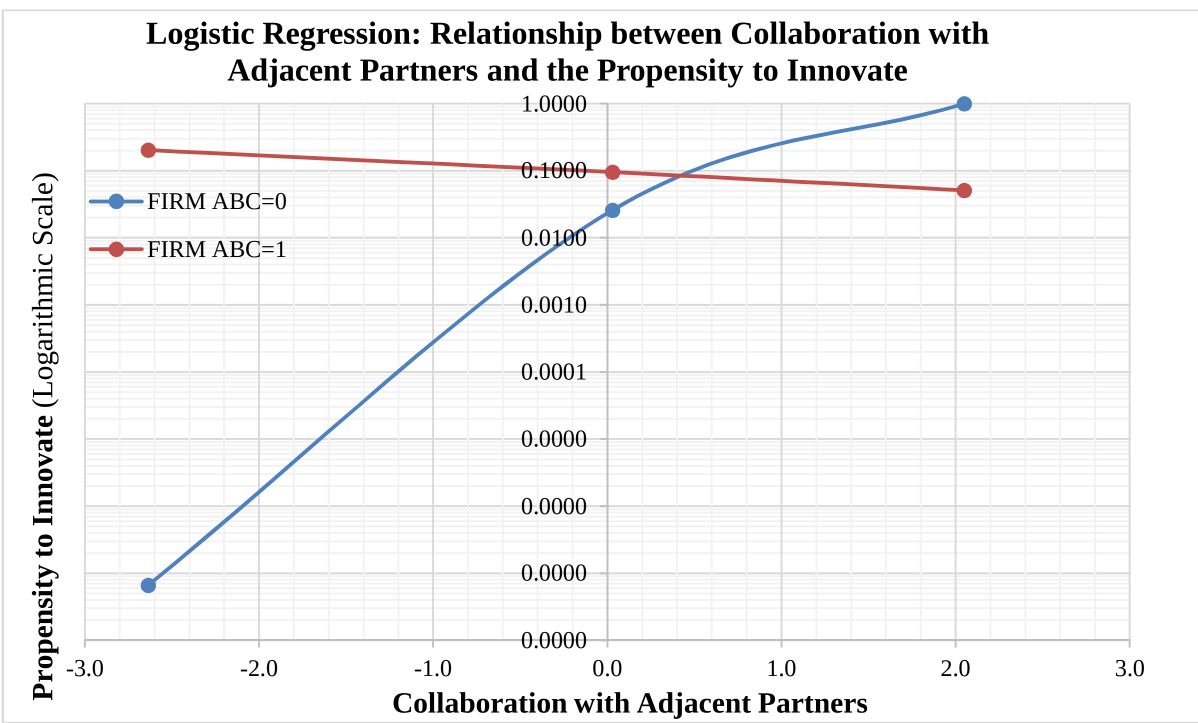

Figure 6-23: Collaboration with Adjacent Partner's Effect on Propensity to innovate

6.2.3.2.2 *Dependent Variable: Practice Performance – Linear Regression*

In this section, a similar approach is also taken. The coefficients and significance results used for the linear regression are presented in Table 6-40 below, with the significant cross-products highlighted.

Table 6-40: Linear Regression Coefficients and Significance Results - Performance

VARIABLES	Unstandardized Coefficients β	Unstandardized Coefficients Std. Error	Sig.
(Constant)	-0.010	0.265	
Q1_TAX	-0.041	0.132	
Q1_CONS	0.201	0.133	
Q1_DEALS	0.299	0.192	
Q1_IFS	0.246	0.180	
Q2_PRAIRIES	0.150	0.140	
Q2_BC	-0.219	0.153	
Q2_QUEBEC	0.282	0.136	**
Q2_MARITIMES	0.015	0.323	
Q3_CONT	-0.003	0.035	
Q4_MGR	0.078	0.098	
FIRM ABC	-0.160	0.178	
Zscore: COL_IN_OUT_F1	0.203	0.155	
Zscore: COL_OUT_IN_F2	0.175	0.141	
Zscore: COL_for_CLIENT_F3	0.242	0.099	**
Zscore: COL_COUPLE_PRACT_F1	-0.252	0.161	
Zscore: COL_COUPLE_TYPE_PHASE_F2	-0.015	0.162	
Zscore: COL_COUPLE_PARTNER_CORE_F1	0.420	0.198	**
Zscore: COL_COUPLE_PARTNER_ADJ_F2	0.173	0.131	
Cross Products (interactions)			
Z_COL_IN_OUT_F1 x FIRM ABC	0.075	0.165	
Z_COL_OUT_IN_F2 x FIRM ABC	0.054	0.152	
Z_COL_for_CLIENT_F3 x FIRM ABC	-0.032	0.113	
Z_COL_COUPLE_PRACT_F1 x FIRM ABC	0.432	0.173	**
Z_COL_COUPLE_TYPE_PHASE_F2 x FIRM ABC	-0.017	0.173	
Z_COL_COUPLE_PARTNER_CORE_F1 x FIRM ABC	-0.273	0.208	
Z_COL_COUPLE_PARTNER_ADJ_F2 x FIRM ABC	-0.139	0.144	

Inside-out and outside-in open innovation processes, as well as innovations for clients' positive effect on the financial performance of the practice have no significant differences between Firm ABC and the external sample. Given that these three relationships were validated in Firm ABC, they are also valid in the external sample. The positive effect of external collaborations during internal and client projects, at all phases of the innovation process, and with core and adjacent partners' on the financial performance were not validated in the Firm ABC. Given that there is no difference between the two samples as shown in the table above, then these relationships are also not valid in the external sample. Coupled OI processes' positive effect on the financial performance of the practice has a significant difference in the two samples. The graph 6-24 below depicts this difference:

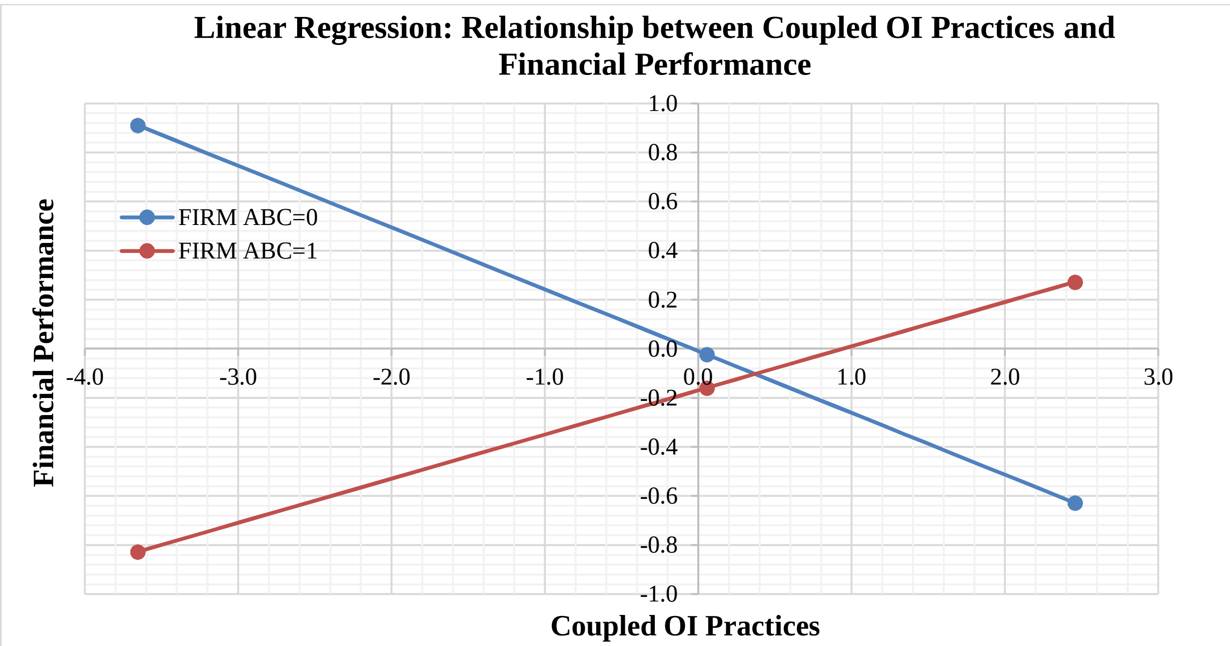

Figure 6-24: Relationship between Coupled OI Practices and Financial Performance

Interpretation

As shown in the figure 6-24 above, the effect of the coupled OI practices on the financial performance is different between the two samples. It is positive for the Firm ABC but negative for the external sample. Hence, this relationship, though valid in Firm ABC, is not validated in the external sample. Given that three relationships out of seven were validated externally, the 2nd level proposition of the positive effect of the open innovation processes on the financial performance of the practice is also validated externally.

6.2.3.2.3 *Summary of the External Validity Results for P2*

Given that the two 2nd level propositions are valid externally (positive effect of OI processes on the number of generated innovations and on the financial performance), ***the proposition P2 is***

therefore validated for the external sample as well. However, not all underlying relationships in open innovation are valid. The following table 6-41 summarizes the findings from the external validity regression test conducted between the independent variables and the dependent ones:

Table 6-41: Summary Table External Validity Performance and Open Innovation Processes

VARIABLE	INNOVATION NUMBER	OVERALL PERFORMANCE
COL_IN_OUT_F1	Significant	Not significant
	External validity	External validity
COL_OUT_IN_F2	Not significant	Not significant
	External validity	External validity
COL_for_CLIENT_F3	Not significant	Not significant
	No External validity	External validity
COL_COUPLE_PRACT_F1	Significant	Significant
	No External validity	No External validity
COL_COUPLE_TYPE_PHASE_F2	Not significant	Not significant
	No External validity	No External validity
COL_COUPLE_PARTNER_CORE_F1	Significant	Not significant
	External validity	No External validity
COL_COUPLE_PARTNER_ADJ_F2	Significant	Not significant
	No External validity	No External validity

6.2.4 Conclusion

The two direct propositions P1 and P2 are therefore valid both in the Firm ABC and in the external sample. The main relations in the conceptual model that was developed for open innovation in professional services firms are valid in Firm ABC and in the external sample. An increase in the intensity of the erosion factors lead to an increase in the adoption of open innovation processes. This increase leads in turn to an improvement in the overall performance of the practices. Figure 6-25 recaps the conceptual model and the validation of the main propositions, both in Firm ABC and in the external sample.

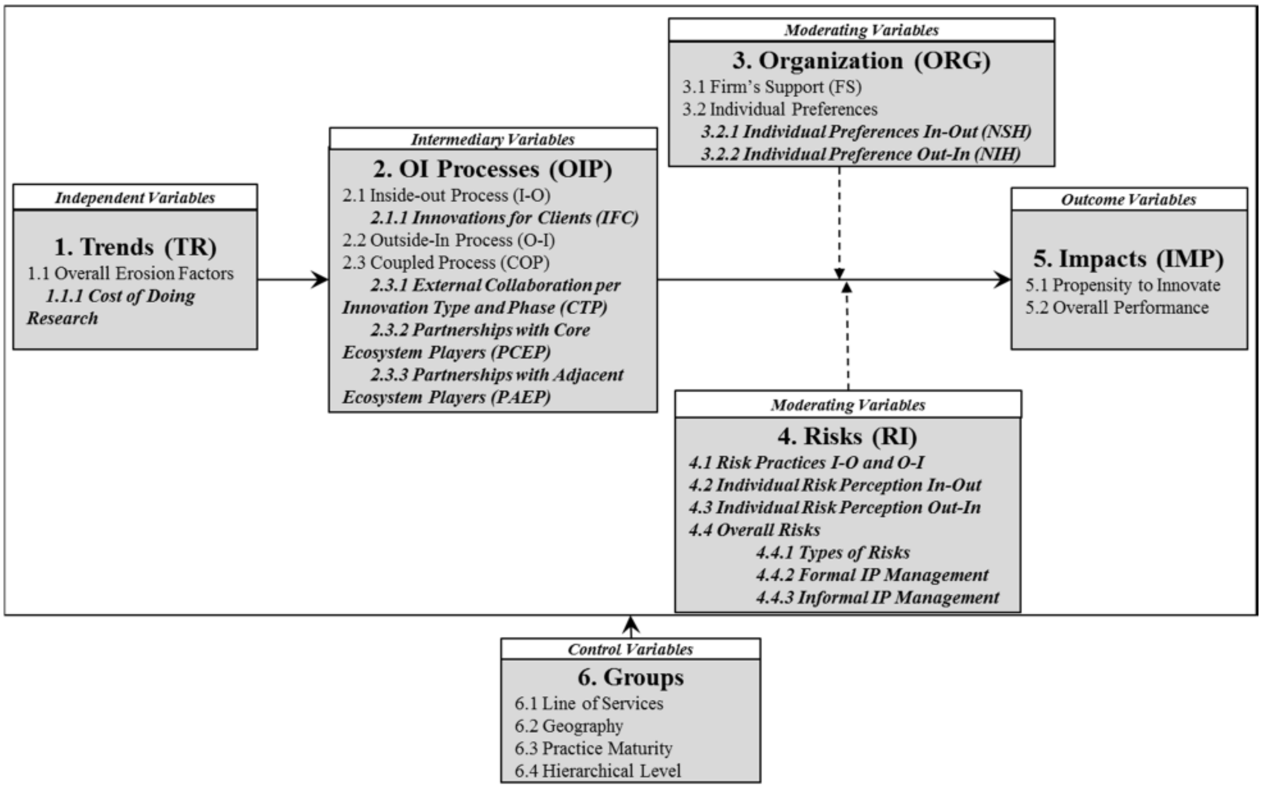

Figure 6-25: Validated Conceptual Model in Firm ABC and External Sample

CHAPTER 7 DISCUSSION & CONCLUSION

This chapter reviews the results presented in the previous one and draws the main conclusions from the research. Theoretical and practical implications are presented, along with the research limitations and suggested future research.

7.1 Research Questions Summary

In summary, the research aims to answer the following overarching question:

How is Open innovation applicable in the professional services firms? What is its impact on performance?

To answer this large question, several sub-questions are addressed:

1. Are erosion factors observed in the professional services sector?
2. Do these erosion factors impact the open innovation processes?
3. Do the different open innovation processes impact the overall performance of practices?
   i) In terms of propensity to innovates?
   ii) In terms of financial performance?
4. Does organizational culture affect the relationship between OI processes & performance?
5. Does risk management affect the relationship between open innovation processes and performance?
6. Do contextual factors have an impact on the overall open innovation dynamic?
   i) Line of Service?
   ii) Geography?
   iii) Years of Existence of Practice?
   iv) Hierarchical Level?

A framework was developed based on literature and on exploratory research, then tested in a large professional services firm. This resulted in the adjustment of the framework with factors that are supported by the PCA tests conducted. An external validity exercise was then done to test if the results can be externalised to other professional services firms or are only unique to Firm ABC.

7.2 Overall Descriptive Results

In general, literature, interviews and surveys are aligned around the finding that most aspects of the open innovation blocks are applicable in both Firm ABC and the external sample. The latter rated higher in a significant way on most of the variables compared to the Firm ABC. This confirms the proposition that open innovation seem to be applied in professional services firms, with some particularities. For instance, outside-in is more important than inside-out, client-focused innovations play an important role in the overall open innovation dynamics. These findings are in line with literature (Kohler et al., 2008; Love et al, 2011).

Interviewees confirmed and attempted to explain the results and the nature of the differences between service lines. Transaction practices are more secretive by the nature of their task. Auditing practices are increasingly commoditisation, so work to open up and innovate in a traditionally structured and regulated world. This is also what Knechel (2007) found in his research on audit firms. The advisory practices are based on a strong sharing of knowledge since these are the types of services that clients have been able to internalize the most. In addition, customers increasingly want to be part of the solution development process. So erosion factors are intense and encourage professionals to open up, especially in consulting practices.
In fact, consulting is one of the practices in Firm ABC that are more prone to openness than the others. Given this, the sample composition is possibly one reason for that difference with 79% of the sample being in consulting for the external sample, compared to a more diverse sample for Firm ABC. From a descriptive statistics point of view, Firm ABC seems to be less open then the rest of the external sample as it several significantly lower means for the variables. When looking at each block of the framework separately, several interesting observations can be made.

First, ***erosion factors*** are very present in the sector according to the interviews and both surveys. The firm is becoming increasingly a broker or integrator of knowledge, playing the role of intermediary. On most erosion factors, empirical findings align with the literature (Chesbrough, 2003a), except for the alliances with universities. Despite the fact that some authors found educational institutions an important player in the OI dynamics of services firms (Janeiro et al, 2013; Laine et al., 2015), surveys and interviews with PSFs did not support this point. This could be explained by the fact that PSFs end product is intangible and hence harder to partner with universities for research. The other reason that some interviewees mention is the difference in pace: PSFs have very short and strict deadlines to deliver their projects to clients. This is a different pace than what the educational system is acquainted with.

Second, ***Open Innovation processes,*** in particular the coupled ones, are supported in both samples, with the external ones having a significantly stronger support to the openness of practices than Firm ABC. Increased collaboration with partners is important, especially in client engagements. A key difference between the two samples is that Firm ABC has stronger tendency for openness in early stages of the innovation process, while the external sample is more open in later delivery stages. Firm ABC is aligned with what Love et al. (2011) found in his study on the UK KIBS. Inbound and Outbound processes seem to be less prevalent in the two samples than coupled open innovation. Inbound is however stronger than outbound, which is in line with the literature (Helge Aas & Pedersen, 2012; Rubera et al., 2015).

Third, ***Risk Management practices*** are also present in both samples. Internal Firm Services are generally more prone to apply risk management practices than the more client-focused practices. Despite the fact that the external sample exhibits more open innovation practices, it also perceives risk in openness as more important. One possible explanation is the fact that the external sample applies more risk management practices then Firm ABC.

Fourth, ***Organizational Support*** for open innovation is lower at the firm and leadership level than at the individual managers' levels. Firm ABC seems to have employees that are interested and supportive of open innovation practices, which isn't completely in line with what leadership and firm processes allow. This difference is less prevalent in the external sample, where leadership and organizational processes seem to be well supportive of open innovation. Firm ABC leadership and organizational processes for open innovation are largely lower compared to the external sample.

Fifth, ***Performance wise,*** no significant differences exist between the two samples in terms of propensity to innovate. The external sample believes that its financial performance is higher than what the Firm ABC respondents believe. The difference is significant.

In terms of types of innovations, respondents confirmed that new services are the most prominent, business models much less. The latter finding does not align with what Chesbrough (2011a, 2011b) claimed. Process innovation plays an important role as well. Despite the fact that descriptive statistics give insights along with the interviews, these are not enough to explain the model. Therefore, regression analyses on the relationships between the variables were conducted.

7.3 Relationship Analysis

All relationships in the conceptual model (P1, P2, P3, and P4) have been validated through the regression analyses conducted, both in Firm ABC and in the external sample. Following the linear and logistic regression analyses, 35 out of the 154 relationships were validated. As some authors in the literature try to simplify the concept of open innovation, results show, given the number of variables and relationships, that it is far more complex than originally thought. This is mostly caused by the fact that open innovation encompasses many underlying theories and bodies of knowledge that makes it a very large concept.

7.3.1 Validation of the Erosion Factors Effect on OI Processes (P1)

Erosion factors in the industry have a positive and significant impact on all of the six factors in Firm ABC that constitute open innovation processes. The more erosion factors increase, the more open innovation processes increase. The effect is the strongest on coupled open innovation processes ($\beta = 0.314$), and the weakest on outside-in processes ($\beta = 0.124$). In fact, interviewees confirm that the need for partnerships with different firms, technology providers, and research centers are increasing due to these erosion factors. Therefore, the findings are in line with the interviews, but not very aligned with the literature that claims inbound OI is the most prevalent industries in general (Helge Aas & Pedersen, 2012; Rubera et al., 2015).

When comparing with the sample of the rest of the professional services sector, no external validity can be confirmed. Erosion factors effect on inside-out and coupled open innovation processes, as well as on collaboration with core and adjacent partners, are significant but the results on the relationship were not validated in the external sample (different slopes for the fitted line). However, in both samples, erosion factors have a positive and significant effect on inside-out, coupled open innovation processes and on collaboration with core partners.

The cost of doing research, being an erosion factor as noted in the literature, have only a significant and positive effect on the outside-in open innovation processes in Firm ABC. The costlier the research is to be conducted internally, the more open Firm ABC is for getting knowledge and innovations from outside the boundaries of the company.

In the external sample, a significant effect exists on innovations geared towards clients. The two samples have opposite effect however: Firm ABC decreases innovations for clients when the cost of doing research increases. The external sample has an opposite effect, hence there is no external validity. It will be interesting to understand the reason behind this difference in future research.

The results demonstrate the positive effect of erosion factors on open innovation processes. This is in line with literature (Chesbrough, 2003a) that claims that erosion factors in the industry are the main reason for the need to open the innovation process. Interviewees have also converged on the important impact that the changing industry dynamics and structure is having on the way they innovate. With the exception of the increasing cost of doing research, the other erosion factors have a positive effect on the implementation of open innovation processes.

7.3.2 Validation of the OI Processes Effect on Performance (P2)

In testing for the propositions of the effect of open innovation processes on performance (P2), the research validated that OI processes have a positive and significant impact on performance. This is in line with large amount of literature that claims the same in the services industry (Cheng & Huizingh, 2014; Foroughi et al., 2015; Gianiodis et al., 2014; Martovoy et al., 2015). Of all the Level 2 propositions, only five were validated in Firm ABC. None of these had a significant difference in the external validity test conducted too. Outside-in open innovation processes were proven to have a positive effect on the propensity to innovate in Firm ABC. More variables have been shown to have an effect on the financial performance of the practice: inside-out, outside-in and coupled open innovation processes as well as the client-focused innovations. The more these variables increase, the better the financial performance in the practices of Firm ABC. In fact, interviewees confirmed that they normally see better result in their practices when they collaborate more internally and externally. They even started delivering solutions that are geared around involving customers in the early innovation processes. Collaboration and innovation labs that are increasing in PSFs offices is a clear example of this trend. The findings in Firm ABC cannot be externalised as the results of regression analysis on the extended external sample showed no significance.

7.3.3 Validation of the Moderating Effect of Organizational Culture (P3)

The moderating effect of organizational support on the relationship between open innovation processes and performance has been analysed. Seven main moderating effects were validated. The overall conclusion is that organizational culture and its appreciation of external knowledge and competencies have indeed a moderating effect on this direct relationship. This is in line with the literature on the topic (Gassmann et al., 2010; Herzog & Leker, 2010). Interviewees confirmed that it all starts from the culture of the firm and its risk appetite.

Firm's support (leadership openness to innovation and collaboration, knowledge-sharing, and incentives system) has a negative moderating effect on the relationship between innovations for clients and the propensity to innovate of the practice. Therefore, the more the firm's support for innovation is important, the more doing client-focused innovations decreases the capacity to innovate. Hence it reduces this effect. This could be explained by the fact that employees in that case will be focusing on innovations that are not only client-focused but are larger than that.

Firm's support has also the same effect on the relationship between coupled open innovation processes and the propensity to innovate. Hence it reduces this effect. This could be explained by the fact that with an increase of firm's support, there is less of a need to get external partners in a coupled open innovation context. More innovations can be generated by tapping further into the internal firm network, and there will be less need for external partners.

This support has a positive quasi-moderator effect (modifies the form of the relationship between predictor and criterion/outcome variables, and is also a predictor) on the relationship between partnerships with adjacent ecosystem players and the financial performance of the practice. In fact, adjacent players are not core to the operations of professional services firms. With increased support from the firm, collaboration with this type of players can improve since it is very little otherwise.

Individuals' personal preference for inside-out processes has a negative pure moderating effect on the relationship between client-focused innovations and the innovation capacity, as well as on the practice's financial performance. Hence, the more the individuals in Firm ABC are open for inside-out innovation processes, the more important is the decrease in the effect of open innovation processes on its innovation capacity and financial performance.

This same factor has also the same negative pure moderating effect on the relationship between coupled open innovation processes and the innovation capacity of the practice. Hence it reduces this effect. With an increase of individual interest in collaboration, the coupled OI processes and practices of partnerships become less important. The reason could be that since it is a very human resource focused type of industry, individual's increasing interest can play an important role of replacing the need for other practices.

Individuals' personal preference for outside-in processes has a pure negative moderating effect on the relationship between partnerships with Adjacent Ecosystem Players and the financial performance of the practice. Hence it reduces this effect. The same reason outlined in the previous paragraph can help explain this finding as well. These individual capabilities are in line with what Lichtenthaler (2011) proposed, and is confirmed by interviewees that believe in the strong role the individual employee plays in the OI dynamics.

In general, when organizational support effects the relationships between open innovation processes and performance, it does so by reducing them. The relationships between inside-out, outside-in open innovation processes, collaborations for clients and for different phases of the innovation process, as well as partnerships with core ecosystem players with performance (whether innovation or financial) are never impacted by organizational support.

7.3.4 Validation of the Moderating Effect of Risk Management (P4)

Using the same approach as for the organizational culture moderating effect, the research finds that risk management has also a moderating effect on the relationship between open innovation processes and their impacts on performance. The conclusion differs however based on the underlying factors constituting the risk management variable.

Risk management practices have a negative quasi-moderating effect (both moderator and predictor) on the relationships between core and adjacent ecosystem partners and the financial performance of the practices. An interesting finding is the fact that risk practices have a positive predictor effect on all the relationships between the open innovation processes and the number of generated innovations. Hence, risk practices in this case do not play a moderating role but contribute to the increase in the propensity to innovate. This could be explained by the fact that the more risk practices are implemented, the safer and more organized innovation becomes, the better the result in terms of number innovations is. Further research into the link between risk management practices and the innovative capacity of professional services firms could be interesting.

Not-Invented-Here (NIH) behavior has a pure positive moderating effect on the intensity of the relationships between frequency of external collaboration in internal and client-focused innovations and both innovation capacity and financial performance. It has the same effect on the relationship between collaboration with external entities at different phases of the innovation process and both the innovation capacity and financial performance. In other words, NIH boosts the relationship strength between these variables.

The ***different types of risks*** have a pure negative moderating effect only on the relationship between the inside-out OI processes and the innovation capacity. Therefore, risk decreases the effect of OI processes on the capacity of the Firm ABC to innovate. This finding is in line with the literature, where the perception of risk is a factor limiting the sharing and openness of knowledge and innovation to the outside the borders of the firm.

The increase in ***formal IP protection*** practices has a positive quasi moderator effect on the relationship between adjacent ecosystem partners and the innovation capacity. This can be explained by the fact that the distance between Firm ABC and adjacent partners is reduced by putting in place formal IP protection practices. These practices, limiting the risks, allow for more intense collaborations with these adjacent partners, which in turn have a positive effect on the innovation capacity.

These practices have a pure negative moderating effect on the relationships between innovations for clients and coupled OI processes on one hand, and the financial performance of the practice on the other hand. Literature on risk management in OI (Chesbrough, 2003; Lichtenthaler, 2011; Paasi et al, 2015) is in line with these empirical findings as to the important role this building block plays on the OI impacts. In practice, the more protection and limitations are put in place to manage the IP, the less positive effect client-focused innovations and coupled OI processes have on the financial performance of the practice. This can be explained by the fact that these additional hurdles in dealing with openness can limit the real benefits realised from innovating for clients and from coupled OI processes.

Informal IP protection practices have moderating effect on more relationships, as predicted by the literature that recognized the presence of a paradox between openness and protection (Bogers, 2011):

1) Negative pure moderation on the effect of innovations for clients on the number of generated innovations
2) Negative pure moderation on the effect of coupled OI processes on the number of generated innovations
3) Positive pure moderation on the effect of collaboration with Core external partners on the number of generated innovations
4) Negative quasi-moderation on the effect of outside-in processes on the financial performance
5) Positive quasi-moderation on the effect of collaboration with adjacent external partners on the financial performance.

Hence, informal IP protection improves the strength of the effect of collaboration with core external partners on the innovation capacity. In fact, informal IP protection practices are the more common in professional services firms (mean = 4.43) compared to formal ones (mean = 3.97), as the descriptive statistics in Firm ABC shows. Interviewees confirm as well this finding, as most mentioned informal protection as the main IP management strategy. Contracts being very prevalent, they are however a traditional and integrated part of the business regardless of the proliferation of OI. The more they are important, the safer professionals feel in collaborating with external core partners to the firm, which in turn leads to more capacity to innovate. A similar effect is observed on the relationship between collaboration with adjacent external partners and the practices' financial performance. At the same time, it plays also a predictor effect in this relationship, which is interesting to explore in future research. On the other, a negative pure moderation effect that informal IP protection has is on the relationships between client-focused innovations and coupled OI processes on one hand, and the number of generated innovations on the other hand. Informal IP protection decreases the effect of outside-in OI processes on the practice's financial performance, while also decreasing (predictor role) the financial performance. Hence, these protection measures do not help in improving the impact of innovating for clients, conducting coupled OI, and acquiring externally available knowledge and innovations on the performance of the practices.

7.4 Contribution and Implications of the Research

7.4.1 Theoretical Implications

Several theoretical implications can be drawn from the current research. A literature review on the topic of innovation and OI was conducted and allowed the development of a model in practice and tested, the main contribution of this research. Research in the literature was limited only to some of the building blocks, and not really expanding their approach to such a large set of variables. Existing empirical research also focused on the overall services sectors with many diverse companies in the sector all bundled together, without building a research based on both qualitative and empirical approaches to better grasp the details and the differences between each. Our methodology is a combination of an extensive literature review, extended through interviews and cases, another detailed and focused survey in one company, and finally validated with an external sample through a survey. The main implication is the conceptual model that was built.

7.4.2 Practical Implications for Managers

On the other hand, some practical implications for managers are important from this research. First, there is a need to prioritize the areas of open innovation that have the highest impact on performance. Second, the innovation processes and approaches need to be structured accordingly. Third, this implies the necessity to understand which organizational factors can impact positively or negatively the potential outcome from OI on performance. And finally, another implication for manager in professional services in particular, and in services in general is the need to understand which risks can impact positively or negatively the potential outcome from OI on performance

7.5 Research Limitations

Despite the diversified nature of the methodology followed for this research (interviews, multiple examples from practice, survey, external validity assessment), there are several research limitations are noteworthy to mention. First, there is a potential bias in the choice of interviewees based on availability and network of the researcher. Another bias is that of the survey respondents which was not tested for and might have an impact on the findings. A second limitation is that most of the results were drawn from the survey within one single firm. With the diversity of the professional services sector compared to the limited number of companies that were covered externally in this research, this limitation is important for future research. In fact, not all sub-sectors of the professional services sector have been covered in the research. A third limitation is the limited amount of onsite observations and deep-dives to understand the details of the processes and the way innovation is made. A fourth limitation is that in the external sample, entities are independent as they are separate companies with separate respondents. In the Firm ABC sample, it is one single company where there might be dependencies between the respondents as a large portion is concentrated in the same offices. Therefore, this research has limited understanding of the nature of the differences observed between Firm ABC and the External Sample results have not been investigated.

7.6 Future Research

To cope with the current research limitations from the thesis, some interesting research avenues can be considered to validate and expand the findings further:

- Extend the survey and cases to more diversified firms and a wider number of companies in the sector in order to test the external validity of the findings
- Since the line of service is a main variable impacting the openness level, future research should focus on better understanding the differences between each line of service
- Case studies and detailed analysis of processes, people and culture should be conducted
- Investigating the role of professional services firms as intermediaries rather than innovators is another interesting avenue, given the very nature of the sector in play
- Understanding further the predictive role of risk management on the innovative capacity of professional services firms, as was found in the current research
- Consider the moderating effect of other external factors like firm size, competitive intensity (Gonnewa & Sunny, 2014, p. 174-177), economy, etc.

  Further research on the reasons behind the differences observed between Firm ABC and the external sample. Understanding this further can shed light on organizational context
- Conduct further external validity on the two moderating variables to test propositions P3 - P4.

7.7 Conclusion

The current research proved that Open innovation is applicable in professional services firms. Erosion factors impact the need to increase open innovation practices, who in turn have positive and significant impact on firms' performance. This impact is moderated by the organizational culture and risk management. The objective of this thesis was to better understand open innovation in professional services. To do so, a conceptual model was developed based on literature and exploratory research. The model was then tested through a survey in the industry, first in a large professional services firm in Canada, then opened to a large set of companies in the industry to validate the findings. Most findings were valid externally.

In fact, on site observations confirm that professional services apply several of the open innovation practices brought forward in the theory. Collaborating with external partners, sourcing knowledge and innovations from outside the firm boundaries, taking internal knowledge and innovations and sharing them openly with the public and the customers, and engaging in active M&A activities to bring in external resources are all key activities that professional services conduct regularly. The nature of their work, very geared towards value creation through knowledge creation and transfer to clients in particular, makes professional services firms more inclined to engage in open innovation practices, both inside-out and outside-in.

As suspected in the literature, inbound open innovation (outside-in) is more prominent in this type of sector then the outbound open innovation. Individuals find higher-risks in outbound innovation, but don't see the importance of the traditional risks highlighted in the survey. One reason to explain that is the prominence of risk management practices in this type of firms, strongly supported by the survey results. Individuals are open to external collaborations and sharing of knowledge, but leadership doesn't necessarily support these efforts. Whether through dedicated time for innovation, knowledge-sharing tools, or rewards for collaboration, leadership teams don't seem to follow what the individuals believe in regarding open innovation practices.

This collaboration with external partners is stronger in early phases of the innovation process, but is still quite present upstream for the Firm ABC, an opposite result to what was found externally. Firms in this industry mostly innovate in terms of products & services, more than in technology.

The four propositions put forward in the thesis are all validated, both in Firm ABC and in the external sample. The underlying propositions are however not all validated. The conclusion is that in aggregate, open innovation is observed and applicable in professional services, but not all its components are. The research conducted highlighted which underlying factors and relationships are validate and which ones are not.

Erosion factors are present and growing in the professional services firms, supporting Chesbrough (2003a) claim. The increase in these erosion factors (including the cost of doing research) cause an increase in the adoption of open innovation practices. These practices are well engrained in the firms studied in this research. The increase in the adoption of open innovation processes lead to a better overall performance of the practices, financial performance in particular. This impact however is moderated by two main factors: organizational culture and risk management. Organizational culture is a pure moderator, mostly negatively, while risk management is a mix between moderator and predictor. The effects of these moderating variables, risk management in particular, are an interesting areas for future research.

The two main propositions in the conceptual model the first testing the direct relationships between erosion factors and open innovation processes, then the second testing the latter’s impact on performance, are both validated externally. Hence, the findings made in Firm ABC can be externalized to the external sample.

Some limitations however exist in the research, mostly caused by the limited number of respondents and companies studied, and all this might cause in terms of biases. Not all sub-sectors in the professional services firms were represented. Future research should expand the target sample to a much larger population in order to validate the findings for the entire professional services sector. As some authors in the literature try to simplify the concept of open innovation, results show, given the number of variables and relationships, that it is far more complex than originally thought. This is mostly caused by the fact that open innovation encompasses many underlying theories and bodies of knowledge that makes it a very large concept.

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APPENDICES

APPENDIX A - LITERATURE REVIEW SUMMARY FOR ALL OI

Table A - 1 : Literature Review Summary For All OI

Author	Year	Industry covered	Type of research	Qualitative vs. Quantitative
Ulrich Lichtenthaler; Holger Ernst	2008	Diverse industries; intermediaries	Empirical	Quantitative
Heusinkveld, Stefan; Benders, Jos; Van den Berg, Robert-Jan	2009	Management consulting	Empirical	Qualitative
Elad Harisona; Heli Koski	2010	Software	Empirical	Quantitative
Chihiro Watanabe; Jae-Ho Shin; Juho Heikkinen; Weilin Zhao; Charla Griffy-Brown	2010	Goods and services	Theoretical	Quantitative
Subroto Roy; K. Sivakumar	2010	Diverse; outsourcing of KIBS	Theoretical	Qualitative
Sungjoo Lee; Gwangman Park; Byungun Yoon; Jinwoo Park	2010	SMEs (diverse)	Empirical	Qualitative
Peter T Gianiodis; SC Ellis; E Secch	2010	N/A	Literature review	
Karsten Frey; Christian Lüthje; Simon Haag	2011	N/A; online platforms	Empirical	Quantitative
Hsin-Ning Sua; Pei-Chun Lee	2011	N/A; literature review	Theoretical	Literature Review
Krassimira Antonova Paskalevaab	2011	Public sector	Empirical	Qualitative
Colombo G; Dell'Era C; Frattini F	2011	Footwear, appliances, and vending machine services	Empirical	Qualitative

Table A - 1 : Literature Review Summary For All OI (cont'd)

Author	Year	Industry covered	Type of research	Qualitative vs. Quantitative
Henry Chesbrough	2011	Services	Empirical	Qualitative
Anne-Laure Mention	2011	Services	Empirical	Quantitative
Carliss Baldwin; Eric von Hippel	2011	Not specified	Theoretical	
David Romeroa; Arturo Molinaa	2011	Manufacturing software telecommuncations	Theoretical	Literature Review
Ulrika H. Westergren	2011	Manufacturer	Empirical	Qualitative
M Hossain, I Kauranen	2011	Developing countries	Theoretical	Qualitative
Ulrich Lichtenthaler	2011	N/A	Theoretical	Qualitative
James H Lovea; Stephen Roperb; John R Brysonc	2011	Knowlege-based busines services	Empirical	Quantitative
Henry Chesbrough	2011	Services coupled around products	Empirical	Qualitative
Eelko K.R.E. Huizingh	2011	N/A	Literature review	
Lars Fuglsang; Jon Sundbo; Flemming Sørensen	2011	Tourism, arts & culture, design and branding, entertainment and leisure	Empirical	Quantitative
Walsh, ST; Linton, JD	2011	Technology	Empirical	Qualitative

Table A - 1 : Literature Review Summary For All OI (cont'd)

Author	Year	Industry covered	Type of research	Qualitative vs. Quantitative
Seongwuk Moon	2011	Services in Korea	Empirical	Quantitative
Mette Praest Knudsen; Thomas Bøtker Mortensen	2011	Manufacturing, development of software, and high-tech firms (Danish)	Empirical	Quantitative
Marlen Arnold; Volker Barth	2012	Utilities	Empirical	Qualitative
Angelika C Bullingera;, Matthias Rassa; Sabrina Adamczyka; Kathrin M Moesleina; Stefan Sohna	2012	Healthcare	Empirical	Quantitative
Francesco Carbonea; Jesús Contrerasb; Josefa Z. Hernándezc; Jose Manuel Gomez-Pereza	2012	Banking, telecommunications, and oil	Empirical	Qualitative
Mario I Kafouros; Nicolas Forsans	2012	Chemicals manufacturing (India)	Empirical	Quantitative
Remneland-Wikhamn; Björn Knights, David	2012	Auto industry	Empirical	Qualitative
Ian Chaston	2012	Public sector	Empirical	Quantitative
Johann Füller; Kurt Matzler; Katja Hutter; Julia Hautz	2012	NPD; all industries (consumers directly)	Empirical	Quantitative
Yongyoon Suh; Moon-Soo Kim	2012	Services (communications, R&D, financial, and software industries); SMEs	Empirical	Quantitative

Table A - 1 : Literature Review Summary For All OI (cont'd)

Author	Year	Industry covered	Type of research	Qualitative vs. Quantitative
Katja Henttonen; Pasi Pussinen; Timo Koivumäki	2012	Software	Empirical	Qualitative
Andrea Lasagni	2012	Diverse; SMEs (Europe)	Empirical	Quantitative
Sarel Gronum; Martie-Louise Verreynne; Tim Kastelle	2012	Diverse; SMEs	Empirical	Quantitative
Charles R Greer; David Lei	2012	N/A; literature review	Theoretical	Qualitative
Sabrina Adamczyk; Angelika C Bullinger; Kathrin M Möslein	2012	Diverse; IT-based innovation, contests	Theoretical; (literature review and conceptual model)	
Jens Hemphälä; Mats Magnusson	2012	Pharmacies (Sweden)	Empirical	Quantiative
D'Alvano, L; Hidalgo, A	2012	Services (trade (chain stores), health-care (private hospitals), and education (universities with engineering programs)	Empirical	Quatitative
Anne-Laure Mention; Anna-Leena Asikainen	2012	Services (wholesale, transport, finance, B2B)	Empirical	Quantitative
Alex da Mota Pedrosa	2012	Logistics services	Empirical	Qualitatitive
Perks, H; Gruber, T; Edvardsson, B	2012	Services; Car insurance (UK)	Empirical	Qualitative
Salge, TO; Vera, A	2012	Public sector; hospials	Empirical	Quantitative

Table A - 1 : Literature Review Summary For All OI (cont'd)

Author	Year	Industry covered	Type of research	Qualitative vs. Quantitative
		(England)		
Mokter Hossein	2012	Telecommunications	Empirical	Qualitative
M Hossain	2012	Open innovation intermediaries	Empirical	Qualitatife
M Hossain	2012	Telecommunications	Empirial	Qualitative
Teemu Santonen; Mokter Hossain; Henri Simula	2012	N/A	Literature review	
Kuo-Nan Hsieha; Joe Tidd	2012	Services - chain convenience stores	Empirical	Qualitative
M Hossain	2012	N/A	Theoretical	Qualitative
M Hossain	2012	N/A	Theoretical	Qualitative
R Halonen; M Hoque; M Hossain; G Moktan; T Ritola, M Kuikka	2012	N/A	Theoretical	Qualitative
Vanhaverbeke, W.	2012	SMEs	Empirical	Qualitative
Aas, Tor Helge	2012	Tourism	Empirical	Qualitative
Alexander A; Pearson S; Fielding S; Bessant J	2012	University		
Tibor Dory; Attila Tilinger	2012	University	Empirical	Qualitative
Alexander, Allen T; Pearson, Sarah J; Fielding, Sean N; Bessant, John R.	2012	University	Empirical	Qualitative
Helge Aas Tor; Pedersen Per Egil	2012	Services	Theoretical	Conceptual
Carol Kelleher & al.	2012	Services; online platforms	Empirical	Qualitative
Sang M Lee; Taewon Hwang; Donghyun Choi	2012	Public sector	Empirical	Quantitative

Table A - 1 : Literature Review Summary For All OI (cont'd)

Author	Year	Industry covered	Type of research	Qualitative vs. Quantitative
José A Miguel Dávila; David López; Carmen de Pablos Heredero	2012	Telecommunications	Empirical	Qualitative
Yongyoon Suha; Moon-Soo Kim	2012	Service SMEs (communications, R&D, financial, and software industries)	Empirical	Quantitative
Howard R Moskowitz; IS Saguy; Moskowitz Jacobs,	2013	Food & beverage		
Volker Arrass; Peter Hottum; Marc Kohler; Tim Straub; Dennis Welter	2013	Services	Empirical	Quantitative
Paavo Ritala; Pia Hurmelinna-Laukkanen	2013	Cross-industries (Finland)	Empirical	Quantitative
Jean Hartley; Eva Sørensen; Jacob Torfing	2013	Public sector	Empirical	Qualitative
Tindara Abbate; Raffaella Coppolino; Francesco Schiavone	2013	Not specified	Theoretical	Qualitative
Stephan M. Wagner	2013	Transportation and logistics services	Empirical	Quantiatitive
Hsing-Er Lin; Edward F McDonough; Shu-Jou Lin; Carol Yeh-Yun Lin; et al	2013	Diverse; Taiwan (chemicals, pharmaceuticals, financial management, mechanical engineering, and electronic engineering sectors)	Empirical	Quantitative
Temel, Serdal; Mention, Anne-Laure; Torkkeli, Marko	2013	Manufacturing	Empirical	Quantitative

Table A - 1 : Literature Review Summary For All OI (cont'd)

Author	Year	Industry covered	Type of research	Qualitative vs. Quantitative
Hossain, Mokter	2013	N/A	Literature review	
M Hossain	2013	N/A	Theoretical	Qualitative
Joe Tidd; Kuo-Nan Hsieh	2013	Retail services (convenience stores)	Empirical	Qualitative
Amy Huang; John Rice	2013	Services	Empirical	Quantitative
Anne-Laure Mention; Anna-Leena Asikainen	2013	Wholesale, transport, finance, B2B	Empirical	Quantitative
Henry Chesbrough; Sabine Brunswicker	2013	Large firms	Empirical	Quantitative
Dimitri Schuurman; Bastiaan Baccarne; Peter Mechant	2013	ICT, living labs, telecommunications, pulic sector, technology	Empirical	Qualitative
Hutter; Hautz; Repke; Matzler	2013	SME	Empirical	Qualitative
M Hossain	2013	Telecommunications	Theoretical	Qualitative
Alex da Mota Pedrosa; Margus Välling, Britta Boyd	2013	Manufacturing and services	Empirical	Qualitative
A. Majchrzak; A. Malhotra	2013	Online crowdsourcing platforms (IBM, Lego, Heineken, GE)	Theoretical	Conceptual
Alessandro Avenali; Cinzia Battistella; Giorgio Matteucci; Fabio Nonino	2013	N/A	Theoretical	Conceptual

Table A - 1 : Literature Review Summary For All OI (cont'd)

Author	Year	Industry covered	Type of research	Qualitative vs. Quantitative
Claudia A. Louis	2013	Public sector	Empirical	Qualitative
Ulrich Lichtenthaler	2013	Manufacturing & intermediary services	Empirical	Qualitative
Pedro Janeiro; Isabel Proença; Vítor da Conceição Gonçalves	2013	Services	Empirical	Quantitative
Salge, TO; Farchi, T; Barrett, MI; Dopson, S	2013	Healthcare	Empirical	Quantitative
Guy Parmentier; Romain Gandia	2013	Video games	Empirical	Qualitative
Chaston, Ian	2013	Financial advisory	Empirical	Quantitative
Theresa Veer; Annika Lorenz; Knut Blind	2013	German companies mix	Empirical	Quantitative
David Doloreux; Anika Laperrière	2014	KIBS	Empirical	Qualitative
Dominik Mahr; Annouk Lievens; Vera Blazevic	2014	Industrial production, wholesale, retailing, and financial, and technology-driven services	Empirical	Quantitative
Bulent Menguc; Seigyoung Auh; Peter Yannopoulos	2014	High-tech (Canadian)	Empirical	Quantiative
Ching-Hsun Chang; Yu-Shan Chen; Ming-Ji James Lin	2014	Manufacturing & services (Taiwan)	Empirical	Quantatitive
Sheen S. Levine; Michael J. Prietula	2014	N/A		
Colin CJ; Cheng eric C; C. Shiu; John A Dawson	2014	Service firms in Taiwan	Empirical	Quantiative
James h. Love, stephen roper, and priit vahter	2014	Manufacturing	Empirical	Quantitative

Table A - 1 : Literature Review Summary For All OI (cont'd)

Author	Year	Industry covered	Type of research	Qualitative vs. Quantitative
Sharon Belenzon; Mark Schankerman	2014	Software	Theoretical	Quantitative
Valentina Lazzarotti; Raffaella Manzini	2014	Manufacturing	Empirical	Qualitative
Tommaso Buganza; Davide Chiaroni; Gabriele Colombo; Federico Frattini	2014	Construction, pharmaceuticals, A&D, steel pipes, semiconductors, automotive systems, integrators	Empirical	Qualitative
Torsten Oliver Salge; Thomas Marc Bohné; Tomas Farchi; Erk Peter Piening	2014	Manufacturing services	Empirical	Quantitative
	2014	Technology and engineering consulting	Empirical	Qualitative
J Zhang; L Chen	2014	SMEs	Literature review	
Joel West; Marcel Bogers	2014	N/A	Literature review	
Randhawa; Wilden; Hohberger	2014	N/A	Literature review	
M Hossain; I Kauranen	2014	Non-profit foundations	Empirical	Qualitative
M Hossain; I Kauranen	2014	OI intermediary platoforms	Empirical	Qualitative
Andrea Mina; Elif Bascavusoglu-Moreau;Alan Hughes	2014	Business services and manufacturing (UK)	Empirical	Quantitative
Colin CJ; Cheng and Eelko K; RE Huizingh	2014	Services; finance, information & electronics, retail & logistics, and others (Asia)	Empirical	Quantitative

Table A - 1 : Literature Review Summary For All OI (cont'd)

Author	Year	Industry covered	Type of research	Qualitative vs. Quantitative
Esteve Almiralla, Melissa Lee, Ann Majchrzaka	2014	Public sector	Empirical	Qualitative
PT Gianiodis; JE Ettlie; JJ Urbina	2014	Banking	Empirical	Qualitative
Brink, Tove	2014	SMEs; Danish food industry	Empirical	Quantitative
Johan Maes; Luc Sels	2014	SMEs	Empirical	Quantitative
Elizabeth E Richard; Jeffrey R Davis	2014	Space	Empirical	Qualitative
Thomas Holzmanna; Klaus Sailer; Bernhard R. Katzy	2014	Automotive	Empirical	Qualitative
Guy Parmentier; Vincent Mangematin	2014	Creative industries (video games, music software databases, software Internet box)	Empirical	Qualitative
Macchi M; Rizzo U; Ramaciotti L	2014	Incubators	Empirical	Qualitative
Paasi J; Rantala T; Lappalainen I; Pikkarainen M	2014	Manufacturing and some services	Empirical	Qualitative
Carlos Eduardo; Yamasaki Sato	2014	Telecommunications	Empirical	Qualitative
James H. Love; Stephen Roper; Priit Vahter	2014	Manufacturing	Empirical	Quantitative
Heidi K. Gardner	2015	Professional services	Empirical	Qualitative
Noel Carroll; Markus Helfert	2015	IT cloud-computing driven services	Theoretical (iiterature review)	
M Hossain	2015	SMEs	Literature review	

Table A - 1 : Literature Review Summary For All OI (cont'd)

Author	Year	Industry covered	Type of research	Qualitative vs. Quantitative
M Hossain; KMZ Islam	2015	Technology	Empirical	Qualitative
M Hossain; I Kauranen	2015	N/A	Literature review	
M Hossain; KMZ Islam	2015	Starbucks	Empirical	Qualitative
del Rocio Martinez-Torres; Maria Rodriguez-Pinero; Toral, Sergio L	2015	Starbucks	Empirical	Qualitative
Foroughi, Amir; Buang, Nor Aishah; Senik, Zizah Che; Hajmirsadeghi, Reihaneh Sadat; Bagheri, Mahdi Mohammad	2015	Tourism services	Empirical	Quantitative
Adrián Kovács; Bart Van Looy; Bruno Cassiman	2015	N/A	Literature review	
M. Hossain	2015	N/A	Literature review	
Henri Simula; Mokter Hossain; Minna Halme	2015	N/A		
M. Teresa Fernández Fernández; Francisco J. Blanco Jiménez; Juan R Cuadrado Roura	2015	KIBS; business incubators	Empirical	Quantitative
John Hagedoorn & Ann-Kristin Zobel	2015	High-tech	Empirical	Qualitative & Quantitative
Bob Lillis; Marek Szwejczewski; Keith Goffin	2015	Services; insurance, IT, vocational awarding, pensions, admin; security services	Empirical	Qualitative
J. Mattson	2015	IT consuting	Empirical	Qualitative
Shukuan Zhao; Yu Sun; Xiaobo Xu	2015	N/A	Literature review	
Chiara Verbano; Maria Crema; Karen Venturini	2015	SMEs	Empirical	Quantitative

Table A - 1 : Literature Review Summary For All OI (cont'd)

Author	Year	Industry covered	Type of research	Qualitative vs. Quantitative
Sabine Brunswicker; Wim Vanhaverbeke	2015	SMEs	Empirical	Quantitative
Nazanin Eftekhari; Marcel Bogers	2015	Start-ups incubator	Empirical	Qualitative
Jennifer L Gustetic; Jason Crusan; Steve Rader; Sam Ortega	2015	Space	Empirical	Qualitatitive
Richard EE; Keeton KE	2015	Space	Empirical	Qualitative
Kari Laine; Mirka Leino; Petteri Pulkkinen	2015	University	Empirical	Qualitative
Gaia Rubera; Deepa Chandrasekaran; Andrea Ordanini	2015	Food	Empirical	Quantitative
Andrey Martovoy; Anne-Laure Mention; Marko Torkkeli	2015	Financial services	Empirical	Quantitative
Patrick Schueffel; Iustin Vadana	2015	Financial services (banking, insurance & wealth management)	Literature review	
David M. Andrews; Sébastien L. Degorce; David J. Drake; Magnus Gustafsson; Kevin M. Higgins; Jon J. Winter	2015	Pharmaceutical	Empirical	Qualitative
Battisti G; Gallego J; Rubalcaba L; Windrum P.	2015	Services (17 sectors, 18 countries in Europe)	Empirical	Quantitative
Susha I; Gronlund A; Janssen M.	2015	ICT and media industry	Empirical	Quantitative
Foroughi, Amir; Buang, Nor Aishah; Senik, Zizah Che; Hajmirsadeghi, Reihaneh Sada; Bagheri, Mahdi Mohammad	2015	Tourism; Iran	Empirical	Quantitative
Mokter Hossain, Muhammad Anees-ur-Rehman	2016	N/A	Literature review	
Amy C. Edmondson, Jean-Francois Harvey	2016	Information technology	Empirical	Qualitative

Table A - 1 : Literature Review Summary For All OI (cont'd)

Author	Year	Industry covered	Type of research	Qualitative vs. Quantitative
Institut national de la recherche scientifique (INRS) - Urbanisation Culture Société		KIBS	Empirical	Qualitative
H Simula, M Hossain, M Halme	2016	N/A	Literature review	

APPENDIX B - LITERATURE REVIEW SUMMARY FOR NON-SERVICES FIRMS

Table B-1: Literature Review by Industry For Non-Services Firms

Sub-sector	Main finding and authors
High-tech	• Hagadoorn and Zobel (2015); European and North American firms • Xerox, Philips, Lego, Intel, and IBM (Chesbrough, 2003a) • French high-tech firm (Mitkova, 2014): *“focus on organizational set-ups and stakeholders during the early phases of inbound open innovation”* • Consumer electronics (Christensen *et al.*, 2005)
PC	• Dell (Dell Ideastorm); Hossain and Islam (2015)
NASA	• *“NASA's use of open innovation tools to solve a variety of types of problems and advance of number of outcomes continues to grow”* (Gustetic, Crusan, and Ortega, 2015) • *“New business models and significant advances in external collaboration… successful use of open innovation to solve technical problems.’’* (Richard and Davis, 2014) • Richard and Keeton (2015)

Table B-1: Literature Review by Industry For Non-Services Firms (cont'd)

Sub-sector	Main finding and authors
Video games	• *"… identify four modalities for managing sustainable innovation with a user community toolkit."* (Parmentier and Gandia, 2013)
Software development	• *"… companies with a larger volume of intellectual capital (i.e. human capital and intellectual property) are more likely to adopt Open Source Software"* (Harisona and Koski, 2010) • *"… studies how business models can be designed to tap effectively into open innovation labor markets with heterogeneously motivated workers."* (Belenzon & Schankerman, 2014)
Utilities	• *"Opening closed urban planning processes and using open innovation tools can foster bottom-up urban energy system transformation by addressing the interactive ways of decision-making integrating company representatives and citizens."* (Arnold & Barth, 2012)
Healthcare	• *"… open innovation practices in health care lead to interesting innovation outcomes and are well accepted by participants"* (Rass, Adamczyk, Moslein, and Sohn, 2012) • Dutch State Mines (e.g., Kirschbaum, 2006) • Salge, Farchi, Barrett, and Dopson (2013); Studied openness in healthcare projects and their key success

Table B-1: Literature Review by Industry For Non-Services Firms (cont'd)

Sub-sector	Main finding and authors
	factors: *"Too little as well as too much search openness at the ideation stage will be detrimental to new product outcomes".*
Consumer packaged goods	• Procter & Gamble (Chesbrough, 2003a) • *"paradigm shifts …: a different way of working—from testing to open sourcing… open new product development (NPD) process…"* (Moskowitz, Saguy, and Jacobs, 2013)
Pharmaceuticals	• *"Merck has leveraged OI to achieve product innovations while reducing research and design staff"* (Chesbrough, 2003a) • *"Pharmaceutical companies procure solutions by jointly developing technologies with strategic partners or by acquiring smaller companies which developed them"* (Tidd, 2013) • DSM (Kirschbaum, 2005) • Bio-pharmaceutical industry (Bianchi, Cavaliere, Chiaroni, Frattini, & Chiesa, 2011) • "*industry has realigned resources away from early R&D, making industry more reliant on collaboration with academic groups to share the risks (and rewards) of conducting discovery and early validation*

Table B-1: Literature Review by Industry For Non-Services Firms (cont'd)

Sub-sector	**Main finding and authors**
	efforts" (Andrews *et al.*, 2015) • *"More chances to success of new drug launch in OI than in closed context"* (Deloitte, 2015)
Public sector	• *"… our examination of six cities opening their data for innovation"* (Almiralla, Lee, and Majchrzaka, 2014) • "*Although outside-in open innovation principles seem to be popular, there have been emerging attempts to exploit the value of government data through inside-out approaches."* (Lee, Hwang, and Choi, 2012) • *"… factors and conditions that influence the adoption and implementation of open innovation practices in public sector agencies"* (Louis, 2013) • *"Authorities engaged in open innovation have developed more effective knowledge management processes"* (Chaston, 2012) • *"…new approach to open innovation is emerging, which links technologies with people, urban territory and other cities…"* (Paskaleva, 2011)
Construction	• Buganza, Chiaroni, Colombo, and Frattini (2014)

Table B-1: Literature Review by Industry For Non-Services Firms (cont'd)

Sub-sector	Main finding and authors
Manufacturing	• *"… emphasis clearly seems to be on the suppliers of manufactured goods, and much less on services and service firms."* (Eduardo & Sati, 2014). • Diverse industries in technology and manufacturing from low-tech to high-tech companies (steel pipes, floors, automotive systems, A&D, semiconductors) (T. Buganza *et al.*, 2013) • Italcementi (Chiaroni et al., 2011) • PowerDrive, a manufacturer of hydraulic drive systems (Westergreen, 2011) • Irish manufacturing on importance of learning effects - *"establishments with substantial experience of external collaborations in previous periods derive more innovation output from openness in the current period."* (Love, Roper, and Vahter, 2014) • Chemicals manufacturing in India (Kafouros & Forsans, 2012) • Auto industry (Remneland-Wikhamn, and Knights (2012); automotive (e.g., Lichtenthaler,2007), • Manufacturing firms use of intermediaries for open innovation (Lichtenthaler, 2013) • Italian Manufacturing SMEs (Verbano, Crema, and Venturini, 2015) • Aerospace (Witzeman *et al.*, 2007; Armellini, Kaminski, and Beaudry, 2014)

Table B-1: Literature Review by Industry For Non-Services Firms (cont'd)

Sub-sector	Main finding and authors
	o *"… open innovation in the cluster is still "unfreezing", but with great potential to emerge once these problems are solved"* • Aerospace - "… *companies from emerging economies are more prone to open innovation, since they are often heavily dependent on foreign knowledge and expertise."* (Armellini, Kaminski, and Beaudry, 2012) • Manufacturing and services: *"boundary between the provider and the customer has become less clear and the distributed innovation practices make the management of innovation more challenging than in the case of innovation for the customer"* (Paasi, Rantala, Lappalainen, and Pikkarainen, 2014)
Telecommunications	• Lucent (Chesbrough, 2003a) • Studying ICT and media companies: *"in practice service innovation on the basis of open data is in its infancy"* (Susha, Gronlund, and Janssen, 2015) • Nokia (Koen and Geert, 2007; Miguel Dávila, López, Heredero; 2012; Hossein, 2012): o "*Nokia Corporation provides its non-core ideas to other existing and start-ups companies through IM to turn these ideas into valuable products and services"*.

Table B-1: Literature Review by Industry For Non-Services Firms (cont'd)

Sub-sector	Main finding and authors
	• Deutche Telecom (e.g., Rohrbeck et al., 2009). • *"…(i) BT is moving to a more open innovation model, collaborating and allowing collaboration with external partners; and (ii) open innovation is a management injunction which BT is using to systematise innovation"*. British Telecom in the UK as a case of open services innovation (Sato and Eduardo, 2014) • *"… driving factors motivating businesses to innovate with open data differ widely, however on average innovativeness of the company and its expertise and skills play an important role."* (Susha, Gronlund, and Janssen, 2015) • *"Mobile ecosystems constitute a clear example of emerging business models promoting openness and collaboration with external agents."* Mobile phone industry (Miguel Dávila, López, de Pablos Heredero, 2012)
Large firms	• Managing Open Innovation in Multinational Enterprises (Vanhavarbeke, Du, and von Zedtwitz, 2013) • *"Applying Open Innovation to MNEs results in a series of new managerial and organizational challenges"* (Chesbrough and Brunswicker, 2013)

APPENDIX C – BARRIERS AND KEY SUCCESS FACTORS FROM OI

This appendix presents the main barriers and the key success factors for the implementation of open innovation.

Barriers to Open innovation

Despite the perceived benefits of IO, several strategic, organisational, and managerial barriers exist for open innovation success (Hagedoorn and Zobel, 2015; Paasi *et al.,* 2015); some are better articulated in professional services firms. The most significant are: governance of the relationshionship; management of intellectual property; lack of absorptive capacity; cultural barriers; difficulties appropriating the innovation as well as difficulties of internalizing tacit knowledge; and the specific nature of the services that are offered (Chesbrough, 2006a, 2006b, Laursen and Salter 2014).

A firm's absorptive capacity (Cohen and Levinthal, 1990), which is its ability to absorb skills (i.e., its receptivity as defined by Hamel (1991), knowledge, and hence learning from outside knowledge, is yet another barrier that can hinder a firm's capacity to benefit from open innovation. This capacity is a key determinant of the speed of learning about a company when allying with a partner for development of innovation projects.

Chesbrough (2003; 2006) identified two major cultural barriers to open innovation. The first is referred to as NIH (not-invented-here), where employees resist knowledge that is not invented inside the boundaries of the firm, and hence are less receptive to inbound innovation and knowledge transfer that open innovation can induce. The second is what Chesbrough calls the NSH (not-sold-here) attitude, where employees resist the possibility of transferring internally-created knowledge or innovation to the external boundaries of the firm.

Enterprises are usually unable to fully capitalize on the innovation benefits generated internally or through alliances and partnerships (Chaminade & Edquist, 2006). As argued by Teece (1986; p. 285): *''It is quite common for innovators – those who are first to commercialize a new product or process in the market – to lament the fact that competitors/imitators have profited more than the one first to commercialize it''*. This lack of appropriability can be a key barrier to open innovation in professional services firms (Lauren and Salter, 2014).

Some of the challenges typical for working in an open innovation context are: low reciprocal commitment; lower social cohesion; unsafe learning climate; high diversity and cognitive distances; high level of uncertainty; low resource availability; absence of traditional hierarchical lines; and power differences (du Chatenier, Verstegen, Biemans, Mulder and Omta, 2010).

The process of innovation can be problematic in professional services firms (Taminiau *et al,* 2009). Professionals in these firms simply do not find the time to innovate since they are mainly rewarded for client-related work (billable hours). And this lack of time and resources restricts the possibility of involving clients (Van Riel, 2004), and can therefore affect innovation in the industry. In order to innovate, consultants need to share knowledge with clients, colleague consultants, and their experienced superiors. The knowledge sharing routes that consultants can use are codified and formal and informal knowledge sharing. Taminiau *et al.* (2009) claim that the most productive route to innovation in professional services is informal knowledge sharing. Yet this causes another barrier to open innovation, which is the lack of flexible knowledge. This is intrinsic to the knowledge characteristics and properties expected to be shared with the partner during the open innovation process. In that case, lack of complementarity and difficulty in codifying the knowledge intended to be transferred (Borges, 2011) represents a barrier to a successful innovation partnership. This is can be the case in particular for tacit knowledge (Nanoka, 1994), which is prevalent in professional services firms.

The lack of formal innovation processes in services is a key barrier to the success of open innovation (Thomke, 2006), especially in professional services. Thomke (2006) pointed out the challenges of applying the discipline of formal R&D processes to services: because a service often exists only in the moment of its delivery to a customer, it is difficult to isolate in a traditional laboratory. And since many services are tailored to individual buyers at point of purchase, they cannot be tested in large samples. As a result, experiments with new services are most useful when they are conducted live: i.e., with real customers engaged in real transactions. But live tests increase the costs of failure; an experiment that does not work can harm customer relationships and even the brand.

Key Success Factors for Open Innovation

Given the various risks and barriers that open innovation entail, some key success factors have been identified that allow for better implementation from a strategic, managerial, and contextual angle (Tidd, 2014). Anand, Gardner, and Morris (2007) presented three approaches of knowledge creation based on people, processes, and systems: 1) The importance of individual expertise and the creation of policies that enable the recruitment, development, and retention of highly talented; 2) The importance of social processes by which knowledge becomes recognized as useful and valuable in an organizational context; and 3) The importance of systems such as codification routines by which innovative types of expertise can be appropriated. Since innovation in professional services firms is knowledge-based and therefore depends largely on experienced and senior professionals around whom new practice areas are built, the need for a strong alignment between the employees and the organization is one of the most important success factors (Anand, Gardner, and Morris, 2007). Internal research capacity increases the potential for success (Salge, Bohme, Farchi, and Pienning, 2014). Successful innovation depends on strategic leadership and organizational structures and processes that are appropriate to the type of innovation adopted (Roberts and Berry, 1985). A project leaderès prior innovation and management experience improves the pay-off from search openness (Salge, Farchi, Barrett, and Dopson, 2013). It depends also on the organization's values, decision-making style, culture, and rewards/incentives (Duncan, 1972; Salge, Bohme, Farchi, and Pienning, 2014; Zhao, Sun, and Xu, 2015). Lichtenthaler (2010) proposed that the degree of openness seems to be determined by a firm's strategic choice rather than the industry in which it is active. Therefore, he draws the decisions on *'make or buy'* and *'keep or sell'*, which are key in decision-making as it relates to open innovation, depending on the company's strategy. A firm's size is a determinant of adoption of OI. According to the same author, most firms have become aware of the importance of OI but do not it in its entirety, thereby risking missing out on the substantial benefits of its strategies.

Kale, Singh, and Perlmutter (2000) introduced the notion of *'relational capital'*, which refers to *''the level of mutual trust, respect, and friendship that arises out of close interaction at the individual level between alliance partners''*. Relational capital can help companies successfully balance the acquisition of new capabilities with the protection of existing proprietary assets in an open innovation context. Conversely, relational capital facilitates learning through close one-on-

one interactions between partners. Also, it minimizes the likelihood that a partner will engage in opportunistic behavior to unilaterally absorb or steal information or know-how that is core or proprietary to its partners. Trust enables firms to reduce dependence on equity structures to govern the relationships and lower negotiating costs in alliances, and also enhances alliance performance (Gulati, 1995). It plays an important role in this relationship because it can facilitate a good ’knowledge sharing atmosphere’, which makes the process of knowledge sharing smoother while the partners take a less protective attitude. Trust, as a central element of the relationship, is affected by other relational elements such as commitment of the partners and the distance between them (Gulati, 1995). An open and informal organizational climate favorable to the exchange of knowledge and innovation affects the chances of success of service firms (Van Riel, 2004). The use of socially-embedded network relations ensures trust building through the use of ‘*reputational knowledge’* (Hislop, 2002), and hence bridges the gaps needed for successful open innovation. Warren and Susman (2005) identified the major key success factors for open innovation as follows:

Table C-1: KSFs in OI

Category	Key Success Factors
Internal	IP management, knowledge management, IT applications, maturity, governance, culture, human resource practices.
External	Closeness to customers, the supply chain, and competitor knowledge; proactive engagement with the environment for acquisition of technology, knowledge, etc.
Bridging	Creative business model, partnerships, integration across stages of the product development cycle, balance between external and internal factors.

‘*A better business model often will beat a better idea or technology*’ (Chesbrough and Rosenbloom, 2002). An effective and appropriate open business model is considered by some scholars as a key success factor for implementation of open innovation (Chesbrough, 2003; 2006; 2007a; 2007b; Chesbrough, Vanhaverbeke, and West, 2006). External factors outside the boundaries of a firm play an important role as well: characteristics of the environment, flow of knowledge within an industry, an industry’s product life-cycle (Gianiodis, Ellis, and Secchi, 2010). All these factors are key to the success of open innovation implementation.

APPENDIX D - KNOWLEDGE MANAGEMENT CHALLENGES

This appendix summarizes the main challenges are related to knowledge management:

- Lichtenthaler and Lichtenthaler (2009) and Lichtenthaler (2011) merged the literature of knowledge management, dynamic capabilities, and absorptive capabilities as a novel way of studying knowledge in and out of the boundaries of a firm involved in open innovation practices as per the table below

Table D-1: Capabilities for OI

	Knowledge exploration	Knowledge retention	Knowledge exploitation
Internal (Intrafirm)	Inventive capacity	Transformative capacity	Innovative capacity
External (Interfirm)	Absorptive capacity	Connective capacity	Desorptive capacity

- These new capabilities require specific resources, thus creating a challenge for HR management in finding the right talent, training the actual resources, and for operations management teams in putting in place organizational routines and mechanisms to develop and sustain such capabilities. Open innovation requires the development of specialized and dedicated knowledge management systems to be able to link internal innovation process with external networks in order to capture and channel ideas and value in a swift and quick way (Chiaroni, Chiesa, and Frattini, 2010). These authors actually developed a framework with four managerial levers for open innovation, KMS being one of them. This point is emphasized by the practical cases of P & G and BMW platforms, as well as the emergence of new innovation intermediaries such as InnoCentive, which fill the gap actually present at this level (Chesbrough, 2003). This raises challenges also for IT departments, whose role extends and becomes central.
- Open innovation brings forward yet another challenge to existing knowledge management practices. Organizational memory, learning, and knowledge are not confined to hierarchies anymore. Communities, customers, suppliers, universities, and others possess increasing awareness of the knowledge needed for sustainable competitive advantage; knowledge is

therefore co-developed (Pénin *et al.,* 2011, Chesbrough, 2006). The element of trust in collaborations brought forward by Gulati (1995) becomes a central part of the equation, and knowledge management strongly depends on it in the open innovation paradigm, as does the relational dimension. A key issue becomes the possibility of partners to share knowledge when it is the first time they collaborate. In open innovation, this is likely to happen.

- Since the emerging paradigm advances the lucrative possibilities of co-development and co-ownership of knowledge, a key issue is the need for common routines and mechanisms for knowledge creation and transfer (Pénin *et al.*¸2011). Not only should companies look at their own way of doing business, they should alsoconsider their partners', customers' or others' processes and routines. With the locus of knowledge becoming increasingly located in markets in some of the open innovation processes and practices, firms are at risk of becoming overwhelmed with the amount of knowledge that flows into it (Pénin *et al.*, 2011). This poses significant challenges to managing knowledge, especially at the scanning phase, where relevant data and information are being researched. At the same time, a firm might start relying solely on external knowledge instead of using it to complement its internal existing knowledge, which is supposed to be the intention of open innovation implementation in firms and services, in particular given their strong dependence on knowledge.
- Bogers (2011) recognized the presence of an inherent paradox because of the natural tension between knowledge sharing and protection in open innovation. He calls it the ''*open innovation paradox*'' and identifies it as a major issue regarding how a firm can create and capture value out of this paradigm while managing its knowledge effectively.
- Despite widely-recognized fact that a broader set external sources of knowledge reduces the risk of unexpected development, too much openness can also become a negative issue (Kohler, Sofka, and Grimpe, 2009). Firms are constrained by their ability to absorb external knowledge, labeled by Cohen and Levinthal (1990) as '*absorptive capacity*'. Laursen and Salter (2006) found an inverted U-shape relationship between breadth and depth of search and innovation performance, where efforts initially increase a firm's innovation performance. There is then a trade-off from '*over*-searching' the environment, most probably caused by lack of management attention. This issue of knowledge management in open innovation in services focuses on the internal capabilities of the firm.

- Yet another issue in the literature on managing collaboration in open innovation is the role of the governance structure in creating and protecting one's knowledge (Bogers, 2011). Arrow (1962) identified a *"disclosure dilemma"* or *"information paradox"* as knowledge that must be revealed in negotiations for alliances or partnerships to show its value – effectively entailing the transfer of the knowledge.
- Organizational challenges are also important for a beneficial knowledge management strategy in an open innovation context. Gassmann, Enkel, and Chesbrough (2010) stressed the importance of creating a culture that values outside competence and know-how as crucial for open innovation practice. Such a culture should be oriented towards a few basic concrete artefacts such as information systems management, communications tools (platform), incentive systems, and so on. Open innovation in fact requires a change in culture; after all, it is a paradigm shift according to Chesbrough (2003).
- As Gassmann and Enkel (2004) noted, external knowledge gained through inbound open innovation activity must be *integrated* into the company. The existence of external knowledge provides no benefits to the firm if the relevant knowledge cannot be identified and incorporated into the firm's innovation activities (West & Gallagher, 2006). Wallin and von Krogh (2010) state that organizing open innovation is a matter of selecting the right mechanisms for integrating knowledge held by people outside and within the firm boundaries. Thus a relevant issue to consider in open innovation is the possible integration or application of the knowledge acquired.
- An important challenge in knowledge sharing and creation in open innovation concerns the difficulty to support, in a dynamic way, divergent knowledge and cognitive and communicative barriers stemming from different cultures (Bergman *et al.,* 2010). It becomes essential for effective knowledge management to provide a context where participants interact and exchange despite different mental maps and backgrounds, which are usually linked and affected by the environment and other communities.
- Bogers (2011) found a challenge in knowledge management according to the characteristics of a collaboration, which is its nature: whether it's pro-competitive or pre-competitive. Knowledge sharing can become an issue as part of the global corporate strategy of the firm. A key organizational and cultural barrier in this context refers to the *unwillingness* of employees to undertake extra-organizational knowledge transactions (Chesbrough and Crowther, 2006,

Lichtenthaler and Ernst, 2006). Negative attitudes against the use of external knowledge (i.e., the not-invented-here (NIH) syndrome), as well as agains*t the external* commercialization of knowledge assets, for example via licensing (i.e., the not-sold-here (NSH) syndrome), have been identified in the literature as important elements of resistance to these activities (Lichtenthaler et al., 2010). These negative attitudes can create a misalignment between the intentions of top management and the behaviour of involved employees, rendering the implementation less probable and knowledge management a significant issue.

- The tools required to manage knowledge such as KMS are very expensive and their actual tangible benefits hard to assess, especially those for knowledge-intensive service providers such as consulting (Sarvary, 1999). Measuring outcomes and putting in place a metrics system in services is more difficult than in other fields (Ettlie & Rosenthal, 2011). As a result, it becomes another challenge affecting the possibility of measuring the actual effect on performance of KMS's to justify the additional investments and monitoring required for open innovation. Indeed, Brown and Duguid (1998) mention the *''productivity paradox''*, which dictates that the increasing investment in new technology is not yet resulting in increased national productivity. A similar paradox in practice is recognized, especially in service firms where the bulk of the knowledge is tacit (Gallouj and Weinstein, 1997).

APPENDIX E – PCA VARIABLE IDENTIFICATION BASED ON LITTERATURE

Independent Variables

The following table summarizes the erosion factor measure, some of the relevant literature and the reliability (if available) measured in the literature.

Table E-1: PCA Literature - Erosion Factors

Independent Variables	Sources of Item in the Literature or Exploratory Interviews	Item Reliability (α Cronbach)
1.1 Erosion Factors	Chesbrough (2003a); Rahikka *et al.* (2011); Abbate, Coppolino, & Schiavone, (2013); Hipp, Gallego, and Rubalcaba, (2015)	No reliability test found in the literature. Qualitative observations were made by Chesbrough (2003a)
Corresponding literature main outcomes	Chesbrough (2003a): - Skilled workers are increasingly mobile - External suppliers (e.g. research providers, software providers) are increasingly knowledgeable - External options for unused internal ideas or knowledge developed by the firm are increasingly available - Clients are increasingly knowledgeable - Knowledge available outside traditional large companies is increasingly available - Relevant research in universities and research centers is increasingly available - Costs of doing research and development internally is increasing - Venture capital market is creating new opportunities for firms in your industry - Modularity of services leads to an increasing integration/brokerage role, a key factor explaining the new open innovation concept in professional services (Abbate, Coppolino, & Schiavone, 2013; Hipp, Gallego, and Rubalcaba, 2015) - Increased modularity (Rahikka et al., 2011)	

Intermediary Variables

The following table summarizes the information for this variable:

Table E-2: PCA Literature - Intermediary Variables

Intermediary Variables	Sources and Items	Reliability (α Cronbach)
Openness – OI Processes	This openness is split into the subcomponents in the next lines of this table: Inside-In, Outside-In, and Coupled OI processes (Gassmann and Enkel, 2004)	**α Cronbach = 0.79** (Hagadoorn and Zobel, 2015, p. 1060)
2.1 Inside-Out Processes	Gassmann and Enkel (2004), Dahlander & Gann, (2010), Cheng and Huizingh (2014), Suh and Kim (2012); (Cheng and Huizingh, 2015)	**α Cronbach = 0.804** (Cheng and Huizingh, 2015)
Corresponding literature outcome	- Company constantly seeks new applications outside the firm for internally developed innovations, knowledge, tools, or ideas - Important innovations in the company are shared with external sources (outside the company’s boundaries) - Company sells or licenses-out internally developed innovations & ideas to external entities - Company spins-off parts of its business and products to external entities	
2.2 Outside-In Processes	Gassmann and Enkel (2004), Dahlander & Gann (2010), Cheng and Huizingh (2014); (Wagner, 2013); Kafouros and Forans, (2012)	**α Cronbach = 0.75** (Cheng and Huizingh, 2015)
Corresponding literature outcome	- Company constantly scans innovations developed outside the firm - Important ideas in the company come from external sources - Company open to external knowledge - Company uses external partners as sources of innovation - Company buys or licenses-in externally developed innovations, ideas, and knowledge to use during internal innovation projects - Company acquires (M&A) parts of the products, business or services from external entities	

Table E-2: PCA Literature - Intermediary Variables (cont'd)

Intermediary Variables	Sources and Items	Reliability (α Cronbach)
2.3 Innovations for clients	Mahr, Lievens, and Blazevic, (2014) Exploratory interviews	- Factors identified and used but in their quantitative empirical research. No reliability measure was provided. However, given that the authors used these items in their regression analysis, the assumption is that the factor was reliable to start with, as it is a pre-condition.
Corresponding literature outcome	- Customer acceptance and learning - Innovations are mostly focused on clients	
2.4 Coupled Processes	Gassmann and Enkel (2004), Dahlander & Gann, (2010), Cheng and Huizingh (2014); Menguc, Auh, and Yannopoulos (2014)	**α Cronbach = 0.877** (Cheng and Huizingh, 2015) for the overall Coupled OI Processes.
Corresponding literature outcome	- Customer and supplier involvement in the design phase (Menguc, Auh, and Yannopoulos, 2014; Temel, Mention, and Torkkeli, 2013) - Customer acceptance and learning (Mahr, Lievens, and Blazevic, 2014) - Involvement of core and adjacent partners from the ecosystem, like universities, customers, suppliers, and competitors (Temel, Mention, and Torkkeli, 2013).	
2.5 External Collaboration per Innovation Type and Phase	Menguc, Auh, and Yannopoulos, 2014; Temel, Mention, and Torkkeli, (2013);	Menguc, Auh, & Yannopoulos, (2014): - **Customer** involvement in the design stage (**α = 0.83**). - **Supplier** involvement in the design stage (**α = 0.79**).
Corresponding literature outcome	- Customer and supplier involvement in the design phase	

Moderating Variables

The following table summarizes the information related to these variables:

Table E-3: PCA Literature - Moderating Variables 1 – Organizational Culture

Moderating Variables	Sources and Items	Item Reliability (α Cronbach)
3.1 Organizational Culture	Chesbrough (2003a), Dombrowski, Kim, Desouza, Braganza, Aapagari, Baloh, and Jha (2007); Herzog and Leker (2010); Lin; McDonough; Lin; Lin; et al, (2013); Kianto and Andreeva (2015)	- Strategic management of knowledge: **Cronbach's α = 0.892** - Organizational culture **Cronbach's α = 0.942** - Rewards and incentives for collaboration: **Cronbach's α = 0.877** (Kianto and Andreeva, 2015, p. 226). - Information and communication technologies **Cronbach's α = 0.884**
Corresponding literature outcome	- Dedicated time to work on innovation projects - Leadership open to external collaboration opportunities - Rewards/incentives in place for external collaboration - Knowledge-sharing activities, tools, and processes externally with partners or public	
3.2 Personal Preference	Chesbrough (2003a); Frey, Luthje, and Haag, (2011); Eftekhari & Borges (2015)	Intrinsic enjoyment of contributing (**CR = 0.91**) (Frey, Luthje, and Haag, 2011) Other authors cover this topic qualitatively (Chesbrough, 2003a; Eftekhari and Borges, 2015)
Corresponding literature outcome	- Intrinsic enjoyment of contributing	

Table E-4: PCA Literature - Moderating Variables 2 - Risk Management

Moderating Variables	Sources and Items	Item Reliability (α Cronbach)
5. Risk Management	Chesbrough (2003a), Knetchel (2007); Contractor, Woodley, and Piepenbrink (2011); Moon (2011) Das and Teng (2001); Veer, Lorenz, and Blind (2012); and Hagerdoon & Zebel (2015).	No empirical studies cover **risk management in general.**
Corresponding literature outcome	**5.1 Outside-In Risks** - Not-Invented-Here risk	No empirical studies cover **personal risk perception**, only qualitatively.
Corresponding literature outcome	**5.2 Inside-Out Risks** - Not-Sold-Here Risk	
Corresponding literatu outcome	**5.3 Couple OI Risks** - IPR are the main risks in OI and are the most difficult to protect - Moon (2011, p. 189) covered what he called "*tightness of appropriability*" that is related to the same IP Management Factor in OI - Risk of imitation by competitors - Impact on firm's reputation - Knowledge leakage and copying by the industry or competitors - Loss of human resources to industry or competitors (4)	**α Cronbach = 0.81** (Hagerdoorn and Zobel, 2015) for **IP Management** Reliability results were not presented but this factor was used for regression and hence conclusion can be made that it was reliable as it is a pre-condition. **Type of risks -** No reliability information found but imitation and risks in OI were used as reliable factors for regression analysis in Veer, Lorenz, and Blind (2012). The assumption is that this is a relevant factor to use.

Dependent or Outcome Variables

The following table summarizes these items as identified in the literature:

Table E-5: PCA Literature - Outcome Variable - Impacts

Outcome Variables	Sources and Items	Item Reliability (α Cronbach)
Impacts on Innovations	Menguc *et al.*, (2014); Menguc, Auh, and Yannopoulos, 2014; Temel, Mention, and Torkkeli, 2013, Wagner, 2013; Hemphälä and Magnusson, 2012)	Menguc *et al.*, (2014) - **Radical innovation capability (α = 0.81)** - **Incremental innovation capability (α =0 .80)** **New product performance (α = 0.88)**.
Corresponding literature outcome	- Positive impact on new product development - Positive on innovation performance - Degree of incremental and radical innovations\	
Impacts on performance	Mahr, Lievens, and Blazevic, 2014; Menguc *et al.*, (2014); Kafouros and Forans, 2012, Foroughi, Buang, Senik, Hajmirsadeghi, and Bagheri, 2015	Foroughi *et al.* (2015) - **Customer Retention (α = 0.748)** - **Financial Performance (α = 0.787)** - **Reputation (α = 0.786)**
Corresponding literature outcome	- Positive impact on market and financial success - Positive impact on financial performance - On customer retention - On reputation	

Control Variables

The relevant literature is identified and linked to the different items. Where available, the source and reliability of the item is presented. The table below summarizes the results:

Table E-6: PCA Literature - Control Variables

Control Variable	Sources of Item in the Literature or Interviews	Item Reliability (α Cronbach)
Line of Service	Exploratory Interviews	Not available in the literature
Geography	Armellini, Kaminski, and Beaudry (2012)	Not available in the literature
Practice Maturity	Moon (2011), Shiu, and Dawson (2014)	No reliability information provided but Moon (2011) uses this item in regression analysis based on previous literature. Hence, it can be assumed as a reliable measure.
Hierarchical Level	Salge, Farchi, Barrett, and Dopson (2013)	No reliability information provided but Salge, Farchi, Barret, and Dopson (2013) use this item in regression analysis based on previous literature as a control variable. Hence, it can be assumed as a reliable measure.

APPENDIX F – RESEARCH INSTRUMENT – SURVEY QUESTIONNAIRE

Professional Services Firms

The following is the research instrument for conducting interviews with professional services practitionners.

No.	SEMI-DIRECTIVE INTERVIEWS - GUIDE - Professional Service Firms Respondents Topics/Questions
	Compare the following items 10-15 years ago with today's situation (key trends, differences, evolution, novelty):
	A. The interviewee background **Objective:** Understand the background and whether the interviewee experience covers enough the evolution of the industry over the past 10 years
1	§ Company name, location, number of employees, revenues
2	§ Please explain to me briefly your background (professional and academic)
3	§ What is your experience within the professional services industry? How many years of experience? What positions have you occupied?
4	§ What is your current position and main responsibilities?
5	§ What does your company offer?
	B. Your industry **Objectives:** - Verify if the professional services industry and the service offering has matured. - Verify if the value chain of the professional services industry has disintegrated.
6	§ What level of maturity has your industry reached? (i.e. slowing growth rates, slowing earnings growth, competition over cost increasing)
7	§ What are the key drivers of the service advancement in the professional services industry? What about the indicators that service providers have met the needs/specification of the mainstream clients?
8	§ What level of standardization (best practices) has your industry reached? Which aspects?
9	§ How far are the service providers from meeting the service level requirement of the clients?
10	§ How integrated is the industry value chain? What types of traditional activities are being increasingly outsourced?
	C. Innovation in your company **Objective:** Verify the type and sources of innovations in professional services firms
11	§ How does your company create new innovations (services, products, processes, client experiences, etc.)?
12	§ What type of innovations are the most common in your industry (services, products, processes, client experiences, etc.) ?

SEMI-DIRECTIVE INTERVIEWS - GUIDE - Professional Service Firms Respondents

Topics/Questions

13 § How does your company create new innovations (services, products, processes, client experiences, etc.)?

14 § Where did the important ideas in your company and your industry come from in the past years?

15 § What types of internal innovation projects do you mostly have?

16 § How are the main stakeholders in new innovation projects, internally and externally?

17 § What are the main limitations to increasing the firm's and your practice's innovation capability?

D. Open Innovation Practices in your company
Objective: Verify the applicability of Open Innovation Practices

18 § How often do you collaborate with external entities (e.g. clients, suppliers, partners, universities, agencies) on new innovation projects? (outside-in)

19 § Which external entities do you collaborate most with in innovation projects? (outside-in)

20 § How do you use external ideas, knowledge, and technology in innovation projects? (outside-in)

21 § How important are spin-ins in your innovation? (outside-in)

22 § How important are M&A for your firm's strategy and innovation? (outside-in)

23 § How important is licensing out to your firm's strategy and innovation? (inside-out)

24 § How often do you do spin-offs and divestments? (inside-out)

25 § Do you do any new service development outsourcing?

26 § How important is co-development with other companies to your firm's strategy and innovations? (coupled)

27 § How important is collaboration with universities and business schools to your firm's strategy and innovations? (coupled)

28 § What role do Venture capitalists play in your firm's innovation? (coupled)

29 § What risks do you perceive in opening up and collaborating with external entities:
- inside-out?
- outside-in?
- coupled?

E. The Services offered by your firm
Objective: Verify the change over time of the complexity, specialisation, modularity, disintegration, commoditisation, knowledge brokerage in the development and delivery of services

30 § What kinds of problem do your services solve? What kinds of need do customers have?

31 § How much customization is needed?

32 § What benefit is sought through the service? What kind of value does the customer expect?

33 § Which aspects of your service offering have increased in complexity? Which ones have decreased? In which way? What are the drivers?

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Topics/Questions

34 § Which aspects of your service offering have increased in specialisation? Which ones have decreased? In which way? What are the drivers?

35 § What type of new services, not needed before, are now more in demand? Why - what has changed?

36 § What aspects of your service have become more modular (sub-components or elements of service that are done independently by different practices or players in the industry, without necessarily needing to coordinate together – e.g. Computers vs. Pill concept) ?
Which ones become more integral?

37 § Architecture openness means that different suppliers can produce components of the product without any direct contractual relationships but based on published product standards. For example, PC component makers can innovate separately as long as they adhere to standards such as the USB. Closed architectures, on the other hand, are ones where integration is entirely done by the systems integrator based on a proprietary design. In light of this explanation, does professional service you offer have a closed or an open architecture? How (if any) has this evolved over the past 5 years?

38 § Do you see an increase in the commoditization (explanation: choice is not a question of differentiation or niche, but mostly about price with little value-added to the buyer beyond its usability) of some services?
- Which services?

39 § Do you see an increasing or decreasing role of knowledge and services integration for professional services firms like yours?

40 § In the more modular projects, who plays the role of knowledge brokerage: your company or the client?

41 § Describe the process of knowledge and service sub-components integration into a complete integrated solution

F. Your Company's Internal Resources & Capabilities
Objective: Verify the change over time of the internal resources, capabilities and knowledge of the service provider

42 § What have been the key changes to the firm's capabilities in the past years?

43 § What have been the key changes to the profiles that you hire in the past 5 years?

44 § What knowledge is now required that wasn't required in the past 10+ years?

45 § What have become the core resources and competencies to your firm?

46 § What new kind of Training have you started offering recently that wasn't part of the past curriculum?

47 § How important is Knowledge management in your firm? How did this change over the past few years?

48 § How do you manage knowlege in your firm?

49 § What limits the opportunity to collaborate further with external entities? Any risks?

G. Your Clients Behaviour and Internal Competencies
Objectives:
- Verify the clients evolution in terms of integration and involvement in the service development and production.
- Verify the type of internal resources clients have and if they are becoming more independent/autonomous.

50 § What type of clients do you work for (profile of companies)?

51 § How did the clients' internal knowledge about the technical side of your service offering evolve over the past years?

SEMI-DIRECTIVE INTERVIEWS - GUIDE - Professional Service Firms Respondents
Topics/Questions

52 § How did their internal teams working with you evolve in term of competencies and resources?

53 § How did the nature of their needs evolve in the past years? What types of services have become more popular? Less popular? More internalised?

54 § How did their buying behavior change in the past years

55 § How did their involvement in your service production & development evolve in the past years?

56 § How does the customer participate in the service/problem solving process? What kinds of resource/contribution are needed from the customer?

57 § How does the customer participate in internal innovation projects?

58 § What does the customer need to do in order to facilitate the success of the solution?

59 § What kind of value does the customer perceive in the service? How does the customer evaluate the service and its supplier?

60 § What kind of value does the customer perceive in the service? How does the customer evaluate the service and its supplier?

61 § How does the client participate in knowledge creating? In knowledge integration from different service providers in more modular & complex projects?

62 § Did they evolve into more independent towards the type of services offered by your company?

63 § What redundant capabilities to yours do the clients now have in-house that weren't existant 10-15 years ago?

H. The Partners/Suppliers your firm deals with
Objective: Investigate the involvement of the partners/suppliers in the development and delivery of services or innovations

64 § Which incumbents suppliers do you deal with?

65 § Which newly entering suppliers do you deal with?

66 § To what level do these suppliers get involved in the service sales?

67 § To what level do these suppliers get involved in the service development?

68 § To what level do these suppliers get involved in the service delivery?

69 § To what level do these suppliers get involved in the client relationship?

70 § Have the alternative service delivery model or independent contracts increased on your engagements? Any % or #s?

71 § How much of your expenses do your partners and suppliers fees represent vs. 10-15 years ago?

72 § What role do universities play in contributing knowledge and understanding to your services and engagements?

73 § What role do universities play in contributing knowledge and understanding to your internal innovation projects?

I. Your Different Competitors
Objective: Investigate the types of competitors and whether new entrants have been disrupting the industry

SEMI-DIRECTIVE INTERVIEWS - GUIDE - Professional Service Firms Respondents

Topics/Questions

§ For your ***incumbent traditional competitors***, please elaborate on the following elements:

74 What is their profile?

75 Where are they located?

76 What is their differentiating Elements: advantages, disadvantages against your company

77 What role do they play in innovation?

78 How did their market share evolve in the past years?

§ For your ***new entrants competitors***, please elaborate on the following elements:

79 What is their profile?

80 Where are they located?

81 What is their differentiating Elements: advantages, disadvantages against your company

82 What role do they play in innovation?

83 How did their market share evolve in the past years?

84 Do you consider new start-up professional services firms business models a threat (10EQ, Maven, GLG, etc.)?

G. Impacts
Objective: Verify the impacts of the changes in the industry and firm's internal resources

85 § How would you rate your financial performance in the past 5 years? (exceeds targets, on targets, below targets?)

86 § How would you rate your overall innovativeness in the past 5 years? (above industry average, similar to industry, below industry?)

Clients of Professional Services Firms

	SEMI-DIRECTIVE INTERVIEWS - GUIDE - Professional Service Firms *Clients* Respondents **Topics/Questions**
	Compare the following items 10-15 years ago with today's situation (key trends, differences, evolution, novelty):
No.	**A. The interviewee background** **Objective:** Understand the background and whether the interviewee experience covers enough the evolution of the industry over the past 10 years
1	§ Company name, location, number of employees, revenues
2	§ Please explain to me briefly your background (professional and academic)
3	§ What is your current position and main responsibilities?
4	§ What does your company offer?
	B. Innovation in your company **Objective:** Investigate the innovation process at high-level in the company, and the contribution of professional services firm
5	§ How does your company create new innovations (services, products, processes, client experiences, etc.)?
6	§ What type of innovations are the most common in your company (services, products, processes, client experiences, etc.) ?
7	§ How does your company create new innovations (services, products, processes, client experiences, etc.)?
8	§ Who are the main external parties that contribute to your innovation projects (e.g. universities, technology suppliers, professional services firms, competitots)?
	C. Your Knowledge Intensive Professional Services Buying Behavior **Objectives:** - Investigate the key decision factors for buying professional services. - Verify the evolution of the type of services needed, their commoditisation and internalisation
9	§ What kinds of knowledge intensive professional services (tax, audit, consulting, deals, etc.) do you buy? Who provides the service? How did it evolve over the years?
10	§ Why does the organization buy professional services?
11	§ How did your buying behavior evolve over the past years? What are the key decision factors (price, quality, relationship, expertise, etc.)?
12	§ What have become the core resources and competencies that you look for when buying professional services? How different was it 10+ years ago?
13	§ What kinds of challenge are involved in buying a knowledge intensive service?

14 § How did the nature of your needs related to KIBS evolve in the past years? What types of services have become more popular? Less popular?

15 § What types of services have become more internalised? More commoditised?

16 § How does your company's specialized knowledge associated with the acquired service influence the buying process? How did it evolve over the past years?

C. Your Knowledge Intensive Professional Services Providers
Objectives:
- Verify the level of involvement of the buyer in the professional services provider's process for developing and delivering the service.
- Validate the opening of the architecture of professional services, the commoditisation of some of it and the knowledge brokerage taking place.

17 § What type of KIBS providers do you work with (e.g. traditional incumbent, new entrants, SMEs, start-ups)? How did it evolve over the past years?

18 § How does your company participate in the providers's knowledge creation process? In knowledge integration from different service providers in more modular & complex projects?

19 § How does the knowledge intensiveness of the professional service influence the utilization/use of the service?

20 § What kind of value do you perceive in the service of a knowledge intensive professional services? How do you evaluate the service and its provider?

21 § How did the complexity of the services that you need evolved over the past years? increased or decreased? In which way?

22 § Have you seen an increase in the need for specialization from the service providers in the past years? If yes, what are the drivers?

23 § What type of new services have become more popular? What has changed?

24 § How did the modularity/disintegration of the professional services evolve in the past years (sub-components or elements of service that are done independently by different practices or players in the industry, without necessarily needing to coordinate together – e.g. Computers vs. Pill concept)?
- Which services?

25 § Architecture openness means that different suppliers can produce components of the product without any direct contractual relationships but based on published product standards. For example, PC component makers can innovate separately as long as they adhere to standards such as the USB. Closed architectures, on the other hand, are ones where integration is entirely done by the systems integrator based on a proprietary design. In light of this explanation, does professional service you offer have a closed or an open architecture? How (if any) has this evolved over the past 5 years?

26 § How did the commoditisation of some of the services evolve in the past years? More or less commodotised?
- Which services?

27 § How did the service integration evolve in the past years? Increased or decreased Integration need?

28 § Who does the brokerage (scanning and integration from different sources) of knowledge in the service design and delivery? Service provider or your company?

29 § Describe the process of knowledge and service sub-components integration into a complete integrated solution

D. Your Company's Internal Resources Dealing with Professional Services Firms
Objective: Investigate the evolution of the role that the internal resources play and their profile

30 § What type of redundant capabilities do you have in-house today that didn't exist 10-15 years ago?

31 § Did your company evolve into becoming more independent/autonomous towards some of the type of services offered by these providers? If yes, which services?

32 § What kind of resources do you invest in the problem solving that the service provider is offering? How did it evolve over the past years?

33 § What do you usually need to do in order to facilitate the success of the solution? How did it evolve over the past years?

34 § How did your internal knowledge about the technical side of the services provided evolve over the past years?

35 § How did you internal teams working with the KIBS provider evolve in terms of competencies and resources?

36 § What have been the key changes to the profiles that you hire that deal with the KIBS provider?

37 § What knowledge is now required from these resources that wasn't required in the past 15+ years?

APPENDIX G – ETHICS CERTIFICATE

POLYTECHNIQUE MONTRÉAL

LE GÉNIE EN PREMIÈRE CLASSE

CERTIFICAT DE CONFORMITÉ ÉTHIQUE

Le 29 avril 2016

M. Shadi Fahra
Mme Nathalie de Marcellis-Warin
Département de mathématiques et génie industriel
Polytechnique Montréal

N/Réf : Dossier CÉR-15/16-23 (UBR 3180018)

Madame, Monsieur,

J'ai le plaisir de vous informer que les membres du Comité d'éthique de la recherche (CÉR) ont procédé à l'évaluation en comité restreint de votre projet de recherche intitulé « *Implementing open innovation in professional services* ».

Les membres du CÉR ayant examiné votre projet en ont recommandé l'approbation sur la base de la documentation amendée que vous nous avez fait parvenir hier.

Veuillez noter que le présent certificat est valable pour une durée d'un an, soit du **29 avril 2016 au 28 avril 2017**, pour le projet tel que soumis au Comité d'éthique de la recherche avec des êtres humains.

Nous vous saurions gré de nous faire parvenir un bref **rapport annuel** (http://www.polymtl.ca/recherche/document/deonto.php) afin de renouveler votre certificat au moins un mois avant l'expiration du présent certificat. La secrétaire du Comité d'éthique de la recherche avec des sujets humains devra également être informée de toute modification qui pourrait être apportée ultérieurement au protocole expérimental, de même que de tout problème imprévu pouvant avoir une incidence sur la santé et la sécurité des personnes impliquées dans le projet de recherche (sujets, professionnels de recherche ou chercheurs).

Je vous souhaite bonne chance dans vos travaux de recherche,

Delphine Périé-Curnier, présidente
Comité d'éthique de la recherche avec des êtres humains

Comité d'éthique de la recherche avec des êtres humains
Pavillon principal
Téléphone : 514 340-4990
Télécopieur : 514 340-4992
Céline Roehrig
Secrétaire du Comité d'éthique de la recherche
Courriel : celine.roehrig@polymtl.ca

Campus de l'Université de Montréal
2900, boul. Édouard-Montpetit
2500, chemin de Polytechnique
Montréal (Québec) Canada H3T 1J4

Adresse postale
C.P. 6079, succ. Centre-Ville
Montréal (Québec) Canada H3C 3A7

APPENDIX H – SURVEY INTRODUCTORY MESSAGE

Welcome and Thank you!

Dear Respondent,

Thank you for your interest in taking the survey. Your help allows us to better understand innovation & collaboration in our firm, the first step in improving our performance.

Please answer to the best of your knowledge. This survey should take you 8 -10 minutes to complete and is divided into 7 short sections:

1. Introduction

2. Overall industry evolution

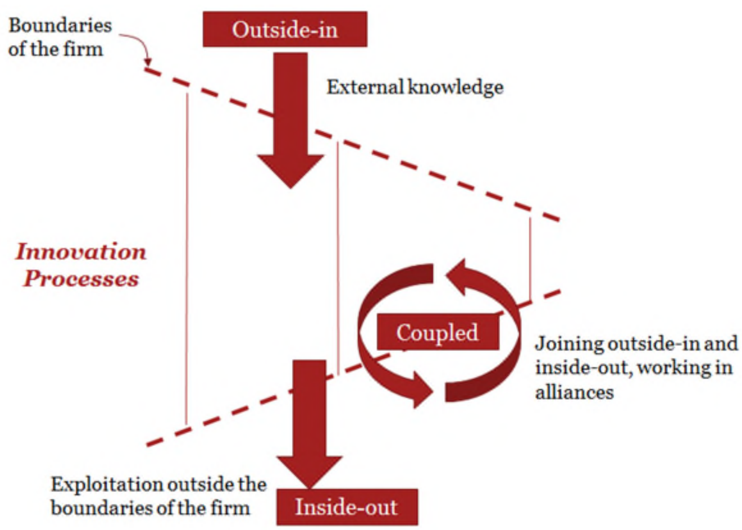
3. Inside-Out (Outbound) Innovation

4. Outside-In (Inbound) Innovation

5. Coupled Innovation

6. Organization

7. Results



We will share early and privileged results with each respondent.

Best regards,

The Researchers.

APPENDIX I - INFORMED CONSENT FORM

<u>Presentation of the research project and its objectives</u>:

We invite you to participate in a research project to better understand innovation at your firm. The objective of this study is the following: collect information about innovation & collaboration practices at your firm, challenges, underlying risks, and key success factors. The ultimate goal is to provide a framework or a process for innovation in professional services firms.

<u>Nature and duration of your participation in this research project</u>:

Your participation in this project will consist in answering a series of online survey questions, based on your personal experience. All the answers you provide will be confidential. We estimate that the survey will require 8 to 10 minutes of your time.

<u>Benefits and disadvantages resulting from your participation in the research project</u>:

There are no disadvantages to participate in the research project, except the time spent to answer our questions. The main advantage is to have access to the preliminary results and to share information on the evolution of innovation.

<u>Risks resulting from your participation in the research project</u>:

This research project will not subject you to any additional risk than those you are subject to in your regular daily activities.

<u>Financial compensation</u>:

You will not receive any financial compensation for your participation in this study.

<u>Voluntary participation and withdrawal</u>:

Your participation in this research project is voluntary. Therefore you are free to refuse to participate in it. You can also stop the survey at any time if you wish. In this case, the information collected will be destroyed and the answers provided by you will not be considered.

Any participant may withdraw his/her consent at any time, even after the survey is completed. If the participant wants to withdraw his/her consent after the survey, the data collected will be destroyed and will not be used in any manner whatsoever.

The participant is not obliged to answer all questions, if some make them uncomfortable for various reasons (e.g. confidentiality).

The research results could lead to scientific publications. However, no information that could lead to your identification or your company will appear in those publications.

Participants may be withdrawn without their consent by the researchers or the Research Ethics Board of Ecole Polytechnique de Montréal should they not follow the instructions provided or should there be some administrative reasons to abandon the project, notably for safety or feasibility reasons.

Confidentiality:

After you answer the survey, the researchers in charge of the project will compile the answers to the questions asked. No information that could lead to your identification will be associated with the compiled responses.

The researchers will perform their confidentiality obligations of data and respect for private life and that for the entire useful duration of the information.

Your answers will be securely saved to allow a better analysis after the survey. The answers will remain confidential and protected by a password. The file name will be coded and the person's name will not appear. Once the research project is completed, all the answers will be transferred anonymously (no mention of names) to Ecole Polytechnique de Montréal.

Contact people:

Should you have any questions pertaining to the research project, you can communicate with Shadi Farha, researcher in charge of the project at: (514) 654-4902 or by e-mail at: shadi.farha@polymtl.ca.

Should you have any questions pertaining to your participation in this research project, you can communicate with the Chair of Polytechnique's Research Ethics Board, Ms. Delphine Périé-Curnier, at (514) 340-4711, Ext. 4437 or by e-mail at: delphine.perie@polymtl.ca.

Consent:

By responding to the current survey, you agree to participate in this research project in accordance with the conditions set out in this document.

Given this consent form details, would you like to continue with the survey?
Yes
No

APPENDIX J - RESEARCH INSTRUMENT – SURVEY

Section 1/7: Introduction (4 questions)

Please allow us to know you better.

Q1 Which Line of Service do you work for?

- Assurance (1)
- Tax (2)
- Consulting (3)
- Deals (4)
- IFS (5)
- Other (6) ____________________

Q2 Which office do you work in?

Choose office from the list (1) (offices choices hidden to keep anonymity of the Firm ABC

Q3 How long has the practice that you belong to been active in the firm?

- Less than 1 year (1)
- 1 to 3 years (2)
- 4 to 5 years (3)
- More than 5 years (4)

Q4 What is your current position in the firm?

- Manager (1)
- Director (2)
- Managing Director (3)
- Partner (4)
- Other (5) ____________________

Section 2/7: Overall industry and practice evolution (1 question)

Objectives: To investigate further the evolution of the industry to which your practice belongs, in the past 3 years.

Q5 Please indicate your level of agreement with the following statements (covering last 3 years):

1= totally disagree; 2 = disagree, 3= somewhat disagree; 4 = neutral (omitted in the choices below), 5= somewhat agree; 6. agree; 7. totally agree

	1 (totally disagree) (1)	2 (2)	3 (3)	5 (4)	6 (5)	7 (totally agree) (6)
1. Our role as a firm is increasingly becoming an integrator of knowledge from different sources internally and externally (6)	❍	❍	❍	❍	❍	❍
2. Skilled workers are increasingly mobile (16)	❍	❍	❍	❍	❍	❍
3. External suppliers (e.g. research providers, software providers) are increasingly knowledgeable (17)	❍	❍	❍	❍	❍	❍
4. External options for unused internal ideas or knowledge developed by the firm are increasingly	❍	❍	❍	❍	❍	❍

available (18)						
5. Clients are increasingly knowledgeable (20)	❍	❍	❍	❍	❍	❍
6. Knowledge available outside traditional large professional services firms (e.g. Big Four) is increasingly available (21)	❍	❍	❍	❍	❍	❍
7. Relevant research in universities and research centers is increasingly available (22)	❍	❍	❍	❍	❍	❍
8. Costs of doing research and development internally is increasing (23)	❍	❍	❍	❍	❍	❍
9. Venture capital market is creating new opportunities for firms in your industry (24)	❍	❍	❍	❍	❍	❍

Section 3/7: Organization (1 question)

Objectives: To inquire about your firm's overall organization and support systems for innovation.

By innovation, we mean: new or significantly improved service, process, product, business model, organizational model/structure, marketing, or technology/software.

Q6 Please indicate your level of agreement to the following statements:

1= totally disagree; 2 = disagree, 3= somewhat disagree; 4 = neutral (omitted in the choices below); 5= somewhat agree; 6. agree; 7. totally agree

	1 (totally disagree) (1)	2 (2)	3 (3)	5 (4)	6 (5)	7 (totally agree) (6)
1. We are always given time to work on innovation projects (1)	❍	❍	❍	❍	❍	❍
2. Our leadership has become more open to external collaboration opportunities for the firm (2)	❍	❍	❍	❍	❍	❍
3. The firm increased rewards/incentives in place for external collaboration (4)	❍	❍	❍	❍	❍	❍
4. The firm increased knowledge-sharing activities, tools, and processes externally with partners or public (6)	❍	❍	❍	❍	❍	❍

Section 4/7: Inside-Out Innovation Process (Outbound) (2 questions)

Objective: To inquire about your practice's activities regarding taking internal ideas out to market during innovation

Q7 Please indicate your level of agreement with the following statements:

1= totally disagree; 2 = disagree, 3= somewhat disagree; 4 = neutral (omitted in the choices below); 5= somewhat agree; 6. agree; 7. totally agree

	1 (totally disagree) (1)	2 (2)	3 (3)	5 (4)	6 (5)	7 (totally agree) (6)
1. Your practice constantly seeks new applications outside the firm for internally developed innovations, knowledge, tools, or ideas (1)	❍	❍	❍	❍	❍	❍
2. Important innovations in your practice are shared with external sources (outside the firm's boundaries) (3)	❍	❍	❍	❍	❍	❍
3. Innovations are in majority used for clients and not for internal use (4)	❍	❍	❍	❍	❍	❍
4. Clear and strict risk management practices are in place when it comes to sharing inside ideas and innovations externally (5)	❍	❍	❍	❍	❍	❍

Q8 Please indicate your level of agreement with the following statements:

	1 (totally disagree) (1)	2 (2)	3 (3)	5 (4)	6 (5)	7 (totally agree) (6)
1. Your practice sells or licenses-out internally developed innovations & ideas to external entities (1)	❍	❍	❍	❍	❍	❍
2. Your practice spins-off parts of its services or business to external entities (2)	❍	❍	❍	❍	❍	❍
3. You personally believe that it is important to share internal knowledge and innovation with external parties (3)	❍	❍	❍	❍	❍	❍
4. You personally believe there is a risk of taking internally developed ideas & innovations to external parties (4)	❍	❍	❍	❍	❍	❍

Section 5/7: Outside-In Innovation Process (Inbound) (2 questions)

Objectives: To inquire about your practice's activities regarding bringing external ideas from the market internally during innovation.

Q9 Please indicate your level of agreement with the following statements:

1= totally disagree; 2 = disagree, 3= somewhat disagree; 4 = neutral (omitted in the choices below); 5= somewhat agree; 6. agree; 7. totally agree

	1 (totally disagree) (1)	2 (2)	3 (3)	5 (4)	6 (5)	7 (totally agree) (6)
1. Your practice constantly scans innovations developed outside the firm (1)	❍	❍	❍	❍	❍	❍
2. These innovations are primarily used for clients and not for internal use (2)	❍	❍	❍	❍	❍	❍
3. Many important ideas in your practice and on client engagements come from external sources (3)	❍	❍	❍	❍	❍	❍
4. Clear and strict risk management practices are in place when it comes to using externally developed ideas, innovations, and knowledge (4)	❍	❍	❍	❍	❍	❍

Q10 Please indicate your level of agreement with the following statements:

	1 (totally disagree) (1)	2 (2)	3 (3)	5 (4)	6 (5)	7 (totally agree) (6)
1. Your practice buys or licenses-in externally developed innovations, ideas, and knowledge to use during internal innovation projects (1)	❍	❍	❍	❍	❍	❍
2. Your practice acquires (M&A) parts of your services, business or practice from external entities (2)	❍	❍	❍	❍	❍	❍
3. You personally believe that it is a good practice to use external sources of ideas, services, knowledge, products to innovate internally (3)	❍	❍	❍	❍	❍	❍
4. You personally prefer to use internal knowledge or develop your own, rather than what is already existing externally (4)	❍	❍	❍	❍	❍	❍

Section 6/7: Coupled Innovation Process (6 questions)

Objectives: To investigate your practice's overall collaboration, and integration/coordination of external and internal knowledge/innovations/ services.

By collaboration we mean themes such as knowledge sharing, joint conferences, joint business offering, joint proposals, co-branding, partnerships, collaboration consortia, or co-investments.

Q11 How often does your practice collaborate with external entities (e.g. clients, suppliers, universities, partners) for:

	Never (1)	Very few (0-25% of innovation projects) (2)	Sometimes (25-50% of innovation projects) (3)	Most of the times (50-75% of innovation projects) (4)	Always (>75% of innovation projects) (5)
1. New internal projects (i.e. related to non-billable work - e.g. thought leadership, new service development, conferences) (1)	❍	❍	❍	❍	❍
2. During client engagements (i.e. billable work)? (2)	❍	❍	❍	❍	❍

Q12 How important for your practice is collaborating with external entities during each of the following phases of the innovation process:

1= Not at all important; 2= Very slightly important; 3. Slightly important; 4 = neutral (omitted in the choices below); 5. Moderately important; 6. Very important; 7. Extremely important

	1 (Not at all important) (1)	2 (2)	3 (3)	5 (4)	6 (5)	7 (Extremely important) (6)
Phase 1: Idea Generation/Brainstorming (1)	❍	❍	❍	❍	❍	❍
Phase 2: Development (2)	❍	❍	❍	❍	❍	❍
Phase 3: Delivery & Commercialization (3)	❍	❍	❍	❍	❍	❍

Q13 Please indicate the level of importance of each of the following statements for your practice's innovation strategy:

	1 (Not at all important) (1)	2 (2)	3 (3)	5 (4)	6 (5)	7 (Extremely important) (6)
1. Share internal knowledge outside the boundaries of the firm (2)	❍	❍	❍	❍	❍	❍
2. Constantly look for partnerships with external entities to innovate jointly (4)	❍	❍	❍	❍	❍	❍
3. Coordinate and integrate the exchange of external	❍	❍	❍	❍	❍	❍

knowledge between different entities (6)						
4. Use online collaboration tools to innovate with external partners (8)	❍	❍	❍	❍	❍	❍
5. Protect the firm's intellectual property in innovation development (9)	❍	❍	❍	❍	❍	❍
6. Manage risks in your practice during collaborations (10)	❍	❍	❍	❍	❍	❍

Q14 How important is the collaboration with these potential external entities for your practice's innovation:

	1 (not at all important) (1)	2 (2)	3 (3)	5 (4)	6 (5)	7 (Extremely important) (6)
1. Suppliers (e.g. market research/technology/service providers) (1)	❍	❍	❍	❍	❍	❍
2. Universities, Colleges, and Research Centers (3)	❍	❍	❍	❍	❍	❍
3. Communities (5)	❍	❍	❍	❍	❍	❍
4. Industry associations (6)	❍	❍	❍	❍	❍	❍

5. Public sector (e.g. government, municipality) (7)	❍	❍	❍	❍	❍	❍
6. Clients (8)	❍	❍	❍	❍	❍	❍
7. Venture Capitalists (9)	❍	❍	❍	❍	❍	❍
8. Competitors (10)	❍	❍	❍	❍	❍	❍
9. Conferences, journals (12)	❍	❍	❍	❍	❍	❍

Q15 How important are each of these practices for protecting the firm's intellectual property (IP) when collaborating with external parties on innovation projects:

	1 (not at all important) (1)	2 (2)	3 (3)	5 (4)	6 (5)	7 (Extremely important) (6)
1. Patents and utility models (1)	❍	❍	❍	❍	❍	❍
2. Trademarks (2)	❍	❍	❍	❍	❍	❍
3. Registration of service (3)	❍	❍	❍	❍	❍	❍
4. Contractual agreement (4)	❍	❍	❍	❍	❍	❍
5. Secrecy (5)	❍	❍	❍	❍	❍	❍
6. Complexity of service offering (6)	❍	❍	❍	❍	❍	❍

7. Restricted access to information (8)	❍	❍	❍	❍	❍	❍
8. Informal IP protection (10)	❍	❍	❍	❍	❍	❍
9. Publishing (to deter imitators) (11)	❍	❍	❍	❍	❍	❍

Q16 How important is each of the following risks when collaborating closely with external parties on innovation projects:

	1 (not at all important) (1)	2 (2)	3 (3)	5 (4)	6 (5)	7 (Extremely important) (6)
1. Negative impact on firm's reputation (1)	❍	❍	❍	❍	❍	❍
2. Knowledge leakage and copying by the industry or competitors (2)	❍	❍	❍	❍	❍	❍
3. Loss of human resources to industry or competitors (4)	❍	❍	❍	❍	❍	❍
4. Difficulty of protecting the firm's intellectual property (5)	❍	❍	❍	❍	❍	❍
5. External partner's opportunistic	❍	❍	❍	❍	❍	❍

behavior to take advantage of the openness (7)						
6. Loss of focus on key priorities & client engagements (8)	❍	❍	❍	❍	❍	❍
7. Higher cost of developing the innovation than if done only internally (9)	❍	❍	❍	❍	❍	❍
8. Low potential pay-off from the collaboration (10)	❍	❍	❍	❍	❍	❍

Section 7/7: Results (3 questions)

Objectives: To inquire about the practice and firm's performance and innovation.

Q17 -Which type of innovation contributed most to the growth of your practice's revenues in the past 3 years? New or significantly improved:

- ❍ Processes (1)
- ❍ Products (2)
- ❍ Services (9)
- ❍ Organizational models (3)
- ❍ Business models (5)
- ❍ Marketing (e.g. events, conferences, promotions, social media) (6)
- ❍ Technologies/software (7)
- ❍ Other (8) ____________________

Q18 Approximately, for the past 3 years, how many new innovations (e.g. a new or significantly improved service offering, new or significantly improved medium of delivering our services) did your practice launch (to the best of your knowledge)?

- ❍ None (1)
- ❍ 1 (2)
- ❍ 2 (3)
- ❍ 3 (4)
- ❍ 4 (5)
- ❍ 5 or more (6)

Q19 Please indicate your level of agreement to the following statements:

1= totally disagree; 2 = disagree, 3= somewhat disagree; 4= neutral (omitted from choices below); 5= somewhat agree; 6. agree; 7. totally agree

In the past 3 years, your practice has:

	1 (totally disagree) (1)	2 (2)	3 (3)	5 (4)	6 (5)	7 (totally agree) (6)
1. Increased client loyalty (1)	❍	❍	❍	❍	❍	❍
2. Attracted a significant number of new clients (2)	❍	❍	❍	❍	❍	❍
3.Constantly met its financial objectives (3)	❍	❍	❍	❍	❍	❍
4. Become more innovative in the market (4)	❍	❍	❍	❍	❍	❍
5. Improved its reputation in the market place (6)	❍	❍	❍	❍	❍	❍

APPENDIX K – VARIABLES PCA RESULTS FOR FIRM ABC

Independent Variables

Erosion Factors is the only independent variable in the conceptual model. The factor analysis (PCA using a *varimax* rotation) resulted in splitting Erosion Factors in two reliable factors: Main Erosion Factors and Cost of doing Research. The Main Erosion Factors groups all the following variables (see table below) except the Cost of doing Research that was separated as it didn't have the appropriate factor loading value. The result of the loading factors of each variable is outlined in the table below.

Table K-1: PCA Results - Independent Variables

Code	Main Erosion Factors (EROSION_F1)	Loading
EF1	Q5.1. Our role as a firm is increasingly becoming an integrator of knowledge from different sources internally and externally	0.603
EF2	Q5.2. Skilled workers are increasingly mobile	0.600
EF3	Q5.3. External suppliers (e.g. research providers, software providers) are increasingly knowledgeable	0.734
EF4	Q5.4. External options for unused internal ideas or knowledge developed by the firm are increasingly available	0.663
EF5	Q5.5. Clients are increasingly knowledgeable	0.691
EF6	Q5.6. Knowledge available outside traditional large professional services firms (e.g. Big Four) is increasingly available	0.711
EF7	Q5.7. Relevant research in universities and research centers is increasingly available	0.712
EF8	Q5.8. Costs of doing research and development internally is increasing	Separated
EF9	Q5.9. Venture capital market is creating new opportunities for firms in your industry	0.505
% VAR		43.072
KMO		0.862
Significance of Bartlett test of sphericity		0,000
α Cronbach		0.808

A Split-Half test (random two sets of items of four grouped together) was conducted to ensure that the fact that 8 items constitute the Erosion factor is what drives a higher alpha Cronbach. The result is a reliability measure of 0.77, which is considered close to the reliability of all 8 items together. Hence, using the 8 items under one factor is deemed reasonable.

The cost of research has been withdrawn because its loading factor was not appropriate (<0.5) and is therefore treated as a separate factor. Therefore, the factor Main Erosion Factors:

- Explains 43% of the variance alone
- Has a KMO result of 0.862, higher than rule of thumb of 0.5
- A significance of Bartlett test of sphericity of 0,000 which is ≤ 0.05, confirming that there is a minimum amount of correlation in the model for the PCA analysis to be valid
- A reliability of α Cronbach of 0.808, higher than the rule of thumb of 0.6.

Therefore, all the independent variables can be reduced and explained well through only two factors: Cost of doing Research (ECR) and Main Erosion Factors (EF).

Intermediary Variables

Open Innovation Processes is considered an intermediary variable based on the literature and exploratory studies, which revealed five main variables underlying it: inside-out, outside in, and coupled open innovation processes, client-focused innovations and external collaboration per type and phase of the innovation. As a result of the PCA, these five factors were confirmed and two new ones were added to the model: collaboration with core partners (5 variables within) and collaboration with adjacent partners (4 variables within). That resulted in a total of 7 reliable factors being considered grouping 29 variables as detailed below:

Intermediary Variable 1 - Factors Results

- **KMO = 0.771**
- **Cumulative Variance Explained = 59.994%**

Table K-2: PCA Results - Intermediary Variables 1

Code	OI In-Out Processes (COL_IN_OUT_F1)	Loading
CIO1	Q7.1. Your practice constantly seeks new applications outside the firm for internally developed innovations, tools, ideas....	0.519
CIO2	Q7.2. Important innovations in your practice are shared with external sources (outside the firm's boundaries)	0.663
CIO3	Q8.1. Your practice sells or licenses-out internally developed innovations & ideas to external entities	0.803
CIO4	Q8.2. Your practice spins-off parts of its services or business to external entities	0.806
% VAR		23.274
Significance of Bartlett test of sphericity		0.000
α Cronbach		0.745
Code	**OI Out-In Processes (COL _OUT_IN_F2)**	**Loading**
COI5	Q9. 1. Your practice constantly scans innovations developed outside the firm	0.736
COI6	Q9.3. Many important ideas in your practice and on client engagements come from external sources	0.670
COI7	Q10.1. Your practice buys or licenses-in externally developed innovations, ideas, and knowledge to use during internal innovation projects	0.638
COI8	Q10.2. Your practice acquires (M&A) parts of your services, business or practice from external entities	0.652
% VAR		20.681
Significance of Bartlett test of sphericity		0.000
α Cronbach		0.687
Code	**Innovation for Clients (COL_FOR_CLIENT_F3)**	**Loading**
CC9	Q7.3. Innovations are in majority used for clients and not for internal use	0.820
CC10	Q9.2. These innovations are primarily used for clients and not for internal use	0.853
% VAR		16.039
Significance of Bartlett test of sphericity		0.000
α Cronbach		0.677

Intermediary Variable 2 - Factors Results

- **KMO = 0.850 - Cumulative Variance Explained = 57.559 %**

Table K-3: PCA Results - Intermediary Variables 2

Code	Coupled processes practices (COL_COUPLE_PRACT_F1)	Loading
CPP1	Q13.1. Share internal knowledge outside the boundaries of the firm	0.647
CPP2	Q13.2. Constantly look for partnerships with external entities to innovate jointly	0.795
CPP3	Q13.3. Coordinate and integrate the exchange of external knowledge between different entities	0.827
CPP4	Q13.4. Use online collaboration tools to innovate with external partners	0.777
CPP5	Q13.5. Protect the firm's intellectual property in innovation development	0.504
% VAR		28.967
Significance of Bartlett test of sphericity		0.000
α Cronbach		0.805
Code	**Coupled processes types and phases (COL_COUPLE_TYPE_PHASE_F2)**	**Loading**
CTP1	- How often does your practice collaborate with external entities : Q11.1. New internal projects (i.e. related to non-billable work - e.g. thought leadership, new service development, conferences)	0.578
CTP2	Q11.2. During client engagements (i.e. billable work)?	0.691
CTP3	How important for your practice is collaborating with external entities during each of the following phases of innovation process: Q12.1 - Phase 1: Idea Generation/Brainstorming	0.752
CTP4	Q12.2 - Phase 2: Development	0.810
CTP5	Q12.3 - Phase 3: Delivery & Commercialization	0.751
% VAR		28.592
Significance of Bartlett test of sphericity		0.000
α Cronbach		0.810

Intermediary Variable 3 - Factors Results

- **KMO = 0.882 - Cumulative Variance Explained = 61.010% - Significance of Bartlett test of sphericity = 0.000**

Table K-4: PCA Results - Intermediary Variables 3

Code	Coupled Processes Partners Core (COL_COUPLE_PARTNER_CORE_F1)	Loading
CPC1	How important is the collaboration with these potential external entities for your practice's innovation: Q14.1. Suppliers (e.g. market research/technology/service providers)	0.587
CPC2	Q14.4. Industry associations	0.778
CPC3	Q14.5. Public sector (e.g. government, municipality)	0.655
CPC4	Q14.6. Clients	0.876
CPC5	Q14.9. Conferences, journals	0.555
% VAR		31.097
α Cronbach		0.813
Code	**Coupled Processes Partners Adjacent (COL_COUPLE_PARTNER_ADJACENT_F1)**	**Loading**
CPA1	Q14.2. Universities, Colleges, and Research Centers	0.734
CPA2	Q14.3. Communities	0.721
CPA3	Q14.7. Venture Capitalists	0.729
CPA4	Q14.8. Competitors	0.752
% VAR		29.914
α Cronbach		0.795

All the 29 intermediary variables are reduced under 7 factors grouped in 3 categories:

- **In-Out and Out-In processes (3 factors):**
    - The three factors explain 60% of the variance (equals the rule of thumb of 60% minimum)
    - Has a KMO result of 0.771, higher than rule of thumb of 0.5

- A significance of Bartlett test of sphericity of 0,000 which is ≤ 0.05, confirming that there is a minimum amount of correlation in the model for the PCA analysis to be valid
- A reliability of α Cronbach of 0.754, 0.687, and 0.677 respectively, all three higher than the rule of thumb of 0.6.

- **Coupled processes practices, types and phases (2 factors):**
  - The two factors explain 58% of the variance (very close to the rule of thumb of 60% minimum)
  - Has a KMO result of 0.850, higher than rule of thumb of 0.5
  - A significance of Bartlett test of sphericity of 0,000 is ≤ 0.05, confirming that there is a minimum amount of correlation in the model for the PCA analysis to be valid
  - A reliability of α Cronbach of 0.805 and 0.810 respectively, both factors higher than the rule of thumb of 0.6.
- **Coupled processes partners (2 factors):**
  - The two factors explain 61% of the variance (more than the rule of thumb of 60% minimum)
  - Has a KMO result of 0.882, higher than rule of thumb of 0.5
  - A significance of Bartlett test of sphericity of 0,000 is ≤ 0.05, confirming that there is a minimum amount of correlation in the model for the PCA analysis to be valid
  - A reliability of α Cronbach of 0.813 and 0.795 respectively, both factors higher than the rule of thumb of 0.6.

Based on these results, the intermediary variables can be explained well through the 7 factors.

Moderating Variables

Organizational Support

Organizational Support is the first of two variables presented as moderating the relationship between the Open Innovation Processes and the Impact on Practice's performance. The factor analysis resulted in one factor for the Organizational Support Variable and two independent factors that had only one variable (survey question) attributed to them respectively. The Organizational Support Variable groups the following questions with the results of the rotated component matrix presented in the following table:

Moderating Variables 1 - Factors Results

- **KMO = 0.750 - Significance of Bartlett test of sphericity = 0.000 - Variance explained = 66.842%**

Table K-5: PCA Results - Moderating Variables 1

Code	Organizational Support (ORG_SUPPORT_F1)	Loading
OS1	Q6.1. We are always given time to work on innovation projects	0.798
OS2	Q6.2. Our leadership has become more open to external collaboration opportunities for the firm	0.788
OS3	Q6.3. The firm increased rewards/incentives in place for external collaboration	0.825
OS4	Q6.4. The firm increased knowledge-sharing activities, tools, and processes externally with partners or public	0.793
% VAR		43.034
α Cronbach		0.819
Independent Factors: Individual Perception of OI		
Code	**Individual Preference In-Out (ORG_PREF_IN_OUT)**	**Loading**
PIO1	Q8.3. You personally believe that it is important to share internal knowledge and innovation with external parties	0.817
Code	**Individual Preference Out-In (ORG_PREF_OUT_IN)**	**Loading**
POI1	Q10.3. You personally believe that it is a good practice to use external sources of ideas, services, knowledge, products to innovate internally	0.836
VAR%		23.808
α Cronbach (for the last two variables)		**0.555**

The organizational support moderating variables resulted two independent factors with an α Cronbach <0.6, and are therefore treated separately. A third factor grouped the remaining 4 variables in this block. These moderating variables end up with three factors that:

- Explain 67% of the variance (more than the rule of thumb of 60% minimum)

- Have a KMO result of 0.750, higher than rule of thumb of 0.5
- A significance of Bartlett test of sphericity of 0,000 which is ≤ 0.05, confirming that there is a minimum amount of correlation in the model for the PCA analysis to be valid

Therefore, these moderating variables are reduced into the following factors:

1. **Organizational Support:**
   - Explains 43% of the variance
   - Has a reliability of α Cronbach of 0.819, higher than the rule of thumb of 0.6.
2. **Personal Preferences In-Out and Personal Preferences Out-In:**
   - Explain 24% of the variance
   - Became two separate factors with respective loading factors of 0.817 and 0.836.

Risk Management

Risk Management is the second group of the two moderating variables that affect the relationship between the Open Innovation Processes and the Impact on practices' performance. Initially, it groups 21 variables (questions). The PCA reduced them into six factors, out of which two are independent and had only one variable (question) attributed to each of them. The results are presented in these tables:

Moderating Variable 2 - Factors Results

- **KMO = 0.510**
- **Cumulative Variance Explained = 70.741%**
- **Bartlett Sphericity Significance = 0.000**
- **Three factors (2 being independent)**

Table K-6: PCA Results - Moderating Variables 2

Code	**Risk Management Practices (RISK_PRAC_F1)**	**Loading**
RP1	Q7.4. Clear and strict risk management practices are in place when it comes to sharing inside ideas and innovations externally	0.900
RP2	Q9.4. Clear and strict risk management practices are in place when it comes to using externally developed ideas, innovations, and knowledge	0.901
% VAR		40.893%
α Cronbach		0.774
Independent Factors: Individual Perception of Risk/Culture		
Code	**Not-Sold-Here (RISK_PER_IN_OUT)**	**Loading**
NSH1	Q8.4. You personally believe there is a risk of taking internally developed ideas & innovations to external parties	0.755
Code	**Not-Invented-Here (RISK_PER_OUT_IN)**	**Loading**
NIH1	Q10.4. You personally prefer to use internal knowledge or develop your own, rather than what is already existing externally	0.788
% VAR		29.849%
α Cronbach (for last two questions)		**0.333**

Moderating Variable 3 - Factors Results

- **KMO = 0.909**
- **Cumulative Variance Explained = 62.373%**
- **Bartlett Sphericity Significance = 0.000**

Table K-7: PCA Results Moderating Variable 3

Code	Risk Types (RISK_TYPE_F1)	Loading
RMT1	*How important is each of the following risks when collaborating closely with external parties on innovation projects:* Q16.1. Negative impact on firm's reputation	0.628
RMT2	Q16.2. Knowledge leakage and copying by the industry or competitors	0.636
RMT3	Q16.3. Loss of human resources to industry or competitors	0.643
RMT4	Q16.4. Difficulty of protecting the firm's intellectual property	0.649
RMT5	Q16.5. External partner's opportunistic behavior to take advantage of the openness	0.694
RMT6	Q16.6. Loss of focus on key priorities & client engagements	0.694
RMT7	Q16.7. Higher cost of developing the innovation than if done only internally	0.711
RMT8	Q16.8. Low potential pay-off from the collaboration	0.716
% VAR		23.607%
α Cronbach		0.867
Code	**IP Management Formal Means (IP_FORMAL_F2)**	**Loading**
IPF1	*How important are each of these practices for protecting the firm's intellectual property (IP):* Q15.1. Patents and utility models	0.883
IPF2	Q15.2. Trademarks	0.881
IPF3	Q15.3. Registration of service	0.833
IPF4	Q15.9. Publishing (to deter imitators)	0.650
% VAR		19.494%
α Cronbach		0.909

Table K-7: PCA Results Moderating Variable 3 (cont'd)

Code	IP Management Informal Means (IP_INFORMAL_F3)	Loading
IPI1	Q15.4. Contractual agreement	0.696
IPI2	Q15.5. Secrecy	0.738
IPI3	Q15.6. Complexity of service offering	0.610
IPI4	Q15.7. Restricted access to information	0.833
IP5	Q15.8. Informal IP protection	0.645
% VAR		19.272%
α Cronbach		0.845

The overall 21 risk management moderating variables were reduced to six factors, out of which two remained independent since their α Cronbach was <0.6 and are hence treated separately.

- **Group 1**

The first set of moderating variables within Risk management explain 70.7% of the variance, have a KMO of 0.510 (higher than the minimum 0.5 rule of thumb), and significance of Bartlett test of sphericity of 0,000:

1. **Risk Management Practices:**
   - Explains 40.9% of the variance
   - A reliability of α Cronbach of 0.774 for the first factor, higher than the rule of thumb of 0.6.
2. **Not-Invented-Here and Not-Sold-Here:**
   - Explains 29.9% of the variance
   - Became two separate factors with respective loading factors of 0.817 and 0.836.
   - A reliability of α Cronbach of 0.333, which implicate that the two questions are treated independently.

Questions on personal preferences are treated separately and not in a factor because their reliability is not enough, internal consistency is not achieved with this factor as part of the rotated matrix (α Cronbach is less than 0.6).

- **Group 2**

This group of variables analysis resulted in three factors that explain a combined 62.4% of the variance (more than the 60% rule of thumb), with a KMO of 0.909 and significance of Bartlett test of sphericity of 0,000:

1. **Risk Types:**
    - Explains 23.6% of the variance
    - α Cronbach of 0.867 for the first factor, higher than the rule of thumb of 0.6.
2. **IP protection formal means:**
    - Explains 19.5% of the variance
    - α Cronbach of 0.909 for the second factor, higher than the rule of thumb of 0.6.
3. **IP protection informal means:**
    - Explains 19.2% of the variance
    - α Cronbach of 0.845 for the third factor, higher than the rule of thumb of 0.6.

Dependent Variable

In total 6 dependent variables were part of the conceptual model: the propensity to innovate and the performance (5). The PCA was conducted on the 5 dependent variables under performance and reduced them into one factor grouping them all, as per table below:

Dependent/Outcome Variable 1 - Factors Results

- **KMO = 0.840**
- **Cumulative Variance Explained = 64.960%**
- **Bartlett Sphericity Significance = 0.000**
- **One factor**

Table K-8: PCA Results - Outcome Variables

Code	Performance (INNOV_PER_FIN_F1)	Loading
PER1	Q19.1. Increased client loyalty	0.809
PER2	Q19.2. Attracted a significant number of new clients	0.832
PER3	Q19.3.Constantly met its financial objectives	0.709
PER4	Q19.4. Become more innovative in the market	0.791
PER5	Q19.5. Improved its reputation in the market place	0.879
% VAR		64.960%
α Cronbach		0.864

In summary, the performance variables resulted in one factor that:

- Explains 64.9% of the variance (more than the rule of thumb of 60% minimum)
- Have a KMO result of 0.840, higher than rule of thumb of 0.5
- A significance of Bartlett test of sphericity of 0,000 which is ≤ 0.05.

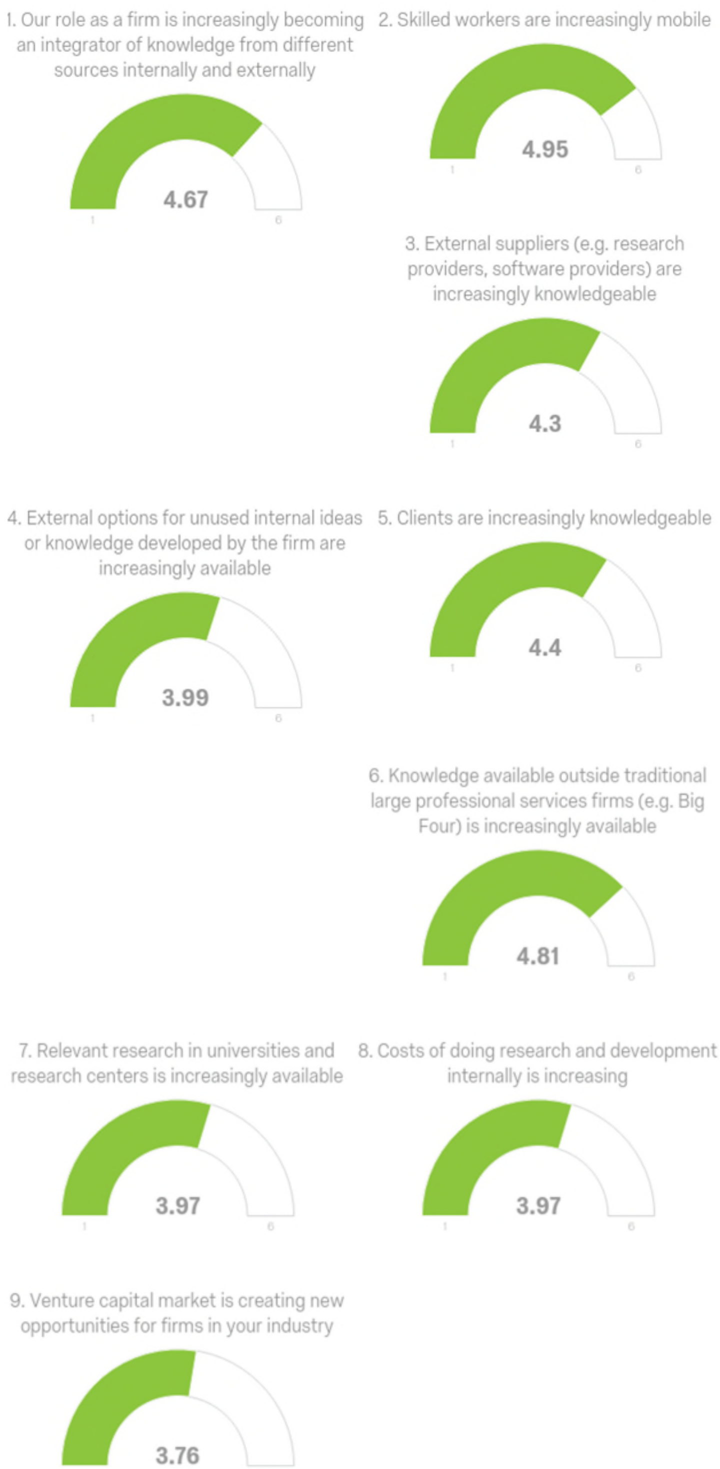
The two remaining dependent variables are: 1) the types of innovations that contributed to most of the growth, and 2) the propensity to innovate in the past 3 years:

Variable 3 – Propensity to innovate (NU_INNOV or NI) - Q18_5_ETPLUS: Split between less than 5 vs. more than 5 innovations.

APPENDIX L – FIRM ABC DETAILED SURVEY RESULTS (NOT TREATED, N=345)

Section 2 Erosion Factors

Q5 - Please indicate your level of agreement with the following statements (covering last 3 years):



Section 3 Organization

Q6 - Please indicate your level of agreement with the following statements:

Section 4 Inside-Out Innovation Process (Outbound)

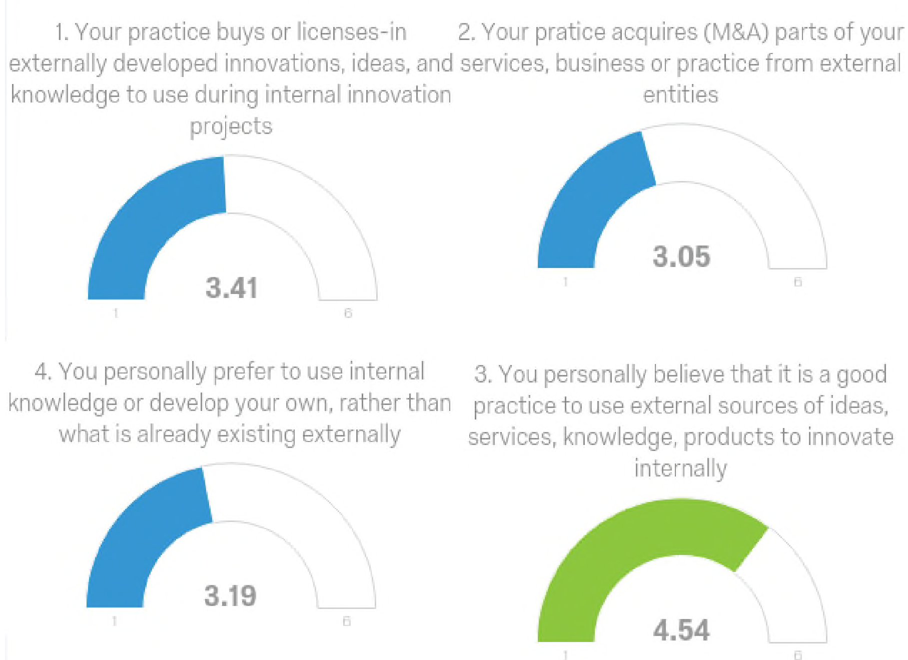
Q7 - Please indicate your level of agreement with the following statements:

Q9 - Please indicate your level of agreement with the following statements:

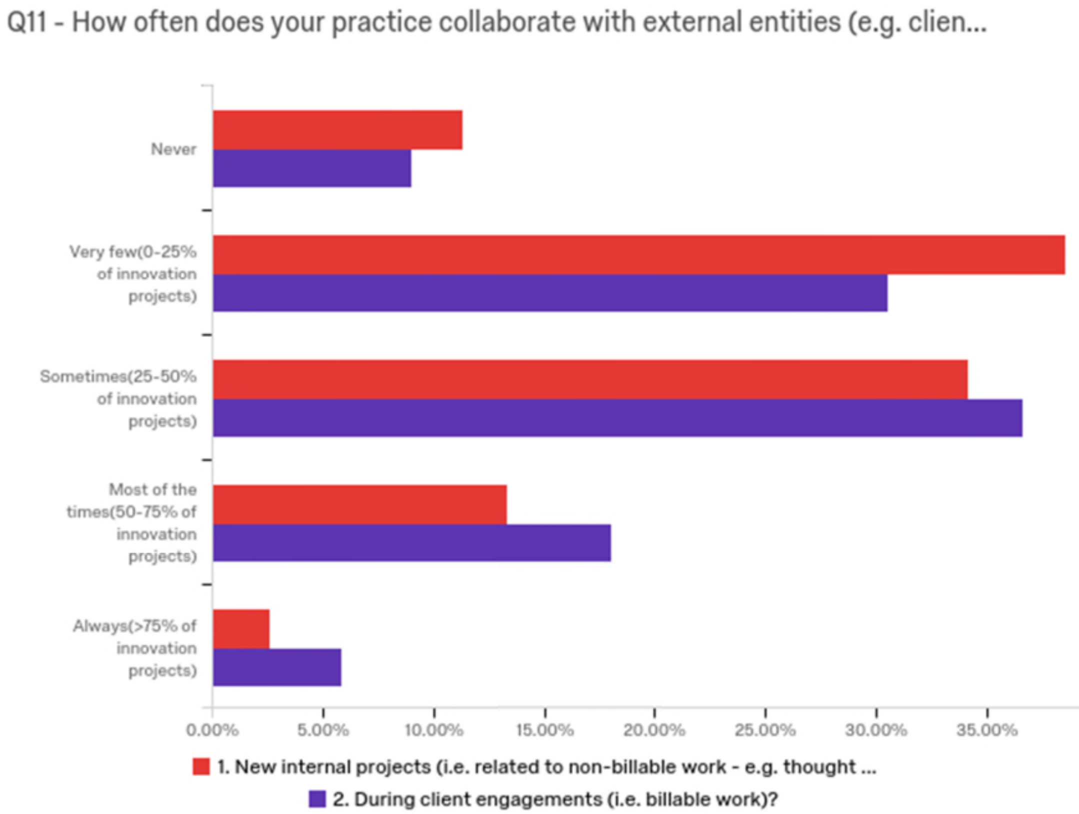
Section 5 Outside-In Innovation Process (Inbound)

Q9 - Please indicate your level of agreement with the following statements:1= to...

Q10 - Please indicate your level of agreement with the following statements:



Section 6 Coupled Open Innovation Process (Coupled)



Q12 – How important for your practice is collaboration with external entities during each of the following phases of the innovation process:

Q13 – Please indicate the level of importance of each of the following statements:

Q14 – How important is collaboration with these potential external entities

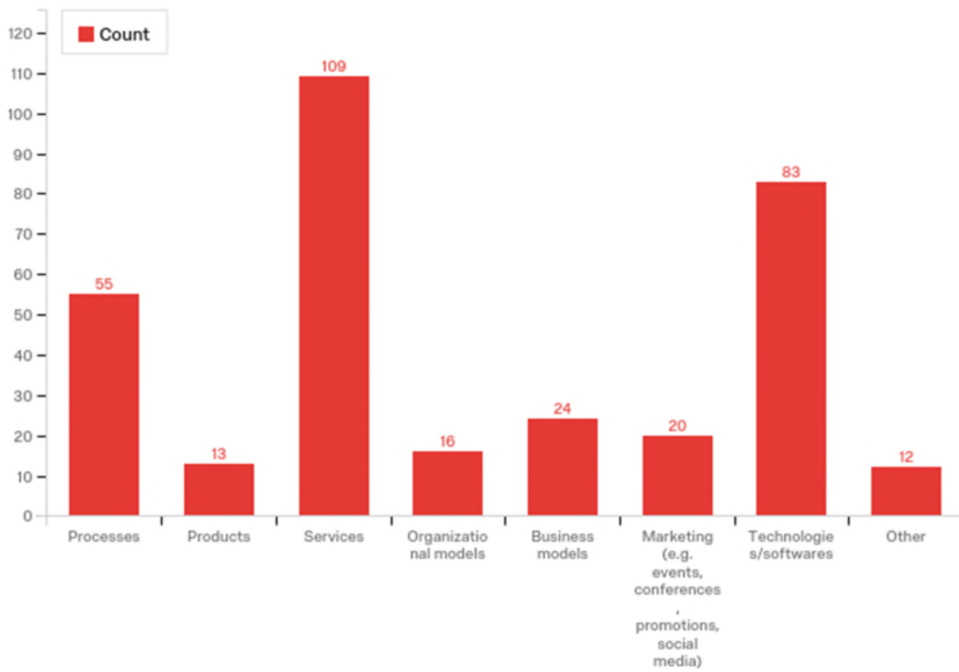
Q15 – How important are each of these practices for protecting the firm's IP

Q15 - How important are each of these practices for protecting the firm's intellectual property when collaborating with external parties in innovation						
Sub-Question	**Mean**	**Std Dev**	**Var.**	**N**	**Bottom 3 Box**	**Top 3 Box**
1. Patents and utility models	4.09	1.52	2.31	332	30.7%	69.3%
2. Trademarks	4.2	1.48	2.19	331	28.7%	71.3%
3. Registration of service	4.1	1.49	2.21	329	30.7%	69.3%
4. Contractual agreement	**4.96**	1.02	1.05	331	7.9%	92.2%
5. Secrecy	**4.37**	1.25	1.56	330	21.5%	78.5%
6. Complexity of service offering	4.25	1.25	1.57	329	22.8%	77.2%
7. Restricted access to information	**4.59**	1.21	1.46	332	17.2%	82.8%
8. Informal IP protection	**4.37**	1.32	1.74	331	23.0%	77.0%
9. Publishing (to deter imitators)	4.18	1.38	1.89	329	27.1%	73.0%

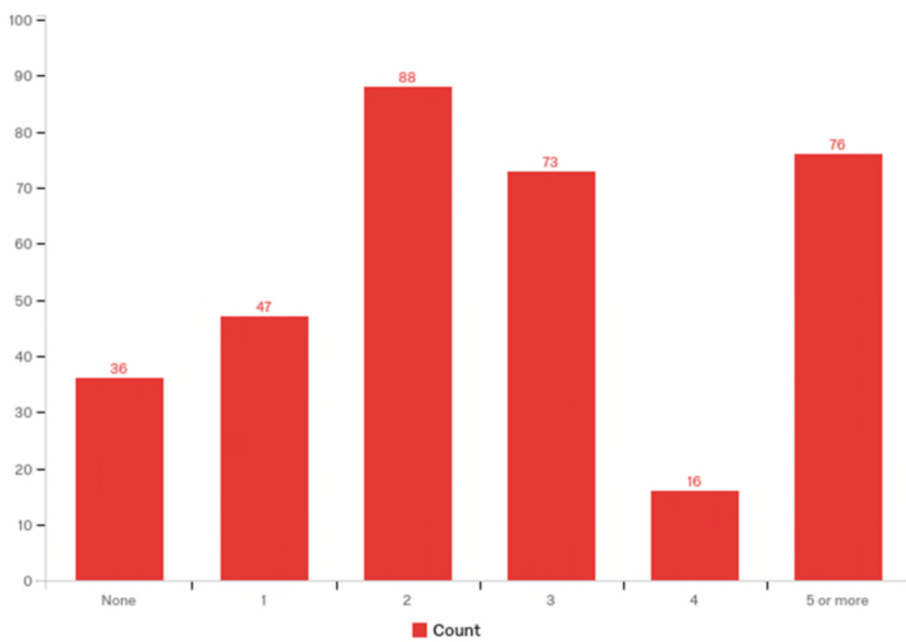
Q16 - How important is each of the following risks when collaborating closely with external parties								
Sub-Questions	**Min**	**Max**	**Mean**	**Std. Dev.**	**Var.**	**N**	**Bottom 3 Box**	**Top 3 Box**
1. Negative impact on firm's reputation	2	6	4.97	1.13	1.27	336	11.0%	89.0%
2. Knowledge leakage and copying by the industry or competitors	2	6	4.67	1.1	1.21	336	15.8%	84.2%
3. Loss of human resources to industry or competitors	1	6	4.39	1.15	1.33	336	20.5%	79.5%
4. Difficulty of protecting the firm's intellectual property	2	6	4.49	1.14	1.31	333	19.5%	80.5%
5. External partner's opportunistic behavior to take advantage of the openness	1	6	4.32	1.13	1.27	335	23.3%	76.7%
6. Loss of focus on key priorities & client engagements	1	6	4.35	1.15	1.32	335	22.1%	77.9%
7. Higher cost of developing the innovation than if done only internally	1	6	4.01	1.21	1.46	335	34.0%	66.0%
8. Low potential pay-off from the collaboration	1	6	4.24	1.16	1.34	334	25.2%	74.9%

Section 7 Impacts on Performance

Q17 - Which type of innovation contributed most to the growth of your practice's...



Q18 - Approximately, for the past 3 years, how many new innovations (e.g. a new o...



Q19 - Please indicate your level of agreement to the following statements: 1= to...

APPENDIX M – FACTORS MAPPING TO SURVEY QUESTIONS

Table M-1: Factors Mapping to Survey Questions

Group	Variable	Code	Questions no.	Survey Question Title
INDEPENDENT VARIABLES				
EROSION	Z_EROSION_F1	E1	Q5_6_REC	1. Our role as a firm is increasingly becoming an integrator of knowledge from different sources internally and externally
			Q5_16_REC	2. Skilled workers are increasingly mobile
			Q5_17_REC	3. External suppliers (e.g. research providers, software providers);are increasingly knowledgeable
			Q5_18_REC	4. External options for unused internal ideas or knowledge developed by the firm are increasingly available
			Q5_20_REC	5. Clients are increasingly knowledgeable
			Q5_21_REC	6. Knowledge available outside traditional large professional services firms (e.g. Big Four) is increasingly available
			Q5_22_REC	7. Relevant research in universities and research centers is increasingly available
			Q5_24_REC	9. Venture capital market is creating new opportunities for firms in your industry
	Z_EROSION_COST_RESEARCH	E2	Q5_23_REC	8. Costs of doing research and development internally is increasing
INTERMEDIARY VARIABLES				
OPEN INNOVATION PROCESSES	COL_IN_OUT_F1	C5	Q7_1_REC	1. Your practice constantly seeks new applications outside the firm for internally developed innovations, knowledge, tools, or ideas
			Q7_3_REC	2. Important innovations in your practice are shared with external sources (outside the firm's boundaries)
			Q8_1_REC	1. Your practice sells or licenses-out internally developed innovations & ideas to external entities
			Q8_2_REC	2. Your practice spins-off parts of its services or business to external entities
	COL_OUT_IN_F2	C6	Q9_1_REC	1. Your practice constantly scans innovations developed outside the firm
			Q9_3_REC	3. Many important ideas in your practice and on client engagements come from external sources
			Q10_1_REC	1. Your practice buys or licenses-in externally developed innovations,

Table M-1: Factors Mapping to Survey Questions (cont'd)

Group	Variable	Code	Questions no.	Survey Question Title
				ideas, and knowledge to use during internal innovation projects
			Q10_2_REC	2. Your practice acquires (M&A) parts of your services, business or practice from external entities
	COL_for_CLIENT_F3	C7	Q7_4_REC	3. Innovations are in majority used for clients and not for internal use
			Q9_2_REC	2. These innovations are primarily used for clients and not for internal use
	COL_COUPLE_PRACT_F1	C1	Q13_2_REC	1. Share internal knowledge outside the boundaries of the firm
			Q13_4_REC	2. Constantly look for partnerships with external entities to innovate jointly
			Q13_6_REC	3. Coordinate and integrate the exchange of external knowledge between different entities
			Q13_8_REC	4. Use online collaboration tools to innovate with external partners
			Q13_9_REC	5. Protect the firm's intellectual property in innovation development
	COL_COUPLE_TYPE_PHASE_F2	C2	Q11_1_POURCENTAGE	How often does your practice collaborate with external entities (e.g. clients, suppliers, universities...-1. New internal projects;(i.e. related to non-billable work - e.g. thought leadership, new service development, conferences)
			Q11_2_POURCENTAGE	How often does your practice collaborate with external entities (e.g. clients, suppliers, universities...-2. During client engagements (i.e. billable work)?
			Q12_1_REC	How important for your practice is collaborating with external entities during each of the follow...-Phase 1: Idea Generation/Brainstorming
			Q12_2_REC	How important for your practice is collaborating with external entities during each of the follow...-Phase 2: Development
			Q12_3_REC	How important for your practice is collaborating with external entities during each of the follow...- Phase 3: Delivery & Commercialization
	COL_COUPLE_PARTNER_CORE_F1	C3	Q14_1_REC	1. Suppliers (e.g. market research/technology/service providers)
			Q14_6_REC	4. Industry associations
			Q14_7_REC	5. Public sector (e.g. government, municipality)
			Q14_8_REC	6. Clients
			Q14_12_REC	9. Conferences, journals
	COL_COUPLE_PARTNER_ADJ_F2	C4	Q14_3_REC	2. Universities, Colleges, and Research Centers
			Q14_5_REC	3. Communities
			Q14_9_REC	7. Venture Capitalists

Table M-1: Factors Mapping to Survey Questions (cont'd)

Group	Variable	Code	Questions no.	Survey Question Title
			Q14_10_REC	8. Competitors
MODERATING VARIABLES				
ORGANIZATION	Z_ORG_SUPPORT_F1	O1	Q6_1_REC	1. We are always given time to work on innovation projects
			Q6_2_REC	2. Our leadership has become more open to external collaboration opportunities for the firm
			Q6_4_REC	3. The firm increased rewards/incentives in place for external collaboration
			Q6_6_REC	4. The firm increased knowledge-sharing activities, tools, and processes externally with partners or public
	Z_ORG_PREF_IN_OUT	O2	Q8_3_REC	3. You personally believe that it is important to share internal knowledge and innovation with external parties
	Z_ORG_PREF_OUT_IN	O3	Q10_3_REC	3. You personally believe that it is a good practice to use external sources of ideas, services, knowledge, products to innovate internally
RISK	RISK_PRAC_F1	R1	Q7_5_REC	4. Clear and strict risk management practices are in place when it comes to sharing inside ideas and innovations externally
			Q9_4_REC	4. Clear and strict risk management practices are in place when it comes to using externally developed ideas, innovations, and knowledge
	RISK_PER_IN_OUT	R2	Q8_4_REC	4. You personally believe there is a risk of taking internally developed ideas & innovations to external parties
	RISK_PER_OUT_IN	R3	Q10_4_REC	4. You personally prefer to use internal knowledge or develop your own, rather than what is already existing externally
	RISK_TYPE_F1	R4	Q16_1_REC	1. Negative impact on firm's reputation
			Q16_2_REC	2. Knowledge leakage and copying by the industry or competitors
			Q16_4_REC	3. Loss of human resources to industry or competitors
			Q16_5_REC	4. Difficulty of protecting the firm's intellectual property
			Q16_7_REC	5. External partner's opportunistic behavior to take advantage of the openness
			Q16_8_REC	6. Loss of focus on key priorities & client engagements
			Q16_9_REC	7. Higher cost of developing the innovation than if done only internally
			Q16_10_REC	8. Low potential pay-off from the collaboration
	IP_FORMAL_F2	R5	Q15_1_REC	1. Patents and utility models
			Q15_2_REC	2. Trademarks

Table M-1: Factors Mapping to Survey Questions (cont'd)

Group	Variable	Code	Questions no.	Survey Question Title
			Q15_3_REC	3. Registration of service
			Q15_11_REC	9. Publishing (to deter imitators)
	IP_INFORMAL_F3	R6	Q15_4_REC	4. Contractual agreement
			Q15_5_REC	5. Secrecy
			Q15_6_REC	6. Complexity of service offering
			Q15_8_REC	7. Restricted access to information
			Q15_10_REC	8. Informal IP protection
OUTCOME/ DEPENDENT VARIABLES				
IMPACT	INNOV_PER_FIN_F1	I1	Q19_1_REC	1. Increased client loyalty
			Q19_2_REC	2. Attracted a significant number of new clients
			Q19_3_REC	3.Constantly met its financial objectives
			Q19_4_REC	4. Become more innovative in the market
			Q19_6_REC	5. Improved its reputation in the market place
	INNOV_PROCESS	I2	Q17	INNOV_PROCESS
	INNOV_PRODUCT	I3		INNOV_PRODUCT
	INNOV_ORG	I4		INNOV_ORG
	INNOV_TECH	I5		INNOV_TECH
	Q18_REC	I6	Q18	Q18_REC
	Q18_0_1	I7		Q18_0_1
	Q18_MED	I8		Q18_MED
	Q18_5_ETPLUS	I9		Q18_5_ETPLUS
CONTROL VARIABLES				
LINE OF SERVICE	Q1_ASS		Q1	Q1_ASS
	Q1_TAX			Q1_TAX
	Q1_CONS			Q1_CONS
	Q1_DEALS			Q1_DEALS
	Q1_IFS			Q1_IFS

Table M-1: Factors Mapping to Survey Questions (cont'd)

Group	Variable	Code	Questions no.	Survey Question Title
GEOGRAPHY	Q2_QUEBEC		Q2	Q2_QUEBEC
	Q2_ONTARIO			Q2_ONTARIO
	Q2_BC			Q2_BC
	Q2_MARITIMES			Q2_MARITIMES
YEARS OF EXISTENCE	Q3_CONT		Q3	Q3_CONT
LEVEL	Q4_MGRDIR		Q4	Q4_MGRDIR

APPENDIX N – CORRELATION MATRIX FIRM ABC

Correlation Matrix (Part 1 – Control Variables)

Table N-1: Correlation Matrix Part 1

	Q1_ASS		Q1_TAX		Q1_CONS		Q1_DEALS		Q1_IFS		Q2_PRAIRIES		Q2_ONTARIO		Q2_BC		Q2_QUEBEC		Q2_MARITIMES		Q3_CONT		Q4_MGR		Q4_MGRPART	
	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)
Q1_ASS	1																									
Q1_TAX	-0.365	0.000	1.000																							
Q1_CONS	-0.395	0.000	-0.307	0.000	1																					
Q1_DEALS	-0.220	0.000	-0.171	0.001	-0.185	0.000	1																			
Q1_IFS	-0.249	0.000	-0.193	0.000	-0.209	0.000	-0.116	0.029	1																	
Q2_PRAIRIES	0.080	0.136	0.096	0.071	-0.081	0.128	-0.055	0.300	-0.080	0.132	1															
Q2_ONTARIO	-0.168	0.002	-0.055	0.306	0.098	0.067	0.008	0.884	0.176	0.001	-0.483	0.000	1													
Q2_BC	0.070	0.191	0.024	0.659	-0.021	0.693	-0.012	0.826	-0.093	0.081	-0.143	0.007	-0.383	0.000	1											
Q2_QUEBEC	0.090	0.090	-0.022	0.684	-0.013	0.810	0.023	0.666	-0.107	0.045	-0.183	0.001	-0.488	0.000	-0.145	0.006	1									
Q2_MARITIMES	0.005	0.932	-0.043	0.422	-0.052	0.333	0.072	0.180	0.054	0.316	-0.069	0.198	-0.184	0.001	-0.055	0.307	-0.069	0.193	1							
Q3_CONT	0.149	0.005	0.100	0.060	-0.192	0.000	0.014	0.792	-0.101	0.059	0.065	0.221	-0.153	0.004	0.039	0.469	0.077	0.147	0.082	0.126	1					
Q4_MGR	0.200	0.000	0.044	0.415	-0.141	0.008	-0.104	0.052	-0.062	0.245	-0.013	0.814	-0.032	0.550	0.002	0.965	0.018	0.734	0.083	0.124	-0.141	0.008	1			
Q4_MGRPART	0.002	0.973	-0.033	0.541	0.034	0.526	0.125	0.019	-0.120	0.025	-0.004	0.935	-0.080	0.137	0.047	0.377	0.070	0.192	0.008	0.889	0.084	0.119	-0.345	0.000	1	
Z_EROSION_F1	-0.085	0.120	0.046	0.397	0.027	0.626	-0.078	0.153	0.103	0.060	0.019	0.726	0.015	0.780	-0.099	0.070	0.062	0.261	-0.050	0.365	0.036	0.516	-0.013	0.820	0.056	0.307
Z_EROSION_COST_RESEARCH	0.024	0.661	0.117	0.029	-0.121	0.024	-0.015	0.783	-0.011	0.843	0.041	0.440	-0.080	0.133	0.017	0.746	0.045	0.407	0.023	0.663	0.066	0.217	0.075	0.166	-0.023	0.670
Z_COL_IN_OUT_F1	0.147	0.007	0.122	0.024	-0.132	0.015	-0.178	0.001	-0.036	0.508	0.100	0.066	-0.034	0.530	-0.104	0.055	0.090	0.097	-0.129	0.017	-0.112	0.039	0.172	0.001	-0.027	0.619
Z_COL_OUT_IN_F2	-0.018	0.734	-0.027	0.621	0.086	0.113	-0.024	0.657	-0.031	0.566	0.024	0.655	0.074	0.175	-0.044	0.413	-0.026	0.636	-0.148	0.006	-0.066	0.227	-0.052	0.344	0.027	0.616
Z_COL_for_CLIENT_F3	-0.135	0.013	0.082	0.130	0.282	0.000	-0.094	0.082	-0.204	0.000	-0.049	0.364	0.108	0.045	-0.015	0.789	-0.042	0.439	-0.108	0.046	-0.099	0.067	-0.095	0.082	0.100	0.066
Z_COL_COUPLE_PRACT_F1	0.023	0.679	0.011	0.847	0.149	0.006	-0.200	0.000	-0.063	0.248	0.017	0.761	0.006	0.910	0.041	0.458	-0.057	0.294	-0.003	0.956	-0.077	0.158	-0.049	0.370	0.017	0.756
Z_COL_COUPLE_TYPE_PHASE_F2	-0.005	0.926	0.043	0.434	0.104	0.055	-0.121	0.026	-0.077	0.160	0.074	0.177	-0.059	0.278	-0.101	0.065	0.110	0.043	-0.040	0.466	-0.059	0.276	0.096	0.079	-0.037	0.505
Z_COL_COUPLE_PARTNER_CORE_F1	-0.058	0.288	0.049	0.375	0.138	0.011	-0.014	0.793	-0.150	0.006	0.022	0.692	-0.081	0.139	0.049	0.372	0.030	0.580	0.038	0.487	0.006	0.907	-0.133	0.015	-0.006	0.918
Z_COL_COUPLE_PARTNER_ADJ_F2	0.110	0.045	-0.004	0.946	-0.077	0.157	-0.116	0.033	0.058	0.290	0.015	0.791	-0.023	0.673	-0.038	0.484	0.062	0.256	-0.029	0.596	-0.039	0.476	0.166	0.002	-0.071	0.197
Z_ORG_SUPPORT_F1	0.003	0.959	0.061	0.261	-0.070	0.193	-0.086	0.109	0.090	0.095	0.019	0.723	0.063	0.244	-0.141	0.009	0.072	0.181	-0.142	0.008	-0.075	0.167	0.047	0.384	0.031	0.565
Z_ORG_PREF_IN_OUT	0.059	0.273	0.038	0.478	0.076	0.155	-0.180	0.001	-0.074	0.165	0.068	0.202	-0.076	0.153	0.037	0.484	0.041	0.442	-0.088	0.102	-0.019	0.727	-0.060	0.268	0.045	0.402
Z_ORG_PREF_OUT_IN	-0.097	0.069	0.004	0.936	0.144	0.007	-0.037	0.495	-0.026	0.633	0.011	0.840	-0.044	0.416	-0.037	0.490	0.084	0.116	-0.010	0.845	0.103	0.053	-0.134	0.013	0.046	0.398
Z_RISK_PRACT_F1	-0.060	0.268	0.122	0.024	-0.150	0.005	0.004	0.942	0.129	0.016	0.003	0.963	0.072	0.182	-0.115	0.033	0.067	0.218	-0.170	0.002	-0.073	0.178	-0.072	0.185	0.034	0.531
Z_RISK_PER_IN_OUT	-0.048	0.366	0.184	0.001	-0.085	0.112	0.029	0.595	-0.079	0.139	0.039	0.464	0.117	0.028	-0.020	0.716	-0.152	0.004	-0.075	0.162	-0.065	0.228	0.029	0.593	-0.094	0.080
Z_RISK_PER_OUT_IN	0.122	0.022	0.035	0.519	-0.136	0.011	-0.023	0.666	-0.018	0.731	-0.043	0.424	0.119	0.026	-0.032	0.549	-0.072	0.181	-0.053	0.322	-0.076	0.155	0.175	0.001	-0.112	0.038
Z_RISK_TYPE_F1	-0.029	0.606	0.132	0.018	-0.099	0.075	-0.012	0.832	0.014	0.800	-0.008	0.886	0.066	0.238	-0.003	0.960	-0.040	0.477	-0.088	0.115	-0.088	0.113	0.032	0.572	0.055	0.330
Z_IP_FORMAL_F2	0.084	0.133	-0.104	0.062	0.002	0.967	-0.093	0.095	0.094	0.092	0.052	0.352	0.014	0.809	-0.059	0.287	-0.051	0.365	0.073	0.193	-0.124	0.025	0.114	0.041	-0.061	0.275
Z_IP_INFORMAL_F3	-0.008	0.887	0.014	0.807	-0.044	0.434	-0.003	0.959	0.054	0.330	-0.047	0.401	0.013	0.815	0.031	0.577	-0.004	0.937	0.012	0.828	0.041	0.463	0.001	0.986	-0.014	0.804
INNOV_PROCESS	-0.036	0.513	0.047	0.387	-0.071	0.192	-0.093	0.089	0.172	0.001	0.006	0.914	0.003	0.949	0.007	0.903	-0.047	0.390	0.075	0.168	-0.002	0.974	0.040	0.465	0.030	0.580
INNOV_PRODUCT	-0.027	0.620	-0.008	0.881	0.030	0.588	0.181	0.001	-0.152	0.005	-0.056	0.306	0.000	0.998	-0.007	0.898	0.093	0.088	-0.079	0.146	-0.088	0.107	-0.077	0.158	-0.013	0.815
INNOV_ORG	-0.115	0.035	-0.037	0.498	0.106	0.053	-0.018	0.740	0.090	0.100	0.079	0.148	-0.036	0.504	-0.025	0.642	0.005	0.933	-0.028	0.611	-0.013	0.811	-0.044	0.418	0.002	0.977
INNOV_TECH	0.168	0.002	0.001	0.991	-0.066	0.227	-0.102	0.062	-0.069	0.209	-0.015	0.778	0.030	0.579	0.025	0.644	-0.066	0.226	0.047	0.394	0.112	0.039	0.091	0.096	-0.015	0.790
Q18_REC	0.099	0.070	0.071	0.193	-0.109	0.047	-0.176	0.001	0.072	0.186	-0.042	0.445	0.018	0.742	0.026	0.637	0.059	0.282	-0.145	0.008	0.169	0.002	-0.046	0.401	0.088	0.111
Q18_0_1	-0.100	0.068	-0.113	0.039	0.063	0.253	0.199	0.000	0.030	0.584	-0.012	0.823	0.013	0.816	-0.065	0.234	-0.021	0.696	0.161	0.003	-0.113	0.038	0.024	0.658	-0.066	0.232
Q18_MED	0.091	0.096	0.068	0.212	-0.118	0.031	-0.127	0.020	0.056	0.307	-0.066	0.229	0.035	0.519	0.046	0.403	0.034	0.540	-0.126	0.021	0.169	0.002	-0.029	0.604	0.080	0.145
Q18_5_ETPLUS	0.059	0.285	0.000	0.996	-0.083	0.131	-0.097	0.075	0.121	0.027	-0.048	0.379	0.020	0.721	-0.025	0.655	0.062	0.262	-0.045	0.412	0.084	0.125	-0.065	0.241	0.102	0.064
INNOV_PERF_FIN	-0.021	0.706	-0.006	0.910	0.079	0.147	-0.030	0.577	-0.043	0.430	0.052	0.342	-0.048	0.381	-0.120	0.027	0.138	0.011	-0.058	0.286	-0.089	0.102	-0.018	0.741	0.061	0.268

Correlation Matrix (Part 2 - Independent Variables and Intermediary: Erosion and OI Processes)

Table N-2: Correlation Matrix Part 2

	Z_EROSION_F1		Z_EROSION_COST_RESEARCH			Z_COL_IN_OUT_F1		Z_COL_OUT_IN_F2		Z_COL_for_CLIENT_F3		Z_COL_COUPLE_PRACT_F1		Z_COL_COUPLE_TYPE_PHASE_F2		Z_COL_COUPLE_PARTNER_CORE_F1		Z_COL_COUPLE_PARTNER_ADJ_F2	
	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)		Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)
Z_EROSION_F1	1																		
Z_EROSION_COST_RESEARCH	0.243	0.000	1																
Z_COL_IN_OUT_F1	0.242	0.000	0.062	0.255		1													
Z_COL_OUT_IN_F2	0.210	0.000	0.195	0.000		0.000	1.000	1											
Z_COL_for_CLIENT_F3	0.148	0.007	-0.015	0.777		0.000	1.000	0.000	1.000	1									
Z_COL_COUPLE_PRACT_F1	0.297	0.000	0.060	0.271		0.146	0.008	0.216	0.000	0.153	0.005	1							
Z_COL_COUPLE_TYPE_PHASE_F2	0.133	0.017	0.040	0.461		0.262	0.000	0.244	0.000	0.069	0.210	0.000	1.000	1					
Z_COL_COUPLE_PARTNER_CORE_F1	0.157	0.005	0.010	0.861		0.105	0.058	0.186	0.001	0.206	0.000	0.469	0.000	0.228	0.000	1			
Z_COL_COUPLE_PARTNER_ADJ_F2	0.245	0.000	0.167	0.002		0.280	0.000	0.078	0.159	-0.046	0.404	0.289	0.000	0.215	0.000	0.000	1.000	1	
Z_ORG_SUPPORT_F1	0.346	0.000	0.163	0.002		0.400	0.000	0.303	0.000	0.071	0.192	0.153	0.005	0.263	0.000	0.063	0.256	0.216	0.000
Z_ORG_PREF_IN_OUT	0.387	0.000	0.123	0.021		0.332	0.000	0.063	0.249	0.220	0.000	0.278	0.000	0.119	0.028	0.193	0.000	0.192	0.000
Z_ORG_PREF_OUT_IN	0.314	0.000	0.192	0.000		0.080	0.139	0.297	0.000	0.178	0.001	0.133	0.015	0.053	0.329	0.209	0.000	0.015	0.787
Z_RISK_PRACT_F1	0.272	0.000	0.143	0.008		0.251	0.000	0.238	0.000	0.109	0.045	0.132	0.016	0.110	0.046	0.085	0.122	0.116	0.036
Z_RISK_PER_IN_OUT	0.044	0.426	0.183	0.001		0.078	0.152	0.223	0.000	0.088	0.105	0.004	0.948	0.044	0.417	0.109	0.046	-0.016	0.776
Z_RISK_PER_OUT_IN	0.069	0.210	0.089	0.097		0.160	0.003	0.100	0.065	0.057	0.298	-0.101	0.065	0.075	0.173	-0.025	0.651	0.141	0.010
Z_RISK_TYPE_F1	0.089	0.119	0.064	0.254		0.059	0.294	0.207	0.000	0.057	0.308	0.098	0.081	0.123	0.030	0.136	0.015	0.112	0.046
Z_IP_FORMAL_F2	0.140	0.014	0.084	0.132		0.116	0.038	-0.007	0.904	-0.097	0.084	0.280	0.000	0.077	0.171	0.116	0.039	0.417	0.000
Z_IP_INFORMAL_F3	0.277	0.000	0.243	0.000		0.162	0.004	0.126	0.025	-0.016	0.770	0.250	0.000	0.099	0.079	0.271	0.000	0.148	0.008
INNOV_PROCESS	-0.019	0.733	0.050	0.360		-0.045	0.414	-0.029	0.597	-0.143	0.009	-0.056	0.314	-0.030	0.584	-0.152	0.006	-0.016	0.772
INNOV_PRODUCT	0.069	0.217	-0.020	0.719		0.081	0.141	-0.033	0.555	0.143	0.010	-0.047	0.398	0.028	0.617	0.090	0.107	0.090	0.104
INNOV_ORG	-0.024	0.665	-0.030	0.590		-0.139	0.011	0.006	0.912	-0.011	0.839	-0.015	0.789	0.036	0.514	-0.034	0.543	-0.035	0.529
INNOV_TECH	-0.038	0.496	0.004	0.943		0.078	0.156	0.057	0.299	-0.020	0.712	0.118	0.033	-0.038	0.496	0.069	0.219	-0.055	0.321
Q18_REC	0.125	0.025	-0.004	0.940		0.196	0.000	0.233	0.000	-0.028	0.619	0.099	0.075	0.081	0.145	0.139	0.013	-0.002	0.975
Q18_0_1	-0.087	0.119	-0.035	0.527		-0.214	0.000	-0.147	0.008	0.005	0.928	-0.086	0.121	-0.091	0.104	-0.098	0.080	-0.034	0.543
Q18_MED	0.083	0.138	-0.014	0.795		0.190	0.001	0.162	0.003	-0.008	0.886	0.046	0.414	0.066	0.238	0.121	0.031	0.050	0.375
Q18_5_ETPLUS	0.112	0.045	-0.029	0.593		0.108	0.050	0.210	0.000	-0.081	0.143	0.060	0.285	0.007	0.895	0.105	0.060	-0.052	0.356
INNOV_PERF_FIN	0.342	0.000	0.088	0.105		0.251	0.000	0.331	0.000	0.197	0.000	0.306	0.000	0.212	0.000	0.295	0.000	0.111	0.045

Correlation Matrix (Part 3 - Moderating Variables: Organizational Support and Risks)

Table N-3: Correlation Matrix Part 3

	Z_ORG_SUPPORT_F1		Z_ORG_PREF_IN_OUT		Z_ORG_PREF_OUT_IN		Z_RISK_PRACT_F1		Z_RISK_PER_IN_OUT		Z_RISK_PER_OUT_IN		Z_RISK_TYPE_F1		Z_IP_FORMAL_F2		Z_IP_INFORMAL_F3	
	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)
Z_EROSION_F1																		
Z_ORG_SUPPORT_F1	1																	
Z_ORG_PREF_IN_OUT	0.117	0.029	1															
Z_ORG_PREF_OUT_IN	0.034	0.524	0.384	0.000	1													
Z_RISK_PRACT_F1	0.371	0.000	0.156	0.004	0.125	0.021	1											
Z_RISK_PER_IN_OUT	0.197	0.000	-0.081	0.131	0.000	0.994	0.109	0.044	1									
Z_RISK_PER_OUT_IN	0.151	0.005	-0.029	0.592	-0.100	0.062	-0.043	0.431	0.198	0.000	1							
Z_RISK_TYPE_F1	0.232	0.000	-0.085	0.128	-0.018	0.747	0.183	0.001	0.225	0.000	0.133	0.017	1					
Z_IP_FORMAL_F2	0.104	0.064	0.133	0.017	-0.024	0.671	0.151	0.007	-0.048	0.387	-0.023	0.685	0.000	1.000	1			
Z_IP_INFORMAL_F3	0.175	0.002	0.109	0.051	0.126	0.023	0.188	0.001	0.231	0.000	-0.001	0.982	0.000	1.000	0.000	1.000	1	
INNOV_PROCESS	-0.126	0.022	-0.037	0.503	-0.045	0.413	-0.048	0.383	-0.043	0.428	-0.068	0.217	-0.005	0.927	0.018	0.754	-0.081	0.151
INNOV_PRODUCT	0.152	0.005	0.095	0.082	0.061	0.267	-0.011	0.845	0.091	0.097	0.157	0.004	0.069	0.225	0.017	0.766	0.000	0.994
INNOV_ORG	-0.111	0.042	-0.038	0.491	0.019	0.731	-0.050	0.365	-0.105	0.056	-0.041	0.460	-0.108	0.056	-0.004	0.946	-0.016	0.780
INNOV_TECH	0.045	0.411	-0.039	0.480	-0.045	0.409	0.103	0.062	0.034	0.534	-0.077	0.159	0.027	0.636	-0.032	0.568	0.090	0.112
Q18_REC	0.225	0.000	0.181	0.001	0.192	0.000	0.236	0.000	0.066	0.229	-0.056	0.309	0.109	0.054	-0.091	0.109	0.193	0.001
Q18_0_1	-0.133	0.015	-0.155	0.005	-0.158	0.004	-0.182	0.001	-0.078	0.155	-0.001	0.991	-0.076	0.179	0.046	0.414	-0.132	0.020
Q18_MED	0.183	0.001	0.140	0.011	0.173	0.001	0.206	0.000	0.074	0.179	-0.037	0.502	0.109	0.053	-0.068	0.229	0.201	0.000
Q18_5_ETPLUS	0.166	0.002	0.117	0.032	0.144	0.008	0.178	0.001	0.047	0.393	-0.087	0.113	0.110	0.052	-0.120	0.034	0.127	0.025
INNOV_PERF_FIN	0.388	0.000	0.213	0.000	0.292	0.000	0.356	0.000	0.124	0.022	0.010	0.853	0.255	0.000	0.116	0.038	0.191	0.001

Correlation Matrix (Part 4 - Outcome/Criterion Variables: Perforamand and Innovations)

Table N-4: Correlation Matrix Part 4

	INNOV_PROCESS		INNOV_PRODUCT		INNOV_ORG		INNOV_TECH		Q18_REC		Q18_0_1		Q18_MED		Q18_5_ETPLUS		INNOV_PERF_FIN	
	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)	Pear. Corr.	Sig. (2-tailed)
INNOV_PROCESS	1																	
INNOV_PRODUCT	-0.368	0.000	1															
INNOV_ORG	-0.237	0.000	-0.379	0.000	1													
INNOV_TECH	-0.274	0.000	-0.439	0.000	-0.282	0.000	1											
Q18_REC	-0.056	0.312	-0.022	0.684	-0.116	0.034	0.182	0.001	1									
Q18_0_1	-0.017	0.758	0.096	0.079	0.024	0.667	-0.114	0.038	-0.735	0.000	1							
Q18_MED	-0.087	0.114	-0.041	0.459	-0.078	0.159	0.195	0.000	0.840	0.000	-0.562	0.000	1					
Q18_5_ETPLUS	-0.093	0.092	0.051	0.351	-0.139	0.011	0.154	0.005	0.790	0.000	-0.308	0.000	0.548	0.000	1			
INNOV_PERF_FIN	-0.135	0.013	0.019	0.726	0.017	0.752	0.085	0.118	0.333	0.000	-0.330	0.000	0.294	0.000	0.193	0.000	1	

APPENDIX O – FIRM ABC ANOVA DETAILED RESULTS

Table O-1: ANOVA Detailed Results – Line of Service

ANOVA Analysis 1

CONTROL VARIABLE: Line of Service

Legend:	ASSURANCE		TAX		CONSULTING		DEALS		IFS		ALL		K-W	M-W									
0,05 < p <= 0,10	N_1=113		N_2=78		N_3=88		N_4=33		N_5=41		N_T=353		p-value Test Global	p-value									
0,01 < p <= 0,05														Two-tail									
0,001 < p <= 0,01	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.		1 vs 2	1 vs 3	1 vs 4	1 vs 5	2 vs 3	2 vs 4	2 vs 5	3 vs 4	3 vs 5	4 vs 5
p <= 0,001																							
EROSION	5.024	0.865	5.205	0.797	5.082	0.857	4.899	0.829	5.276	0.677	5.096	0.828	0.2502	0.1475	0.6237	0.5457	0.0938	0.3929	0.0869	0.8000	0.2549	0.2786	0.0981
EROSION_COST_RESEARCH	4.696	1.407	4.974	1.450	4.326	1.627	4.576	1.437	4.600	1.630	4.645	1.510	0.1130	0.1660	0.1037	0.6378	0.8583	0.0089	0.1616	0.2517	0.4740	0.3486	0.8229
COL_IN_OUT	3.811	1.248	3.901	1.276	3.477	1.275	2.789	1.148	3.375	1.356	3.603	1.299	0.0002	0.6356	0.0638	0.0000	0.0775	0.0469	0.0001	0.0560	0.0073	0.7274	0.0692
COL_OUT_IN	3.988	1.179	4.010	1.074	4.124	1.283	3.656	1.293	3.779	1.354	3.972	1.216	0.5034	0.9191	0.4784	0.2529	0.4841	0.5300	0.2298	0.4468	0.1063	0.2326	0.7036
COL_for_CLIENT	4.176	1.284	4.675	1.169	5.112	1.357	3.969	1.295	3.575	1.678	4.429	1.415	0.0000	0.0064	0.0000	0.4737	0.0288	0.0135	0.0101	0.0004	0.0001	0.0000	0.2516
COL_COUPLE_PRACT	4.960	1.178	4.995	1.072	5.298	1.039	4.121	1.154	4.654	1.285	4.935	1.173	0.0000	0.8169	0.0260	0.0004	0.2482	0.0253	0.0010	0.2882	0.0000	0.0066	0.0511
COL_COUPLE_TYPE_PHASE	0.008	0.728	0.068	0.754	0.159	0.684	-0.423	0.722	-0.152	0.834	-0.001	0.750	0.0042	0.4298	0.1053	0.0056	0.4467	0.6150	0.0022	0.2175	0.0002	0.0864	0.0998
Q11_1_POURCENTAGE	31.307	22.089	27.564	19.878	26.149	20.850	16.667	13.858	34.146	25.160	28.125	21.423	0.0049	0.2871	0.0893	0.0005	0.6394	0.5409	0.0071	0.2183	0.0279	0.0995	0.0021
Q11_2_POURCENTAGE	34.886	24.130	35.256	22.680	40.698	23.809	26.894	17.433	19.375	21.917	33.862	23.679	0.0000	0.7843	0.0763	0.1315	0.0001	0.1600	0.0858	0.0001	0.0042	0.0000	0.0263
Q12_1_REC	4.495	1.725	4.808	1.817	5.267	1.669	3.969	2.040	4.439	1.898	4.702	1.816	0.0017	0.1521	0.0005	0.2454	0.9257	0.0861	0.0568	0.2559	0.0023	0.0090	0.4117
Q12_2_REC	4.495	1.585	4.692	1.622	5.082	1.482	3.875	1.773	4.512	1.938	4.629	1.657	0.0127	0.4825	0.0132	0.0659	0.7958	0.1100	0.0268	0.8285	0.0009	0.1774	0.1508
Q12_3_REC	4.477	1.725	4.859	1.704	4.647	1.723	3.656	2.010	4.049	2.037	4.478	1.811	0.0256	0.1001	0.4104	0.0398	0.3079	0.4330	0.0052	0.0430	0.0182	0.1282	0.4873
COL_COUPLE_PARTNER_CORE	5.068	1.100	5.219	1.133	5.353	1.076	4.879	1.230	4.712	1.433	5.112	1.170	0.0511	0.2936	0.0347	0.4442	0.2847	0.4061	0.1937	0.0851	0.0491	0.0121	0.6670
COL_COUPLE_PARTNER_ADJ	4.175	1.341	3.934	1.538	3.910	1.498	3.477	1.122	3.917	1.421	3.957	1.423	0.1966	0.3297	0.2011	0.0120	0.3864	0.9310	0.1624	0.8418	0.1907	0.8830	0.1340
ORG_SUPPORT	3.808	1.140	3.958	1.335	3.696	1.326	3.435	1.363	4.119	1.275	3.816	1.274	0.2159	0.3742	0.5188	0.2194	0.1747	0.1951	0.0959	0.5683	0.4241	0.1116	0.0536
ORG_PREF_IN_OUT	5.239	1.358	5.218	1.447	5.310	1.425	4.273	1.790	4.800	1.713	5.111	1.505	0.0199	0.9679	0.4514	0.0044	0.2367	0.5507	0.0082	0.2621	0.0020	0.1183	0.1810
ORG_PREF_OUT_IN	5.239	1.152	5.423	1.146	5.724	1.300	5.273	1.376	5.325	1.328	5.413	1.239	0.0050	0.1151	0.0002	0.6156	0.4659	0.0262	0.5732	0.6518	0.0412	0.0393	0.8888

Table O-1: ANOVA Detailed Results – Line of Service (cont'd)

ANOVA Analysis 1

CONTROL VARIABLE: **Line of Service**

RISK_PRACT	4.811	1.382	5.224	1.283	4.529	1.535	4.922	1.368	5.423	1.365	4.913	1.422	0.0040	0.0482	0.2268	0.7228	0.0100	0.0038	0.2678	0.2867	0.2317	0.0016	0.0786
RISK_PER_IN_OUT	4.451	1.506	5.141	1.483	4.322	1.895	4.719	1.689	4.200	1.728	4.569	1.672	0.0057	0.0006	0.9878	0.3282	0.4164	0.0068	0.1789	0.0032	0.4252	0.6181	0.2009
RISK_PER_OUT_IN	3.866	1.602	3.679	1.632	3.184	1.681	3.455	1.660	3.487	1.652	3.573	1.652	0.0214	0.3984	0.0012	0.1467	0.2008	0.0246	0.4266	0.5306	0.3241	0.2457	0.8979
RISK_TYPE	5.150	1.028	5.399	0.927	5.042	1.168	5.086	1.028	5.370	1.163	5.198	1.064	0.2341	0.1242	0.6099	0.8580	0.1371	0.0815	0.2149	0.7119	0.8772	0.1325	0.1815
IP_FORMAL	5.009	1.472	4.651	1.748	4.762	1.700	4.370	1.751	5.338	1.742	4.846	1.664	0.0623	0.1980	0.4852	0.0808	0.0700	0.6516	0.4908	0.0229	0.2418	0.0530	0.0144
IP_INFORMAL	5.378	1.155	5.343	1.197	5.197	1.197	5.175	1.156	5.595	1.337	5.332	1.197	0.2525	0.8387	0.2268	0.3380	0.1994	0.3523	0.5276	0.1633	0.9802	0.0352	0.0978
INNOV_PROCESS	0.167	0.374	0.221	0.417	0.140	0.349	0.069	0.258	0.378	0.492	0.187	0.390	0.0084	0.3556	0.6045	0.1874	0.0076	0.1771	0.0706	0.0779	0.3170	0.0030	0.0039
INNOV_PRODUCT	0.352	0.480	0.364	0.484	0.395	0.492	0.655	0.484	0.162	0.374	0.371	0.484	0.0017	0.8693	0.5344	0.0034	0.0309	0.6781	0.0073	0.0284	0.0157	0.0117	0.0000
INNOV_ORG	0.130	0.337	0.169	0.377	0.267	0.445	0.172	0.384	0.297	0.463	0.196	0.397	0.0703	0.4578	0.0155	0.5554	0.0202	0.1309	0.9652	0.1168	0.3046	0.7352	0.2436
INNOV_TECH	0.352	0.480	0.247	0.434	0.198	0.401	0.103	0.310	0.162	0.374	0.246	0.431	0.0163	0.1280	0.0182	0.0098	0.0309	0.4522	0.1065	0.3089	0.2491	0.6445	0.4936
Q18_REC	2.861	1.550	2.842	1.488	2.329	1.577	1.742	1.632	2.971	1.823	2.630	1.614	0.0014	0.9631	0.0171	0.0007	0.7834	0.0269	0.0011	0.7448	0.0619	0.0844	0.0064
Q18_0_1	0.185	0.390	0.158	0.367	0.294	0.458	0.516	0.508	0.286	0.458	0.248	0.432	0.0009	0.6315	0.0764	0.0002	0.2059	0.0409	0.0001	0.1182	0.0275	0.9270	0.0578
Q18_MED	0.556	0.499	0.553	0.501	0.388	0.490	0.290	0.461	0.571	0.502	0.490	0.501	0.0145	0.9687	0.0213	0.0095	0.8699	0.0374	0.0142	0.8536	0.3336	0.0674	0.0227
Q18_5_ETPLUS	0.259	0.440	0.224	0.419	0.165	0.373	0.097	0.301	0.371	0.490	0.224	0.417	0.0452	0.5814	0.1150	0.0563	0.2038	0.3449	0.1284	0.1050	0.3620	0.0141	0.0099
INNOV_PERF_FIN	5.040	1.054	5.062	1.230	5.234	1.125	4.963	1.185	4.933	1.522	5.076	1.181	0.5462	0.4714	0.0986	0.9092	0.7273	0.4240	0.5068	0.9549	0.2089	0.5362	0.6503

For Geography, the following are the ANOVA results:

Table O-2: ANOVA Detailed Results 2 – Geography

ANOVA Analysis 2

CONTROL VARIABLE: Geography

	QUEBEC		PRAIRIES		ONTAIRO		BC		MARITIMES		ALL		K-W	M-W									
	N_1=55		N_2=54		N_3=197		N_4=36		N_5=9		N_T=350		p-value Test Global	p-value Two-tail									
	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.		1 vs 2	1 vs 3	1 vs 4	1 vs 5	2 vs 3	2 vs 4	2 vs 5	3 vs 4	3 vs 5	4 vs 5
EROSION	5.243	0.787	5.158	0.766	5.092	0.835	4.863	0.840	4.809	1.148	5.096	0.828	0.2391	0.6644	0.2078	0.0360	0.1926	0.6172	0.1293	0.2837	0.1541	0.3533	0.7606
EROSION_COST_RESEARCH	4.800	1.366	4.792	1.335	4.538	1.586	4.722	1.597	4.875	1.356	4.645	1.510	0.8104	0.9897	0.3603	0.9596	0.9568	0.3807	0.9061	0.9278	0.4809	0.6854	0.9875
COL_IN_OUT	3.864	1.459	3.877	1.239	3.605	1.226	3.146	1.253	2.031	1.030	3.603	1.299	0.0004	0.9705	0.1697	0.0128	0.0013	0.1206	0.0065	0.0006	0.0366	0.0012	0.0239
COL_OUT_IN	3.979	1.420	4.118	0.971	4.034	1.231	3.729	0.988	2.531	0.839	3.972	1.216	0.0074	0.4730	0.6867	0.3816	0.0063	0.6720	0.0735	0.0003	0.1294	0.0010	0.0049
COL_for_CLIENT	4.340	1.393	4.340	1.315	4.554	1.429	4.292	1.278	3.188	1.999	4.429	1.415	0.1559	0.9796	0.2984	0.8166	0.0789	0.2523	0.8229	0.0726	0.2560	0.0372	0.0948
COL_COUPLE_PRACT	4.893	1.255	5.059	1.058	4.913	1.189	4.956	1.138	4.889	1.277	4.935	1.173	0.9646	0.5827	0.9754	0.9868	0.8594	0.4822	0.5803	0.5536	0.9395	0.9563	0.9886
COL_COUPLE_TYPE_PHASE	0.151	0.758	0.137	0.670	-0.042	0.782	-0.184	0.662	-0.132	0.628	-0.001	0.750	0.0909	0.9461	0.0994	0.0163	0.2348	0.1306	0.0198	0.2007	0.2782	0.5756	0.9434
Q11_1_POURCENTAGE	32.045	22.148	29.567	19.652	27.870	22.048	23.958	18.987	18.056	19.874	28.125	21.423	0.1832	0.6713	0.1734	0.0899	0.0508	0.3940	0.1717	0.0741	0.3860	0.1515	0.3778
Q11_2_POURCENTAGE	40.455	25.226	36.792	21.430	32.692	23.949	27.083	22.854	28.125	12.939	33.862	23.679	0.0556	0.5144	0.0403	0.0116	0.2006	0.1620	0.0288	0.3042	0.1843	0.7825	0.6079
Q12_1_REC	4.836	1.813	4.887	1.601	4.637	1.883	4.500	1.844	5.000	1.658	4.702	1.816	0.8560	0.7417	0.4758	0.3015	0.9764	0.7146	0.3716	0.9580	0.5534	0.7166	0.5488
Q12_2_REC	4.800	1.532	5.019	1.366	4.505	1.763	4.472	1.630	4.556	1.590	4.629	1.657	0.4442	0.6018	0.3150	0.2790	0.5485	0.1312	0.1054	0.3135	0.6962	0.9043	0.9881
Q12_3_REC	4.691	1.835	4.755	1.616	4.432	1.844	4.056	1.866	4.222	1.787	4.478	1.811	0.3847	0.9546	0.3429	0.0975	0.4130	0.3635	0.0698	0.3445	0.2295	0.6599	0.8272
COL_COUPLE_PARTNER_CORE	5.218	1.069	5.136	1.093	5.046	1.269	5.244	0.888	5.178	1.146	5.112	1.170	0.9895	0.7095	0.5903	0.8610	0.8088	0.9123	0.8667	0.9840	0.8710	0.9976	0.8637
COL_COUPLE_PARTNER_ADJ	4.205	1.475	4.044	1.407	3.888	1.453	3.826	1.113	3.917	1.759	3.957	1.423	0.6457	0.6026	0.1769	0.1860	0.6844	0.5152	0.3628	0.7867	0.7507	0.9738	0.7008
ORG_SUPPORT	4.042	1.106	3.880	1.183	3.881	1.317	3.292	1.128	2.594	1.506	3.816	1.274	0.0059	0.4884	0.4589	0.0031	0.0097	0.9940	0.0171	0.0183	0.0122	0.0142	0.1465
ORG_PREF_IN_OUT	5.255	1.566	5.352	1.376	5.010	1.525	5.278	1.301	4.250	2.053	5.111	1.505	0.2883	0.8332	0.2700	0.9431	0.1589	0.1369	0.7832	0.1227	0.3301	0.2392	0.1478
ORG_PREF_OUT_IN	5.655	1.126	5.444	1.022	5.365	1.324	5.278	1.233	5.333	1.225	5.413	1.239	0.6218	0.2138	0.1892	0.1945	0.3263	0.8762	0.8944	0.6150	0.7387	0.6341	0.7279
RISK_PRACT	5.136	1.234	4.906	1.397	5.010	1.396	4.417	1.481	3.313	1.963	4.913	1.422	0.0191	0.3914	0.7230	0.0211	0.0138	0.5308	0.1329	0.0253	0.0248	0.0145	0.1047
RISK_PER_IN_OUT	3.982	1.800	4.722	1.595	4.741	1.613	4.472	1.715	3.750	1.753	4.569	1.672	0.0241	0.0290	0.0046	0.1980	0.6181	0.8335	0.5588	0.0931	0.4502	0.0510	0.1633

Table O-2: ANOVA Detailed Results 2 – Geography (cont'd)

ANOVA Analysis 2

CONTROL VARIABLE: Geography

	QUEBEC		PRAIRIES		ONTAIRO		BC		MARITIMES		ALL		K-W	M-W									
	N_1=55		N_2=54		N_3=197		N_4=36		N_5=9		N_T=350		p-value Test Global	p-value Two-tail									
	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.		1 vs 2	1 vs 3	1 vs 4	1 vs 5	2 vs 3	2 vs 4	2 vs 5	3 vs 4	3 vs 5	4 vs 5
RISK_PER_OUT_IN	3.296	1.449	3.407	1.421	3.746	1.752	3.417	1.628	3.000	1.773	3.573	1.652	0.3592	0.5092	0.1455	0.8942	0.4489	0.3136	0.8297	0.3995	0.3201	0.1959	0.4160
RISK_TYPE	5.105	0.976	5.159	0.989	5.264	1.128	5.155	0.915	4.792	1.250	5.198	1.064	0.4255	0.5241	0.1419	0.8167	0.5682	0.3254	0.7061	0.5020	0.3231	0.2884	0.6078
IP_FORMAL	4.698	1.615	5.038	1.382	4.865	1.717	4.557	1.898	5.333	1.369	4.846	1.664	0.7403	0.4322	0.3800	0.8140	0.3937	0.8667	0.4311	0.5389	0.3637	0.5842	0.3493
IP_INFORMAL	5.229	1.200	5.321	1.204	5.360	1.219	5.329	1.134	5.422	1.142	5.332	1.197	0.9587	0.6346	0.4455	0.8201	0.7377	0.9093	0.8793	0.9675	0.6964	0.9783	0.9186
INNOV_PROCESS	0.145	0.356	0.192	0.398	0.188	0.392	0.194	0.401	0.375	0.518	0.187	0.390	0.6443	0.5192	0.4682	0.5402	0.1129	0.9464	0.9802	0.2469	0.9301	0.1935	0.2759
INNOV_PRODUCT	0.473	0.504	0.308	0.466	0.371	0.484	0.361	0.487	0.125	0.354	0.371	0.484	0.2481	0.0820	0.1758	0.2954	0.0655	0.4009	0.6022	0.2898	0.9109	0.1571	0.1998
INNOV_ORG	0.200	0.404	0.269	0.448	0.183	0.388	0.167	0.378	0.125	0.354	0.196	0.397	0.6576	0.3998	0.7741	0.6916	0.6166	0.1706	0.2617	0.3845	0.8181	0.6780	0.7733
INNOV_TECH	0.182	0.389	0.231	0.425	0.258	0.439	0.278	0.454	0.375	0.518	0.246	0.431	0.6740	0.5331	0.2462	0.2824	0.2108	0.6892	0.6186	0.3845	0.8058	0.4631	0.5899
Q18_REC	2.849	1.692	2.471	1.474	2.656	1.631	2.750	1.481	1.222	1.641	2.630	1.614	0.0609	0.2555	0.4935	0.8574	0.0085	0.4475	0.2826	0.0127	0.6658	0.0085	0.0073
Q18_0_1	0.226	0.423	0.235	0.428	0.253	0.436	0.167	0.378	0.667	0.500	0.248	0.432	0.0420	0.9149	0.6962	0.4934	0.0076	0.7995	0.4391	0.0098	0.2689	0.0065	0.0027
Q18_MED	0.528	0.504	0.412	0.497	0.505	0.501	0.556	0.504	0.111	0.333	0.490	0.501	0.1116	0.2362	0.7688	0.8012	0.0214	0.2370	0.1883	0.0870	0.5822	0.0212	0.0181
Q18_5_ETPLUS	0.283	0.455	0.176	0.385	0.231	0.423	0.194	0.401	0.111	0.333	0.224	0.417	0.6244	0.1995	0.4384	0.3445	0.2797	0.4039	0.8322	0.6305	0.6299	0.4012	0.5630
INNOV_PERF_FIN	5.447	0.870	5.219	1.056	5.026	1.240	4.657	1.211	4.661	1.548	5.076	1.181	0.0353	0.3374	0.0481	0.0024	0.1330	0.4422	0.0358	0.2890	0.0651	0.4384	0.9419

For Hierarchical levels, the following are the ANOVA results:

Table O-3: ANOVA Detailed Results – Hierarchical

ANOVA Analysis 3

CONTROL VARIABLE: Hierarchical

	MANAGER		DIRECTOR		MANAGING DIRECTOR & PARTNER		TOTAL		K-W	M-W		
	N_1=183		N_2=132		N_3=34		N_4=349		p-value	p-value		
									Test Global		Two-tail	
	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.	MEANS	STD. DEV.		1 vs 2	1 vs 3	2 vs 3
EROSION	5.113	0.831	5.050	0.840	5.220	0.804	5.100	0.831	0.6069	0.7203	0.3963	0.3389
EROSION_COST_RESEARCH	4.742	1.420	4.512	1.645	4.529	1.502	4.635	1.515	0.5692	0.3656	0.4412	0.8332
COL_IN_OUT	3.762	1.334	3.390	1.206	3.561	1.424	3.602	1.304	0.0313	0.0084	0.3416	0.6607
COL_OUT_IN	3.973	1.222	3.930	1.178	4.152	1.352	3.974	1.216	0.7638	0.7346	0.5749	0.4779
COL_for_CLIENT	4.335	1.371	4.425	1.467	4.848	1.439	4.418	1.417	0.1631	0.4826	0.0588	0.1588
COL_COUPLE_PRACT	4.904	1.186	4.974	1.161	4.982	1.168	4.939	1.172	0.9831	0.8562	0.9415	0.9578
COL_COUPLE_TYPE_PHASE	0.052	0.747	-0.052	0.736	-0.065	0.791	0.002	0.747	0.2936	0.1552	0.3198	0.8651
Q11_1_POURCENTAGE	29.306	21.522	27.115	20.890	25.735	22.810	28.125	21.391	0.4541	0.3658	0.2943	0.5690
Q11_2_POURCENTAGE	35.208	23.983	31.880	23.643	33.824	22.090	33.819	23.660	0.4450	0.2089	0.8558	0.5451
Q12_1_REC	4.739	1.810	4.734	1.846	4.500	1.745	4.713	1.814	0.6375	0.9360	0.3573	0.3806
Q12_2_REC	4.698	1.624	4.586	1.695	4.500	1.710	4.636	1.656	0.8319	0.7010	0.5838	0.7492
Q12_3_REC	4.637	1.785	4.281	1.865	4.441	1.727	4.484	1.813	0.3335	0.1440	0.5520	0.7400
COL_COUPLE_PARTNER_CORE	5.033	1.211	5.253	1.049	5.030	1.360	5.117	1.169	0.2910	0.1138	0.9024	0.5089
COL_COUPLE_PARTNER_ADJ	4.121	1.437	3.820	1.331	3.662	1.659	3.961	1.427	0.0811	0.0591	0.1208	0.3737
ORG_SUPPORT	3.862	1.321	3.735	1.188	3.970	1.277	3.825	1.267	0.5791	0.4759	0.5647	0.3430
ORG_PREF_IN_OUT	5.033	1.437	5.183	1.583	5.324	1.552	5.118	1.504	0.2319	0.1580	0.1856	0.7430
ORG_PREF_OUT_IN	5.260	1.199	5.591	1.229	5.588	1.373	5.418	1.236	0.0056	0.0027	0.0546	0.8532
RISK_PRACT	4.823	1.374	5.000	1.469	5.030	1.581	4.909	1.429	0.3248	0.1959	0.2874	0.8017

Table O-3: ANOVA Detailed Results – Hierarchical (cont'd)

ANOVA Analysis 3

CONTROL VARIABLE: Hierarchical	MANAGER		DIRECTOR		MANAGING DIRECTOR & PARTNER		TOTAL		K-W	M-W		
	N_1=183		N_2=132		N_3=34		N_4=349		p-value	p-value		
									Test Global	Two-tail		
RISK_PER_IN_OUT	4.621	1.532	4.634	1.824	4.091	1.756	4.575	1.672	0.2905	0.6114	0.1514	0.1532
RISK_PER_OUT_IN	3.830	1.614	3.318	1.668	3.000	1.497	3.557	1.647	0.0017	0.0041	0.0053	0.3556
RISK_TYPE	5.244	1.087	5.121	1.051	5.245	0.971	5.197	1.062	0.5833	0.3187	0.9987	0.5415
IP_FORMAL	4.982	1.637	4.706	1.715	4.602	1.601	4.841	1.665	0.2472	0.1687	0.2007	0.7075
IP_INFORMAL	5.403	1.226	5.271	1.187	5.189	1.072	5.332	1.196	0.3099	0.2617	0.1901	0.5858
INNOV_PROCESS	0.203	0.404	0.159	0.367	0.226	0.425	0.189	0.392	0.5315	0.3244	0.7767	0.3768
INNOV_PRODUCT	0.339	0.475	0.429	0.497	0.355	0.486	0.374	0.485	0.2767	0.1132	0.8640	0.4567
INNOV_ORG	0.175	0.381	0.214	0.412	0.194	0.402	0.192	0.394	0.6953	0.3941	0.8052	0.8002
INNOV_TECH	0.282	0.451	0.198	0.400	0.226	0.425	0.246	0.431	0.2379	0.0952	0.5150	0.7353
Q18_REC	2.554	1.581	2.613	1.611	3.065	1.806	2.623	1.616	0.2576	0.8097	0.0996	0.1525
Q18_0_1	0.260	0.440	0.258	0.439	0.161	0.374	0.250	0.434	0.4887	0.9717	0.2403	0.2598
Q18_MED	0.475	0.501	0.476	0.501	0.613	0.495	0.488	0.501	0.3446	0.9832	0.1563	0.1735
Q18_5_ETPLUS	0.198	0.399	0.226	0.420	0.355	0.486	0.223	0.417	0.1528	0.5564	0.0524	0.1399
INNOV_PERF_FIN	5.058	1.177	5.051	1.235	5.303	1.033	5.078	1.186	0.6902	0.7395	0.4114	0.4923

APPENDIX P – CROSS PRODUCTS INTERACTIONS FOR REGRESSIONS

Table P-1: Interactions For Regressions

Cross-Products (Interactions) used for Regressions
Z_COL_IN_OUT_F1 x Z_RISK_PRACT_F1
Z_COL_OUT_IN_F2 x Z_RISK_PRACT_F1
Z_COL_for_CLIENT_F3 x Z_RISK_PRACT_F1
Z_COL_COUPLE_PRACT_F1 x Z_RISK_PRACT_F1
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_RISK_PRACT_F1
Z_COL_COUPLE_PARTNER_CORE_F1x Z_RISK_PRACT_F1
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_RISK_PRACT_F1
Z_COL_IN_OUT_F1 x Z_RISK_PER_IN_OUT
Z_COL_OUT_IN_F2 x Z_RISK_PER_IN_OUT
Z_COL_for_CLIENT_F3 x Z_RISK_PER_IN_OUT
Z_COL_COUPLE_PRACT_F1 x Z_RISK_PER_IN_OUT
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_RISK_PER_IN_OUT
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_RISK_PER_IN_OUT
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_RISK_PER_IN_OUT
Z_COL_IN_OUT_F1 x Z_RISK_PER_OUT_IN
Z_COL_OUT_IN_F2 x Z_RISK_PER_OUT_IN
Z_COL_for_CLIENT_F3 x Z_RISK_PER_OUT_IN
Z_COL_COUPLE_PRACT_F1 x Z_RISK_PER_OUT_IN
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_RISK_PER_OUT_IN
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_RISK_PER_OUT_IN
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_RISK_PER_OUT_IN
Z_COL_IN_OUT_F1 x Z_RISK_TYPE_F1
Z_COL_OUT_IN_F2 x Z_RISK_TYPE_F1
Z_COL_for_CLIENT_F3 x Z_RISK_TYPE_F1

Table P-1: Interactions For Regressions (cont'd)

Cross-Products (Interactions) used for Regressions
Z_COL_COUPLE_PRACT_F1 x Z_RISK_TYPE_F1
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_RISK_TYPE_F1
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_RISK_TYPE_F1
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_RISK_TYPE_F1
Z_COL_IN_OUT_F1 x Z_IP_FORMAL_F2
Z_COL_OUT_IN_F2 x Z_IP_FORMAL_F2
Z_COL_for_CLIENT_F3 x Z_IP_FORMAL_F2
Z_COL_COUPLE_PRACT_F1 x Z_IP_FORMAL_F2
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_IP_FORMAL_F2
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_IP_FORMAL_F2
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_IP_FORMAL_F2
Z_COL_IN_OUT_F1 x Z_IP_INFORMAL_F3
Z_COL_OUT_IN_F2 x Z_IP_INFORMAL_F3
Z_COL_for_CLIENT_F3 x Z_IP_INFORMAL_F3
Z_COL_COUPLE_PRACT_F1 x Z_IP_INFORMAL_F3
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_IP_INFORMAL_F3
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_IP_INFORMAL_F3
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_IP_INFORMAL_F3

APPENDIX Q – FIRM ABC - RISK MANAGEMENT MODERATING EFFECT – PROPENSITY TO INNVOATE - DETAILED REGRESSION TABLES

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect

MODERATING VARIABLE: Z_Risk_PRACT_F1	MODEL 1 β Std. Error	Sig	MODEL 2 β Std. Error	Sig	MODEL 3 β Std. Error	Sig	MODEL 4 β Std. Error	Sig
Constant	-1.436	**	-2.008	**	-2.134	***	-2.201	***
	(0.725)		(0.803)		(0.817)		(0.851)	
Q1_TAX	-0.434		-0.522		-0.598		-0.541	
	(0.390)		(0.416)		(0.422)		(0.428)	
Q1_CONS	-1.096	**	-1.197	**	-1.019	*	-1.089	*
	(0.455)		(0.528)		(0.533)		(0.557)	
Q1_DEALS	-1.658	**	-1.814	**	-1.975	**	-1.728	**
	(0.793)		(0.857)		(0.867)		(0.857)	
Q1_IFS	0.291		0.629		0.461		0.452	
	(0.505)		(0.558)		(0.572)		(0.602)	
Q2_PRAIRIES	-0.752		-0.908	*	-0.916	*	-0.840	
	(0.501)		(0.527)		(0.532)		(0.541)	
Q2_BC	-0.696		-0.606		-0.574		-0.607	
	(0.546)		(0.577)		(0.583)		(0.608)	
Q2_QUEBEC	-0.121		-0.130		-0.118		-0.113	
	(0.411)		(0.454)		(0.457)		(0.467)	
Q2_MARITIMES	-20.314		-19.571		-19.388		-19.954	
	(15946.94)		(15290.17)		(14946.06)		(14271.09)	
Q3_CONT	0.200		0.255	*	0.267	*	0.265	*

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β		β		β		β	
	(0.130)		(0.139)		(0.139)		(0.144)	
Q4_MGR	-0.107		0.162		0.248		0.195	
	(0.320)		(0.349)		(0.355)		(0.375)	
Z_COL_IN_OUT_F1			0.427	**	0.388	**	0.379	*
			(0.185)		(0.187)		(0.204)	
Z_COL_OUT_IN_F2			0.672	****	0.629	***	0.602	***
			(0.199)		(0.200)		(0.214)	
Z_COL_for_CLIENT_F3			0.003		-0.049		-0.136	
			(0.184)		(0.185)		(0.204)	
Z_COL_COUPLE_PRACT_F1			-0.116		-0.169		-0.190	
			(0.204)		(0.205)		(0.214)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.387	**	-0.398	**	-0.380	*
			(0.193)		(0.193)		(0.219)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.346	*	0.330		0.381	*
			(0.211)		(0.209)		(0.227)	
Z_COL_COUPLE_PARTNER_ADJ_F2			-0.371	**	-0.406	**	-0.418	**
			(0.185)		(0.188)		(0.202)	
Z_RISK_PRACT_F1					0.359	*	0.470	**
					(0.202)		(0.224)	
Z_COL_IN_OUT_F1_Z_RISK_PRACT_F1							-0.213	
							(0.194)	
Z_COL_OUT_IN_F2_Z_RISK_PRACT_F1							0.115	
							(0.234)	
Z_COL_for_CLIENT_F3_Z_RISK_PRACT_F1							0.185	

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
	β	β	β	β
				(0.199)
Z_COL_COUPLE_PRACT_F1_Z_RISK_PRACT_F1				0.024
				(0.218)
Z_COL_COUPLE_TYPE_PHASE_F2_Z_RISK_PRACT_F1				-0.091
				(0.219)
Z_COL_COUPLE_PARTNER_CORE_F1_Z_RISK_PRACT_F1				-0.183
				(0.236)
Z_COL_COUPLE_PARTNER_ADJ_F2_Z_RISK_PRACT_F1				0.318
				(0.196)
R^2	0.1205	0.2403	0.2555	0.2832
R^2_{adj}	NA	NA	NA	NA
p-values	0.0118	0.0001	0.0001	0.0003
VIF_{max}	NA	NA	NA	NA
delta R^2		0.1197	0.0152	0.0277
p-values		0.0009	0.0701	0.5294

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

MODERATING VARIABLE Z_RISK_PER_IN_OUT	MODEL 1 β		MODEL 2 β		MODEL 3 β		MODEL 4 β	
	Std. Error	Sig	Std. Error	Sig	Std. Error	Sig	Std. Error	Sig
Constant	-1.436	**	-2.008	**	-1.978	**	-1.902	**
	(0.725)		(0.803)		(0.806)		(0.818)	
Q1_TAX	-0.434		-0.522		-0.500		-0.636	
	(0.390)		(0.416)		(0.418)		(0.432)	
Q1_CONS	-1.096	**	-1.197	**	-1.236	**	-1.301	**
	(0.455)		(0.528)		(0.536)		(0.546)	
Q1_DEALS	-1.658	**	-1.814	**	-1.805	**	-1.845	**
	(0.793)		(0.857)		(0.858)		(0.905)	
Q1_IFS	0.291		0.629		0.616		0.465	
	(0.505)		(0.558)		(0.560)		(0.586)	
Q2_PRAIRIES	-0.752		-0.908	*	-0.923	*	-0.918	*
	(0.501)		(0.527)		(0.528)		(0.535)	
Q2_BC	-0.696		-0.606		-0.635		-0.734	
	(0.546)		(0.577)		(0.582)		(0.596)	
Q2_QUEBEC	-0.121		-0.130		-0.187		-0.330	
	(0.411)		(0.454)		(0.469)		(0.484)	
Q2_MARITIMES	-20.314		-19.571		-19.604		-19.317	
	(15946.941)		(15290.169)		(15308.212)		(15091.246)	
Q3_CONT	0.200		0.255	*	0.252	*	0.255	*
	(0.130)		(0.139)		(0.139)		(0.141)	

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β		β		β		β	
Q4_MGR	-0.107		0.162		0.163		0.106	
	(0.320)		(0.349)		(0.350)		(0.359)	
Z_COL_IN_OUT_F1			0.427	**	0.434	**	0.468	**
			(0.185)		(0.186)		(0.192)	
Z_COL_OUT_IN_F2			0.672	****	0.687	****	0.697	****
			(0.199)		(0.202)		(0.211)	
Z_COL_for_CLIENT_F3			0.003		0.013		-0.017	
			(0.184)		(0.185)		(0.189)	
Z_COL_COUPLE_PRACT_F1			-0.116		-0.126		-0.117	
			(0.204)		(0.205)		(0.218)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.387	**	-0.392	**	-0.424	**
			(0.193)		(0.194)		(0.207)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.346	*	0.361	*	0.380	*
			(0.211)		(0.213)		(0.220)	
Z_COL_COUPLE_PARTNER_ADJ_F2			-0.371	**	-0.373	**	-0.351	*
			(0.185)		(0.185)		(0.195)	
Z_RISK_PER_IN_OUT					-0.088		-0.042	
					(0.178)		(0.202)	
Z_COL_IN_OUT_F1_Z_RISK_PER_IN_OUT							-0.239	
							(0.200)	
Z_COL_OUT_IN_F2_Z_RISK_PER_IN_OUT							-0.194	
							(0.238)	
Z_COL_for_CLIENT_F3_Z_RISK_PER_IN_OUT							-0.039	
							(0.183)	

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
	β	β	β	β
Z_COL_COUPLE_PRACT_F1_Z_RISK_PER_IN_OUT				-0.224
				(0.229)
Z_COL_COUPLE_TYPE_PHASE_F2_Z_RISK_PER_IN_OUT				0.200
				(0.229)
Z_COL_COUPLE_PARTNER_CORE_F1_Z_RISK_PER_IN_OUT				0.332
				(0.226)
Z_COL_COUPLE_PARTNER_ADJ_F2_Z_RISK_PER_IN_OUT				0.214
				(0.206)
R^2	0.1205	0.2403	0.2414	0.2666
R^2_{adj}	NA	NA	NA	NA
p-values		0.0001	0.0002	0.0009
VIF_{max}	NA	NA	NA	NA
delta R^2		0.1197	0.0011	0.0252
p-values		0.0009	0.6213	0.6030

MODERATING VARIABLE Z_RISK_PER_OUT_IN								
	Std. Error	**Sig**	**Std. Error**	**Sig**	**Std. Error**	**Sig.**	**Std. Error**	**Sig.**
Constant	-1.436	**	-2.008	**	-1.795	**	-1.849	**
	(0.725)		(0.803)		(0.806)		(0.811)	
Q1_TAX	-0.434		-0.522		-0.623		-0.633	
	(0.390)		(0.416)		(0.425)		(0.436)	

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β		β		β		β	
Q1_CONS	-1.096	**	-1.197	**	-1.405	**	-1.408	**
	(0.455)		(0.528)		(0.546)		(0.555)	
Q1_DEALS	-1.658	**	-1.814	**	-1.935	**	-2.058	**
	(0.793)		(0.857)		(0.878)		(0.922)	
Q1_IFS	0.291		0.629		0.472		0.473	
	(0.505)		(0.558)		(0.566)		(0.578)	
Q2_PRAIRIES	-0.752		-0.908	*	-0.948	*	-0.977	*
	(0.501)		(0.527)		(0.536)		(0.548)	
Q2_BC	-0.696		-0.606		-0.745		-0.827	
	(0.546)		(0.577)		(0.594)		(0.611)	
Q2_QUEBEC	-0.121		-0.130		-0.314		-0.296	
	(0.411)		(0.454)		(0.472)		(0.488)	
Q2_MARITIMES	-20.314		-19.571		-19.613		-19.308	
	(15946.941)		(15290.169)		(15377.584)		(15403.931)	
Q3_CONT	0.200		0.255	*	0.234	*	0.232	*
	(0.130)		(0.139)		(0.138)		(0.138)	
Q4_MGR	-0.107		0.162		0.202		0.234	
	(0.320)		(0.349)		(0.356)		(0.370)	
Z_COL_IN_OUT_F1			0.427	**	0.478	**	0.475	**
			(0.185)		(0.189)		(0.196)	
Z_COL_OUT_IN_F2			0.672	****	0.728	****	0.835	****
			(0.199)		(0.204)		(0.220)	
Z_COL_for_CLIENT_F3			0.003		0.026		-0.009	
			(0.184)		(0.184)		(0.196)	

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
	β	β	β	β
Z_COL_COUPLE_PRACT_F1		-0.116	-0.174	-0.154
		(0.204)	(0.209)	(0.210)
Z_COL_COUPLE_TYPE_PHASE_F2		-0.387 **	-0.398 **	-0.423 **
		(0.193)	(0.195)	(0.211)
Z_COL_COUPLE_PARTNER_CORE_F1		0.346 *	0.359 *	0.372 *
		(0.211)	(0.213)	(0.219)
Z_COL_COUPLE_PARTNER_ADJ_F2		-0.371 **	-0.307	-0.325 *
		(0.185)	(0.190)	(0.196)
Z_RISK_PER_OUT_IN			-0.371 **	-0.353 *
			(0.179)	(0.213)
Z_COL_IN_OUT_F1_Z_RISK_PER_OUT_IN				-0.150
				(0.185)
Z_COL_OUT_IN_F2_Z_RISK_PER_OUT_IN				0.030
				(0.196)
Z_COL_for_CLIENT_F3_Z_RISK_PER_OUT_IN				-0.191
				(0.204)
Z_COL_COUPLE_PRACT_F1_Z_RISK_PER_OUT_IN				-0.128
				(0.203)
Z_COL_COUPLE_TYPE_PHASE_F2_Z_RISK_PER_OUT_IN				0.316 *
				(0.191)
Z_COL_COUPLE_PARTNER_CORE_F1_Z_RISK_PER_OUT_IN				0.037
				(0.222)
Z_COL_COUPLE_PARTNER_ADJ_F2_Z_RISK_PER_OUT_IN				0.003
				(0.199)

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
	β	**β**	**β**	**β**
R^2	0.1205	0.2403	0.2609	0.2846
R^2_{adj}	NA	NA	NA	NA
p-values	0.0000	0.0001	0.0000	0.0003
VIF_{max}	NA	NA	NA	NA
delta R^2		0.1197	0.0206	0.0237
p-values		0.0009	0.0347	0.6328

MODERATING VARIABLE Z_RISK_TYPE_F1	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	Std. Error	**Sig**	**Std. Error**	**Sig**	**Std. Error**	**Sig**	**Std. Error**	**Sig**
Constant	-1.436	**	-2.008	**	-2.034	**	-2.638	***
	(0.725)		(0.803)		(0.805)		(0.846)	
Q1_TAX	-0.434		-0.522		-0.610		-0.565	
	(0.390)		(0.416)		(0.425)		(0.438)	
Q1_CONS	-1.096	**	-1.197	**	-1.180	**	-1.135	**
	(0.455)		(0.528)		(0.529)		(0.546)	
Q1_DEALS	-1.658	**	-1.814	**	-1.885	**	-1.979	**
	(0.793)		(0.857)		(0.865)		(0.936)	
Q1_IFS	0.291		0.629		0.606		0.713	
	(0.505)		(0.558)		(0.560)		(0.602)	
Q2_PRAIRIES	-0.752		-0.908	*	-0.939	*	-0.877	

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β		β		β		β	
	(0.501)		(0.527)		(0.530)		(0.541)	
Q2_BC	-0.696		-0.606		-0.618		-0.585	
	(0.546)		(0.577)		(0.578)		(0.618)	
Q2_QUEBEC	-0.121		-0.130		-0.144		-0.267	
	(0.411)		(0.454)		(0.456)		(0.471)	
Q2_MARITIMES	-20.314		-19.571		-19.447		-19.346	
	(15946.94)		(15290.17)		(15299.35)		(14881.36)	
Q3_CONT	0.200		0.255	*	0.264	*	0.366	**
	(0.130)		(0.139)		(0.138)		(0.146)	
Q4_MGR	-0.107		0.162		0.168		0.247	
	(0.320)		(0.349)		(0.351)		(0.377)	
Z_COL_IN_OUT_F1			0.427	**	0.430	**	0.556	***
			(0.185)		(0.184)		(0.211)	
Z_COL_OUT_IN_F2			0.672	****	0.647	***	0.768	****
			(0.199)		(0.201)		(0.216)	
Z_COL_for_CLIENT_F3			0.003		-0.012		-0.048	
			(0.184)		(0.185)		(0.195)	
Z_COL_COUPLE_PRACT_F1			-0.116		-0.131		-0.124	
			(0.204)		(0.203)		(0.223)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.387	**	-0.403	**	-0.347	
			(0.193)		(0.194)		(0.217)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.346	*	0.343	*	0.296	
			(0.211)		(0.207)		(0.240)	
Z_COL_COUPLE_PARTNER_ADJ_F2			-0.371	**	-0.398	**	-0.423	**

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
	β	β	β	β	
		(0.185)	(0.187)	(0.209)	
Z_RISK_TYPE_F1			0.198	0.151	
			(0.181)	(0.205)	
Z_COL_IN_OUT_F1_Z_RISK_TYPE_F1				-0.543	**
				(0.214)	
Z_COL_OUT_IN_F2_Z_RISK_TYPE_F1				0.137	
				(0.226)	
Z_COL_for_CLIENT_F3_Z_RISK_TYPE_F1				-0.085	
				(0.186)	
Z_COL_COUPLE_PRACT_F1_Z_RISK_TYPE_F1				-0.090	
				(0.213)	
Z_COL_COUPLE_TYPE_PHASE_F2_Z_RISK_TYPE_F1				-0.136	
				(0.205)	
Z_COL_COUPLE_PARTNER_CORE_F1_Z_RISK_TYPE_F1				0.085	
				(0.211)	
Z_COL_COUPLE_PARTNER_ADJ_F2_Z_RISK_TYPE_F1				0.304	
				(0.238)	
R^2	0.1205	0.2403	0.2459	0.2989	
R^2_{adj}	NA	NA	NA	NA	
p-values	0.0000	0.0001	0.0001	0.0001	
VIF_{max}	NA	NA	NA	NA	
delta R^2		0.1197	0.0056	0.0530	
p-values		0.0009	0.2715	0.1121	

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β		β		β		β	
MODERATING VARIABLE								
Z_IP_INFORMAL_F3								
	Std. Error	**Sig**	**Std. Error**	**Sig**	**Std. Error**	**Sig**	**Std. Error**	**Sig**
Constant	-1.436	**	-2.008	**	-1.983	**	-1.951	**
	(0.725)		(0.803)		(0.804)		(0.818)	
Q1_TAX	-0.434		-0.522		-0.520		-0.572	
	(0.390)		(0.416)		(0.416)		(0.436)	
Q1_CONS	-1.096	**	-1.197	**	-1.169	**	-1.360	**
	(0.455)		(0.528)		(0.527)		(0.564)	
Q1_DEALS	-1.658	**	-1.814	**	-1.833	**	-2.132	**
	(0.793)		(0.857)		(0.858)		(0.878)	
Q1_IFS	0.291		0.629		0.599		0.579	
	(0.505)		(0.558)		(0.561)		(0.580)	
Q2_PRAIRIES	-0.752		-0.908	*	-0.886	*	-1.042	*
	(0.501)		(0.527)		(0.529)		(0.563)	
Q2_BC	-0.696		-0.606		-0.610		-0.703	
	(0.546)		(0.577)		(0.577)		(0.609)	
Q2_QUEBEC	-0.121		-0.130		-0.104		-0.118	
	(0.411)		(0.454)		(0.456)		(0.481)	

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β		β		β		β	
Q2_MARITIMES	-20.314		-19.571		-19.603		-20.446	
	(15946.941)		(15290.169)		(15175.684)		(14693.348)	
Q3_CONT	0.200		0.255	*	0.248	*	0.236	*
	(0.130)		(0.139)		(0.140)		(0.141)	
Q4_MGR	-0.107		0.162		0.158		0.175	
	(0.320)		(0.349)		(0.349)		(0.374)	
Z_COL_IN_OUT_F1			0.427	**	0.410	**	0.377	*
			(0.185)		(0.187)		(0.194)	
Z_COL_OUT_IN_F2			0.672	****	0.650	***	0.701	***
			(0.199)		(0.201)		(0.218)	
Z_COL_for_CLIENT_F3			0.003		0.008		0.122	
			(0.184)		(0.183)		(0.202)	
Z_COL_COUPLE_PRACT_F1			-0.116		-0.128		-0.123	
			(0.204)		(0.205)		(0.215)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.387	**	-0.381	**	-0.420	**
			(0.193)		(0.192)		(0.211)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.346	*	0.322		0.284	
			(0.211)		(0.214)		(0.229)	
Z_COL_COUPLE_PARTNER_ADJ_F2			-0.371	**	-0.378	**	-0.387	*
			(0.185)		(0.185)		(0.203)	
Z_IP_INFORMAL_F3					0.112		0.181	
					(0.174)		(0.221)	
Z_COL_IN_OUT_F1_Z_IP_INFORMAL_F3							0.207	
							(0.179)	

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
	β	β	β	β	
Z_COL_OUT_IN_F2_Z_IP_INFORMAL_F3				-0.086	
				(0.224)	
Z_COL_for_CLIENT_F3_Z_IP_INFORMAL_F3				-0.389	*
				(0.207)	
Z_COL_COUPLE_PRACT_F1_Z_IP_INFORMAL_F3				-0.577	**
				(0.247)	
Z_COL_COUPLE_TYPE_PHASE_F2_Z_IP_INFORMAL_F3				0.090	
				(0.219)	
Z_COL_COUPLE_PARTNER_CORE_F1_Z_IP_INFORMAL_F3				0.433	**
				(0.188)	
Z_COL_COUPLE_PARTNER_ADJ_F2_Z_IP_INFORMAL_F3				0.182	
				(0.222)	
R^2	0.1205	0.2403	0.2422	0.3043	
R^2_{adj}	NA	NA	NA	NA	
p-values	0.0000	0.0001	0.0002	0.0001	
VIF_{max}	NA	NA	NA	NA	
delta R^2		0.1197	0.0020	0.0621	
p-values		0.0009	0.5151	0.0571	

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

MODERATING VARIABLE Z_IP_FORMAL_F2	MODEL 1 β		MODEL 2 β		MODEL 3 β		MODEL 4 β	
	Std. Error	Sig	Std. Error	Sig	Std. Error	Sig	Std. Error	Sig
Constant	-1.436	**	-2.008	**	-1.960	**	-2.393	***
	(0.725)		(0.803)		(0.812)		(0.847)	
Q1_TAX	-0.434		-0.522		-0.624		-0.519	
	(0.390)		(0.416)		(0.425)		(0.434)	
Q1_CONS	-1.096	**	-1.197	**	-1.236	**	-1.343	**
	(0.455)		(0.528)		(0.534)		(0.562)	
Q1_DEALS	-1.658	**	-1.814	**	-1.801	**	-1.556	*
	(0.793)		(0.857)		(0.848)		(0.886)	
Q1_IFS	0.291		0.629		0.698		0.603	
	(0.505)		(0.558)		(0.566)		(0.574)	
Q2_PRAIRIES	-0.752		-0.908	*	-0.834		-0.797	
	(0.501)		(0.527)		(0.526)		(0.541)	
Q2_BC	-0.696		-0.606		-0.717		-0.504	
	(0.546)		(0.577)		(0.592)		(0.618)	
Q2_QUEBEC	-0.121		-0.130		-0.106		-0.073	
	(0.411)		(0.454)		(0.456)		(0.469)	
Q2_MARITIMES	-20.314		-19.571		-19.407		-19.836	
	(15946.941)		(15290.169)		(15368.156)		(15455.088)	
Q3_CONT	0.200		0.255	*	0.236	*	0.265	*
	(0.130)		(0.139)		(0.141)		(0.146)	

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β		β		β		β	
Q4_MGR	-0.107		0.162		0.215		0.256	
	(0.320)		(0.349)		(0.353)		(0.360)	
Z_COL_IN_OUT_F1			0.427	**	0.399	**	0.375	*
			(0.185)		(0.187)		(0.194)	
Z_COL_OUT_IN_F2			0.672	****	0.639	***	0.689	***
			(0.199)		(0.201)		(0.223)	
Z_COL_for_CLIENT_F3			0.003		-0.017		0.021	
			(0.184)		(0.185)		(0.198)	
Z_COL_COUPLE_PRACT_F1			-0.116		-0.072		-0.036	
			(0.204)		(0.208)		(0.223)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.387	**	-0.404	**	-0.380	*
			(0.193)		(0.196)		(0.204)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.346	*	0.415	*	0.351	
			(0.211)		(0.218)		(0.235)	
Z_COL_COUPLE_PARTNER_ADJ_F2			-0.371	**	-0.230		-0.272	
			(0.185)		(0.202)		(0.220)	
Z_IP_FORMAL_F2					-0.322	*	-0.101	
					(0.181)		(0.245)	
Z_COL_IN_OUT_F1_Z_IP_FORMAL_F2							0.042	
							(0.208)	
Z_COL_OUT_IN_F2_Z_IP_FORMAL_F2							-0.102	
							(0.245)	
Z_COL_for_CLIENT_F3_Z_IP_FORMAL_F2							-0.086	
							(0.166)	

Table Q-1: Detailed Regression Results - Risk Management Moderating Effect (cont'd)

	MODEL 1	MODEL 2	MODEL 3	MODEL 4
	β	β	β	β
Z_COL_COUPLE_PRACT_F1_Z_IP_FORMAL_F2				0.127
				(0.200)
Z_COL_COUPLE_TYPE_PHASE_F2_Z_IP_FORMAL_F2				-0.083
				(0.202)
Z_COL_COUPLE_PARTNER_CORE_F1_Z_IP_FORMAL_F2				0.198
				(0.218)
Z_COL_COUPLE_PARTNER_ADJ_F2_Z_IP_FORMAL_F2				0.360 *
				(0.206)
R^2	0.1205	0.2403	0.2553	0.2924
R^2_{adj}	NA	NA	NA	NA
p-values		0.0001	0.0001	0.0002
VIF_{max}	NA	NA	NA	NA
delta R^2		0.1197	0.0151	0.0370
p-values		0.0009	0.0713	0.3184

APPENDIX R – FIRM ABC - RISK MANAGEMENT MODERATING EFFECT – PRACTICE PERFORMANCE – DETAILED REGRESSION TABLES

The tables below present the results of the regression analyses conducted to test for H4→H2.

Table R-1: Detailed Regressions - Risk Management Moderating Effect - Practice Performance

MODERATING VARIABLE	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Z_RISK_PRACT_F1	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
(Constant)	0.411		-0.034		-0.068		-0.019	
	(0.262)		(0.233)		(0.229)		(0.236)	
Q1_TAX	-0.001		-0.016		-0.049		-0.042	
	(0.161)		(0.141)		(0.139)		(0.140)	
Q1_CONS	0.159		0.159		0.236		0.235	
	(0.166)		(0.153)		(0.153)		(0.155)	
Q1_DEALS	-0.063		0.277		0.209		0.214	
	(0.230)		(0.207)		(0.205)		(0.206)	
Q1_IFS	-0.145		0.227		0.126		0.036	
	(0.224)		(0.200)		(0.200)		(0.206)	
Q2_PRAIRIES	0.155		0.173		0.169		0.179	
	(0.183)		(0.159)		(0.157)		(0.158)	
Q2_BC	-0.335	*	-0.220		-0.185		-0.243	
	(0.194)		(0.170)		(0.168)		(0.173)	
Q2_QUEBEC	0.291	*	0.350	**	0.344	**	0.332	**
	(0.168)		(0.147)		(0.145)		(0.146)	
Q2_MARITIMES	-0.144		0.111		0.246		0.003	
	(0.411)		(0.368)		(0.364)		(0.393)	

Table R-1: Detailed Regressions - Risk Management Moderating Effect - Practice Performance (cont'd)

MODERATING VARIABLE	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Q3_CONT	-0.095	**	-0.031		-0.025		-0.030	
	(0.045)		(0.040)		(0.039)		(0.040)	
Q4_MGR	-0.021		0.078		0.097		0.057	
	(0.125)		(0.112)		(0.110)		(0.114)	
Z_COL_IN_OUT_F1			0.211	****	0.181	***	0.156	***
			(0.058)		(0.058)		(0.060)	
Z_COL_OUT_IN_F2			0.262	****	0.230	****	0.211	****
			(0.058)		(0.058)		(0.058)	
Z_COL_for_CLIENT_F3			0.178	***	0.147	**	0.129	**
			(0.058)		(0.058)		(0.058)	
Z_COL_COUPLE_PRACT_F1			0.174	***	0.158	**	0.147	**
			(0.065)		(0.064)		(0.065)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034		-0.032		-0.023	
			(0.061)		(0.060)		(0.063)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145	**	0.132	**	0.123	*
			(0.065)		(0.064)		(0.064)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033		0.023		0.035	
			(0.059)		(0.058)		(0.059)	
Z_RISK_PRACT_F1					0.177	***	0.209	****
					(0.058)		(0.061)	
Z_COL_IN_OUT_F1_Z_RISK_PRACT_F1							0.012	
							(0.054)	
Z_COL_OUT_IN_F2_Z_RISK_PRACT_F1							0.058	
							(0.060)	
Z_COL_for_CLIENT_F3_Z_RISK_PRACT_F1							0.069	
							(0.049)	

Table R-1: Detailed Regressions - Risk Management Moderating Effect - Practice Performance (cont'd)

MODERATING VARIABLE	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
Z_COL_COUPLE_PRACT_F1_Z_RISK_PRACT_F1				0.009	
				(0.063)	
Z_COL_COUPLE_TYPE_PHASE_F2_Z_RISK_PRACT_F1				-0.055	
				(0.063)	
Z_COL_COUPLE_PARTNER_CORE_F1_Z_RISK_PRACT_F1				-0.124	**
				(0.060)	
Z_COL_COUPLE_PARTNER_ADJ_F2_Z_RISK_PRACT_F1				0.094	*
				(0.056)	
R^2	0.0568	0.3174	0.3414	0.3670	
R^2_{adj}	0.0212	0.2724	0.2952	0.3037	
p-values	0.1080	0.0000	0.0000	0.0000	
VIF_{max}	1.5023	1.5023	1.7790	1.8439	
delta R^2		0.2606	0.0239	0.0256	
p-values		0.0000	0.0025	0.1871	

The second table of detailed regressions is the following:

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
Z_RISK_PREF_IN_OUT: Not-Sold-Here Risk								
(Constant)	0.411		-0.034		-0.039		0.014	
	(0.262)		(0.233)		(0.233)		(0.236)	
Q1_TAX	-0.001		-0.016		-0.021		-0.003	
	(0.161)		(0.141)		(0.142)		(0.142)	
Q1_CONS	0.159		0.159		0.164		0.136	
	(0.166)		(0.153)		(0.154)		(0.153)	
Q1_DEALS	-0.063		0.277		0.276		0.241	
	(0.230)		(0.207)		(0.207)		(0.207)	
Q1_IFS	-0.145		0.227		0.232		0.255	
	(0.224)		(0.200)		(0.201)		(0.202)	
Q2_PRAIRIES	0.155		0.173		0.175		0.212	
	(0.183)		(0.159)		(0.160)		(0.160)	
Q2_BC	-0.335	*	-0.220		-0.216		-0.257	
	(0.194)		(0.170)		(0.171)		(0.170)	
Q2_QUEBEC	0.291	*	0.350	**	0.361	**	0.385	**
	(0.168)		(0.147)		(0.151)		(0.151)	
Q2_MARITIMES	-0.144		0.111		0.118		0.194	
	(0.411)		(0.368)		(0.369)		(0.373)	
Q3_CONT	-0.095	**	-0.031		-0.031		-0.033	
	(0.045)		(0.040)		(0.040)		(0.040)	

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2 (cont'd)

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
Q4_MGR	-0.021 (0.125)		0.078 (0.112)		0.077 (0.112)		0.025 (0.112)	
Z_COL_IN_OUT_F1			0.211 (0.058)	****	0.209 (0.059)	****	0.180 (0.059)	***
Z_COL_OUT_IN_F2			0.262 (0.058)	****	0.257 (0.059)	****	0.228 (0.059)	****
Z_COL_for_CLIENT_F3			0.178 (0.058)	***	0.177 (0.058)	***	0.179 (0.058)	***
Z_COL_COUPLE_PRACT_F1			0.174 (0.065)	***	0.177 (0.066)	***	0.165 (0.066)	**
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034 (0.061)		-0.032 (0.061)		-0.034 (0.061)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145 (0.065)	**	0.142 (0.065)	**	0.149 (0.066)	**
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033 (0.059)		0.033 (0.059)		0.063 (0.060)	
Z_RISK_PER_IN_OUT					0.021 (0.055)		0.008 (0.055)	
Z_COL_IN_OUT_F1_Z_RISK_PER_IN_OUT							-0.124 (0.052)	**
Z_COL_OUT_IN_F2_Z_RISK_PER_IN_OUT							-0.015 (0.060)	
Z_COL_for_CLIENT_F3_Z_RISK_PER_IN_OUT							0.007	

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2 (cont'd)

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
							(0.050)	
Z_COL_COUPLE_PRACT_F1_Z_RISK_PER_IN_OUT							-0.025	
							(0.061)	
Z_COL_COUPLE_TYPE_PHASE_F2_Z_RISK_PER_IN_OUT							-0.003	
							(0.061)	
Z_COL_COUPLE_PARTNER_CORE_F1_Z_RISK_PER_IN_OUT							-0.027	
							(0.064)	
Z_COL_COUPLE_PARTNER_ADJ_F2_Z_RISK_PER_IN_OUT							0.166	***
							(0.056)	
R^2	0.0568		0.3174		0.3178		0.3526	
R^2_{adj}	0.0212		0.2724		0.2700		0.2879	
p-values	0.1080		0.0000		0.0000		0.0000	
VIF_{max}	1.5023		1.7311		1.7438		1.7742	
delta R^2			0.2606		0.0004		0.0348	
p-values			0.0000		0.6986		0.0670	
MODERATING VARIABLE	**MODEL 1**		**MODEL 2**		**MODEL 3**		**MODEL 4**	
Z_RISK_PREF_OUT_IN: Not-Invented-Here								
(Constant)	0.411		-0.034		-0.023		-0.008	
	(0.262)		(0.233)		(0.235)		(0.235)	
Q1_TAX	-0.001		-0.016		-0.020		0.003	
	(0.161)		(0.141)		(0.142)		(0.142)	

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2 (cont'd)

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
Q1_CONS	0.159 (0.166)		0.159 (0.153)		0.151 (0.155)		0.174 (0.155)	
Q1_DEALS	-0.063 (0.230)		0.277 (0.207)		0.270 (0.208)		0.248 (0.209)	
Q1_IFS	-0.145 (0.224)		0.227 (0.200)		0.218 (0.202)		0.244 (0.202)	
Q2_PRAIRIES	0.155 (0.183)		0.173 (0.159)		0.171 (0.160)		0.191 (0.160)	
Q2_BC	-0.335 (0.194)	*	-0.220 (0.170)		-0.223 (0.171)		-0.210 (0.173)	
Q2_QUEBEC	0.291 (0.168)	*	0.350 (0.147)	**	0.340 (0.150)	**	0.385 (0.151)	**
Q2_MARITIMES	-0.144 (0.411)		0.111 (0.368)		0.106 (0.368)		0.132 (0.376)	
Q3_CONT	-0.095 (0.045)	**	-0.031 (0.040)		-0.032 (0.040)		-0.039 (0.040)	
Q4_MGR	-0.021 (0.125)		0.078 (0.112)		0.081 (0.112)		0.013 (0.115)	
Z_COL_IN_OUT_F1			0.211 (0.058)	****	0.213 (0.059)	****	0.199 (0.059)	****
Z_COL_OUT_IN_F2			0.262 (0.058)	****	0.265 (0.058)	****	0.238 (0.060)	****
Z_COL_for_CLIENT_F3			0.178	***	0.179	***	0.167	***

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2 (cont'd)

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
			(0.058)		(0.058)		(0.059)	
Z_COL_COUPLE_PRACT_F1			0.174	***	0.170	**	0.169	**
			(0.065)		(0.066)		(0.067)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034		-0.034		-0.033	
			(0.061)		(0.061)		(0.063)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145	**	0.145	**	0.144	**
			(0.065)		(0.065)		(0.065)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033		0.037		0.020	
			(0.059)		(0.060)		(0.060)	
Z_RISK_PER_OUT_IN					-0.021		-0.012	
					(0.055)		(0.058)	
Z_COL_IN_OUT_F1_Z_RISK_PER_OUT_IN							-0.028	
							(0.052)	
Z_COL_OUT_IN_F2_Z_RISK_PER_OUT_IN							0.052	
							(0.053)	
Z_COL_for_CLIENT_F3_Z_RISK_PER_OUT_IN							0.014	
							(0.059)	
Z_COL_COUPLE_PRACT_F1_Z_RISK_PER_OUT_IN							0.017	
							(0.062)	
Z_COL_COUPLE_TYPE_PHASE_F2_Z_RISK_PER_OUT_IN							-0.015	
							(0.057)	
Z_COL_COUPLE_PARTNER_CORE_F1_Z_RISK_PER_OUT_IN							-0.058	
							(0.064)	

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2 (cont'd)

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
Z_COL_COUPLE_PARTNER_ADJ_F2_Z_RISK_PER_OUT_IN							0.133	**
							(0.059)	
R^2	0.0568		0.3174		0.3178		0.3435	
R^2_{adj}	0.0212		0.2724		0.2700		0.2778	
p-values	0.1080		0.0000		0.0000		0.0000	
VIF_{max}	1.5023		1.7311		1.7654		1.7828	
delta R^2			0.2606		0.0004		0.0257	
p-values			0.0000		0.7043		0.2075	
MODERATING VARIABLE	**MODEL 1**		**MODEL 2**		**MODEL 3**		**MODEL 4**	
Z_RISK_TYPE_F1: Types of Risks								
(Constant)	0.411		-0.034		-0.043		-0.134	
	(0.262)		(0.233)		(0.228)		(0.230)	
Q1_TAX	-0.001		-0.016		-0.087		-0.089	
	(0.161)		(0.141)		(0.140)		(0.137)	
Q1_CONS	0.159		0.159		0.180		0.167	
	(0.166)		(0.153)		(0.151)		(0.148)	
Q1_DEALS	-0.063		0.277		0.247		0.251	
	(0.230)		(0.207)		(0.203)		(0.200)	
Q1_IFS	-0.145		0.227		0.202		0.123	
	(0.224)		(0.200)		(0.197)		(0.195)	
Q2_PRAIRIES	0.155		0.173		0.160		0.215	
	(0.183)		(0.159)		(0.157)		(0.154)	

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2 (cont'd)

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
Q2_BC	-0.335	*	-0.220		-0.240		-0.193	
	(0.194)		(0.170)		(0.167)		(0.164)	
Q2_QUEBEC	0.291	*	0.350	**	0.348	**	0.365	**
	(0.168)		(0.147)		(0.145)		(0.142)	
Q2_MARITIMES	-0.144		0.111		0.191		-0.050	
	(0.411)		(0.368)		(0.362)		(0.365)	
Q3_CONT	-0.095	**	-0.031		-0.024		-0.009	
	(0.045)		(0.040)		(0.039)		(0.039)	
Q4_MGR	-0.021		0.078		0.075		0.067	
	(0.125)		(0.112)		(0.110)		(0.108)	
Z_COL_IN_OUT_F1			0.211	****	0.208	****	0.172	***
			(0.058)		(0.057)		(0.057)	
Z_COL_OUT_IN_F2			0.262	****	0.219	****	0.220	****
			(0.058)		(0.058)		(0.058)	
Z_COL_for_CLIENT_F3			0.178	***	0.168	***	0.171	***
			(0.058)		(0.057)		(0.056)	
Z_COL_COUPLE_PRACT_F1			0.174	***	0.170	***	0.177	***
			(0.065)		(0.064)		(0.065)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034		-0.038		-0.037	
			(0.061)		(0.060)		(0.060)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145	**	0.136	**	0.104	
			(0.065)		(0.064)		(0.064)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033		0.012		0.007	

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2 (cont'd)

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
			(0.059)		(0.058)		(0.058)	
Z_RISK_TYPE_F1					0.177	***	0.173	***
					(0.054)		(0.054)	
Z_COL_IN_OUT_F1_Z_RISK_TYPE_F1							-0.061	
							(0.050)	
Z_COL_OUT_IN_F2_Z_RISK_TYPE_F1							0.107	**
							(0.053)	
Z_COL_for_CLIENT_F3_Z_RISK_TYPE_F1							0.054	
							(0.046)	
Z_COL_COUPLE_PRACT_F1_Z_RISK_TYPE_F1							-0.039	
							(0.061)	
Z_COL_COUPLE_TYPE_PHASE_F2_Z_RISK_TYPE_F1							0.041	
							(0.057)	
Z_COL_COUPLE_PARTNER_CORE_F1_Z_RISK_TYPE_F1							-0.118	**
							(0.052)	
Z_COL_COUPLE_PARTNER_ADJ_F2_Z_RISK_TYPE_F1							0.158	**
							(0.061)	
R^2	0.0568		0.3174		0.3445		0.3985	
R^2_{adj}	0.0212		0.2724		0.2986		0.3383	
p-values	0.1080		0.0000		0.0000		0.0000	
VIF_{max}	1.5023		1.7311		1.7340		2.0249	
delta R^2			0.2606		0.0271		0.0539	
p-values			0.0000		0.0013		0.0029	

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2 (cont'd)

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
MODERATING VARIABLE	**MODEL 1**		**MODEL 2**		**MODEL 3**		**MODEL 4**	
Z_IP_FORMAL_F2								
(Constant)	0.411		-0.034		-0.057		-0.054	
	(0.262)		(0.233)		(0.233)		(0.235)	
Q1_TAX	-0.001		-0.016		0.003		0.013	
	(0.161)		(0.141)		(0.142)		(0.140)	
Q1_CONS	0.159		0.159		0.160		0.152	
	(0.166)		(0.153)		(0.153)		(0.151)	
Q1_DEALS	-0.063		0.277		0.286		0.324	
	(0.230)		(0.207)		(0.207)		(0.208)	
Q1_IFS	-0.145		0.227		0.220		0.148	
	(0.224)		(0.200)		(0.200)		(0.199)	
Q2_PRAIRIES	0.155		0.173		0.160		0.173	
	(0.183)		(0.159)		(0.160)		(0.158)	
Q2_BC	-0.335	*	-0.220		-0.208		-0.161	
	(0.194)		(0.170)		(0.170)		(0.173)	
Q2_QUEBEC	0.291	*	0.350	**	0.355	**	0.377	**
	(0.168)		(0.147)		(0.147)		(0.146)	
Q2_MARITIMES	-0.144		0.111		0.075		-0.123	
	(0.411)		(0.368)		(0.368)		(0.374)	
Q3_CONT	-0.095	**	-0.031		-0.025		-0.030	
	(0.045)		(0.040)		(0.040)		(0.040)	
Q4_MGR	-0.021		0.078		0.071		0.101	

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2 (cont'd)

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
	(0.125)		(0.112)		(0.112)		(0.110)	
Z_COL_IN_OUT_F1			0.211	****	0.216	****	0.217	****
			(0.058)		(0.058)		(0.059)	
Z_COL_OUT_IN_F2			0.262	****	0.268	****	0.284	****
			(0.058)		(0.058)		(0.058)	
Z_COL_for_CLIENT_F3			0.178	***	0.187	***	0.193	***
			(0.058)		(0.058)		(0.058)	
Z_COL_COUPLE_PRACT_F1			0.174	***	0.164	**	0.167	**
			(0.065)		(0.066)		(0.065)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034		-0.033		-0.033	
			(0.061)		(0.061)		(0.060)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145	**	0.132	**	0.086	
			(0.065)		(0.065)		(0.066)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033		0.005		0.002	
			(0.059)		(0.063)		(0.063)	
Z_IP_FORMAL_F2					0.073		0.106	
					(0.058)		(0.066)	
Z_COL_IN_OUT_F1_Z_IP_FORMAL_F2							0.001	
							(0.059)	
Z_COL_OUT_IN_F2_Z_IP_FORMAL_F2							-0.108	*
							(0.056)	
Z_COL_for_CLIENT_F3_Z_IP_FORMAL_F2							-0.132	***
							(0.046)	

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2 (cont'd)

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
Z_COL_COUPLE_PRACT_F1_Z_IP_FORMAL_F2							-0.072	
							(0.059)	
Z_COL_COUPLE_TYPE_PHASE_F2_Z_IP_FORMAL_F2							-0.041	
							(0.058)	
Z_COL_COUPLE_PARTNER_CORE_F1_Z_IP_FORMAL_F2							0.056	
							(0.062)	
Z_COL_COUPLE_PARTNER_ADJ_F2_Z_IP_FORMAL_F2							0.009	
							(0.059)	
R^2	0.0568		0.3174		0.3216		0.3640	
R^2_{adj}	0.0212		0.2724		0.2741		0.3004	
p-values	0.1080		0.0000		0.0000		0.0000	
VIF_{max}	1.5023		1.7311		1.7311		1.8998	
delta R^2			0.2606		0.0042		0.0423	
p-values			0.0000		0.2082		0.0228	

MODERATING VARIABLE	MODEL 1	MODEL 2	MODEL 3	MODEL 4
Z_IP_INFORMAL_F3				
(Constant)	0.411	-0.034	0.003	0.039
	(0.262)	(0.233)	(0.233)	(0.234)
Q1_TAX	-0.001	-0.016	-0.020	-0.056
	(0.161)	(0.141)	(0.141)	(0.141)
Q1_CONS	0.159	0.159	0.170	0.118

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2 (cont’d)

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
	(0.166)		(0.153)		(0.153)		(0.155)	
Q1_DEALS	-0.063		0.277		0.254		0.176	
	(0.230)		(0.207)		(0.206)		(0.209)	
Q1_IFS	-0.145		0.227		0.195		0.151	
	(0.224)		(0.200)		(0.200)		(0.202)	
Q2_PRAIRIES	0.155		0.173		0.194		0.181	
	(0.183)		(0.159)		(0.159)		(0.159)	
Q2_BC	-0.335	*	-0.220		-0.230		-0.207	
	(0.194)		(0.170)		(0.170)		(0.171)	
Q2_QUEBEC	0.291	*	0.350	**	0.358	**	0.341	**
	(0.168)		(0.147)		(0.147)		(0.148)	
Q2_MARITIMES	-0.144		0.111		0.129		0.148	
	(0.411)		(0.368)		(0.366)		(0.374)	
Q3_CONT	-0.095	**	-0.031		-0.038		-0.038	
	(0.045)		(0.040)		(0.040)		(0.040)	
Q4_MGR	-0.021		0.078		0.068		0.024	
	(0.125)		(0.112)		(0.111)		(0.113)	
Z_COL_IN_OUT_F1			0.211	****	0.201	****	0.189	***
			(0.058)		(0.059)		(0.059)	
Z_COL_OUT_IN_F2			0.262	****	0.254	****	0.272	****
			(0.058)		(0.058)		(0.059)	
Z_COL_for_CLIENT_F3			0.178	***	0.180	***	0.197	****
			(0.058)		(0.057)		(0.059)	

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2 (cont'd)

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
Z_COL_COUPLE_PRACT_F1			0.174	***	0.164	**	0.148	**
			(0.065)		(0.065)		(0.066)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034		-0.034		-0.027	
			(0.061)		(0.061)		(0.062)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145	**	0.124	*	0.091	
			(0.065)		(0.066)		(0.069)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033		0.025		0.020	
			(0.059)		(0.059)		(0.059)	
Z_IP_INFORMAL_F3					0.090	*	0.139	**
					(0.054)		(0.059)	
Z_COL_IN_OUT_F1_Z_IP_INFORMAL_F3							-0.001	
							(0.051)	
Z_COL_OUT_IN_F2_Z_IP_INFORMAL_F3							-0.099	*
							(0.057)	
Z_COL_for_CLIENT_F3_Z_IP_INFORMAL_F3							-0.062	
							(0.057)	
Z_COL_COUPLE_PRACT_F1_Z_IP_INFORMAL_F3							-0.016	
							(0.068)	
Z_COL_COUPLE_TYPE_PHASE_F2_Z_IP_INFORMAL_F3							-0.010	
							(0.062)	
Z_COL_COUPLE_PARTNER_CORE_F1_Z_IP_INFORMAL_F3							0.065	
							(0.057)	
Z_COL_COUPLE_PARTNER_ADJ_F2_Z_IP_INFORMAL_F3							0.123	**

Table R-2: Detailed Regressions - Risk Management Moderating Effect - Part 2 (cont'd)

	β		β		β		β	
	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.	Std. Er.	Sig.
							(0.062)	
R^2	0.0568		0.3174		0.3247		0.3479	
R^2_{adj}	0.0212		0.2724		0.2774		0.2827	
p-values	0.1080		0.0000		0.0000		0.0000	
VIF_{max}	1.5023		1.7311		1.7341		1.9024	
delta R^2			0.2606		0.0073		0.0232	
p-values			0.0000		0.0975		0.2647	

APPENDIX S – FIRM ABC - DETAILED BREAKDOWN OF FIRM ABC SAMPLE RETAINED FOR EXTERNAL VALIDITY

Table S-1: Detailed Breakdown of Firm ABC Retained Sample
Q1 * Q2_REGION * Q2_1 Cross-tabulation

Count

Q2_1			Q2_REGION QUEBEC	PRAIRIES	ONTARIO	BC	MARITIMES	Total	**Percentage**
1 - Calgary	Q1	ASSURANCE		10				10	**3.62%**
		TAX		7				7	**2.54%**
		CONSULTING		5				5	**1.81%**
		DEALS		1				1	**0.36%**
		IFS		2				2	**0.72%**
	Total			25				25	**9.06%**
2 - Concord	Q1	ASSURANCE			2			2	**0.72%**
		TAX			1			1	**0.36%**
		IFS			1			1	**0.36%**
	Total				4			4	**1.45%**
4 - Edmonton	Q1	ASSURANCE		5				5	**1.81%**
		TAX		1				1	**0.36%**
		CONSULTING		1				1	**0.36%**
		DEALS		1				1	**0.36%**
	Total			8				8	**2.90%**
5 - Halifax	Q1	CONSULTING					1	1	**0.36%**
		DEALS					1	1	**0.36%**
	Total						2	2	**0.72%**
6 - London	Q1	ASSURANCE			2			2	**0.72%**
		TAX			1			1	**0.36%**
	Total				3			3	**1.09%**
7 - Moncton	Q1	TAX					1	1	**0.36%**
	Total						1	1	**0.36%**
8 - Montreal	Q1	ASSURANCE	16					16	**5.80%**
		TAX	9					9	**3.26%**
		CONSULTING	9					9	**3.26%**
		DEALS	5					5	**1.81%**

Table S-1: Detailed Breakdown of Firm ABC Retained Sample (cont'd)
Q1 * Q2_REGION * Q2_1 Cross-tabulation

Count

Q2_1			QUEBEC	PRAIRIES	ONTARIO	BC	MARITIMES	Total	**Percentage**
			Q2_REGION						
		IFS	1					1	**0.36%**
	Total		40					40	**14.49%**
9 - Ottawa	Q1	ASSURANCE			4			4	**1.45%**
		TAX			2			2	**0.72%**
		CONSULTING			10			10	**3.62%**
		DEALS			1			1	**0.36%**
		IFS			1			1	**0.36%**
	Total				18			18	**6.52%**
11 - Oakville	Q1	ASSURANCE			3			3	**1.09%**
		TAX			8			8	**2.90%**
	Total				11			11	**3.99%**
12 - Prince George	Q1	CONSULTING				1		1	**0.36%**
	Total					1		1	**0.36%**
13 - Quebec City/Sainte-Foy	Q1	ASSURANCE	6					6	**2.17%**
		TAX	1					1	**0.36%**
	Total		7					7	**2.54%**
14 - Regina	Q1	TAX		1				1	**0.36%**
	Total			1				1	**0.36%**
17 - St. John's (NL)	Q1	ASSURANCE					2	2	**0.72%**
	Total						2	2	**0.72%**
18 - Surrey	Q1	TAX				1		1	**0.36%**
	Total					1		1	**0.36%**
20 - Toronto	Q1	ASSURANCE			25			25	**9.06%**
		TAX			19			19	**6.88%**
		CONSULTING			37			37	**13.41%**
		DEALS			11			11	**3.99%**
		IFS			21			21	**7.61%**
	Total				113			113	**40.94%**
21 - Truro	Q1	IFS					1	1	**0.36%**
	Total						1	1	**0.36%**
22- Vancouver	Q1	ASSURANCE				14		14	**5.07%**
		TAX				7		7	**2.54%**

Table S-1: Detailed Breakdown of Firm ABC Retained Sample (cont'd)
Q1 * Q2_REGION * Q2_1 Cross-tabulation

Count

Q2_1			QUEBEC	PRAIRIES	ONTARIO	BC	MARITIMES	Total	Percentage
			Q2_REGION						
		CONSULTING				5		5	**1.81%**
		DEALS				3		3	**1.09%**
	Total					29		29	**10.51%**
23 - Victoria	Q1	CONSULTING				1		1	**0.36%**
	Total					1		1	**0.36%**
24 - Waterloo	Q1	ASSURANCE			1			1	**0.36%**
		TAX			2			2	**0.72%**
	Total				3			3	**1.09%**
25 - Windsor	Q1	ASSURANCE			1			1	**0.36%**
		DEALS			1			1	**0.36%**
	Total				2			2	**0.72%**
26 - Winnipeg	Q1	ASSURANCE		1				1	**0.36%**
		TAX		2				2	**0.72%**
	Total			3				3	**1.09%**
Total	Q1	ASSURANCE	22	16	38	14	2	92	**33.33%**
		TAX	10	11	33	8	1	63	**22.83%**
		CONSULTING	9	6	47	7	1	70	**25.36%**
		DEALS	5	2	13	3	1	24	**8.70%**
		IFS	1	2	23	0	1	27	**9.78%**
	Total		47	37	154	32	6	276	

APPENDIX T – EXTERNAL VALIDITY FACTORS ANALYSIS RESULTS

Table T-1: External Sample Factors vs. Firm ABC

Group	Factor in Firm ABC	Factor in External Sample
Erosion Factors	1. EROSION_F1 2. EROSION_COST_RESEARCH	2. EROSION_F1 3. EROSION_COST_RESEARCH
Open Innovation Processes	3. COL_IN_OUT_F1 4. COL_OUT_IN_F2 5. COL_for_CLIENT_F3 6. COL_COUPLE_PRACT_F1 7. COL_COUPLE_TYPE_PHASE_F2 8. COL_COUPLE_PARTNER_CORE_F1 9. COL_COUPLE_PARTNER_ADJ_F2	4. COL_IN_OUT_F1 5. COL_OUT_IN_F2 6. COL_for_CLIENT_F3 7. COL_COUPLE_TYPE_PHASE_F1 8. COL_COUPLE_PRACT_F2 9. COL_COUPLE_PARTNER_ADJ_F1 10. COL_COUPLE_PARTNER_CORE_F2
Organizational Support	10. ORG_SUPPORT_F1 11. ORG_PREF_IN_OUT 12. ORG_PREF_OUT_IN	11. ORG_SUPPORT_F1 12. ORG_PREF_IN_OUT 13. ORG_PREF_OUT_IN

Table T-1: External Sample Factors vs. Firm ABC (cont'd)

Group	Factor in Firm ABC	Factor in External Sample
Risk Management	13. RISK_PRAC_F1 14. RISK_PER_IN_OUT 15. RISK_PER_OUT_IN 16. RISK_TYPE_F1 17. IP_FORMAL_F2 18. IP_INFORMAL_F3	14. RISK_PRAC_F1 15. RISK_PER_IN_OUT 16. RISK_PER_OUT_IN 17. RISK_TYPE_F1 18. IP_INFORMAL_F2 19. IP_FORMAL_F3
Impacts	19. INNOV_PER_FIN_F1	20. INNOV_PER_FIN_F1

Erosion Factors

Two factors resulted from the analysis:

1. EROSION_F1
2. EROSION_COST_RESEARCH (Q5_23 separately)

Component Matrix

	Component
	1
Q5_6_REC	0.620
Q5_16_REC	0.587
Q5_17_REC	0.733
Q5_18_REC	0.691
Q5_20_REC	0.708
Q5_21_REC	0.663
Q5_22_REC	0.715
Q5_24_REC	0.537

Extraction Method: Principal Component Analysis.

KMO	0.878
Alpha Cronbach	0.807
Bartlett's Test of Sphericity	0.000
Variance Cum. %	43.530

Open Innovation Processes

Seven factors resulted from the analysis with some order change between F1 and F2 highlighted below:

1. COL_IN_OUT_F1
2. COL_OUT_IN_F2
3. COL_for_CLIENT_F3
4. ***COL_COUPLE_TYPE_PHASE_F1***
5. ***COL_COUPLE_PRACT_F2***
6. ***COL_COUPLE_PARTNER_ADJ_F1***
7. ***COL_COUPLE_PARTNER_CORE_F2***

Rotated Component Matrix

	Component 1	Component 2	Component 3
Q7_1_REC	0.638	0.231	0.275
Q7_3_REC	0.752	0.144	0.131
Q7_4_REC	0.212	0.088	0.809
Q8_1_REC	0.748	0.243	0.101
Q8_2_REC	0.746	0.287	0.033
Q9_1_REC	0.283	0.602	0.226
Q9_2_REC	0.093	0.125	0.850
Q9_3_REC	0.037	0.670	0.390
Q10_1_REC	0.338	0.737	-0.028
Q10_2_REC	0.285	0.725	-0.009
Variance %	40.043	12.920	9.255
Variance Cum. %	40.043	52.963	62.218
KMO	0.807		
Alpha Cronbach	0.770		
Bartlett's Test of Sphericity	0.000		

Rotated Component Matrix

	Component 1	Component 2
Q11_1_POURCENTAGE	0.663	0.170
Q11_2_POURCENTAGE	0.722	0.124
Q12_1_REC	0.734	0.319
Q12_2_REC	0.800	0.337
Q12_3_REC	0.739	0.272
Q13_2_REC	0.227	0.676
Q13_4_REC	0.295	0.786
Q13_6_REC	0.329	0.801
Q13_8_REC	0.243	0.771
Q13_9_REC	0.096	0.555
Variance %	47.705	11.796
Variance Cum. %	47.705	59.501
KMO	0.864	
Alpha Cronbach		
Bartlett's Test of Sphericity	0.000	

Risk Management

Six factors resulted from the analysis with a different ordering for the last two factors:

1. RISK_PRAC_F1

2. RISK_PER_IN_OUT

3. RISK_PER_OUT_IN

4. RISK_TYPE_F1

5. IP_INFORMAL_F3

6. IP_FORMAL_F2

Rotated Component Matrix

	Component	
	1	2
Q7_5_REC	0.903	0.071
Q8_4_REC	0.130	0.763
Q9_4_REC	0.899	0.098
Q10_4_REC	0.020	0.806

Variance %	44.415	27.796
Variance Cum. %	44.415	72.211
KMO	0.541	0.396
Alpha Cronbach	0.782	
Bartlett's Test of Sphericity	0.000	

Rotated Component Matrix

	Component		
	1	2	3
Q15_1_REC	0.220	0.205	0.873
Q15_2_REC	0.195	0.208	0.884
Q15_3_REC	0.235	0.308	0.834
Q15_4_REC	0.145	0.676	0.245
Q15_5_REC	0.250	0.747	0.154
Q15_6_REC	0.236	0.605	0.373
Q15_8_REC	0.229	0.838	0.134
Q15_10_REC	0.218	0.651	0.364
Q15_11_REC	0.239	0.434	0.606

Rotated Component Matrix

	Component		
	1	2	
Q16_1_REC	0.607	0.255	0.060
Q16_2_REC	0.624	0.387	0.122
Q16_4_REC	0.657	0.208	0.137
Q16_5_REC	0.616	0.423	0.191
Q16_7_REC	0.685	0.212	0.209
Q16_8_REC	0.730	0.093	0.208
Q16_9_REC	0.727	0.071	0.191
Q16_10_REC	0.712	0.107	0.140
Variance %	44.491	10.641	7.360
Variance Cum. %	44.491	55.132	62.491
KMO	0.919		
Alpha Cronbach	0.870		
Bartlett's Test of Sphericity	0.000		

Organizational Culture

Three factors resulted from the analysis in the same order as the internal sample:

1. ORG_SUPPORT_F1

2. ORG_PREF_IN_OUT

3. ORG_PREF_OUT_IN

Rotated Component Matrix

	Component	
	1	2
Q6_1_REC	0.820	0.066
Q6_2_REC	0.803	0.180
Q6_4_REC	0.851	-0.019
Q6_6_REC	0.821	0.135
Q8_3_REC	0.145	0.803
Q10_3_REC	0.029	0.841
Variance %	47.800	21.309
Variance Cum. %	47.800	69.109
KMO	0.770	
Alpha Cronbach	0.849	**0.534**
Bartlett's Test of Sphericity	0.000	

Impacts

One factor resulted from the analysis of the impacts:

1. INNOV_PER_FIN_F1

Rotated Component Matrix

	Component
	1
Q19_1_REC	0.806
Q19_2_REC	0.834
Q19_3_REC	0.709
Q19_4_REC	0.796
Q19_6_REC	0.880

Variance %	65.123
Variance Cum. %	65.123
KMO	0.845
Alpha Cronbach	0.860
Bartlett's Test of Sphericity	0.000

APPENDIX U – REGRESSION DETAILED RESULTS FOR P2 – PROPENSITY TO INNVOATION AND P3 – ORGANIZATIONAL SUPPORT

Table U-1: Detailed Regression Results For P2-P3

Outcome Variable: PROPENSITY TO INNOVATE Moderating Variable: ORGANIZATIONAL SUPPORT								
	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
ORG_SUPPORT	β		β		β		β	
	Std. Error	Sig	Std. Error	Sig	Std. Error	Sig.	Std. Error	Sig.
Constant	-1.436 (0.725)	**	-2.008 (0.803)	**	-2.040 (0.807)	**	-1.933 (0.866)	**
Q1_TAX	-0.434 (0.390)		-0.522 (0.416)		-0.527 (0.417)		-0.660 (0.442)	
Q1_CONS	-1.096 (0.455)	**	-1.197 (0.528)	**	-1.128 (0.529)	**	-1.218 (0.572)	**
Q1_DEALS	-1.658 (0.793)	**	-1.814 (0.857)	**	-1.818 (0.857)	**	-1.932 (0.919)	**
Q1_IFS	0.291 (0.505)		0.629 (0.558)		0.519 (0.572)		0.487 (0.613)	
Q2_PRAIRIES	-0.752 (0.501)		-0.908 (0.527)	*	-0.905 (0.527)	*	-0.962 (0.547)	*
Q2_BC	-0.696 (0.546)		-0.606 (0.577)		-0.534 (0.582)		-0.339 (0.600)	

Table U-1: Detailed Regression Results For P2-P3 (cont'd)

Outcome Variable: PROPENSITY TO INNOVATE Moderating Variable: ORGANIZATIONAL SUPPORT							
Q2_QUEBEC	-0.121	-0.130		-0.142		-0.109	
	(0.411)	(0.454)		(0.455)		(0.469)	
Q2_MARITIMES	-20.314	-19.571		-19.486		-19.060	
	(15946.941)	(15290.169)		(15182.758)		(15168.984)	
Q3_CONT	0.200	0.255	*	0.258	*	0.214	
	(0.130)	(0.139)		(0.139)		(0.146)	
Q4_MGR	-0.107	0.162		0.152		0.158	
	(0.320)	(0.349)		(0.351)		(0.376)	
Z_COL_IN_OUT_F1		0.427	**	0.366	*	0.382	*
		(0.185)		(0.193)		(0.198)	
Z_COL_OUT_IN_F2		0.672	****	0.615	***	0.744	***
		(0.199)		(0.204)		(0.227)	
Z_COL_for_CLIENT_F3		0.003		-0.033		-0.019	
		(0.184)		(0.187)		(0.201)	
Z_COL_COUPLE_PRACT_F1		-0.116		-0.131		-0.279	
		(0.204)		(0.208)		(0.227)	
Z_COL_COUPLE_TYPE_PHASE_F2		-0.387	**	-0.411	**	-0.535	**
		(0.193)		(0.197)		(0.210)	
Z_COL_COUPLE_PARTNER_CORE_F1		0.346	*	0.361	*	0.461	**
		(0.211)		(0.213)		(0.227)	
Z_COL_COUPLE_PARTNER_ADJ_F2		-0.371	**	-0.398	**	-0.419	**
		(0.185)		(0.189)		(0.204)	
Z_ORG_SUPPORT_F1				0.245		0.284	

Table U-1: Detailed Regression Results For P2-P3 (cont'd)

Outcome Variable: PROPENSITY TO INNOVATE
Moderating Variable: ORGANIZATIONAL SUPPORT

			(0.205)	(0.230)	
Z_COL_IN_OUT_F1 x Z_ORG_SUPPORT_F1				0.000 (0.000)	****
Z_COL_OUT_IN_F2 x Z_ORG_SUPPORT_F1				0.000 (0.000)	****
Z_COL_for_CLIENT_F3 x Z_ORG_SUPPORT_F1				0.000 (0.000)	****
Z_COL_COUPLE_PRACT_F1 x Z_ORG_SUPPORT_F1				0.000 (0.000)	****
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_ORG_SUPPORT_F1				0.000 (0.000)	****
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_ORG_SUPPORT_F1				0.000 (0.000)	****
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_ORG_SUPPORT_F1				0.000 (0.000)	****
R^2	0.1205	0.2403	0.2470	0.3070	
R^2_{adj}	NA	NA	NA	NA	
p-values	0.0118	0.0001	0.0001	0.0001	
VIF_{max}	NA	NA	NA	NA	
delta R^2		0.1197	0.0067	0.0600	
p-values		0.0009	0.2286	0.0661	

Table U-1: Detailed Regression Results For P2-P3 (cont'd)

Outcome Variable: PROPENSITY TO INNOVATE
Moderating Variable: ORGANIZATIONAL SUPPORT

ORG_PREF_IN_OUT	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β Std. Error	Sig	β Std. Error	Sig	β Std. Error	Sig.	β Std. Error	Sig.
Constant	-1.721 (0.706)	**	-2.278 (0.773)	***	-2.342 (0.778)	***	-2.456 0.812	***
Q1_TAX	-0.279 (0.369)		-0.260 (0.389)		-0.218 (0.392)		-0.190 0.404	
Q1_CONS	-0.936 (0.431)	**	-0.881 (0.484)	*	-0.881 (0.483)	*	-0.847 0.490	*
Q1_DEALS	-1.294 (0.664)	*	-1.419 (0.727)	*	-1.327 (0.735)	*	-1.410 0.769	*
Q1_IFS	0.459 (0.470)		0.734 (0.523)		0.813 (0.529)		0.696 0.549	
Q2_PRAIRIES	-0.333 (0.432)		-0.437 (0.456)		-0.472 (0.460)		-0.506 0.480	
Q2_BC	-0.363 (0.479)		-0.166 (0.505)		-0.206 (0.508)		-0.289 0.522	
Q2_QUEBEC	-0.071 (0.404)		-0.124 (0.445)		-0.133 (0.447)		-0.184 0.463	
Q2_MARITIMES	-20.184		-19.394		-19.475		-19.500	

Table U-1: Detailed Regression Results For P2-P3 (cont'd)

Outcome Variable: PROPENSITY TO INNOVATE Moderating Variable: ORGANIZATIONAL SUPPORT								
	(13855.275)		(13416.576)		(13227.613)		13307.694	
Q3_CONT	0.227	*	0.270	**	0.270	**	0.270	*
	(0.127)		(0.133)		(0.134)		0.138	
Q4_MGR	-0.135		0.069		0.129		0.178	
	(0.302)		(0.330)		(0.334)		0.346	
Z_COL_IN_OUT_F1			0.455	**	0.376	**	0.291	
			(0.179)		(0.187)		0.200	
Z_COL_OUT_IN_F2			0.697	****	0.689	****	0.662	***
			(0.192)		(0.192)		0.202	
Z_COL_for_CLIENT_F3			-0.146		-0.182		-0.200	
			(0.168)		(0.171)		0.183	
Z_COL_COUPLE_PRACT_F1			-0.099		-0.112		-0.131	
			(0.193)		(0.195)		0.197	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.317	*	-0.304		-0.332	*
			(0.185)		(0.185)		0.191	
Z_COL_COUPLE_PARTNER_CORE_F1			0.313		0.292		0.323	
			(0.201)		(0.203)		0.209	
Z_COL_COUPLE_PARTNER_ADJ_F2			-0.319	*	-0.357	**	-0.381	**
			(0.177)		(0.180)		0.187	
Z_ORG_PREF_IN_OUT					0.257		0.252	
					(0.188)		0.222	
Z_COL_IN_OUT_F1 x Z_ORG_PREF_IN_OUT							0.000	****
							0.000	

Table U-1: Detailed Regression Results For P2-P3 (cont'd)

Outcome Variable: PROPENSITY TO INNOVATE Moderating Variable: ORGANIZATIONAL SUPPORT					
Z_COL_OUT_IN_F2 x Z_ORG_PREF_IN_OUT				0.000	****
				0.000	
Z_COL_for_CLIENT_F3 x Z_ORG_PREF_IN_OUT				0.000	****
				0.000	
Z_COL_COUPLE_PRACT_F1 x Z_ORG_PREF_IN_OUT				0.000	****
				0.000	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_ORG_PREF_IN_OUT				0.000	****
				0.000	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_ORG_PREF_IN_OUT				0.000	****
				0.000	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_ORG_PREF_IN_OUT				0.000	****
				0.000	
R^2	0.1073	0.2260	0.2341	0.2527	
R^2_{adj}	NA	NA	NA	NA	
p-values	0.0135	0.0001	0.0001	0.0004	
VIF_{max}	NA	NA	NA	NA	
delta R^2		0.1187	0.0081	0.0186	
p-values		0.0004	0.1665	0.7280	

Table U-1: Detailed Regression Results For P2-P3 (cont'd)

Outcome Variable: PROPENSITY TO INNOVATE Moderating Variable: ORGANIZATIONAL SUPPORT ORG_PREF_OUT_IN	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	β Std. Error	Sig	β Std. Error	Sig	β Std. Error	Sig.	β Std. Error	Sig.
Constant	-1.721	**	-2.278	***	-2.227	***	-2.496	***
	0.706		(0.773)		(0.773)		0.803	
Q1_TAX	-0.279		-0.260		-0.285		-0.244	
	0.369		(0.389)		(0.391)		0.401	
Q1_CONS	-0.936	**	-0.881	*	-0.937	*	-0.916	*
	0.431		(0.484)		(0.488)		0.504	
Q1_DEALS	-1.294	*	-1.419	*	-1.466	**	-1.547	**
	0.664		(0.727)		(0.730)		0.770	
Q1_IFS	0.459		0.734		0.697		0.695	
	0.470		(0.523)		(0.525)		0.540	
Q2_PRAIRIES	-0.333		-0.437		-0.445		-0.413	
	0.432		(0.456)		(0.456)		0.468	
Q2_BC	-0.363		-0.166		-0.162		-0.082	
	0.479		(0.505)		(0.507)		0.524	
Q2_QUEBEC	-0.071		-0.124		-0.118		-0.078	
	0.404		(0.445)		(0.445)		0.463	
Q2_MARITIMES	-20.184		-19.394		-19.468		-19.466	
	13855.275		(13416.576)		(13380.048)		13376.141	
Q3_CONT	0.227	*	0.270	**	0.262	*	0.280	**

Table U-1: Detailed Regression Results For P2-P3 (cont'd)

Outcome Variable: PROPENSITY TO INNOVATE
Moderating Variable: ORGANIZATIONAL SUPPORT

	0.127	(0.133)		(0.134)		0.139	
Q4_MGR	-0.135	0.069		0.081		0.127	
	0.302	(0.330)		(0.330)		0.341	
Z_COL_IN_OUT_F1		0.455	**	0.417	**	0.330	
		(0.179)		(0.182)		0.209	
Z_COL_OUT_IN_F2		0.697	****	0.641	***	0.677	***
		(0.192)		(0.198)		0.219	
Z_COL_for_CLIENT_F3		-0.146		-0.161		-0.167	
		(0.168)		(0.170)		0.188	
Z_COL_COUPLE_PRACT_F1		-0.099		-0.077		-0.027	
		(0.193)		(0.194)		0.211	
Z_COL_COUPLE_TYPE_PHASE_F2		-0.317	*	-0.298		-0.199	
		(0.185)		(0.185)		0.217	
Z_COL_COUPLE_PARTNER_CORE_F1		0.313		0.268		0.240	
		(0.201)		(0.206)		0.222	
Z_COL_COUPLE_PARTNER_ADJ_F2		-0.319	*	-0.325	*	-0.425	**
		(0.177)		(0.177)		0.204	
Z_ORG_PREF_OUT_IN				0.191		0.303	
				(0.196)		0.228	
Z_COL_IN_OUT_F1 x Z_ORG_PREF_OUT_IN						0.000	****
						0.000	
Z_COL_OUT_IN_F2 x Z_ORG_PREF_OUT_IN						0.000	****
						0.000	

Table U-1: Detailed Regression Results For P2-P3 (cont'd)

Outcome Variable: PROPENSITY TO INNOVATE Moderating Variable: ORGANIZATIONAL SUPPORT					
Z_COL_for_CLIENT_F3 x Z_ORG_PREF_OUT_IN				0.000 0.000	****
Z_COL_COUPLE_PRACT_F1 x Z_ORG_PREF_OUT_IN				0.000 0.000	****
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_ORG_PREF_OUT_IN				0.000 0.000	****
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_ORG_PREF_OUT_IN				0.000 0.000	****
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_ORG_PREF_OUT_IN				0.000 0.000	****
R^2	0.1073	0.2260	0.2301	0.2687	
R^2_{adj}	NA	NA	NA	NA	
p-values	0.0135	0.0001	0.0001	0.0001	
VIF_{max}	NA	NA	NA	NA	
delta R^2		0.1187	0.0041	0.0386	
p-values		0.0004	0.3230	0.2339	

APPENDIX V – REGRESSION DETAILED RESULTS FOR P2 – OVERALL PERFORMANCE AND P3 – ORGANIZATIONAL SUPPORT

Table V-1: Detailed Regression Results for P2-P3 Overall Performance

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: ORGANIZATIONAL SUPPORT								
	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Moderator: ORG_SUPPORT	**B** **Std. Error**	**Sig.**	**B** **Std. Error**	**Sig.**	**B** **Std. Error**	**Sig.**	**B** **Std. Error**	**Sig.**
(Constant)	0.411 (0.262)		-0.034 (0.233)		-0.057 (0.228)		-0.092 (0.233)	
Q1_TAX	-0.001 (0.161)		-0.016 (0.141)		-0.023 (0.138)		-0.027 (0.140)	
Q1_CONS	0.159 (0.166)		0.159 (0.153)		0.203 (0.151)		0.240 (0.154)	
Q1_DEALS	-0.063 (0.230)		0.277 (0.207)		0.289 (0.202)		0.334 (0.204)	
Q1_IFS	-0.145 (0.224)		0.227 (0.200)		0.135 (0.197)		0.124 (0.199)	
Q2_PRAIRIES	0.155 (0.183)		0.173 (0.159)		0.190 (0.156)		0.232 (0.157)	
Q2_BC	-0.335 (0.194)	*	-0.220 (0.170)		-0.155 (0.167)		-0.148 (0.167)	
Q2_QUEBEC	0.291 (0.168)	*	0.350 (0.147)	**	0.344 (0.144)	**	0.396 (0.145)	***
Q2_MARITIMES	-0.144		0.111		0.199		0.092	

Table V-1: Detailed Regression Results for P2-P3 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: ORGANIZATIONAL SUPPORT	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	(0.411)		(0.368)		(0.360)		(0.382)	
Q3_CONT	-0.095	**	-0.031		-0.028		-0.022	
	(0.045)		(0.040)		(0.039)		(0.040)	
Q4_MGR	-0.021		0.078		0.073		0.054	
	(0.125)		(0.112)		(0.109)		(0.110)	
Z_COL_IN_OUT_F1			0.211	****	0.144	**	0.134	**
			(0.058)		(0.060)		(0.060)	
Z_COL_OUT_IN_F2			0.262	****	0.209	****	0.189	***
			(0.058)		(0.058)		(0.060)	
Z_COL_for_CLIENT_F3			0.178	***	0.153	***	0.150	**
			(0.058)		(0.057)		(0.058)	
Z_COL_COUPLE_PRACT_F1			0.174	***	0.151	**	0.129	*
			(0.065)		(0.064)		(0.070)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034		-0.050		-0.046	
			(0.061)		(0.060)		(0.061)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145	**	0.163	**	0.162	**
			(0.065)		(0.064)		(0.066)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033		0.019		0.043	
			(0.059)		(0.058)		(0.059)	
Z_ORG_SUPPORT_F1					0.218	****	0.208	****
					(0.061)		(0.061)	
Z_COL_IN_OUT_F1 x Z_ORG_SUPPORT_F1							0.000	****

Table V-1: Detailed Regression Results for P2-P3 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: ORGANIZATIONAL SUPPORT					
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
				(0.000)	
Z_COL_OUT_IN_F2 x Z_ORG_SUPPORT_F1				0.000	****
				(0.000)	
Z_COL_for_CLIENT_F3 x Z_ORG_SUPPORT_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_PRACT_F1 x Z_ORG_SUPPORT_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_ORG_SUPPORT_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_ORG_SUPPORT_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_ORG_SUPPORT_F1				0.000	****
				(0.000)	
R^2	0.0568	0.3174	0.3496	0.3750	
R^2_{adj}	0.0212	0.2724	0.3040	0.3126	
p-values	0.1080	0.0000	0.0000	0.0000	
VIF_{max}	1.5023	1.7311	1.7428	2.3627	
delta R^2		0.2606	0.0322	0.0255	
p-values		0.0000	0.0004	0.1841	

Table V-1: Detailed Regression Results for P2-P3 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE
MODERATING VARIABLE: ORGANIZATIONAL SUPPORT

PREF_IN_OUT	MODEL 1 B / Std. Error		MODEL 2 B / Std. Error		MODEL 3 B / Std. Error		MODEL 4 B / Std. Error	
(Constant)	0.411		-0.034		-0.036		-0.018	
	(0.262)		(0.233)		(0.233)		(0.236)	
Q1_TAX	-0.001		-0.016		-0.014		-0.007	
	(0.161)		(0.141)		(0.142)		(0.143)	
Q1_CONS	0.159		0.159		0.159		0.167	
	(0.166)		(0.153)		(0.154)		(0.155)	
Q1_DEALS	-0.063		0.277		0.280		0.252	
	(0.230)		(0.207)		(0.208)		(0.213)	
Q1_IFS	-0.145		0.227		0.228		0.160	
	(0.224)		(0.200)		(0.201)		(0.207)	
Q2_PRAIRIES	0.155		0.173		0.172		0.140	
	(0.183)		(0.159)		(0.160)		(0.162)	
Q2_BC	-0.335	*	-0.220		-0.221		-0.257	
	(0.194)		(0.170)		(0.171)		(0.172)	
Q2_QUEBEC	0.291	*	0.350	**	0.349	**	0.327	**
	(0.168)		(0.147)		(0.148)		(0.149)	
Q2_MARITIMES	-0.144		0.111		0.112		0.019	
	(0.411)		(0.368)		(0.368)		(0.373)	
Q3_CONT	-0.095	**	-0.031		-0.031		-0.030	
	(0.045)		(0.040)		(0.040)		(0.040)	

Table V-1: Detailed Regression Results for P2-P3 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: ORGANIZATIONAL SUPPORT	MODEL 1	MODEL 2		MODEL 3		MODEL 4	
Q4_MGR	-0.021 (0.125)	0.078 (0.112)		0.080 (0.113)		0.070 (0.114)	
Z_COL_IN_OUT_F1		0.211 (0.058)	****	0.209 (0.060)	****	0.176 (0.065)	***
Z_COL_OUT_IN_F2		0.262 (0.058)	****	0.262 (0.058)	****	0.255 (0.060)	****
Z_COL_for_CLIENT_F3		0.178 (0.058)	***	0.177 (0.059)	***	0.159 (0.060)	***
Z_COL_COUPLE_PRACT_F1		0.174 (0.065)	***	0.174 (0.066)	***	0.179 (0.066)	***
Z_COL_COUPLE_TYPE_PHASE_F2		-0.034 (0.061)		-0.034 (0.061)		-0.028 (0.062)	
Z_COL_COUPLE_PARTNER_CORE_F1		0.145 (0.065)	**	0.144 (0.065)	**	0.149 (0.067)	**
Z_COL_COUPLE_PARTNER_ADJ_F2		0.033 (0.059)		0.032 (0.060)		0.041 (0.060)	
Z_ORG_PREF_IN_OUT				0.009 (0.060)		0.026 (0.065)	
Z_COL_IN_OUT_F1 x Z_ORG_PREF_IN_OUT						0.000 (0.000)	****
Z_COL_OUT_IN_F2 x Z_ORG_PREF_IN_OUT						0.000 (0.000)	****

Table V-1: Detailed Regression Results for P2-P3 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: ORGANIZATIONAL SUPPORT	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
Z_COL_for_CLIENT_F3 x Z_ORG_PREF_IN_OUT				0.000 (0.000)	****
Z_COL_COUPLE_PRACT_F1 x Z_ORG_PREF_IN_OUT				0.000 (0.000)	****
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_ORG_PREF_IN_OUT				0.000 (0.000)	****
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_ORG_PREF_IN_OUT				0.000 (0.000)	****
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_ORG_PREF_IN_OUT				0.000 (0.000)	****
R^2	0.0568	0.3174	0.3175	0.3394	
R^2_{adj}	0.0212	0.2724	0.2697	0.2733	
p-values	0.108	0.0000	0.0000	0.0000	
VIF_{max}	1.5023	1.7311	1.7312	1.7700	
delta R^2		0.2606	0.0001	0.0219	
p-values		0.0000	0.8814	0.3127	

Table V-1: Detailed Regression Results for P2-P3 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE
MODERATING VARIABLE: ORGANIZATIONAL SUPPORT

	MODEL 1 CONTROL		MODEL 2 OI PRACTICES		MODEL 3 OI PRACTICES + ORG		MODEL 4 OI PRACTICES + ORG + OI PRAC*ORG	
PREF_OUT_IN	**Unstandardized Coefficients B / Std. Error**		**Unstandardized Coefficients B / Std. Error**		**Unstandardized Coefficients B / Std. Error**		**Unstandardized Coefficients B / Std. Error**	
(Constant)	0.411		-0.034		-0.003		0.051	
	(0.262)		(0.233)		(0.234)		(0.235)	
Q1_TAX	-0.001		-0.016		-0.027		-0.021	
	(0.161)		(0.141)		(0.141)		(0.141)	
Q1_CONS	0.159		0.159		0.138		0.140	
	(0.166)		(0.153)		(0.154)		(0.154)	
Q1_DEALS	-0.063		0.277		0.276		0.149	
	(0.230)		(0.207)		(0.207)		(0.210)	
Q1_IFS	-0.145		0.227		0.208		0.194	
	(0.224)		(0.200)		(0.200)		(0.200)	
Q2_PRAIRIES	0.155		0.173		0.159		0.144	
	(0.183)		(0.159)		(0.160)		(0.159)	
Q2_BC	-0.335	*	-0.220		-0.218		-0.226	
	(0.194)		(0.170)		(0.170)		(0.171)	
Q2_QUEBEC	0.291	*	0.350	**	0.335	**	0.359	**
	(0.168)		(0.147)		(0.148)		(0.150)	
Q2_MARITIMES	-0.144		0.111		0.072		0.239	

Table V-1: Detailed Regression Results for P2-P3 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: ORGANIZATIONAL SUPPORT	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	(0.411)		(0.368)		(0.369)		(0.370)	
Q3_CONT	-0.095	**	-0.031		-0.037		-0.044	
	(0.045)		(0.040)		(0.040)		(0.041)	
Q4_MGR	-0.021		0.078		0.088		0.039	
	(0.125)		(0.112)		(0.112)		(0.114)	
Z_COL_IN_OUT_F1			0.211	****	0.200	****	0.167	**
			(0.058)		(0.059)		(0.065)	
Z_COL_OUT_IN_F2			0.262	****	0.244	****	0.187	***
			(0.058)		(0.059)		(0.062)	
Z_COL_for_CLIENT_F3			0.178	***	0.167	***	0.182	***
			(0.058)		(0.058)		(0.061)	
Z_COL_COUPLE_PRACT_F1			0.174	***	0.179	***	0.201	***
			(0.065)		(0.065)		(0.066)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034		-0.027		0.009	
			(0.061)		(0.061)		(0.065)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145	**	0.133	**	0.086	
			(0.065)		(0.065)		(0.068)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033		0.031		0.034	
			(0.059)		(0.059)		(0.061)	
Z_ORG_PREF_OUT_IN					0.071		0.130	**
					(0.058)		(0.063)	
Z_COL_IN_OUT_F1 x Z_ORG_PREF_OUT_IN							0.000	****

Table V-1: Detailed Regression Results for P2-P3 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: ORGANIZATIONAL SUPPORT					
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
				(0.000)	
Z_COL_OUT_IN_F2 x Z_ORG_PREF_OUT_IN				0.000	****
				(0.000)	
Z_COL_for_CLIENT_F3 x Z_ORG_PREF_OUT_IN				0.000	****
				(0.000)	
Z_COL_COUPLE_PRACT_F1 x Z_ORG_PREF_OUT_IN				0.000	****
				(0.000)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_ORG_PREF_OUT_IN				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_ORG_PREF_OUT_IN				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_ORG_PREF_OUT_IN				0.000	****
				(0.000)	
R^2	0.0568	0.3174	0.3214	0.3539	
R^2_{adj}	0.0212	0.2724	0.2739	0.2893	
p-values	0.108	0.0000	0.0000	0.0000	
VIF_{max}	1.5023	1.7311	1.7533	2.1181	
delta R^2		0.2606	0.0040	0.0325	
p-values		0.0000	0.2220	0.0881	

APPENDIX W – REGRESSION DETAILED RESULTS FOR P2 – PROPENSITY TO INNOVATE AND P4 –RISK MANAGEMENT

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (

OUTCOME VARIABLE: PROPENSITY TO INNOVATE MODERATING VARIABLE: RISK MANAGEMENT								
	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Z_RISK_PRACT_F1	β Std. Error	Sig	β Std. Error	Sig	β Std. Error	Sig.	β Std. Error	Sig.
Constant	-1.436 (0.725)	**	-2.008 (0.803)	**	-2.134 (0.817)	***	-2.201 (0.851)	***
Q1_TAX	-0.434 (0.390)		-0.522 (0.416)		-0.598 (0.422)		-0.541 (0.428)	
Q1_CONS	-1.096 (0.455)	**	-1.197 (0.528)	**	-1.019 (0.533)	*	-1.089 (0.557)	*
Q1_DEALS	-1.658 (0.793)	**	-1.814 (0.857)	**	-1.975 (0.867)	**	-1.728 (0.857)	**
Q1_IFS	0.291 (0.505)		0.629 (0.558)		0.461 (0.572)		0.452 (0.602)	
Q2_PRAIRIES	-0.752 (0.501)		-0.908 (0.527)	*	-0.916 (0.532)	*	-0.840 (0.541)	
Q2_BC	-0.696 (0.546)		-0.606 (0.577)		-0.574 (0.583)		-0.607 (0.608)	
Q2_QUEBEC	-0.121 (0.411)		-0.130 (0.454)		-0.118 (0.457)		-0.113 (0.467)	
Q2_MARITIMES	-20.314		-19.571		-19.388		-19.954	

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE MODERATING VARIABLE: RISK MANAGEMENT								
	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	(15946.941)		(15290.169)		(14946.063)		(14271.085)	
Q3_CONT	0.200		0.255	*	0.267	*	0.265	*
	(0.130)		(0.139)		(0.139)		(0.144)	
Q4_MGR	-0.107		0.162		0.248		0.195	
	(0.320)		(0.349)		(0.355)		(0.375)	
Z_COL_IN_OUT_F1			0.427	**	0.388	**	0.379	*
			(0.185)		(0.187)		(0.204)	
Z_COL_OUT_IN_F2			0.672	****	0.629	***	0.602	***
			(0.199)		(0.200)		(0.214)	
Z_COL_for_CLIENT_F3			0.003		-0.049		-0.136	
			(0.184)		(0.185)		(0.204)	
Z_COL_COUPLE_PRACT_F1			-0.116		-0.169		-0.190	
			(0.204)		(0.205)		(0.214)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.387	**	-0.398	**	-0.380	*
			(0.193)		(0.193)		(0.219)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.346	*	0.330		0.381	*
			(0.211)		(0.209)		(0.227)	
Z_COL_COUPLE_PARTNER_ADJ_F2			-0.371	**	-0.406	**	-0.418	**
			(0.185)		(0.188)		(0.202)	
Z_RISK_PRACT_F1					0.359	*	0.470	**
					(0.202)		(0.224)	
Z_COL_IN_OUT_F1 x Z_RISK_PRACT_F1							0.000	****

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE
MODERATING VARIABLE: RISK MANAGEMENT

	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
				(0.000)	
Z_COL_OUT_IN_F2 x Z_RISK_PRACT_F1				0.000	****
				(0.000)	
Z_COL_for_CLIENT_F3 x Z_RISK_PRACT_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_PRACT_F1 x Z_RISK_PRACT_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_RISK_PRACT_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_RISK_PRACT_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_RISK_PRACT_F1				0.000	****
				(0.000)	
R^2	0.1205	0.2403	0.2555	0.2832	
R^2_{adj}	NA	NA	NA	NA	
p-values	0.0118	0.0001	0.0001	0.0003	
VIF_{max}	NA	NA	NA	NA	
delta R^2		0.1197	0.0152	0.0277	
p-values		0.0009	0.0701	0.5294	

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE
MODERATING VARIABLE: RISK MANAGEMENT

	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Z_RISK_PER_IN_OUT	**β**		**β**		**β**		**β**	
	Std. Error	**Sig**	**Std. Error**	**Sig**	**Std. Error**	**Sig.**	**Std. Error**	**Sig.**
Constant	-1.436	**	-2.008	**	-1.978	**	-1.902	**
	(0.725)		(0.803)		(0.806)		(0.818)	
Q1_TAX	-0.434		-0.522		-0.500		-0.636	
	(0.390)		(0.416)		(0.418)		(0.432)	
Q1_CONS	-1.096	**	-1.197	**	-1.236	**	-1.301	**
	(0.455)		(0.528)		(0.536)		(0.546)	
Q1_DEALS	-1.658	**	-1.814	**	-1.805	**	-1.845	**
	(0.793)		(0.857)		(0.858)		(0.905)	
Q1_IFS	0.291		0.629		0.616		0.465	
	(0.505)		(0.558)		(0.560)		(0.586)	
Q2_PRAIRIES	-0.752		-0.908	*	-0.923	*	-0.918	*
	(0.501)		(0.527)		(0.528)		(0.535)	
Q2_BC	-0.696		-0.606		-0.635		-0.734	
	(0.546)		(0.577)		(0.582)		(0.596)	
Q2_QUEBEC	-0.121		-0.130		-0.187		-0.330	
	(0.411)		(0.454)		(0.469)		(0.484)	
Q2_MARITIMES	-20.314		-19.571		-19.604		-19.317	
	(15946.941)		(15290.169)		(15308.212)		(15091.246)	
Q3_CONT	0.200		0.255	*	0.252	*	0.255	*

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE MODERATING VARIABLE: RISK MANAGEMENT							
	MODEL 1	MODEL 2		MODEL 3		MODEL 4	
	(0.130)	(0.139)		(0.139)		(0.141)	
Q4_MGR	-0.107	0.162		0.163		0.106	
	(0.320)	(0.349)		(0.350)		(0.359)	
Z_COL_IN_OUT_F1		0.427	**	0.434	**	0.468	**
		(0.185)		(0.186)		(0.192)	
Z_COL_OUT_IN_F2		0.672	****	0.687	****	0.697	****
		(0.199)		(0.202)		(0.211)	
Z_COL_for_CLIENT_F3		0.003		0.013		-0.017	
		(0.184)		(0.185)		(0.189)	
Z_COL_COUPLE_PRACT_F1		-0.116		-0.126		-0.117	
		(0.204)		(0.205)		(0.218)	
Z_COL_COUPLE_TYPE_PHASE_F2		-0.387	**	-0.392	**	-0.424	**
		(0.193)		(0.194)		(0.207)	
Z_COL_COUPLE_PARTNER_CORE_F1		0.346	*	0.361	*	0.380	*
		(0.211)		(0.213)		(0.220)	
Z_COL_COUPLE_PARTNER_ADJ_F2		-0.371	**	-0.373	**	-0.351	*
		(0.185)		(0.185)		(0.195)	
Z_RISK_PER_IN_OUT				-0.088		-0.042	
				(0.178)		(0.202)	
Z_COL_IN_OUT_F1 x Z_RISK_PER_IN_OUT						0.000	****
						(0.000)	
Z_COL_OUT_IN_F2 x Z_RISK_PER_IN_OUT						0.000	****

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE MODERATING VARIABLE: RISK MANAGEMENT					
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
				(0.000)	
Z_COL_for_CLIENT_F3 x Z_RISK_PER_IN_OUT				0.000	****
				(0.000)	
Z_COL_COUPLE_PRACT_F1 x Z_RISK_PER_IN_OUT				0.000	****
				(0.000)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_RISK_PER_IN_OUT				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_RISK_PER_IN_OUT				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_RISK_PER_IN_OUT				0.000	****
				(0.000)	
R^2	0.1205	0.2403	0.2414	0.2666	
R^2_{adj}	NA	NA	NA	NA	
p-values	2.9692	0.0001	0.0002	0.0009	
VIF_{max}	NA	NA	NA	NA	
delta R^2		0.1197	0.0011	0.0252	
p-values		0.0009	0.6213	0.6030	

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE
MODERATING VARIABLE: RISK MANAGEMENT

	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Z_RISK_PER_OUT_IN	**β**		**β**		**β**		**β**	
	Std. Error	**Sig**	**Std. Error**	**Sig**	**Std. Error**	**Sig.**	**Std. Error**	**Sig.**
Constant	-1.436	**	-2.008	**	-1.795	**	-1.849	**
	(0.725)		(0.803)		(0.806)		(0.811)	
Q1_TAX	-0.434		-0.522		-0.623		-0.633	
	(0.390)		(0.416)		(0.425)		(0.436)	
Q1_CONS	-1.096	**	-1.197	**	-1.405	**	-1.408	**
	(0.455)		(0.528)		(0.546)		(0.555)	
Q1_DEALS	-1.658	**	-1.814	**	-1.935	**	-2.058	**
	(0.793)		(0.857)		(0.878)		(0.922)	
Q1_IFS	0.291		0.629		0.472		0.473	
	(0.505)		(0.558)		(0.566)		(0.578)	
Q2_PRAIRIES	-0.752		-0.908	*	-0.948	*	-0.977	*
	(0.501)		(0.527)		(0.536)		(0.548)	
Q2_BC	-0.696		-0.606		-0.745		-0.827	
	(0.546)		(0.577)		(0.594)		(0.611)	
Q2_QUEBEC	-0.121		-0.130		-0.314		-0.296	
	(0.411)		(0.454)		(0.472)		(0.488)	
Q2_MARITIMES	-20.314		-19.571		-19.613		-19.308	
	(15946.941)		(15290.169)		(15377.584)		(15403.931)	
Q3_CONT	0.200		0.255	*	0.234	*	0.232	*

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE MODERATING VARIABLE: RISK MANAGEMENT							
	MODEL 1	**MODEL 2**		**MODEL 3**		**MODEL 4**	
	(0.130)	(0.139)		(0.138)		(0.138)	
Q4_MGR	-0.107	0.162		0.202		0.234	
	(0.320)	(0.349)		(0.356)		(0.370)	
Z_COL_IN_OUT_F1		0.427	**	0.478	**	0.475	**
		(0.185)		(0.189)		(0.196)	
Z_COL_OUT_IN_F2		0.672	****	0.728	****	0.835	****
		(0.199)		(0.204)		(0.220)	
Z_COL_for_CLIENT_F3		0.003		0.026		-0.009	
		(0.184)		(0.184)		(0.196)	
Z_COL_COUPLE_PRACT_F1		-0.116		-0.174		-0.154	
		(0.204)		(0.209)		(0.210)	
Z_COL_COUPLE_TYPE_PHASE_F2		-0.387	**	-0.398	**	-0.423	**
		(0.193)		(0.195)		(0.211)	
Z_COL_COUPLE_PARTNER_CORE_F1		0.346	*	0.359	*	0.372	*
		(0.211)		(0.213)		(0.219)	
Z_COL_COUPLE_PARTNER_ADJ_F2		-0.371	**	-0.307		-0.325	*
		(0.185)		(0.190)		(0.196)	
Z_RISK_PER_OUT_IN				-0.371	**	-0.353	*
				(0.179)		(0.213)	
Z_COL_IN_OUT_F1 x Z_RISK_PER_OUT_IN						0.000	****
						(0.000)	
Z_COL_OUT_IN_F2 x Z_RISK_PER_OUT_IN						0.000	****

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE
MODERATING VARIABLE: RISK MANAGEMENT

	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
				(0.000)	
Z_COL_for_CLIENT_F3 x Z_RISK_PER_OUT_IN				0.000	****
				(0.000)	
Z_COL_COUPLE_PRACT_F1 x Z_RISK_PER_OUT_IN				0.000	****
				(0.000)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_RISK_PER_OUT_IN				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_RISK_PER_OUT_IN				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_RISK_PER_OUT_IN				0.000	****
				(0.000)	
R^2	0.1205	0.2403	0.2609	0.2846	
R^2_{adj}	NA	NA	NA	NA	
p-values	0.0000	0.0001	0.0000	0.0003	
VIF_{max}	NA	NA	NA	NA	
delta R^2		0.1197	0.0206	0.0237	
p-values		0.0009	0.0347	0.6328	

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE
MODERATING VARIABLE: RISK MANAGEMENT

	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Z_RISK_TYPE_F1	β Std. Error	Sig	β Std. Error	Sig	β Std. Error	Sig.	β Std. Error	Sig.
Constant	-1.436 (0.725)	**	-2.008 (0.803)	**	-2.034 (0.805)	**	-2.638 (0.846)	***
Q1_TAX	-0.434 (0.390)		-0.522 (0.416)		-0.610 (0.425)		-0.565 (0.438)	
Q1_CONS	-1.096 (0.455)	**	-1.197 (0.528)	**	-1.180 (0.529)	**	-1.135 (0.546)	**
Q1_DEALS	-1.658 (0.793)	**	-1.814 (0.857)	**	-1.885 (0.865)	**	-1.979 (0.936)	**
Q1_IFS	0.291 (0.505)		0.629 (0.558)		0.606 (0.560)		0.713 (0.602)	
Q2_PRAIRIES	-0.752 (0.501)		-0.908 (0.527)	*	-0.939 (0.530)	*	-0.877 (0.541)	
Q2_BC	-0.696 (0.546)		-0.606 (0.577)		-0.618 (0.578)		-0.585 (0.618)	
Q2_QUEBEC	-0.121 (0.411)		-0.130 (0.454)		-0.144 (0.456)		-0.267 (0.471)	
Q2_MARITIMES	-20.314 (15946.941)		-19.571 (15290.169)		-19.447 (15299.350)		-19.346 (14881.360)	
Q3_CONT	0.200		0.255	*	0.264	*	0.366	**

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE MODERATING VARIABLE: RISK MANAGEMENT							
	MODEL 1	MODEL 2		MODEL 3		MODEL 4	
	(0.130)	(0.139)		(0.138)		(0.146)	
Q4_MGR	-0.107	0.162		0.168		0.247	
	(0.320)	(0.349)		(0.351)		(0.377)	
Z_COL_IN_OUT_F1		0.427	**	0.430	**	0.556	***
		(0.185)		(0.184)		(0.211)	
Z_COL_OUT_IN_F2		0.672	****	0.647	***	0.768	****
		(0.199)		(0.201)		(0.216)	
Z_COL_for_CLIENT_F3		0.003		-0.012		-0.048	
		(0.184)		(0.185)		(0.195)	
Z_COL_COUPLE_PRACT_F1		-0.116		-0.131		-0.124	
		(0.204)		(0.203)		(0.223)	
Z_COL_COUPLE_TYPE_PHASE_F2		-0.387	**	-0.403	**	-0.347	
		(0.193)		(0.194)		(0.217)	
Z_COL_COUPLE_PARTNER_CORE_F1		0.346	*	0.343	*	0.296	
		(0.211)		(0.207)		(0.240)	
Z_COL_COUPLE_PARTNER_ADJ_F2		-0.371	**	-0.398	**	-0.423	**
		(0.185)		(0.187)		(0.209)	
Z_RISK_TYPE_F1				0.198		0.151	
				(0.181)		(0.205)	
Z_COL_IN_OUT_F1 x Z_RISK_TYPE_F1						0.000	****
						(0.000)	
Z_COL_OUT_IN_F2 x Z_RISK_TYPE_F1						0.000	****

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE MODERATING VARIABLE: RISK MANAGEMENT					
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
				(0.000)	
Z_COL_for_CLIENT_F3 x Z_RISK_TYPE_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_PRACT_F1 x Z_RISK_TYPE_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_RISK_TYPE_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_RISK_TYPE_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_RISK_TYPE_F1				0.000	****
				(0.000)	
R^2	0.1205	0.2403	0.2459	0.2989	
R^2_{adj}	NA	NA	NA	NA	
p-values	0.0000	0.0001	0.0001	0.0001	
VIF_{max}	NA	NA	NA	NA	
delta R^2		0.1197	0.0056	0.0530	
p-values		0.0009	0.2715	0.1121	

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE
MODERATING VARIABLE: RISK MANAGEMENT

	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Z_IP_INFORMAL_F3	**β**		**β**		**β**		**β**	
	Std. Error	**Sig**	**Std. Error**	**Sig**	**Std. Error**	**Sig.**	**Std. Error**	**Sig.**
Constant	-1.436	**	-2.008	**	-1.983	**	-1.951	**
	(0.725)		(0.803)		(0.804)		(0.818)	
Q1_TAX	-0.434		-0.522		-0.520		-0.572	
	(0.390)		(0.416)		(0.416)		(0.436)	
Q1_CONS	-1.096	**	-1.197	**	-1.169	**	-1.360	**
	(0.455)		(0.528)		(0.527)		(0.564)	
Q1_DEALS	-1.658	**	-1.814	**	-1.833	**	-2.132	**
	(0.793)		(0.857)		(0.858)		(0.878)	
Q1_IFS	0.291		0.629		0.599		0.579	
	(0.505)		(0.558)		(0.561)		(0.580)	
Q2_PRAIRIES	-0.752		-0.908	*	-0.886	*	-1.042	*
	(0.501)		(0.527)		(0.529)		(0.563)	
Q2_BC	-0.696		-0.606		-0.610		-0.703	
	(0.546)		(0.577)		(0.577)		(0.609)	
Q2_QUEBEC	-0.121		-0.130		-0.104		-0.118	
	(0.411)		(0.454)		(0.456)		(0.481)	
Q2_MARITIMES	-20.314		-19.571		-19.603		-20.446	
	(15946.941)		(15290.169)		(15175.684)		(14693.348)	
Q3_CONT	0.200		0.255	*	0.248	*	0.236	*
	(0.130)		(0.139)		(0.140)		(0.141)	

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE MODERATING VARIABLE: RISK MANAGEMENT							
	MODEL 1	MODEL 2		MODEL 3		MODEL 4	
Q4_MGR	-0.107 (0.320)	0.162 (0.349)		0.158 (0.349)		0.175 (0.374)	
Z_COL_IN_OUT_F1		0.427 (0.185)	**	0.410 (0.187)	**	0.377 (0.194)	*
Z_COL_OUT_IN_F2		0.672 (0.199)	****	0.650 (0.201)	***	0.701 (0.218)	***
Z_COL_for_CLIENT_F3		0.003 (0.184)		0.008 (0.183)		0.122 (0.202)	
Z_COL_COUPLE_PRACT_F1		-0.116 (0.204)		-0.128 (0.205)		-0.123 (0.215)	
Z_COL_COUPLE_TYPE_PHASE_F2		-0.387 (0.193)	**	-0.381 (0.192)	**	-0.420 (0.211)	**
Z_COL_COUPLE_PARTNER_CORE_F1		0.346 (0.211)	*	0.322 (0.214)		0.284 (0.229)	
Z_COL_COUPLE_PARTNER_ADJ_F2		-0.371 (0.185)	**	-0.378 (0.185)	**	-0.387 (0.203)	*
Z_IP_INFORMAL_F3				0.112 (0.174)		0.181 (0.221)	
Z_COL_IN_OUT_F1 x Z_IP_INFORMAL_F3						0.000 (0.000)	****
Z_COL_OUT_IN_F2 x Z_IP_INFORMAL_F3						0.000 (0.000)	****

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE MODERATING VARIABLE: RISK MANAGEMENT								
	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Z_COL_for_CLIENT_F3 x Z_IP_INFORMAL_F3							0.000 (0.000)	****
Z_COL_COUPLE_PRACT_F1 x Z_IP_INFORMAL_F3							0.000 (0.000)	****
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_IP_INFORMAL_F3							0.000 (0.000)	****
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_IP_INFORMAL_F3							0.000 (0.000)	****
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_IP_INFORMAL_F3							0.000 (0.000)	****
R^2	0.1205		0.2403		0.2422		0.3043	
R^2_{adj}	NA		NA		NA		NA	
p-values	0.0000		0.0001		0.0002		0.0001	
VIF_{max}	NA		NA		NA		NA	
delta R^2			0.1197		0.0020		0.0621	
p-values			0.0009		0.5151		0.0571	

	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Z_IP_FORMAL_F2	β Std. Error	Sig	β Std. Error	Sig	β Std. Error	Sig.	β Std. Error	Sig.
Constant	-1.436	**	-2.008	**	-1.960	**	-2.393	***

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE MODERATING VARIABLE: RISK MANAGEMENT								
	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	(0.725)		(0.803)		(0.812)		(0.847)	
Q1_TAX	-0.434		-0.522		-0.624		-0.519	
	(0.390)		(0.416)		(0.425)		(0.434)	
Q1_CONS	-1.096	**	-1.197	**	-1.236	**	-1.343	**
	(0.455)		(0.528)		(0.534)		(0.562)	
Q1_DEALS	-1.658	**	-1.814	**	-1.801	**	-1.556	*
	(0.793)		(0.857)		(0.848)		(0.886)	
Q1_IFS	0.291		0.629		0.698		0.603	
	(0.505)		(0.558)		(0.566)		(0.574)	
Q2_PRAIRIES	-0.752		-0.908	*	-0.834		-0.797	
	(0.501)		(0.527)		(0.526)		(0.541)	
Q2_BC	-0.696		-0.606		-0.717		-0.504	
	(0.546)		(0.577)		(0.592)		(0.618)	
Q2_QUEBEC	-0.121		-0.130		-0.106		-0.073	
	(0.411)		(0.454)		(0.456)		(0.469)	
Q2_MARITIMES	-20.314		-19.571		-19.407		-19.836	
	(15946.941)		(15290.169)		(15368.156)		(15455.088)	
Q3_CONT	0.200		0.255	*	0.236	*	0.265	*
	(0.130)		(0.139)		(0.141)		(0.146)	
Q4_MGR	-0.107		0.162		0.215		0.256	
	(0.320)		(0.349)		(0.353)		(0.360)	
Z_COL_IN_OUT_F1			0.427	**	0.399	**	0.375	*

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE
MODERATING VARIABLE: RISK MANAGEMENT

	MODEL 1	MODEL 2		MODEL 3		MODEL 4	
		(0.185)		(0.187)		(0.194)	
Z_COL_OUT_IN_F2		0.672	****	0.639	***	0.689	***
		(0.199)		(0.201)		(0.223)	
Z_COL_for_CLIENT_F3		0.003		-0.017		0.021	
		(0.184)		(0.185)		(0.198)	
Z_COL_COUPLE_PRACT_F1		-0.116		-0.072		-0.036	
		(0.204)		(0.208)		(0.223)	
Z_COL_COUPLE_TYPE_PHASE_F2		-0.387	**	-0.404	**	-0.380	*
		(0.193)		(0.196)		(0.204)	
Z_COL_COUPLE_PARTNER_CORE_F1		0.346	*	0.415	*	0.351	
		(0.211)		(0.218)		(0.235)	
Z_COL_COUPLE_PARTNER_ADJ_F2		-0.371	**	-0.230		-0.272	
		(0.185)		(0.202)		(0.220)	
Z_IP_FORMAL_F2				-0.322	*	-0.101	
				(0.181)		(0.245)	
Z_COL_IN_OUT_F1 x Z_IP_FORMAL_F2						0.000	****
						(0.000)	
Z_COL_OUT_IN_F2 x Z_IP_FORMAL_F2						0.000	****
						(0.000)	
Z_COL_for_CLIENT_F3 x Z_IP_FORMAL_F2						0.000	****
						(0.000)	
Z_COL_COUPLE_PRACT_F1 x Z_IP_FORMAL_F2						0.000	****

Table W-1: Detailed Regression Results for P2-P4 Propensity to Innovate (cont'd)

OUTCOME VARIABLE: PROPENSITY TO INNOVATE MODERATING VARIABLE: RISK MANAGEMENT					
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
				(0.000)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_IP_FORMAL_F2				0.000 (0.000)	****
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_IP_FORMAL_F2				0.000 (0.000)	****
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_IP_FORMAL_F2				0.000 (0.000)	****
R^2	0.1205	0.2403	0.2553	0.2924	
R^2_{adj}	NA	NA	NA	NA	
p-values	3.2366	0.0001	0.0001	0.0002	
VIF_{max}	NA	NA	NA	NA	
delta R^2		0.1197	0.0151	0.0370	
p-values		0.0009	0.0713	0.3184	

APPENDIX X – REGRESSION DETAILED RESULTS FOR P2 – OVERALL PERFORMANCE AND P4 –RISK MANAGEMENT

Table X-1: Detailed Regression Results for P2-P4 Overall Performance

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT								
	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Z_RISK_PRACT_F1	B Std. Error	Sign	B Std. Error	Sign	B Std. Error	Sign	B Std. Error	Sign
(Constant)	0.411 (0.262)		-0.034 (0.233)		-0.068 (0.229)		-0.019 (0.236)	
Q1_TAX	-0.001 (0.161)		-0.016 (0.141)		-0.049 (0.139)		-0.042 (0.140)	
Q1_CONS	0.159 (0.166)		0.159 (0.153)		0.236 (0.153)		0.235 (0.155)	
Q1_DEALS	-0.063 (0.230)		0.277 (0.207)		0.209 (0.205)		0.214 (0.206)	
Q1_IFS	-0.145 (0.224)		0.227 (0.200)		0.126 (0.200)		0.036 (0.206)	
Q2_PRAIRIES	0.155 (0.183)		0.173 (0.159)		0.169 (0.157)		0.179 (0.158)	
Q2_BC	-0.335 (0.194)	*	-0.220 (0.170)		-0.185 (0.168)		-0.243 (0.173)	
Q2_QUEBEC	0.291 (0.168)	*	0.350 (0.147)	**	0.344 (0.145)	**	0.332 (0.146)	**
Q2_MARITIMES	-0.144		0.111		0.246		0.003	

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	(0.411)		(0.368)		(0.364)		(0.393)	
Q3_CONT	-0.095	**	-0.031		-0.025		-0.030	
	(0.045)		(0.040)		(0.039)		(0.040)	
Q4_MGR	-0.021		0.078		0.097		0.057	
	(0.125)		(0.112)		(0.110)		(0.114)	
Z_COL_IN_OUT_F1			0.211	****	0.181	***	0.156	***
			(0.058)		(0.058)		(0.060)	
Z_COL_OUT_IN_F2			0.262	****	0.230	****	0.211	****
			(0.058)		(0.058)		(0.058)	
Z_COL_for_CLIENT_F3			0.178	***	0.147	**	0.129	**
			(0.058)		(0.058)		(0.058)	
Z_COL_COUPLE_PRACT_F1			0.174	***	0.158	**	0.147	**
			(0.065)		(0.064)		(0.065)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034		-0.032		-0.023	
			(0.061)		(0.060)		(0.063)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145	**	0.132	**	0.123	*
			(0.065)		(0.064)		(0.064)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033		0.023		0.035	
			(0.059)		(0.058)		(0.059)	
Z_RISK_PRACT_F1					0.177	***	0.209	****
					(0.058)		(0.061)	
Z_COL_IN_OUT_F1 x Z_RISK_PRACT_F1							0.000	****
							(0.000)	

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT					
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
Z_COL_OUT_IN_F2 x Z_RISK_PRACT_F1				0.000 (0.000)	****
Z_COL_for_CLIENT_F3 x Z_RISK_PRACT_F1				0.000 (0.000)	****
Z_COL_COUPLE_PRACT_F1 x Z_RISK_PRACT_F1				0.000 (0.000)	****
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_RISK_PRACT_F1				0.000 (0.000)	****
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_RISK_PRACT_F1				0.000 (0.000)	****
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_RISK_PRACT_F1				0.000 (0.000)	****
R^2	0.0568	0.3174	0.3414	0.3670	
R^2_{adj}	0.0212	0.2724	0.2952	0.3037	
p-values	0.1080	0.0000	0.0000	0.0000	
VIF_{max}	1.5023	1.5023	1.7790	1.8439	
delta R^2		0.2606	0.0239	0.0256	
p-values		0.0000	0.0025	0.1871	

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	CONTROL		OI PRACTICES		OI PRACTICES + RISK		OI PRACTICES + RISK + OI PRAC*RISK	
Z_RISK_PER_IN_OUT	Unstandardized Coefficients B Std. Error		Unstandardized Coefficients B Std. Error		Unstandardized Coefficients B Std. Error		Unstandardized Coefficients B Std. Error	
(Constant)	0.411 (0.262)		-0.034 (0.233)		-0.039 (0.233)		0.014 (0.236)	
Q1_TAX	-0.001 (0.161)		-0.016 (0.141)		-0.021 (0.142)		-0.003 (0.142)	
Q1_CONS	0.159 (0.166)		0.159 (0.153)		0.164 (0.154)		0.136 (0.153)	
Q1_DEALS	-0.063 (0.230)		0.277 (0.207)		0.276 (0.207)		0.241 (0.207)	
Q1_IFS	-0.145 (0.224)		0.227 (0.200)		0.232 (0.201)		0.255 (0.202)	
Q2_PRAIRIES	0.155 (0.183)		0.173 (0.159)		0.175 (0.160)		0.212 (0.160)	
Q2_BC	-0.335 (0.194)	*	-0.220 (0.170)		-0.216 (0.171)		-0.257 (0.170)	
Q2_QUEBEC	0.291 (0.168)	*	0.350 (0.147)	**	0.361 (0.151)	**	0.385 (0.151)	**
Q2_MARITIMES	-0.144		0.111		0.118		0.194	

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT								
	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
	(0.411)		(0.368)		(0.369)		(0.373)	
Q3_CONT	-0.095	**	-0.031		-0.031		-0.033	
	(0.045)		(0.040)		(0.040)		(0.040)	
Q4_MGR	-0.021		0.078		0.077		0.025	
	(0.125)		(0.112)		(0.112)		(0.112)	
Z_COL_IN_OUT_F1			0.211	****	0.209	****	0.180	***
			(0.058)		(0.059)		(0.059)	
Z_COL_OUT_IN_F2			0.262	****	0.257	****	0.228	****
			(0.058)		(0.059)		(0.059)	
Z_COL_for_CLIENT_F3			0.178	***	0.177	***	0.179	***
			(0.058)		(0.058)		(0.058)	
Z_COL_COUPLE_PRACT_F1			0.174	***	0.177	***	0.165	**
			(0.065)		(0.066)		(0.066)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034		-0.032		-0.034	
			(0.061)		(0.061)		(0.061)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145	**	0.142	**	0.149	**
			(0.065)		(0.065)		(0.066)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033		0.033		0.063	
			(0.059)		(0.059)		(0.060)	
Z_RISK_PER_IN_OUT					0.021		0.008	
					(0.055)		(0.055)	
Z_COL_IN_OUT_F1 x Z_RISK_PER_IN_OUT							0.000	****
							(0.000)	

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
Z_COL_OUT_IN_F2 x Z_RISK_PER_IN_OUT				0.000 (0.000)	****
Z_COL_for_CLIENT_F3 x Z_RISK_PER_IN_OUT				0.000 (0.000)	****
Z_COL_COUPLE_PRACT_F1 x Z_RISK_PER_IN_OUT				0.000 (0.000)	****
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_RISK_PER_IN_OUT				0.000 (0.000)	****
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_RISK_PER_IN_OUT				0.000 (0.000)	****
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_RISK_PER_IN_OUT				0.000 (0.000)	****
R^2	0.0568	0.3174	0.3178	0.3526	
R^2_{adj}	0.0212	0.2724	0.2700	0.2879	
p-values	0.1080	0.0000	0.0000	0.0000	
VIF_{max}	1.5023	1.7311	1.7438	1.7742	
delta R^2		0.2606	0.0004	0.0348	
p-values		0.0000	0.6986	0.0670	

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Z_RISK_PER_OUT_IN	**B** / **Std. Error**		**B** / **Std. Error**		**B** / **Std. Error**		**B** / **Std. Error**	
(Constant)	0.411		-0.034		-0.023		-0.008	
	(0.262)		(0.233)		(0.235)		(0.235)	
Q1_TAX	-0.001		-0.016		-0.020		0.003	
	(0.161)		(0.141)		(0.142)		(0.142)	
Q1_CONS	0.159		0.159		0.151		0.174	
	(0.166)		(0.153)		(0.155)		(0.155)	
Q1_DEALS	-0.063		0.277		0.270		0.248	
	(0.230)		(0.207)		(0.208)		(0.209)	
Q1_IFS	-0.145		0.227		0.218		0.244	
	(0.224)		(0.200)		(0.202)		(0.202)	
Q2_PRAIRIES	0.155		0.173		0.171		0.191	
	(0.183)		(0.159)		(0.160)		(0.160)	
Q2_BC	-0.335	*	-0.220		-0.223		-0.210	
	(0.194)		(0.170)		(0.171)		(0.173)	
Q2_QUEBEC	0.291	*	0.350	**	0.340	**	0.385	**
	(0.168)		(0.147)		(0.150)		(0.151)	
Q2_MARITIMES	-0.144		0.111		0.106		0.132	
	(0.411)		(0.368)		(0.368)		(0.376)	
Q3_CONT	-0.095	**	-0.031		-0.032		-0.039	
	(0.045)		(0.040)		(0.040)		(0.040)	

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT							
	MODEL 1	MODEL 2		MODEL 3		MODEL 4	
Q4_MGR	-0.021 (0.125)	0.078 (0.112)		0.081 (0.112)		0.013 (0.115)	
Z_COL_IN_OUT_F1		0.211 (0.058)	****	0.213 (0.059)	****	0.199 (0.059)	****
Z_COL_OUT_IN_F2		0.262 (0.058)	****	0.265 (0.058)	****	0.238 (0.060)	****
Z_COL_for_CLIENT_F3		0.178 (0.058)	***	0.179 (0.058)	***	0.167 (0.059)	***
Z_COL_COUPLE_PRACT_F1		0.174 (0.065)	***	0.170 (0.066)	**	0.169 (0.067)	**
Z_COL_COUPLE_TYPE_PHASE_F2		-0.034 (0.061)		-0.034 (0.061)		-0.033 (0.063)	
Z_COL_COUPLE_PARTNER_CORE_F1		0.145 (0.065)	**	0.145 (0.065)	**	0.144 (0.065)	**
Z_COL_COUPLE_PARTNER_ADJ_F2		0.033 (0.059)		0.037 (0.060)		0.020 (0.060)	
Z_RISK_PER_OUT_IN				-0.021 (0.055)		-0.012 (0.058)	
Z_COL_IN_OUT_F1 x Z_RISK_PER_OUT_IN						0.000 (0.000)	****
Z_COL_OUT_IN_F2 x Z_RISK_PER_OUT_IN						0.000 (0.000)	****
Z_COL_for_CLIENT_F3 x Z_RISK_PER_OUT_IN						0.000	****

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT					
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
				(0.000)	
Z_COL_COUPLE_PRACT_F1 x Z_RISK_PER_OUT_IN				0.000	****
				(0.000)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_RISK_PER_OUT_IN				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_RISK_PER_OUT_IN				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_RISK_PER_OUT_IN				0.000	****
				(0.000)	
R^2	0.0568	0.3174	0.3178	0.3435	
R^2_{adj}	0.0212	0.2724	0.2700	0.2778	
p-values	0.1080	0.0000	0.0000	0.0000	
VIF_{max}	1.5023	1.7311	1.7654	1.7828	
delta R^2		0.2606	0.0004	0.0257	
p-values		0.0000	0.7043	0.2075	

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Z_RISK_TYPE_F1	**B** **Std. Error**		**B** **Std. Error**		**B** **Std. Error**		**B** **Std. Error**	
(Constant)	0.411 (0.262)		-0.034 (0.233)		-0.043 (0.228)		-0.134 (0.230)	
Q1_TAX	-0.001 (0.161)		-0.016 (0.141)		-0.087 (0.140)		-0.089 (0.137)	
Q1_CONS	0.159 (0.166)		0.159 (0.153)		0.180 (0.151)		0.167 (0.148)	
Q1_DEALS	-0.063 (0.230)		0.277 (0.207)		0.247 (0.203)		0.251 (0.200)	
Q1_IFS	-0.145 (0.224)		0.227 (0.200)		0.202 (0.197)		0.123 (0.195)	
Q2_PRAIRIES	0.155 (0.183)		0.173 (0.159)		0.160 (0.157)		0.215 (0.154)	
Q2_BC	-0.335 (0.194)	*	-0.220 (0.170)		-0.240 (0.167)		-0.193 (0.164)	
Q2_QUEBEC	0.291 (0.168)	*	0.350 (0.147)	**	0.348 (0.145)	**	0.365 (0.142)	**
Q2_MARITIMES	-0.144 (0.411)		0.111 (0.368)		0.191 (0.362)		-0.050 (0.365)	
Q3_CONT	-0.095 (0.045)	**	-0.031 (0.040)		-0.024 (0.039)		-0.009 (0.039)	

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT								
	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Q4_MGR	-0.021 (0.125)		0.078 (0.112)		0.075 (0.110)		0.067 (0.108)	
Z_COL_IN_OUT_F1			0.211 (0.058)	****	0.208 (0.057)	****	0.172 (0.057)	***
Z_COL_OUT_IN_F2			0.262 (0.058)	****	0.219 (0.058)	****	0.220 (0.058)	****
Z_COL_for_CLIENT_F3			0.178 (0.058)	***	0.168 (0.057)	***	0.171 (0.056)	***
Z_COL_COUPLE_PRACT_F1			0.174 (0.065)	***	0.170 (0.064)	***	0.177 (0.065)	***
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034 (0.061)		-0.038 (0.060)		-0.037 (0.060)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145 (0.065)	**	0.136 (0.064)	**	0.104 (0.064)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033 (0.059)		0.012 (0.058)		0.007 (0.058)	
Z_RISK_TYPE_F1					0.177 (0.054)	***	0.173 (0.054)	***
Z_COL_IN_OUT_F1 x Z_RISK_TYPE_F1							0.000 (0.000)	****
Z_COL_OUT_IN_F2 x Z_RISK_TYPE_F1							0.000 (0.000)	****
Z_COL_for_CLIENT_F3 x Z_RISK_TYPE_F1							0.000	****

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT					
	MODEL 1	**MODEL 2**	**MODEL 3**	**MODEL 4**	
				(0.000)	
Z_COL_COUPLE_PRACT_F1 x Z_RISK_TYPE_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_RISK_TYPE_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_RISK_TYPE_F1				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_RISK_TYPE_F1				0.000	****
				(0.000)	
R^2	0.0568	0.3174	0.3445	0.3985	
R^2_{adj}	0.0212	0.2724	0.2986	0.3383	
p-values	0.1080	0.0000	0.0000	0.0000	
VIF_{max}	1.5023	1.7311	1.7340	2.0249	
delta R^2		0.2606	0.0271	0.0539	
p-values		0.0000	0.0013	0.0029	

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT								
	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Z_IP_FORMAL_F2	**B** **Std. Error**		**B** **Std. Error**		**B** **Std. Error**		**B** **Std. Error**	
(Constant)	0.411 (0.262)		-0.034 (0.233)		-0.057 (0.233)		-0.054 (0.235)	
Q1_TAX	-0.001 (0.161)		-0.016 (0.141)		0.003 (0.142)		0.013 (0.140)	
Q1_CONS	0.159 (0.166)		0.159 (0.153)		0.160 (0.153)		0.152 (0.151)	
Q1_DEALS	-0.063 (0.230)		0.277 (0.207)		0.286 (0.207)		0.324 (0.208)	
Q1_IFS	-0.145 (0.224)		0.227 (0.200)		0.220 (0.200)		0.148 (0.199)	
Q2_PRAIRIES	0.155 (0.183)		0.173 (0.159)		0.160 (0.160)		0.173 (0.158)	
Q2_BC	-0.335 (0.194)	*	-0.220 (0.170)		-0.208 (0.170)		-0.161 (0.173)	
Q2_QUEBEC	0.291 (0.168)	*	0.350 (0.147)	**	0.355 (0.147)	**	0.377 (0.146)	**
Q2_MARITIMES	-0.144 (0.411)		0.111 (0.368)		0.075 (0.368)		-0.123 (0.374)	
Q3_CONT	-0.095 (0.045)	**	-0.031 (0.040)		-0.025 (0.040)		-0.030 (0.040)	

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT								
	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Q4_MGR	-0.021		0.078		0.071		0.101	
	(0.125)		(0.112)		(0.112)		(0.110)	
Z_COL_IN_OUT_F1			0.211	****	0.216	****	0.217	****
			(0.058)		(0.058)		(0.059)	
Z_COL_OUT_IN_F2			0.262	****	0.268	****	0.284	****
			(0.058)		(0.058)		(0.058)	
Z_COL_for_CLIENT_F3			0.178	***	0.187	***	0.193	***
			(0.058)		(0.058)		(0.058)	
Z_COL_COUPLE_PRACT_F1			0.174	***	0.164	**	0.167	**
			(0.065)		(0.066)		(0.065)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034		-0.033		-0.033	
			(0.061)		(0.061)		(0.060)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145	**	0.132	**	0.086	
			(0.065)		(0.065)		(0.066)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033		0.005		0.002	
			(0.059)		(0.063)		(0.063)	
Z_IP_FORMAL_F2					0.073		0.106	
					(0.058)		(0.066)	
Z_COL_IN_OUT_F1 x Z_IP_FORMAL_F2							0.000	****
							(0.000)	
Z_COL_OUT_IN_F2 x Z_IP_FORMAL_F2							0.000	****
							(0.000)	
Z_COL_for_CLIENT_F3 x Z_IP_FORMAL_F2							0.000	****

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
				(0.000)	
Z_COL_COUPLE_PRACT_F1 x Z_IP_FORMAL_F2				0.000	****
				(0.000)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_IP_FORMAL_F2				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_IP_FORMAL_F2				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_IP_FORMAL_F2				0.000	****
				(0.000)	
R^2	0.0568	0.3174	0.3216	0.3640	
R^2_{adj}	0.0212	0.2724	0.2741	0.3004	
p-values	0.1080	0.0000	0.0000	0.0000	
VIF_{max}	1.5023	1.7311	1.7311	1.8998	
delta R^2		0.2606	0.0042	0.0423	
p-values		0.0000	0.2082	0.0228	

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT								
	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Z_IP_INFORMAL_F3	**B** **Std. Error**		**B** **Std. Error**		**B** **Std. Error**		**B** **Std. Error**	
(Constant)	0.411 (0.262)		-0.034 (0.233)		0.003 (0.233)		0.039 (0.234)	
Q1_TAX	-0.001 (0.161)		-0.016 (0.141)		-0.020 (0.141)		-0.056 (0.141)	
Q1_CONS	0.159 (0.166)		0.159 (0.153)		0.170 (0.153)		0.118 (0.155)	
Q1_DEALS	-0.063 (0.230)		0.277 (0.207)		0.254 (0.206)		0.176 (0.209)	
Q1_IFS	-0.145 (0.224)		0.227 (0.200)		0.195 (0.200)		0.151 (0.202)	
Q2_PRAIRIES	0.155 (0.183)		0.173 (0.159)		0.194 (0.159)		0.181 (0.159)	
Q2_BC	-0.335 (0.194)	*	-0.220 (0.170)		-0.230 (0.170)		-0.207 (0.171)	
Q2_QUEBEC	0.291 (0.168)	*	0.350 (0.147)	**	0.358 (0.147)	**	0.341 (0.148)	**
Q2_MARITIMES	-0.144 (0.411)		0.111 (0.368)		0.129 (0.366)		0.148 (0.374)	
Q3_CONT	-0.095 (0.045)	**	-0.031 (0.040)		-0.038 (0.040)		-0.038 (0.040)	

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT								
	MODEL 1		MODEL 2		MODEL 3		MODEL 4	
Q4_MGR	-0.021		0.078		0.068		0.024	
	(0.125)		(0.112)		(0.111)		(0.113)	
Z_COL_IN_OUT_F1			0.211	****	0.201	****	0.189	***
			(0.058)		(0.059)		(0.059)	
Z_COL_OUT_IN_F2			0.262	****	0.254	****	0.272	****
			(0.058)		(0.058)		(0.059)	
Z_COL_for_CLIENT_F3			0.178	***	0.180	***	0.197	****
			(0.058)		(0.057)		(0.059)	
Z_COL_COUPLE_PRACT_F1			0.174	***	0.164	**	0.148	**
			(0.065)		(0.065)		(0.066)	
Z_COL_COUPLE_TYPE_PHASE_F2			-0.034		-0.034		-0.027	
			(0.061)		(0.061)		(0.062)	
Z_COL_COUPLE_PARTNER_CORE_F1			0.145	**	0.124	*	0.091	
			(0.065)		(0.066)		(0.069)	
Z_COL_COUPLE_PARTNER_ADJ_F2			0.033		0.025		0.020	
			(0.059)		(0.059)		(0.059)	
Z_IP_INFORMAL_F3					0.090	*	0.139	**
					(0.054)		(0.059)	
Z_COL_IN_OUT_F1 x Z_IP_INFORMAL_F3							0.000	****
							(0.000)	
Z_COL_OUT_IN_F2 x Z_IP_INFORMAL_F3							0.000	****
							(0.000)	
Z_COL_for_CLIENT_F3 x Z_IP_INFORMAL_F3							0.000	****

Table X-1: Detailed Regression Results for P2-P4 Overall Performance (cont'd)

OUTCOME VARIABLE: OVERALL PERFORMANCE MODERATING VARIABLE: RISK MANAGEMENT					
	MODEL 1	MODEL 2	MODEL 3	MODEL 4	
				(0.000)	
Z_COL_COUPLE_PRACT_F1 x Z_IP_INFORMAL_F3				0.000	****
				(0.000)	
Z_COL_COUPLE_TYPE_PHASE_F2 x Z_IP_INFORMAL_F3				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_CORE_F1 x Z_IP_INFORMAL_F3				0.000	****
				(0.000)	
Z_COL_COUPLE_PARTNER_ADJ_F2 x Z_IP_INFORMAL_F3				0.000	****
				(0.000)	
R^2	0.0568	0.3174	0.3247	0.3479	
R^2_{adj}	0.0212	0.2724	0.2774	0.2827	
p-values	0.1080	0.0000	0.0000	0.0000	
VIF_{max}	1.5023	1.7311	1.7341	1.9024	
delta R^2		0.2606	0.0073	0.0232	
p-values		0.0000	0.0975	0.2647	