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REFORMING TECHNOLOGY COMPANY INCENTIVE PROGRAMS FOR ACHIEVING KNOWLEDGE-BASED ECONOMIC DEVELOPMENT:
a Brazil-Australia comparative study

Doctoral thesis presented to the Examining Board of the Post-Graduate Program in Engineering and Knowledge Management, Universidade Federal de Santa Catarina, as a partial requirement to achieve the title of Ph.D. in Engineering and Knowledge Management.
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Co-supervisor: Prof. Tan Yigitcanlar, Dr.

Florianópolis
2016

Ficha de identificação da obra elaborada pelo autor
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Marques, Jamile Sabatini
REFORMING TECHNOLOGY COMPANY INCENTIVE PROGRAMS FOR ACHIEVING KNOWLEDGE-BASED ECONOMIC DEVELOPMENT : a Brazil Australia comparative study / Jamile Sabatini Marques ; orientador, Eduardo Moreira da Costa ; coorientador, Tan Yigitcanlar. - Florianópolis, SC, 2016.
265 p.

Tese (doutorado) - Universidade Federal de Santa Catarina, Centro Tecnológico. Programa de Pós-Graduação em Engenharia e Gestão do Conhecimento.

Inclui referências

1. Engenharia e Gestão do Conhecimento. 2. Knowledge based urban development. 3. Knowledge-based economic development. 4. Incentives to innovation. 5. Brazil - Australia. I. Costa, Eduardo Moreira da. II. Yigitcanlar, Tan. III. Universidade Federal de Santa Catarina. Programa de Pós-Graduação em Engenharia e Gestão do Conhecimento. IV. Titulo.

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This Doctoral Thesis was considered adequate for granting its author the Title of "Ph.D. in Engineering and Knowledge Management"; its final version was approved by the Post-Graduate Program in Engineering and Knowledge Management at the Universidade Federal de Santa Catarina.

Florianópolis, 18th March 2016.

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I dedicate this thesis to

My father, so present in my life, delivering so many important lessons, values and memories (*in memoriam*).

My mother, a tireless and endless light in my life, a permanent inspiration that guides me through my quest for knowledge.

My zealous husband, whom I love so much, my unconditional partner at all times, he who – with great care – supports me in my experiences, from the simplest to the most daring ones.

My children, expressions of unlimited love, as a lesson and demonstration of the challenges they will have in life.

Dedico esta tese

Ao meu pai, tão presente em minha vida, transmitindo tantos e importantes aprendizados, valores e memórias (*in memoriam*).

À minha mãe, luz incansável e infinita da vida, que é a inspiração permanente que me guia na busca pelo conhecimento.

Ao meu marido, pessoa zelosa que tanto amo, parceiro incondicional de todas as horas e que com esmero me acompanha nas mais singelas e ousadas experiências que me proponho a viver.

Aos meus filhos, expressões de um amor sem medidas, como ensinamento e demonstração dos desafios futuros em suas vidas.

ACKNOWLEDGEMENTS

To God for making me believe and move ahead with health, energy and perseverance.

To my Family (sister and brothers, sisters- and brothers-in-law, nieces and nephews), who are so special in my life and who are always present in the most unique ways possible. They cheer for me and support me in the challenges I dare to face. Each one of them gives their own contribution: a smile, a look, a gesture, a word, a moment of silence… They give me the push I need to move on.

To my friends, who made themselves present in this journey with words of incentive and emotional support. They gave me strength at my every step with words, contacts and teachings.

To my advisor, Professor Eduardo Costa, for his advice and support. The issues and challenges he brought up guided me throughout this study.

To Professor Neri dos Santos, for showing me the path to be followed and for taking me in the program.

To my co-advisor, Professor Tan Yigitcanlar, for sharing incomparable support, attention and teachings, as well as for giving me the chance to study at such a great institution as the Queensland University of Technology – QUT. Moreover, I am flattered by the caring way he welcomed my family in his home and country.

To the faculty of EGC for promoting my learning at each contact and in each course I took during my Ph.D. studies.

To the ÁgoraLab research group and friends – especially, Alexander Prada, Lucas Abdala, Tatiana Schreiner and Thiago Furlani – who instigated me and made me take a different look at the issues we discussed, making me grow at each group work. Many of the moments we were together contributed to the development of this thesis.

To Joice Ramos for being a great friend and partner during the development of this work.

To the friends and partners I made while in Australia: Márcia Reis, Márcio Machado, Surabhi Pancholi, Jorge Schurmann, Jenny Nobel, Valéria Noleto, Emerson Kalaf, Júlio Falcão and Graham Young. They made my experience abroad smoother, more pleasant and constructive.

To the directors of the *Associação Brasileira das Empresas de Software* – Abes, for supporting me in this phase of a sandwich doctorate.

To Rui Luiz Gonçalves and Moacir Marafon for their incentive in this new beginning and phase of my academic life.

To the members of the examining board for accepting to participate and helping me improve this thesis with their suggestions and experience.

To the interviewees for their participation in the surveys, which was vital for reaching the results of this work.

To the translator of this work, Mr. Caio Martino, who – with much professionalism – was always available to assist me, allowing me to meet deadlines.

To CAPES for the financial and in-kind contributions of the Federal University of Santa Catarina, Queensland University of Technology, and Ministry of Education of Brazil in jointly supporting the research project. (CAPES-PDSE: 99999.004527/2014-03).

Finally, I thank all of you who contributed, one way or another, for this thesis to come to life.

AGRADECIMENTOS

A Deus por me fazer acreditar e seguir em frente com saúde, energia e perseverança.

Aos meus familiares (irmãos, irmã, cunhados, cunhadas e sobrinhos), pessoas tão especiais em minha vida, que estão sempre presentes das formas mais singulares possíveis. Torcem por mim e me apoiam nos desafios com os quais me envolvo. Cada um deles emite suas próprias contribuições - um sorriso, um olhar, um gesto, uma palavra, um silêncio… E é nessa riqueza de impulsos que sou lançada a sempre seguir em frente.

Aos meus amigos presentes nessa jornada com palavras de incentivo e apoio emocional. Deram-me suporte a cada etapa com palavras, contatos e ensinamentos.

Ao Professor Eduardo Costa, meu orientador, pelos conselhos e apoio. As provações e desafios por ele apresentados foram elementos balizadores para o desenvolvimento desse trabalho.

Ao Professor Neri dos Santos, por me indicar caminhos a serem seguidos e por me aceitar no programa.

Ao Professor Tan Yigitcanlar, meu coorientador, pelo seu incomparável apoio, atenção e ensinamentos compartilhados, assim como pela oportunidade oferecida para estudar em uma universidade como a Queensland University of Technology – QUT. Além disso, sinto-me lisonjeada pela recepção tão carinhosa da minha família em sua casa e em seu país.

Aos docentes do EGC pelo aprendizado oportunizado, a cada contato e em cada disciplina cursada durante o doutorado.

Ao grupo de pesquisa e amigos do ÁgoraLab – em especial ao Alexander Prada, Lucas Abdala, Tatiana Schreiner e Thiago Furlani -, que me intigaram e me fizeram olhar sob diferentes perspectivas para os assuntos que discutíamos, fazendo com que eu crescesse a cada trabalho coletivo. Muitos dos momentos que estivemos juntos contribuíram para o desenvolvimento dessa tese.

À Joice Ramos pela amizade, parceria e cumplicidade nos encaminhamentos desse trabalho.

Aos amigos e parceiros que conquistei durante a minha passagem pela Austrália e que contribuiram de alguma forma para que este trabalho fosse realizado: Márcia Reis, Márcio Machado, Surabhi Pancholi, Jorge Schurmann, Jenny Nobel, Valéria Noleto, Emerson

Kalaf, Júlio Falcão e Graham Young. Eles fizeram com que a minha experiência naquele país se tornasse mais suave, agradável e construtiva.

À diretoria da Associação Brasileira das Empresas de Software - Abes por me apoiar nesse ciclo de um doutorado sanduíche.

Ao Rui Luiz Gonçalves e ao Moacir Marafon pelo incentivo em um novo começo e etapa da minha vida acadêmica.

Aos membros da banca por aceitarem participar e agregarem com suas sugestões e experiências na melhoria dessa tese.

Aos entrevistados que participaram das pesquisas realizadas, fator esse de caráter indispensável para o encaminhamento do desfecho do trabalho.

Ao tradutor dessa obra, Sr. Caio Martino, que sempre demonstrou profissionalismo e disponibilidade para me dar suporte, possibilitando o cumprimento do cronograma estabelecido.

A CAPES, pelo suporte financeiro e contribuições da Universidade Federal de Santa Catarina, Universidade de Tecnologia de Queensland e Ministério de Educação brasileiro por dar suporte a esta pesquisa. (CAPES-PDSE: 99999.004527/2014-03).

Por fim, agradeço a todos que contribuíram, de forma direta ou indireta, para que essa tese se tornasse realidade.

Feliz aquele que transfere o que sabe e aprende o que ensina.
(Cora Coralina)

ABSTRACT

This doctoral thesis aims to demonstrate the importance of incentives to technology-based firms as a strategy to promote knowledge-based economic development (KBED). To remain competitive, technology-based firms must innovate and seek new markets; therefore, this study aims to propose an incentive model to technology-based firms as a strategy to promote knowledge-based urban development, according to framework described by Yigitcanlar (2011). This is an exploratory and descriptive research with a qualitative approach. Surveys were carried out with national trade associations that represented technology-based firms both in Brazil and Australia. After analysing the surveys, structured interviews were conducted with government representatives, trade associations and businessmen who had used financial support by the federal government. When comparing both countries, the study found the importance of direct incentives through tax incentives, for it is a less bureaucratic, quicker and more direct process for firms. We suggest to include the terms incentives in the framework of knowledge-based urban development, as one of the pillars that contribute to knowledge-based economic development.

Key words: Knowledge-based urban development. Knowledge-based economic development. Incentives to innovation. Brazil. Australia.

RESUMO

Esta tese busca demonstrar a importância do fomento para empresas de base tecnológica como estratégia para promover o desenvolvimento econômico baseado no conhecimento (DEBC). As empresas de base tecnológica para que se mantenham competitivas devem inovar e buscar novos mercados, neste sentido a pesquisa tem por objetivo propor um modelo de fomento às empresas de base tecnológica como estratégia para a promoção do desenvolvimento urbano baseado no conhecimento. A pesquisa é de natureza exploratória e descritiva com uma abordagem qualitativa. Foram feitas pesquisas por meio de entidades de classe com representatividade nacional que representem empresas de base tecnológicas no Brasil e na Austrália. Após análise dos questionários foram feitas entrevistas estruturadas com representantes do governo, entidades de classe e empresários que já receberam aporte financeiro por parte do governo federal. Após feito o comparativo entre os dois países percebe-se a importância do fomento de forma direta por meio de incentivos fiscais, como um processo menos burocrático, rápido e direto para as empresas. É sugerida a inclusão do termo fomento no framework de desenvolvimento urbano baseado no conhecimento, como um dos pilares que contribuem para o desenvolvimento econômico baseado no conhecimento.

Palavras-chave: Desenvolvimento urbano baseado no conhecimento. Desenvolvimento econômico baseado no conhecimento. Fomento à inovação. Brasil. Austrália.

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LIST OF ABBREVIATIONS AND ACRONYMS

ABDI	Brazilian Agency for Industrial Development
ABES	Brazilian Software Companies Association
ABVCap	Brazilian Private Equity & Venture Capital Association
AIIA	Australian Information Industry Association
AIS	Australian Innovation System
AmEx	American Express
ANPROTEC	National Association of Entities Promoting Innovative Enterprises
APEC	Asia - Pacific Economic Cooperation
APEX	Brazilian Trade and Investment Promotion Agency
APS	Australian Public Service
ARC	Australian Research Council
ATN	Australian Technology Network of Universities
ATO	Accounting Tools Online
B2C	Business to Commerce
BNDES	National Bank for Economic and Social Development
BOVESPA	BMF &Bovespa Stock Exchange
BRD	Regional Development Banks
BRICS	Brazil, Russia, India, China and South Africa
CA	Commercialisation Australia Program
CAPES	Coordination for the Improvement of Higher Education Personnel
CEMPES	Leopoldo Américo Miguez de Mello Research and Development Centre
CERTICS	Software and Services National Technology Certification
CNPq	National Council for Scientific and Technological Development
COMET	Commercialising Emerging Technologies
CPqD	Telecommunication Research and Development Centre
CRCA	Cooperative Research Centres Association
CSIRO	Commonwealth Scientific and Industrial Research Organisation
CSLL	Social Contribution on Net Profit

CTA	Technical Aerospace Centre
Desenvolve SP	São Paulo State Develops
DIIS	Department of Industry, Innovation and Science
DTO	Digital Transformation Office
EC	European Commission
EGC	Graduate Program in Engineering and Knowledge Management
EMBRAER	Brazilian Aeronautics Company
EMBRAPA	Brazilian Corporation of Agricultural Research
EMDG	Export Market Development Grants/Austrade
ENCTI	National Strategy of Science, Technology and Innovation
ERA	Excellence in Research for Australia
ESVCLP	Early stage Venture capital limited Partnerships
EU	European Union
FAP	Research Support Funds
FINEP	Financier of Studies and Projects
FORTEC	National Forum of Managers of Innovation and Technology Transfer
FUNTTEL	Fund for the Technological Development of Telecommunications
G08	Group of Eight
GDP	Gross domestic product
HDI	Human Development Bank
IASP	International Association of Science Parks
ICIP	Industry Cooperative Innovation Program
ICMS	Tax on Goods and Services
ICT	Information and Communication Technology
IIF	Innovation investment fund
IIFF	Innovation investment follow – on fund
INPI	National Institute of Industry Property
IPEA	Institute of Applied Economic Research
IPI	Manufactured Products Tax
IPR	Intellectual Property Rights
ISO –	International Organisation for Standardisation
KBED	Knowledgment Baesd Economic Development
KBUD	Knowledgment Based Urban Development
KM	Knowledge Management
LPS	Linkage Projects Scheme
MCT	Ministry of Science and Technology

MCTI	Ministry of Science, Technology and Innovation
MD	Ministry of Defence
MDIC	Ministry of Development, Industry and Foreign Trade
MEC	Ministry of Education and Culture
MFP	Multi-factor Productivity
MPEs	Micro and Small Business
MPME ess	Inovadora – Micro, Small and Medium Innovative Busin
MRE	Ministry of External Relations
NCGP	National Competitive Grants Program
OECD	Organisation for Economic Co-operation and Development
PACTI	Action Plan for Science, technology and Innovation
PAPPE	Company Research Support Program
PBM	Bigger Brazil Plan
PBQP	Brazilian Quality and Productivity Program
PDF	Pooled development funds
PDP	Production Development Policy
PETROBRAS	Brazilian Petroleum Corporation
PhDs	Doctor of Philosophy Degree
PINTEC	Innovation Research
PITCE	Industrial, Technological and Foreign Trade
PMSEIC	Prime Minister's Science, Engineering And Innovation Council
PNI	National Program of Support to Company Incubators and Technology Parks
PPB	Basic Productive Process
PRIME	The First Innovative Business Program
PROSOFT	Program for the Development of National Software Industry and Information Technology Services
PSF	Pre-seed Fund
QLD	Queensland
QUT	Queensland University of Technology
R&D	Research and Development
R&D&I	Research and Development and Innovation
Redi	Renewable Energy Development Initiative
REEF	Renewable Energy Equity Fund
REUNI	Plan for Restructuring and Expanding Federal Universities

RHAE	Training Program of Human Resources in Strategic Areas
ROI	Investments On Return
S&T	Science and Technology
SEBRAE	Brazil's Micro and Small Business Support Service
SIBRATEC	Brazilian Technology System
SME	Small and Medium- size Enterprises
ST&I	Science, Technology and Innovation
STEM	Science, Technology, Engineering, and Mathematics
STI	Science, Technology and Innovation
TELEBRAS	Brazilian Telecommunications S.A.
TIC	Technology, Information and Communication
TPP –	Technological Product and Process
TRIPS	Trade Related Aspects of Intellectual Property Rights
UA	Universities Australia
UFSC	Santa Catarina Federal University
UK	United Kingdom
USA	United States of America
VCLP	Venture Capital Limited Partnerships
WB	World Bank
WKCI	World Knowledge Competitiveness Index
WTO	World Trade Organisation
WW II	Second World War

SUMÁRIO

1 INTRODUCTION

The first chapter of this thesis aims to introduce (*i*) the contextualisation of the theme of this study, and the importance of incentives for technology-based firms to leverage knowledge-based economic development; (*ii*) the problem this study aims to address; (*iii*) the general objective and specific objectives of this study; (*iv*) the justification of this study, considering its relevance, originality and uniqueness of this study; (*v*) the delimitation of this study; and, (*vi*) the thesis structure.

1.1 CONTEXTUALISATION

This thesis aims to propose the inclusion of incentive as a pillar of the economic development domain of the KBUD framework, with a focus on technology-based firms, as a strategy to promote knowledge-based economic development. Such aim converges with the view that a technology-based firm is more capable of absorbing knowledge in order to generate innovation and open new markets, then obtaining better financial performance (NONAKA; TAKEUCHI; UEMOTO, 1996). When speaking about incentives for innovation it is important that knowledge be mentioned. The innovative entrepreneur needs to have a detailed and extensive knowledge about certain themes in order to create a new product or service, which includes the desired business market segment. Knowledge is a strategic resource to technologic-based firms, since innovation depends on new knowledge in order to be generated (JOHANNESSEN; OLSEN; OLAISEN, 1999).

Knowledge Management (KM) is characterised by activities and processes for leveraging organisational knowledge to increase competitiveness through better use and creation of individual and collective knowledge resources (SANTOS, 2012).

Knowledge Management has involved the academic and organisational means both in theory and practice. However most organisations still have serious difficulties to understand and manage knowledge as a resource (NONAKA; TOYAMA; HIRATA, 2008).

It is noteworthy that sharing knowledge increases the competitive power of organisations since knowledge is a production factor that expands when shared (NONAKA; TAKEUSHI, 1997).

Knowledge is recognised as a key ingredient underlying the competitiveness of regions, nations, sectors and firms. At its most

fundamental level, the knowledge-base of an economy can be defined as the capability to create and develop innovative new ideas, thoughts, processes and products, and to translate these into economic value and wealth (HUGGINS; IZUSHI, 2009).

Schumpeter (1982) treats the economic cycles as periods of prosperity and economic recession; common to the process of capitalist development in the Theory of Economic Development in 1911. The author relates the periods of prosperity to the innovative entrepreneur who, by creating new products, is imitated by non-innovative entrepreneurs who invest resources to produce and copy goods created by their innovative peers. The relationship between innovation and creation of new markets gives rise to an economic change, generating new needs and wish to consume. For innovation, credit is like a wave of capital investment that activates the economy, generates prosperity and raises employment levels.

KBUD is based on the emphasis of the role of knowledge as a driver for the processes of richness generation and sustainable development, proposing processes of transformation of the cities/societies into knowledge cities/societies, whose central element is that of promoting the capacity to attract, generate, retain and foster creativity, knowledge and innovation (KNIGHT, 1995; YIGITCANLAR, 2011).

According to Knight (1995), the rising of a global knowledge society and the growing importance of the so-called knowledge economy requires that urban planning – so far focused on planning physical spaces and attracting tangible assets (land, capital and labour) – incorporate means and create structures capable of better managing (generate/retain/disseminate) intangible assets.

KBUD is the new paradigm of development in the knowledge era that aims to bring economic prosperity, environmental sustainability, a just socio-spatial order and good governance to cities. This new concept is meant to develop a city purposefully designed to encourage the production and circulation of knowledge in an environmentally conserved, economically secure, socially just and well-governed human setting (YIGITCANLAR, 2011).

The KBUD framework described by Yigitcanlar (2011), is equally based on four pillars, that is, four major development domains: (*i*) Economic; (*ii*) Socio-cultural; (*iii*) Enviro-urban; and (*iv*) Institutional.

The research focus of this thesis proposal lies in the economic development domain of KBUD, which is referred to as Knowledge-Based Economic Development (KBED). KBED consists of economic terms such as Competitiveness, Creativity, Innovation and Knowledge Basis.

In addition, this study aims to demonstrate the importance of credit to innovative businessmen, including incentive as one of the pillars of economic development.

1.2 RESEARCH QUESTION

Considering the context introduced in section 1.1 above, the following research question arises, which guides the development of this thesis:

How can financial support provided to technology firms contribute to knowledge-based economic development?

1.3 RESEARCH OBJECTIVES

This subsection presents the general objective as well as the specific objectives to be accomplished by this thesis.

1.3.1 General objectives

Proposing the inclusion of incentive as a pillar of the economic development domain of the KBUD framework, with a focus on technology-based firms, as a strategy to promote knowledge-based economic development.

1.3.2 Specific objectives

In order to reach the general objective of this thesis the following specific objectives were defined:

a) To analyse the public policies on incentives to technology-based firms in Brazil and Australia, under the perspective of their contribution to knowledge-based economic development;

b) To analyse the practice in Brazil and Australia in the field of incentives to technology-based firms as a strategy to achieve knowledge-based economic development;

c) To compare the Brazilian scenario with the Australian experience in the field of incentives for innovation.

1.4 JUSTIFICATION FOR CONDUCTING THIS STUDY

The justification for conducting this study will be built upon arguments concerning relevance, originality and uniqueness.

1.4.1 Relevance

The relevance of this research lies in theoretical and functional contributions, which is evidenced through the review of literature conducted by searching the following key words: Knowledge-Based Urban Development, Knowledge-Based Economic Development, Australia Incentives, tech*, comp*, and innovation. A second search was done with the term Brazil Incentives in the place of Australia Incentives. The survey was conducted on 12nd January 2015, on Scopus.

Relevance lies in the impact this thesis proposal may have on public policies on incentives and on Brazilian technology-based firms. Eventually, it will contribute to the development and competitiveness of innovative firms in the country and internationally and to scientific research and society at large.

The functional contribution of this work is perceived in the proposal of an incentive framework as a strategy to promote KBED. This work is relevant since the scientific literature seems to lack researches on KBUD and KBED: gaps have been found on the Scopus database, through the use of key words such as Technology Parks, Scientific Parks, Incentives and Competitive.

1.4.2 Originality

The originality of this thesis proposal lies in addressing incentives to technology-based firms in the economic development domain.

The identification of this gap in the literature renders this work as original, since it uses a qualitative approach to propose the inclusion if the incentives in the framework to technology-based firms as a strategy to promote knowledge-based economic development.

The literature analysis found gaps, which this thesis shall attempt to bridge by demonstrating the importance of including incentives as

part of the economic development domain in the framework proposed by Yigitcanlar (2011).

1.4.3 Uniqueness

This study is unique in that it proposes an incentive framework to technology-based firms as a strategy to promote knowledge-based urban development.

In the international literature, KBUD has been studied since 2008 by several authors, especially Prof. Tan Yigitcanlar, who introduces four pillars for economic development: competitiveness, creativity, innovation and knowledge, which are all associated with technology-based firms. However, during the phase of literature analysis in this study, a fifth pillar was identified as lacking for economic development: the need for incentives.

This research aims to study this gap and to demonstrate the importance of incentives as a fifth domain of economic development in the framework proposed by Yigitcanlar (2011).

1.4.4 Adherence to EGC

In addition to the variables of relevance, originality and uniqueness, the current work is justified by its contribution and adherence to the Graduate Program in Engineering and Knowledge Management at Santa Catarina Federal University (UFSC), which aims to (*i*) study incentive framework to technology-based firms, in order to contribute to the knowledge-based economic development; (*ii*) adhere to Engineering and Knowledge Management through the research branch of sustainability knowledge management; (*iii*) be socially relevant, since knowledge-based urban development congregates aspects of growing importance in the so-called knowledge economy and the generation, retention and dissemination of intangible assets; and (*iv*) contribute to the development of public policies that will have an impact on society in the economic, social and scientific aspects.

1.5 DELIMITATION OF THIS STUDY

Conducting a qualitative research requires analysing the current public policies on incentives to technology-based firms.

This study will be limited to the national laws for micro, small and medium-sized technology-based firms. Therefore, since incentive is the theme of this study, one must understand that it is limited to the credit lines with subsidised interest, economic subvention, both with financial incentive and scholarships. Incentive through federal taxes and investment fund resources will also be presented as a way of promoting innovation.

One limitation of this study refers to the systematic literature review that was carried out. The research process described in the Literature Review was limited to the papers published in journals that offer free access to the full texts online, through the CAPES journal database, or by direct searching for papers on the Scopus database.

1.6 THESIS STRUCTURE

This thesis comprises seven chapters, as follows: (*i*) Introduction; (*ii*) Literature review; (*iii*) Methodology; (*iv*) Tech-firm incentive schemes; (*v*) Firms awareness on incentives; (*vi*) Contribution of incentives to firms performance and knowledge economy, and; (*vii*) Final Considerations and discussions. The references used are also presented following these chapters.

The second chapter introduces the theoretical references that were looked up in order to find this thesis proposal. At first, the chapter presents the procedures used for the systematic review, as well as the procedures for the analysis of the papers found on the Scopus and Ebsco databases associated with the theme of this study.

The third chapter covers the research methodology, which can be subdivided into: (*i*) Methodological framework, and; (*ii*) Procedures to construct this thesis proposal.

The fourth chapter is about Tech-firm incentive schemes, and analyses the Brazilian Incentive Scheme through: (*i*) Governance of Innovation in Brazil; (*ii*) Incentives scheme; and (*iii*) Summary of Brazilian Incentives schemes; as well as the Australian Incentive scheme through (*i*) Governance of Innovation in Australia; (*ii*) Incentives scheme and (*iii*) Summary of Australian Incentives schemes. It aims to explain how the two countries promote innovation through their respective federal government programmes.

Chapter 5, Firms Awareness on Incentives, is about the survey sent out to innovative firms as a way to understand to what extent firms know about these incentives. This chapter is subdivided into: (*i*)

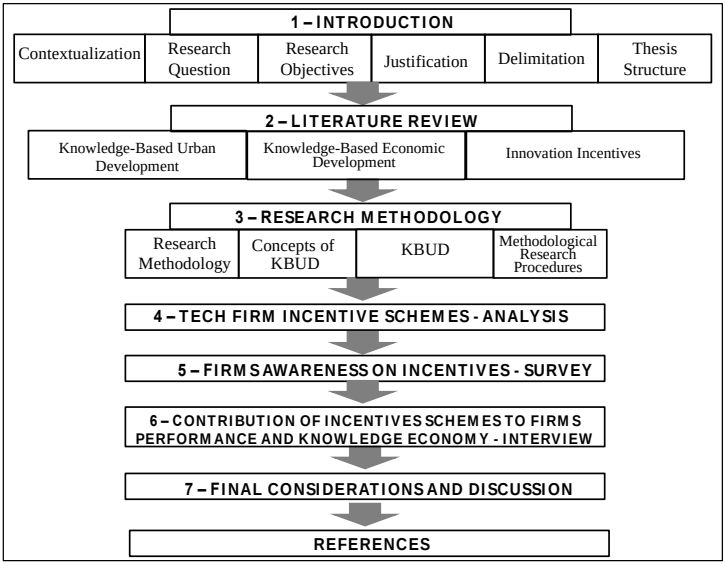
Brazilian Firms – awareness on incentives schemes; (*ii*) Australian Firms – awareness on incentives schemes; and (*iii*) Summary of the chapter.

Chapter 6 covers structured interviews that were carried out as a way to learn the perspectives of both governments, people from national trade associations in both countries, as well as businessmen, who have borrowed money from the public policies towards incentive for innovation. Chapter 6 is subdivided into: (*i*) Introduction; (*ii*) Findings from Brazil from the Government, Associations and Entrepreneur Perspective; (*iii*) Summary; (*iv*) Findings from Australia from the Government, Associations and Entrepreneur Perspective; and (*v*) Summary of the chapter.

Chapter 7 presents the final considerations and discussions on this thesis.

Figure 1 below shows the structure of this thesis

Figure 1 - Thesis structure.



Source: The author, 2015.

2 LITERATURE REVIEW

This thesis aims to propose the inclusion of incentive as a pillar of the economic development domain of the KBUD framework, with a focus on technology-based firms, as a strategy to promote knowledge-based economic development (KBED). Incentive here shall be understood as credit for funding and developing technology-based firms.

The justification for conducting this study will be built upon arguments concerning relevance, originality and uniqueness.

The relevance of this research lies in theoretical and functional contributions, which is evidenced through the review of literature conducted by searching the following key words: Knowledge-Based Urban Development, Knowledge-Based Economic Development, Australia Incentives, tech*, comp*, and innovation. A second search was done with the term Brazil Incentives in the place of Australia Incentives. The survey was conducted on 12nd January 2015, on Scopus.

Relevance lies in the impact this thesis proposal may have on public policies on incentives and on Brazilian technology-based firms. Eventually, it will contribute to the development and competitiveness of innovative firms in the country and internationally, to scientific research and society at large.

The functional contribution of this work is perceived in the proposal of an incentive framework as a strategy to promote KBED. This work is relevant since scientific literature is perceived to lack researches on Knowledge-Based Urban Development and Knowledge-Based Economic Development: gaps have been found on the Scopus database, through the use of key words such as Technology Parks, Scientific Parks, Incentives and Competitive.

The originality of this thesis proposal lies in addressing incentives to technology-based firms in the economic development domain.

The identification of this gap in the literature allows for the argument that this work is original, since it uses a qualitative approach to propose a development framework to technology-based firms as a strategy to promote knowledge-based economic development.

The literature analysis found gaps, which this thesis shall attempt to bridge by demonstrating the importance of including incentive as part of the economic development domain in the framework proposed by Yigitcanlar (2011).

2.1 KNOWLEDGE-BASED URBAN DEVELOPMENT

Knowledge-based Urban Development (KBUD) provides a new urban development perspective. This topic is relatively new to the academy: the first articles on this topic found in international databases date back to 2008. However, it has been growing in relevance and contribution to the development of the societies. In the last decades knowledge has become a key element in the production and creation of a vibrant economy, a prosperous society and a city of sustainable knowledge (METAXIOTIS; CARRILLO; YIGITCANLAR, 2010). The knowledge-based economy enabled the birth of the knowledge society concept, which has influenced the shaping of our cities (YIGITCANLAR, 2010).

KBUD is an emerging field of study and practice, especially about processes of knowledge production and their impact on the urban shaping and functions, which provides a new perspective for developing creative urban regions (YIGITCANLAR; VELIBEYOGLU, 2008). KBUD aims to produce a city that is meant to promote continuous production, circulation and trade of knowledge: the "knowledge city" (YIGITCANLAR; VELIBEYOGLU, 2008).

A knowledge-based economy creates, distributes, and uses knowledge to generate value, and gives rise to a network society. Generating opportunities and being capable to access and join knowledge and learning in intense relationships, determines the socio-economic position of individuals and firms (CLARK, 2001). Economic growth and development are highly associated with knowledge economies (METCALFE; RAMLOGAN, 2006). So, in the last decades, knowledge has become a key element in the production and creation of a vibrant economy, a prosperous society and a city of sustainable knowledge (METAXIOTIS; CARRILLO; YIGITCANLAR, 2010).

Knowledge is the basis for KBUD, whose objective is an economic development that is local, competitive and integrated with the global economy (YIGITCANLAR; VELIBEYOGLU; MARTINEZ-FERNANDEZ, 2008). Moreover, KBUD indicates an increase in the skills and knowledge of the people who live and work in any one region as a means for intellectual, human and social development (GONZALEZ; ALVARO; MARTINEZ, 2005).

The concepts of KBUD come from international economic organisations, such as the Organisation for Economic Co-operation and Development (OECD), the World Bank (WB), the European

Commission (EC), the Asia-Pacific Economic Cooperation (APEC), which provide some functional guidelines for building knowledge-based economy by means of KBUD in developed and developing countries. These guidelines were published by the WB in 1999 and by APEC and the EC in 2000.

Many cities around the world are now considered as successful in setting examples for implementing KBUD concepts, but only a few have actually managed to successfully formulate integrated and strategic KBUD approaches (YIGITCANLAR; LONNQVIST, 2014). The initiatives and approaches of most cities are rather ad-hoc and not based on structured and specific methodologies (HEYWOOD, 2008). In this sense, Heywood (2008) states that the measurement methods on KBUD normally vary based on the geographical area being observed (i.e., either at national, regional or municipal level). Therefore, it is a more complex task towards the establishment of a common KBUD framework.

Howells (2002) argues that there are five ways in which geography and knowledge are interrelated in one single geographical area: through *i*) human development, *ii*) human interaction, *iii*) human information, *iv*) human learning and *v*) human interpretation. In this context, Howells (2002) further argues that both categories of knowledge (codified and tacit) play an equally important role in economic geography.

A study conducted by Ergazakis, Metaxiotis and Psarras (2006) revealed that the present KBUD approaches are too fragmented, and that the need to follow a common approach is apparent. A similar conclusion was mentioned in a study conducted by Martinez (2006). In the framework proposed by the international economic organisations by analysing previous studies, it was verified that there has been no viable, standardised and unified framework to develop comprehensive and integrated KBUD strategies (ERGAZAKIS; METAXIOTIS; PSARRAS, 2006).

Ergazakis, Metaxiotis and Psarras (2006) analysed the KBUD approaches of six selected cities that have explicitly adopted KBUD in their urban development process (i.e., Barcelona/Spain, Stockholm/Sweden, Munich/Germany, Montreal/Canada, Dublin/Ireland and Delft/Netherlands. His research revealed that each city's approach in implementing the KBUD concept is different although all are targeting towards the same set of goals. In the case of Barcelona, the city has developed a strategic plan has been developed to place the city into the leading group of urban regions concerning

Information and Communications Technology (ICT). Delft has chosen a project-based approach and Stockholm followed a process-oriented approach. Meanwhile, Dublin and Montreal were focusing more on physical infrastructure and investment- related ICT.

Yigitcanlar (2009) has also conducted a study on five cities that have adopted the KBUD approach: Austin/Texas/USA, Barcelona/Spain, Helsinki/Finland, Melbourne/Australia and Singapore/city-State. The research has concluded on some common and similar patterns in the KBUD implementations, although each city put emphasise on different strategies. Such strategies include having a political and societal will and good governance, a strategic vision and dynamic long-term development plan: (*i*) setting up agencies to promote KBUD, (*ii*) having a strong financial support, (*iii*) partnership and strategic investment, according to the international and multicultural character of the city, (*iv*) creating urban innovation engines, (*v*) having research universities and excellent R&D institutes, (*vi*) having a metropolitan web-portal, creating values to citizens, (*vii*) having quality of place and life, and finally, (*viii*) providing a low-cost access to an advanced communication network.

Specifically, KBUD has an integrated focus on four key development aspects of development: (*i*) Economic, (*ii*) Socio-cultural, (*iii*) Enviro-urban and (*iv*) Institutional. This contemporary approach aims to bring economic prosperity, environmental sustainability and institutional competence, with a fair social-spacial order to the cities (YIGITCANLAR; FACHINELLI, 2011).

The development of knowledge economy requires a different city environment and KBUD is tailoring for this. KBUD concerns primarily with upgrading human and organisational capacities and creating environments, which are conductive to innovation, learning, creativity and change (YIGITCANLAR; LÖNNQVIST, 2013).

KBUD transcends many areas of economic, social and urban policy, and comprises four general purposes (YIGITCANLAR; VELIBEYOGLU, 2008). KBUD is an economic development strategy that codifies technical knowledge for the innovation of products and services; including urban services, market knowledge for understanding changes in economy, financial knowledge to measure the inputs and outputs of production and development processes; and human knowledge in the form of skills and creativity, within an economic framework (LEVER, 2002). KBUD indicates the intention to increase the skills and knowledge of residents and employees as a means for intellectual, human and social development (GONZALEZ; ALVARO;

MARTINEZ, 2005). KBUD aims to increase the quality of life by providing necessary services for societal development (YIGITCANLAR; VELIBEYOGLU, 2008).

KBUD builds a strong spatial relationship among knowledge community precincts for augmenting the knowledge spillover effect that contributes significantly to the establishment and expansion of creative urban regions and supports linkages and knowledge transfer between these precincts (YIGITCANLAR; VELIBEYOGLU, 2008). KBUD also aims to an urban development that is ecologically sensitive, sustainable and safe, a sustainable urban development (YIGITCANLAR; VELIBEYOGLU, 2008).

In the KBUD perspective the orchestration of the knowledge-based development of cities is critical to bring together all of the key actors and sources, organise and facilitate necessary knowledge-intensive activities and plan strategically for knowledge city transformation (YIGITCANLAR, 2011). In essence, the main attributes of KBUD are high levels of economic success, high levels of knowledge intensity, diverse knowledge industries, strong academic institutions, excellent communications and transport infrastructure, unique offering to investors and individuals, strategies to ensure all benefit from knowledge and economic success (YIGITCANLAR; VELIBEYOGLU, 2008).

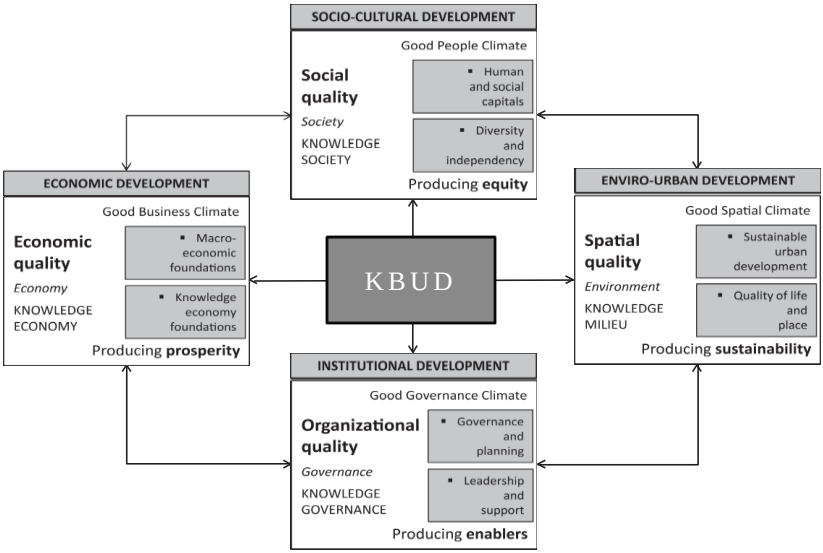
KBUD has set a new paradigm of urban planning that bridges the tensions via an effective governance mechanism that normally exists among some forms of economic growth, social development and environmental concerns (YIGITCANLAR; VELIBEYOGLU, 2008).

The term domain is used by the KBUD framework for the strategic areas, which are represented in the framework proposed by Yigitcanlar and Lönnqvist (2013). Such areas are described below:

- **Economic –** Strong economic development strategy that codifies knowledge, i.e., based on competitive, creative and innovative knowledge, etc.
- **Socio-cultural –** Effective education strategies and construction skills, quality of life, human and social development, intellectual capital, etc.
- **Enviro-Urban –** Strong spatial relation between knowledge clusters, quality of place, sustainable identity, original, urban design, environment preservation, etc.

- **Institutional** – Management of institutional arrangement to supervise development, strategic and integrated, democratic and transparent, social equality, etc.

Figure 2 - KBUD Framework.



Source: Yigitcanlar and Lönnqvist (2013).

For a better understanding of the subject, the development domains and their respective KBUD pillars are described bellow. Each domain's pillars serve as a foundation of development.

2.1.1 Economic development domain

The economic development domain, with a KBUD perspective, aims to form a knowledge economy based on creating, evaluating, and trading knowledge; the use of knowledge to produce economic benefits especially in terms of high-technology businesses and services as well as education and R&D (YIGITCANLAR; VELIBEYOGLU, 2008).

In the era of knowledge, success in local economic development is highly correlated with the cities' ability to adapt itself to the knowledge economy (NGUYEN, 2010). The pillars that compose the economic development domain are: Competitiveness, creativity,

innovation and knowledge, which are described by Yigitcanlar and Velibeyoglu (2008):

- **Competitiveness Pillar** - In order to find out cities' common characteristics to deal with a global competitive environment, the literature (YIGITCANLAR, 2009) was looked up for a successful global knowledge experimental city and for the way governors are planning for the development of their knowledge-based creative urban regions. Cases of different creative urban regions were analysed, which were selected on their accomplishments and innovative approaches towards KBUD (YIGITCANLAR, 2009). Cities that are managing to attract and generate knowledge-based new industries, by offering places to meet their needs and high-quality urban spaces to satisfy their knowledge workers, supply examples to other cities (YIGITCANLAR, 2009). Yigitcanlar (2009) considers that these examples bring richness of information and inspiration to the cities and contribute for them to be able to prepare for the era of knowledge and for a global economy. As previously mentioned, the case studies analysed by Yigitcanlar (2009) include: Austin, Barcelona, Helsinki, Melbourne and Singapore, which illustrate a broad range of knowledge-based urban planning and development, and how creative urban regions can be designed. There regions' economic development also supply quality of life and a place for their residents and workers with various options of lifestyle in one safe and clean environment (YIGITCANLAR; BAUM; HORTON, 2007).

- **Creativity Pillar** - Creative urban regions provide vast opportunities for knowledge production, which lead to the formation of knowledge cities. Thus, these creative urban regions have been growing and developing (YIGITCANLAR; VELIBEYOGLU, 2008). In the era of knowledge, the concept of creativity gained greater attention among urban planners and policy makers, thus influencing cities' development strategies, and attracting the attention towards creative industries as an important stimulus for knowledge-based urban growth (BAUM; CONNOR; YIGITCANLAR, 2009). The knowledge-based economy promotes knowledge generation and creativity as the central activities of economic and urban growth mechanisms.

Recent literature indicates a strong correlation between creative places and economic growth (DURMAZ; YIGITCANLAR; VELIBEYOGLU, 2008).

- **Innovation Pillar** - In 1990 the OECD published the first edition of the Oslo Manual: Guidelines for Collecting and Interpreting Innovation Data, which aims to guide and standardise concepts, methodologies and build statistics and R&D research indicators of industrialised countries. The Oslo Manual considers technological innovation the conception of a new product or manufacturing process, as well as adding new functionalities or characteristics to the product or process which lead to incremental improvements and effective quality or productivity gain, thus resulting into more competitiveness in the market. Innovation is essential for economic development. In technology, it is possible to codify technical knowledge for the innovation of products and services, thus providing access to a new market and ways of production and suggesting new ways of consumption (SCHUMPETER, 1982).

> The growing range of stakeholders in the innovation process and the growing impact of innovation on society increasingly require the involvement of stakeholders in shaping policies for innovation. Social well-being is an explicit goal – and not simply a consequence – of innovation. Government can work to remove barriers to full participation by the public and private sectors and other stakeholders in the development of innovative solutions to social problems and thus help to develop a shared vision and make policies more effective in meeting social goals (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2010, p. 23).

- **Knowledge Pillar** - To compete nationally and internationally cities need knowledge infrastructure, with universities and R&D institutes; a concentration of well-educated people; technological, mainly electronic, infrastructure; and connections to the global-knowledge economy, with international companies and financial institutions for trade and investment (YIGITCANLAR, 2009).

Knowledge cities must possess the people and infrastructure for the production of knowledge so they function as breeding grounds for talent and innovation (WINDEN; BERG, 2004). The economy of a knowledge city creates high value-added products using research, technology, and brainpower. Many city initiatives call themselves knowledge cities. Currently, there are only a few cities around the world – Barcelona, Delft, Dublin, Montreal, Munich, Singapore and Stockholm – that have earned that title. Many other cities aspire to the status of knowledge city through urban development programmes that target KBUD (ERGAZAKIS; METAXIOTIS; PSARRAS, 2004). Examples include Bangalore, Brisbane, Copenhagen, Dubai, Kuala Lumpur and Shanghai (YIGITCANLAR, 2009).

2.1.2 Socio-cultural development domain

Socio-cultural development, with a KBUD perspective, aims to progress towards establishing a society – knowledge society – in which the generation, distribution, diffusion, use, integration and manipulation of knowledge and information is a significant economic, political, and cultural activity. Therefore, for social-cultural development it is essential to work towards increasing the skills and knowledge of residents as a means for individual and community development (GONZALEZ; ALVARO; MARTINEZ, 2005). Social and human capitals of a society are seen highly interrelated with the high level achievements in the domain of socio-cultural development (FRANE et al., 2005):

- **Quality of Life Pillar** - Quality of life and place are defined not only by the level of public service (e.g. health, education) but also by the conservation and development of the cultural, aesthetic and ecological values that give cities their character to attract the creative class of knowledge workers (FLORIDA, 2005). According to Yigitcanlar, Velibeyoglu and Martinez-Fernandez (2008) quality of life is influenced through a variety of questions such as environmental quality, safety, quality and availability of services, as well as open and fair government.

- **Human and Social Development Pillar** - A new generation of workers emerged in the last decade, the “knowledge workers”.

Knowledge workers have high degree of proficiency, education or understanding and the fundamental purpose of their job involves the creation, allocation or application of knowledge (DAVENPORT, 2005). According to Yigitcanlar (2007), the knowledge worker is free from machine domination. Florida (2002) refers to these workers as the creative class, including scientists, engineers, architects, educators, writers, artists and entertainers. The author defines this class as that whose economic function is to create new ideas, new technologies and new creative contents. Therefore, keeping a creative mind in an ideal situation will be the driving force for cities' economic prosperity.

- **Intellectual Capital Pillar -** As a result of the expansion of global knowledge economy and of the strong growth of knowledge-based production in the last decade, the competition for highly educated knowledge workers has intensified (KING; KEATING, 2005). The seemingly ever-tightening market for mental labour has tended to polarise urban regions (YIGITCANLAR, 2010).Those areas with a concentration of such workers prosper at above average rates, while those that keep thinking as in the industrial era are increasingly losing ground not only relatively, but also absolutely (KING; KEATING, 2005). The value of a well-educated knowledge workforce (engineers, scientists, PhDs – in proximity to major universities, with world class faculty and large R&D budgets) has grown in recent years (YIGITCANLAR; LÖNNQVIST, 2013). Florida (2005), Baum (2006) and Yigitcanlar (2007) perceive knowledge workers or creative class as a strong strategy of economic development; these workers act as growth engines. In a work on the economy of cities Jacobs (1969), states that city growth is related with human capital. Since then, an extensive empirical work has confirmed the connection between human capital, economic growth and urban development (KNIGHT, 1995). All these studies agree that the key to regional growth lies in concentrating a critical nucleus of highly educated and productive people, the knowledge workers (YIGITCANLAR; BAUM; HORTON, 2007). From these studies, it can be affirmed that knowledge workers are a rich supply in a city, which is highly related with urban growth (KING; KEATING, 2005). Policy makers have cared to attract and keep knowledge workers

in their cities. In this context, urban planning would have an important role to help governments adopt adequate strategies to reach this objective through KBUD (SARIMIN; YIGITCANLAR, 2012).

2.1.3 Enviro-urban development domain

Enviro-urban development (development of both natural and built environments), with a KBUD perspective, aims to meet human needs while preserving the environment so that these needs can be met not only in the present, but also for generations to come (YIGITCANLAR; VELIBEYOGLU, 2008).

Enviro-urban development ties together concerns for the natural systems with the social challenges facing humanity and builds a strong spatial network relationship between urban development clusters while driving an urban development that is ecologically friendly. Therefore, enviro-urban development is a sustainable urban development which values quality of life, particularly in the knowledge community precincts and plays a significant role in the spatial formation of sustainable KBUD strategies and achieving sustainable KBUD outcomes (YIGITCANLAR, 2010).

- **Quality of Place Pillar -** The era of knowledge-based economy requires a new approach towards urban planning and development. The reflection of this new society framework and how to build it put creating suitable milieus for knowledge generation, exchange and commercialisation at the heart of the development. This leads to imagining a collaborative development framework where growth is no longer viewed as an end in itself, but simply as a means to reach the target by giving knowledge an unprecedented knowledge and accessibility and by engaging in capacity-building for everyone (YIGITCANLAR; LÖNNQVIST, 2013). Lor and Britz (2007) argue that this knowledge society is not a goal but an outcome of an apparently irreversible development process, while Carrillo (2002, 2004, 2006) referred to this process as a knowledge-based development. The movement and creation of such knowledge places technology parks, incubators, start-up accelerators, hubs and co-working spaces in the center of attention of knowledge professionals and innovative entrepreneurs, thus forming technology-oriented firm

clusters. These spaces promote meetings that generate networking, thus creating new business opportunities. This whole scenario has certainly placed a crucial question on the quality of future cities particularly in answering to the global challenge of the era of knowledge-based economy; and it will create an even bigger challenge for architects, urban designers, planners, developers, and decision-makers alike around the world (YIGITCANLAR; VELIBEYOGLU, 2008).

- **Sustainability Pillar -** Knight (1995, 2008) argued that city development has been viewed primarily from the perspective of city planning with a focus on their physical form and built environment (e.g. on land use zoning, building and infrastructure). Very little consideration has been given to their knowledge resources or to the cultures that produce knowledge. Previous emphasis has been put on attracting tangible forms of wealth (i.e. labour, land and capital) and knowledge as an intangible asset is often ignored. With the advent of the global knowledge society, there is a greater attention that needs to be given to the structure of cities and to make knowledge an input to local development in a sustainable way (CARRILLO, 2006).

- **Uniqueness Pillar** - In the last three decades creative urban regions have become icons with an identity of their own. Silicon Valley, DNA Valley and One-North are world-famous locations of community knowledge and knowledge clusters. These places are urban environments with a knowledge community that gathers R&D, manufacturing of high technology and intensive knowledge, including housing, business, education and leisure within a single setting (YIGITCANLAR; VELIBEYOGLU, 2008).

2.1.4 Institutional development domain

Institutional development, with a KBUD perspective, aims to orchestrate the KBUD of the city and bring together all of the main actors and sources so that they are able to organise and facilitate necessary knowledge-intensive activities and plan strategically for knowledge city, which is under transformation (YIGITCANLAR, 2009). To institutional development, it is critical to govern via the principles of

institutional leadership, good governance, strategic planning, targeting socio-economic and socio-politic equality, and branding the city as its promise of value in order to make a significant difference for the city in achieving its knowledge city status (BAUM, 2007).

Achieving coherence and co-ordination is difficult. Coherence involves co-ordination of simultaneous policy actions and consideration of possible interaction of policies with other objectives. Supporting the growth of young dynamic firms, for example, requires close co-ordination of innovation and entrepreneurship policies (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2010).

Likewise, closer integration of policies to foster innovation and a cleaner environment can help guide economies towards greater sustainability.

> Policies for innovation often remain compartmentalised in different departments and agencies. This can create obstacles to co-operation and lead to a proliferation of innovation policies that are duplicative and wasteful. The budget process, as one of government's main decision-making tools, can help lead to effective innovation policies. Multi-year budgeting can help develop a long-term vision for innovation and secure funds on a multi-year basis. Performance budgeting can help position the policy goals and costs of innovation with respect to other policy goals of government (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2010, p. 23).

- **Strategy and Integration Pillar** - Institutional development demonstrates the importance of strategy and integration of actors and entities, as a means to jointly set society's strategic goals for reaching local development and global competitiveness (KNIGHT, 2008). Knight (2008) emphasises that orchestrating the development of creative urban regions is not an easy task. Yigitcanlar and Velibeyoglu (2008) suggest the creation of a KBUD organ to work as an orchestrator, able to lead the strategies and whose mission is the integration of several peers that contribute for economic development, with no individual interest.

> The growing range of stakeholders in the innovation process and the growing impact of innovation on society increasingly require the involvement of stakeholders in shaping policies for innovation. Social well-being is an explicit goal – and not simply a consequence – of innovation. Government can work to remove barriers to full participation by the public and private sectors and other stakeholders in the development of innovative solutions to social problems and thus help to develop a shared vision and make policies more effective in meeting social goals (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2010, p. 23).

- **Democracy and Transport Pillar** - Carrillo (2004, 2006) noted that the most immediate impact of the knowledge economy in relation to the urban environment is the reduction in displacements made possible by the internet and wireless telecommunications.The standards of working and schooling, apart from the way people consume will be changed substantially. Some of the most distinctive characters of industrial city such as commuting, suburban residence, central districts and zoning in general are fading and they will be replaced by the distribution of work and learning, as well as of services offered through the Internet, so called e-services. As a consequence, offices will be relocated and zones will be reconverted (YIGITCANLAR; LÖNNQVIST, 2013). Carrillo (2004, 2006) also calls the attention to aspects of knowledge, which no longer require presence and simultaneity, and therefore the current patterns of transportation, scheduling, configuration, zoning and infrastructure will be changed. The present configuration, organisation and lifestyle of urban centres might be more of inheritance of tribal, hierarchical and material production patterns than an urban design and culture fit for knowledge society (GRAHAM; MARVIN, 1996). The new city designs should, for example, consider the notion of accessibility rather than proximity and contiguity, networked knowledge innovation zones rather than classical land use zoning, and the flow of information,

goods and people rather than users and products' movement from one area to another.

- **Social Equality Pillar** - KBUD proposed social equality with strategic and integrated policies, which must benefit from the contribution of the main actors and entities, in order to have a fairer and more democratic society (YIGITCANLAR; VELIBEYOGLU, 2008). Public policies and entities must be integrated so that society can profit, be fairer and experience less class difference. Knowledge and education provide a more egalitarian society.

  The KBUD literature review shows the importance of each domain and their pillars and how they are integrated. Considering the focus of this thesis on Knowledge-Based Economic Development (KBED), the research will explore this important domain in the technological firms' context.

  The choice of the theme with a focus on economy within the KBUD framework comes from the author's practical experience of working with innovative firms that seek incentives as a way to leverage their businesses.

  There once were researches on an incentive programme for innovative firms – named *Programa Juro Zero* (Zero Interest Programme), which the author coordinated in the Brazilian state of Santa Catarina, and aimed to promote research, development and innovation in the state –, which found that the programme's outcomes have contributed to the relevance of incentives for economic development: companies that were given grants from the *Programa Juro Zero* in Santa Catarina, Brazil, have grown above national average and some of them have managed to obtain international funding.

  With the aim to contribute to the development of innovative firms through public policies for the generation of economic development in the country, the author aimed to delve into this theme through this thesis.

2.2 KNOWLEDGE-BASED ECONOMIC DEVELOPMENT

The OECD (1996) defines knowledge-based economy as trends in advanced economies towards a greater reliance on knowledge,

information, and highly skilled labour. Fighting social exclusion is also important.

The term "knowledge-based economy" has added the structural aspects of technological trajectories and regimes from a systems perspective (COOKE; LEYDESDORFF, 2006). The transition to a knowledge-based economy, which emphasises knowledge production, certainly affected the process of urban development. A series of great changes has been brought about by knowledge-based economy, which is meant to impact the standards of human activity and urban life (YIGITCANLAR; VELIBEYOGLU, 2008).

Today's most advanced economies are fundamentally knowledge-based (DUNNING, 2000[1] *apud* COOKE; LEYDESDORFF, 2006). Burton-Jones (1999)[2] *apud* Cooke and Leydesdorff (2006) noted that the gap between rich and poor nations is accelerating under "knowledge capitalism". Knowledge-intensity can also lead to a growing gap within societies.

> The evolution towards a knowledge-based economy not only represents a new competitiveness challenge, but a shift in both the nature of organisations and the way in which they devise and implement their strategies. The growing dependency of wealth creation on intangibles is making the global economy more fluid and volatile, and the capacity to access and combine new and existing knowledge effectively has become more important in the context of the competitiveness of firms, regions and nations (HUGGINS, 2011, p. 1459).

OECD countries supply the needs of their people with education. Developing countries continue in the pursuit of basic education; however, one of the barriers seen by political leaders is the long-term until education is reflected in society, as the major concern is that of votes in the next election; they end up not prioritising education, making social inequality greater and the country less competitive.

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[1] DUNNING, J. (ed.). *Regions, Globalisation & the Knowledge-Based Economy*, Oxford: Oxford University, 2000.
[2] BURTON-JONES, A. *Knowledge Capitalism*. Oxford: Oxford University, 1999.

> Low-income countries face specific challenges for making innovation the source of economic development, such as poor framework conditions, and low human and social capital. They should therefore be supported in strengthening their framework conditions and educational attainment. Improving rural productivity requires significant investments in basic infrastructure, including transport, rural energy and irrigation (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2010, p. 22).

The pillars of economic development are directly associated with the technology sector in the view of the author of this thesis, who has a strong professional connection with this sector and today represents the area of innovation and development in the *Associação Brasileira das Empresas de Software – ABES* (Brazilian Association of Software Companies). Knowledge base, creativity, innovation and competitiveness are the foundations of technology firms, which need knowledge and creativity to innovate and lead the market, and thus become more and more competitive. These days a firm that does not seek innovation by means of knowledge and creativity is destined to failure since technology becomes obsolete in no time.

The regional innovation systems literature recognises the role of knowledge for growth economies (COOKE, 2004[3] *apud* HUGGINS; IZUSHI, 2013). It was Schumpeter (1982) who first acknowledged of the importance of knowledge in the economy by his reference to "new combinations of knowledge" at the heart of innovation and entrepreneurship (SCHUMPETER, 1911 [4] *apud* COOKE; LEYDESDORFF, 2006).

To be able to keep up-to-date and innovating in their markets – or many times create new markets –, they can and must seek funding. By developing firms with tax subsidies or grants, the government is a partner in the risk of innovation, since it is understood that this

[3] COOKE, P. Regional innovation systems: an evolutionary approach, in: COOKE, P.; HEIDENREICH, M.; BRACZYK, H.-J. (Eds). *Regional Innovation Systems*, 2nd. ed., pp. 1–18. London: Routledge, 2004.
[4] SCHUMPETER, J. *The Theory of Economic Development*, Oxford: Oxford University, 1911.

innovation may contribute to the economic development by means of creating jobs for skilled professionals.

Universities have a major role in forming professionals that R&D firms need. Today the technology sector needs qualified labour in a much larger quantity than universities can prepare. The technology sector has been growing year after year and universities and technical schools have not formed enough professionals to meet this demand. This turns out into a deficit of skilled people and a problem for economic development. The knowledge economy is a set of sectors, which intensely concentrate knowledge and assets in terms of both human and fixed capital (MACHLUP, 1962[5] *apud* COOKE; LEYDESDORFF, 2006).

Considering that innovation requires knowledge, the countries that provide knowledge to their people turn out to be more competitive, because they innovate more.

The future regional policy targeted to be more competitiveness, improving innovation, should be focused on three keys areas:

> (1) making finance available to firms to expand R&D and other knowledge-based activities; (2) improving the physical infrastructure allowing companies to locate in better equipment premises; and (3) creating better networks with universities and R&D performing organisations (HUGGINS; STRAKOVA, 2012, p. 969).

Huggins and Strakova (2012), also consider that policy-makers may need to support the intermediary organisation to induce more active innovation collaborations between knowledge creators and small and medium-sized enterprises – (SMEs).

Nauwelaers and Wintjes (2003)[6] *apud* Huggins and Strakova (2012, p. 964) classify regional innovation policies according to two core types:

- Firm-oriented – principally access to human capital (for example, business support and

[5] MACHLUP, F. *The Production and Distribution of Knowledge in the United States*, Princeton: Princeton University, 1962.

[6] NAUWELAERS C.; WINTJES R. Towards a new paradigm for innovation policy?, in ASHEIM, B.; ISAKSEN, A.; NAUWELAERS, C.; TÖDTLING, F. (Eds). *Regional Innovation Policy for Small–Medium Enterprises*, pp. 193–219. Cheltenham: Edward Elgar, 2003.

advice), financial capital (for example, risk capital, loans or subsidies), or physical capital (for example, incubators, research and technology centres).

- System-oriented (regional) – principally network building and brokering, cluster development, innovation system development, building an innovation culture, cooperation and mobility.

They mentioned the importance of both types of policies where they should operate together, coordinating across the policies so they can tandem each other.

Since hiring the knowledge professionals is rather difficult, firms lose new contracts, or rather, many times they sign up new contracts but eventually experience difficulty to deliver the product or service by the deadline stated in the contract. Another important point that must be highlighted concerning labour for innovation – R&D in technology firms – is professional turnover. Since job supply is much bigger than demand, people can choose which firm they want to work for, which increases the value of such professional. "The firm is a repository of knowledge" (NONAKA; TAKEUCHI, 1995, p. 34)

These professionals can work in a market beyond that of R&D firms, which are not directly connected with the technology sector. Many firms have their own IT centre, such as universities, hospitals, airports, and government in general.

Concerning human resources, to promote economic development, governments in general have been working with public policies that open into two fronts: one is a way of generating new firms, by giving support to start-ups and accelerators, by supporting innovative entrepreneurs; the other is by seeking professionals to take to the market. This search is also done by means of stimuli to the young, those who are to make a decision about their profession.

The president of the USA, Barack Obama, asks every American to take a shot at learning computer science. Mr. Obama says: This week I'm proud to join the students, teachers, businesses, and non-profit organisations taking big new steps to support computer science in America's schools. Learning these skills isn't just important for your future; it's important for our country's future. If we want America to stay on the cutting edge, we need young Americans like you to master the tools and technology that will change the way we do just about

everything. That is why I am asking you to get involved. Do not just buy a new video game; make one. Do not just download the latest app; help design it. Do not just play on your phone; program it. No one's born a computer scientist, but with a little hard work and some math and science, just about anyone can become one. The video is available on You Tube; it is called "President Obama asks America to learn computer science" and was posted on 8 December 2013. It kicked off the Hour of Code campaign for Computer Science Education Week 2013 (verbal information)[7].

Urban centres with good universities focused on schools of engineering, automation, computing, creative industry, among others, tend to become clusters of innovative firms. Clusters that stand out and are more innovative are located close to universities. Universities develop entrepreneurship and seek to supply the demands of firms. These clusters are organised by non-profit trade associations that orchestrate this movement by means of incubators, technology parks, accelerators, hubs and innovation centres, and that eventually integrate start-ups to investment funds, thus increasing the success rates of firms that are part of this arrangement. The networking connecting the many actors is extremely relevant to generate new businesses.

The rise of business knowledge networks represents a metamorphosis in the contemporary economy. The key to the knowledge-based economy is at least partly revealed as this metamorphosis in the nature of industry organisation that facilitates interaction with valuable knowledge, rather than conceals it, as was common in the previous phase of the global economy (PENROSE, 1995[8] *apud* COOKE; LEYDESDORFF, 2006).

The university-firm integration is an important factor to generate innovation. Researchers have a lot to add to firms and vice-versa. Many public policies favour this type of knowledge exchange to generate economy-based development. The internationalisation of the university-company relationship has been developing (HUGGINS; STRAKOVA, 2012). There has been a growing evidence base, in both academic literature and policy documents, indicating that economic development

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[7] "President Obama asks America to learn computer science", Transcription television field announced on national television in the United States of America. Campaign for Computer Science Education Week 2013 on 8th Dec. 2013. Available in: <http://code.org >. Accessed on: 25th Feb. 2015.

[8] PENROSE, E. *The Theory of the Growth of the Firm*. Oxford: Oxford University, 1959.

and the welfare of regions can be enhanced through universities, various engagements with the local economy, including research, infrastructure development, education, effective industry-university partnerships, technological innovation and community development (KELLY et al., 2002; HEFCE, 2001; BENNEWORTH; CHARLES, 2005; LAWTON SMITH; BAGCHI-SEN, 2006; HUGGINS et al., 2008; SURF *et al.*, 2006; KITSON *et al.*, 2009[9] *apud* HUGGINS; STRAKOVA, 2012).

Carrillo (2004) has categorised these changes into four groups namely: (*i*) dematerialisation (i.e. a lesser volume of material inputs and outputs); (*ii*) environmentalism (i.e. a greater concern with sustainability); (*iii*) an experience upgrade (i.e. the capacity to attain the same results without the conventional means of space and time, and, (*iv*) essentialism (i.e. the understanding and pursuit of ever more fundamental values).

The main novelty of the knowledge economy consists of the need to manage an intangible asset that, in contrast to material resources, does not depreciate through use but rather becomes more valuable the more it is used (LASZLO; LASZLO, 2006).

With the progress of information and communications technologies (ICT) in the last two decades a technological infrastructure has been established which allows knowledge-based economy to grow and distances to shorten. Thus, KBUD gains more importance for the global competitiveness of the regions and society represented by it.

The concept of the knowledge-based economy has emerged from an increasing recognition of the requirement for the production, distribution, and use of knowledge within modern economies (HARRIS, 2001[10] *apud* HUGGINS; IZUSHI, 2009).

According to the World Knowledge Competitiveness Index (WKCI), which compares regions across the continents, there is a significant variation in the knowledge-based regional economic development framework around the globe. Silicon Valley, is the highest ranked WKCI region (IMD, 2009 *apud* HUGGINS; IZUSHI, 2009). The WKCI represents an integrated and overall benchmarking of the knowledge capacity, capability, and sustainability of each region, and

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[9] KITSON, M.; HOWELLS, J.; BRAHAM, R.; WESTLAKE, S. *The Connected University*: Driving Recovery and Growth in the UK Economy. London: National Endowment for Science, Technology and the Arts (NESTA), 2009.

[10] HARRIS, R. G. The knowledge-based economy: Intellectual origins and new economic perspectives. *International Journal of Management Reviews*, n. 3, pp. 21-40, 2001.

the extent to which this knowledge in translated into economic value and transferred into the wealth of the citizens of each region (HUGGINS; IZUSHI, 2009). Silicon Valley, the “Hollywood of Innovation”, is the number one in the WKCI ranking (HUGGINS; IZUSHI, 2009). The region holds a unique global position as a region where strong capacities of ICT and computer manufacturing and a relatively strong supply of venture capital are complemented by the use of patents and a solid foundation of high-tech services producing high levels of economic output (HUGGINS; IZUSHI, 2009).

U.S. regions are ones that stand out the most in the WKCI ranking. The OECD countries are much representative in the ranking. Considering BRICS (Brazil, Russia, India, China and South Africa), only China and India appears in the ranking (HUGGINS; IZUSHI, 2009).

2.3 INNOVATION INCENTIVES

Schumpeter (1982) considers the innovative entrepreneur as an economic agent, so it is important that development banks approve credit for them with subsidised taxes; the risk to innovative startups should be minimised to the entrepreneurs. Consideration has been given to the importance of credit to the innovative entrepreneur.

The OECD countries appreciate the importance of the innovation incentives for the technology companies. These government financial incentives for innovation cause the government to share the development risk to generate a new product or service. It is known that innovation creates competitiveness, breaks barriers and opens new markets, generates exports bringing foreign capital into the country, creates qualified jobs with higher salaries and therefore a greater purchasing power, thus generating the knowledge-based economic development (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2014).

The incentives for innovation are supplied in various ways. The first way is through Economic Subsidy. This means that the money will not be returned to the financing agency. The second way to encourage innovative companies is through loan at low interest rates. In this case, companies usually have more time to repay the loan, so they will have enough time to bring innovation into the market. The third way is to reduce taxes, compared to other countries, through laws with a focus on innovation. This framework has been widely used by the OECD

countries, with companies paying much less taxes, but generating more research and development outputs.

As mentioned earlier, in 2004, the OECD created the Oslo Manual, as a way to bring uniformity to what innovation is. Many institutions of promotion and governments use the Oslo Manual as a base. This manual describes:

Technological product and process (TPP) innovations comprise implemented technologically new products and processes and significant technological improvements in product and processes. A TPP innovation has been implemented if it has been introduced on the market (product innovation) or used within a production process (process innovation). TPP innovations involve a series of scientific, technological, organisational, financial and commercial activities. The TPP innovating firm is one that has implemented technologically new or significantly technologically improved products or processes during the period under review (OSLO MANUAL, 2005).

For a country to be competitive, keep its domestic market and conquer new markets, it is necessary to invest in people who hold knowledge and to innovate and generate innovative companies. For this, it is necessary to build their own policies for innovation.

The regulation for innovation should already determine the existence of sector funds that guarantee government investment in innovative companies. This is a way for the government to encourage innovation and make the country gain competitiveness and generate knowledge-based economic development.

Time is a very important variable to companies that innovate; many types of financing to innovation companies are bureaucratic. And banks and lenders will often take more than six months to make the resources reach the companies that submit their project proposals.

A number of studies deals with the preferential tax treatment of R&D investment in selected OECD countries (NAM, 2011). Many member countries have exceptionally kept and even extended such a tax-base subsidy system as an important technology and innovation policy measure, although they have recently carried out a series of ‘tax-rate-cut-cum-base-broadening’ corporate tax reforms. This fact suggests that there has been a sort of tax competition among the OECD countries regarding R&D promotion (NAM, 2011).

Many authors consider innovation as the main driver to generate economic development (HUGGINS; IZUSHI, 2013; COOKE; LEYDESDORFF, 2006). Innovative companies are more

competitiveness, get new markets and give their contribution to the society.

As to innovation to strengthen growth and address global and social challenges, the Ministerial report on the OECD Innovation Strategy (2010) has some important key findings that are mentioned below. This is an executive document that is cross-referenced with academic literature to reinforce the importance of this context.The document defines and measures innovation. To define it they use the third and last edition of the Oslo Manual (2005) which defines innovation as the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organisational method in business practices, work-place organisation or external relations.

By definition, all innovation must contain a degree of novelty. The Oslo Manual distinguishes three types of novelty: an innovation can be new to the firm, new to the market or new to the world. The first concept covers the diffusion of an existing innovation to a firm – the innovation may have already been implemented by other firms, but it is new to the firm. Innovations are new to the market when the firm is the first to introduce the innovation on its market. An innovation is new to the world when the firm is the first to introduce the innovation to all markets and industries (OSLO MANUAL, 2005).

Innovation, thus defined, is clearly a much broader notion than R&D and is therefore influenced by a wide range of factors, some of which can be influenced by policy. Innovation can occur in any sector of the economy, including government services such as health or education. However, the current measurement framework applies to business innovation, even though innovation is also important for the public sector. Consideration is being given to extending the methodology to the public sector innovation and innovation for social goals (OSLO MANUAL, 2005).

The OECD Innovation Strategy is based on five priorities for government action, which together can support a strategic and broad-based approach to promote innovation. These strategies are: (1) empowering people to innovate; (2) unleashing innovation in firms; (3) creating and applying knowledge; (4) applying innovation to address global and social challenges; and, (5) improving the governance and measurement of policies for innovation (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2010).

These five strategic points covered by the OECD (2010) are connected with the domains of KBUD and knowledge-based economic development. Next, a brief description of the themes is provided: Empowering people to innovate; in this case universities, technology parks, start-up incubators, accelerators as well as regional and national trade associations may contribute as a link between public policies and companies' needs. These entities can also contribute to the sector and innovation firms by demonstrating the end needs, as perceived by entrepreneurs, to those who formulate public policies. Unleashing innovation in firms; also up to the trade associations, technology parks and incubators to disseminate opportunities of innovation through seminars and by promoting meetings with businesses to disseminate knowledge. Creating and applying knowledge; it demonstrates the importance of university to firms, the university as a knowledge generating pole. Concerning this item it is important to highlight the public policies that integrate universities and firms for a common development. This stimulus takes place through public calls. Applying innovation to address global and social challenges. Governments support innovation concerning strategic affairs, so that countries become more competitive in some matters. Some areas of incentive that stand out are: Health, Energy, Oil and Gas, Sustainability, Education, Telecommunications, Security, Games, Agribusiness and Cloud Computing. Improving the governance and measurement of policies for innovation; this is the proposal of KBUD, where the main actors must be integrated so they can jointly propose the improvement of public policies. These policies must be reviewed periodically so they follow the market and global competitiveness.

Innovation public policies focused on R&D must care for the fact that investments are intangible, which hinders the access of innovative businessmen to loans from private banks. Innovative firms, especially software companies, have few assets to offer as security to private banks. Development banks, in turn, have made this process easier, for they understand they must support this type of firm to generate economic development. The government will need to take the risks in uncertain areas and takes the lead for firms through investment in public research. The private initiative will not undertake the investment in long-term research and innovation development (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2010). Therefore, the innovative companies needs special treatment on

incentives (taxes or grants) from the government and development banks, because they have no real guarantees to offer.

> New financing mechanisms can be used to provide incentives for global and local innovations that address global challenges. Philanthropies and foundations to increase funding for research projects that address global challenges are using new modes of financing and managing innovation borrowed from the venture capital sector to increase funding for research projects that address global challenges. International public-private partnerships can also be used by governments to address financing gaps in the areas of infrastructure, research or technology development (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2010, p. 21).

According to an OECD report (2010), estimates for several OECD countries shows that firms invest more in intangible assets related to innovation (R&D, software, skills, organisational know-how and branding), than they invest in traditional capital such as machinery, equipment and buildings.

> Innovation was the main driver of growth. Differences in multi- factor productivity (MFP) also account for much of the gap between advanced and emerging countries, an indication that innovation is also a key source of future growth for emerging economies (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2010, p. 4).

One way to measure how innovative a country is the intellectual property register. In some countries the process to get the register is bureaucratic and takes a long time, which make entrepreneurs to seek more agile countries such as the USA to register their innovative products/services.

> Intellectual Property Rights (IPRs) provide an important incentive to invest in innovation by

> allowing firms to recover their investment costs. Patents are particularly important for small firms, as they can facilitate entry into new markets and enable competition and collaboration with other firms. IPRs should be well protected and appropriately enforced. Weak protection of IPRs undermines incentives to invest in innovation, facilitates counterfeiting and piracy, reduces the potential for technology transfer and limits the formation of markets for knowledge (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2010, p. 18).

Apart from registering intellectual property through a quicker process, the government may promote innovation by demonstrating the problems that must be tackled within the country; the government can help develop these firms by purchasing these innovative products and services from them.

> Fostering growth of new firms will be essential, as they are often the source of the most radical innovations. Policies should allow the private sector to identify the most promising means of addressing global problems through innovation. A flexible policy regime can encourage innovators to identify the most innovative technologies and solutions and adopters to invest in cost-effective Technologies (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2010, p. 21).

Governments must support companies towards innovation and demonstrate the problems so that an innovative solution can be created in a more effective way.

> Where possible, policies should focus directly on solutions to the problems themselves, rather than some indirect 'proxy'. For instance, in addressing climate change, a tax on carbon will be more effective for inducing an optimal innovation path than a tax on fuel or electricity use (ORGANISATION FOR ECONOMIC CO-

> OPERATION AND DEVELOPMENT, 2010, p. 22).

This way, chances of mutual success between the government and firms will grow; the government will find the solution to its problems and firms will become the government's supplier, thus creating an innovative portfolio in order to penetrate other regions. This type of business brings economic development and generates an investment cycle; it helps develop national firms, create new jobs and generate more tax money. According to the Organisation for Economic Co-operation and Development (2010, p. 26).

> It is important to balance policies aimed at the creation of new knowledge and innovations with those aimed at fostering its uptake and diffusion in the economy. Policy actions also need to reflect the changing nature of innovation. This implies an emphasis on the following areas:
> A more strategic focus on the role of policies for innovation in delivering stronger, cleaner and fairer growth.Broadening policies to foster innovation beyond science and technology in recognition of the fact that innovation involves a wide range of investments in intangible assets and actors.Education and training policies adapted to the needs of society today to empower people throughout society to be creative, engage in innovation, and benefit from its outcomes.Greater policy attention to the creation and growth of new firms and their role in creating breakthrough innovations and new jobs.Improved mechanisms to foster the diffusion and application of knowledge through well-functioning networks and markets.New approaches and governance mechanisms for international cooperation in science and technology to help address global challenges and share costs and risks.Frameworks for measuring the broader and more networked concept of innovation, and its impacts to guide policy making.

These innovation-oriented policies and the alignment of government, firms and universities are extremely relevant for economic

development. Public policies must be close to the market so they can propose and legislate according to the needs of those who seek them. It seems simple but several times public policies are far from the actual needs of innovative entrepreneurs.

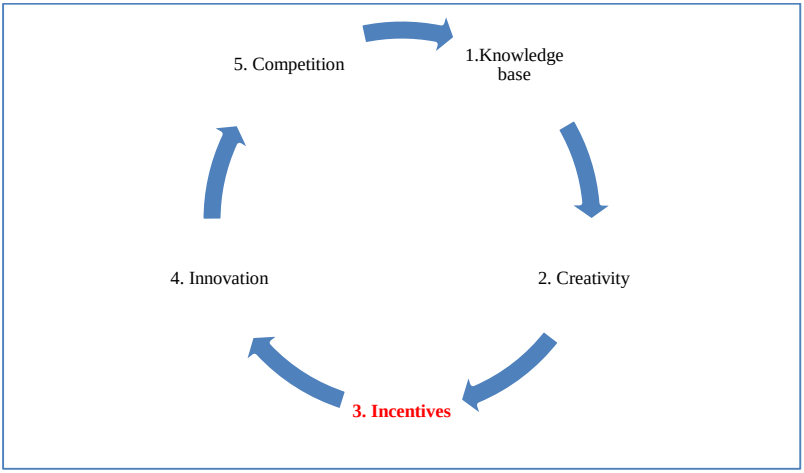
In the literature review of KBUD, KBED and Innovation incentives: some key aspects are noticeably important for a country to be more competitive and globalised. The literature strongly demonstrates the importance of the formation of human resources through knowledge to the competitiveness of firms. The literature review also shows the importance of knowledge as a basis for technological innovation and the role to the society in the integration between university and firm, as a way to generate wealth and economic development. Also the literature demonstrates the relevance of legislation for registering intellectual property and generating international competitiveness.

Government and public policies also have an important and transverse emphasis in the researched themes. The government is seen as an integrator, a developer, demanding new innovations as a buyer of new technologies. It is also expected to lead public policies concerning innovation and the development of technology poles in order to generate and support new firms. To make these firms competitive, the government must also participate of the risk of innovation by providing fiscal and financial incentives.

2.4 CHAPTER SUMMARY

The literature review reveals a gap that this thesis aims to bridge by demonstrating the importance of incentives to innovative companies as a way to generate knowledge-based economic development.

Figure 3 - Knowledge-based economic development.



Source: The author, 2014.

OECD countries are the most covered in the literature. It is noteworthy that in most of the cases countries adopt incentives in the form of tax reduction, whereas incentive through grants is barely considered. However, papers produced with a focus on the Brazilian incentive framework will mention grants or incentive programmes.

The literature highlights the importance of knowledge for the generation of innovation. It usually mentions universities as promoters of economic development, and it also calls the attention to the integration between universities and companies to generate innovation. The outcome of all this process is economic development, and more competitive, innovative and creative knowledge-based companies.

The government is also mentioned as a key element as they design public policies according to the needs of the country and in sync with innovative companies. These policies must remain updated and must be integrated with trade associations and other actors that work towards economic development and wealth generation.

The literature review demonstrates how important it is to incorporate incentive to generate economic development as a way to promote competitiveness. Skills such as knowledge, creativity and innovation are factors that already belong to the innovative businessman. By adding incentives the government may promote companies' competitiveness by means of public policies, which makes the country also more competitive.

3 METODOLOGY

The methodological procedures adopted in this thesis are now described in this chapter.

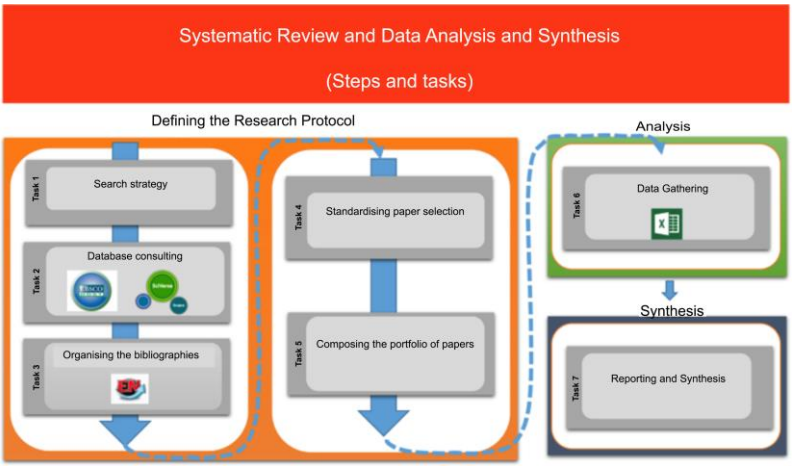
3.1 RESEARCH METHODOLOGY

This chapter covers the research methodology and is subdivided into four sections: (*i*) procedures used for literature review and analysis; (*ii*) analysis category and data gathering tools; (*iii*) the process for composing the portfolio of papers, and; (*iv*) research methodological procedures of the research.

3.1.1 Procedures used for literature review and analysis

To carry out the research based on the systematic review procedures and bibliometrics, the author referred to the framework of Ferenhof and Fernandes (2013). These authors propose three phases and their corresponding set of systematisation tasks to unveil the scientific production on a specific theme. The said phases are: defining the research protocol; analysis, and synthesis, as shown in detail in the figure below.

Figure 4 - Steps and tasks of the Systematic Review and Data Analysis and Synthesis.



Source: Adapted of Ferenhof and Fernandes, 2013.

The systematic and bibliometric review of this document is set to map the scientific production on KBUD. It is a descriptive longitudinal search, since the study cared for the academic production on the said theme from 2008 to 2013. The transversal aspect that will cover incentive as a term is to be developed at a later moment.

3.1.2 Analysis Category And Data Gathering Tools

The frame below shows details of the analysis categories and data gathering tools, through their specific objectives.

Frame 1 - Analysis category and data gathering tools.

SPECIFIC OBJECTIVES	ANALYSIS CATEGORY	DATA GATHERING TOOLS
1. To analyse the public policies for incentive to technology-based firms in Brazil and Australia, under the perspective of their contribution to knowledge-based urban development.	Public policies towards innovation incentive.	Electronic and documentary analysis.
2. To analyse the practice in Brazil and Australia in the field of incentive to technology-based firms as a strategy to achieve knowledge-based urban development.	Analysis of the public policies in both countries.	Using theoretical reference and public policy analysis. Observing – on-site – the international experience in the cities of Melbourne, Brisbane and Sydney (Australia). Visits to incentive offices.

SPECIFIC OBJECTIVES	ANALYSIS CATEGORY	DATA GATHERING TOOLS
3. To compare the Brazilian scenario with the Australian experience in the field of incentive for innovation.	To compare the Brazilian and Australian public policies in order to propose a Brazilian incentive framework to tech-firms.	Analysing the programmes of incentive to tech-firms that have contributed to KBUD. Survey sent out to tech-firms in both countries. Structured interviews with national trade associations, government people and businessmen in the sector. To identify the success cases that generate KBUD.

Source: The author, 2014.

Frame 1 shows the path taken by the researcher to achieve the specific objectives of this thesis.

3.1.3 The process of composing the portfolio of papers

In this process of systematic review, the study is subdivided into two sections: (*i*) defining the research protocol – Step 1; (*ii*) Analysis and Synthesis – Step 2.

3.1.3.1 Step 1 – Defining the research protocol

Figure 4 presents the steps and tasks concerning the systematic review of literature on the analysis of scientific production. Step 1 is *Defining the Research Protocol* and it involves creating a set of rules and parameters to set up the process, determining the characteristics according to their needs. This phase includes creating a pattern, a system for the strategy of research development, considering that the

information for its creation is crucial for identifying the elements that will respond to the proposed focus of investigation (CARLSON; THUROW; JONES, 1993). Five are the tasks of **step 1** in the Ferenhof and Fernandes (2013) framework:

- **Task 1 – Search strategy:** it includes a set of procedures that define the search mechanisms and the retrieval of online information; **Task 2 – Database consulting:** through a computer interface it is possible to index the information and raise the search reach in both national and international bases;**Task 3 – Organising the bibliographies:** in this task appropriate software is used to generate bibliography and references of papers, books and other works, automatising and speeding up the process of searching, storing, inserting it in the text as a citation and as bibliographical reference; **Task 4 – Standardising paper selection**: in this task theme groups are created in order to organise the issues that are researched, filtered and selected. This task includes reading the title, abstract and key-words of each paper, leading to the choice of those that relate to the search theme; **Task 5 – Composing the portfolio of papers:** this task includes reading all the papers in full, allowing for another filtering in order to exclude those that do not show adherence to the investigated theme.

As for the development of step 1 the respective tasks as pointed out in the systematic review framework of Ferenhof and Fernandes (2013) – in this systematic review under the term *knowledge-based urban development* – the search protocol was shaped on the definition of the theme and the search words. Therefore, in order to learn the state-of-the-art of the term "knowledge-based urban development", the search word was defined: *"knowledge-based urban development*".

After defining the key words the databases to be searched into were listed. In order to choose the databases – *Scopus* and *Ebsco* – the criteria defined by Lancaster (2004) were used:

a) *Coverage*, that is, how complete is the content of the database is on the searched issue;
b) *Retrieval*, the quantity of items that are possible to be retrieved through a not-very-complex search strategy;

c) *Predictability*, for a document to be considered relevant based on the information of the database;
d) *Updatedness*, which measures the speed of inclusion of new publications in the database.

Another factor that has guided the choice of databases was the study of Jacso (2005). That author claims that the *Scopus* and *Ebsco* databases are among the biggest multidisciplinary databases, which is an important factor, for it shapes the studies of the theoretical and pragmatic aspects of all study areas.

The End Note software was used to manage the bibliography search results of the aforementioned databases. The choice of this software was motivated by the easy integration of results obtained from from database search. The software helps importing the bibliographical references of the Scopus and Ebsco databases, providing the systematised construction of interest groups. Therefore it helps insert and format references in the text body when typed into data processors.

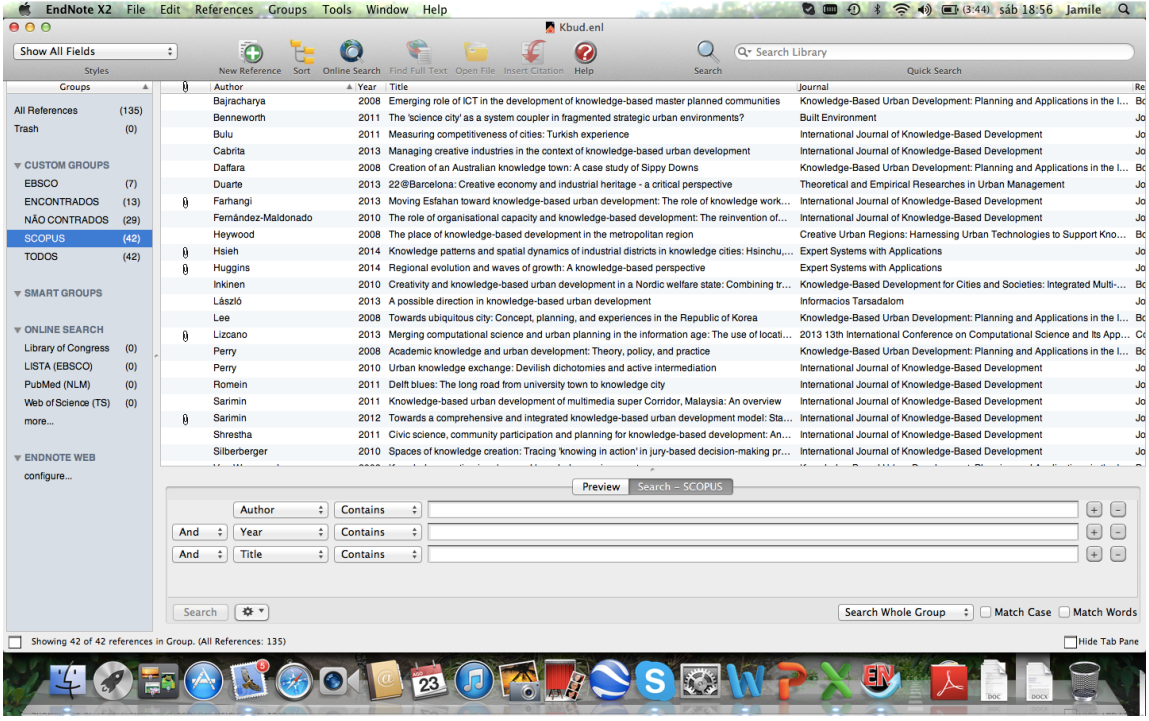
In order to delineate this research protocol, by setting preliminary search criteria, other parameters were defined for the systematic review of the theme of study. As for the *definition of the time length*, it was decided that papers to be searched had to be published in recent years, given the novelty of the issue. Therefore, the publications found were dated 2008 to 2014.

A second parameter adopted to the search of papers refers to *presence and absence of descriptors* – terms or key-words used by the databases to index papers (NOBRE; BERNARDO, 2006). Therefore, the tiles, key-words and abstracts of 42 papers were read.

After using this first filter, the End Note tool was used to search and download papers, of which 13 were found and downloaded in PDF format and 29 were not found. The 13 papers were read in full and they were checked for adequacy of the study theme. The portfolio comprises the 42 papers submitted to the analysis and synthesis steps of the bibliographical systematic review process on the factors that favour knowledge-based urban development. The 42 papers were analysed because this study will continue in Brisbane (Australia) and because it is believed that the author will have access to more papers.

In figure 5 it is possible to see the End Note software interface with the results of the conducted searches:

Figure 5 - End Note software screen print showing search results.



Source: The author, 2014.

3.1.3.2 Step 2 – Analysis and Synthesis

During analysis and synthesis, according to Ferenhof and Fernandes (2013), the references on the theme are constructed and, then, condensed into reports. This step includes task 7 – Reporting and Synthesis, when the most cited papers on the research topic are identified, and reports on each of the conducted analyses are constructed. Data synthesis also allows generating new knowledge, based on the results obtained from previous researches (MENDES; SILVEIRA; GALVÃO, 2008; BENEFIELD, 2003; POLIT; BECK, 2006).

One of the tools used to extract and organise data from the analysis of papers is the Synthesis Matrix. The matrix contains information on aspects related to the research theme, then helping interpret and construct the text of integrating review for researchers (KLOPPER; LUBBE; RUGBEER, 2007; BOTELHO; CUNHA; MACEDO, 2011).

The first of the synthesis matrix analyses is on general search data, such as the quantity of publications found in each database, quantity of publications available for download and total publications that composed the portfolio of analysed papers, according to what is shown in table 1.

Table 1- General search data.

Databases	Quantity of publications	Repeated Publications	Publications avaiable for download
Scopus	42	0	13
Ebsco	7	7	5 (Scopus repeats)
Total	49	7	13

Source: Research data, 2014.

As shown in table 1, all papers found in the Ebsco database were also found in Scopus, which is the most relevant for this study. Scopus returns more than 375 results as whole texts and secondary research database and more than 550,000 e-books, apart from subscription management of 360 thousand e-journals, e-publication packages and printed journals.

3.1.3.3 Step 3 – Synthesis

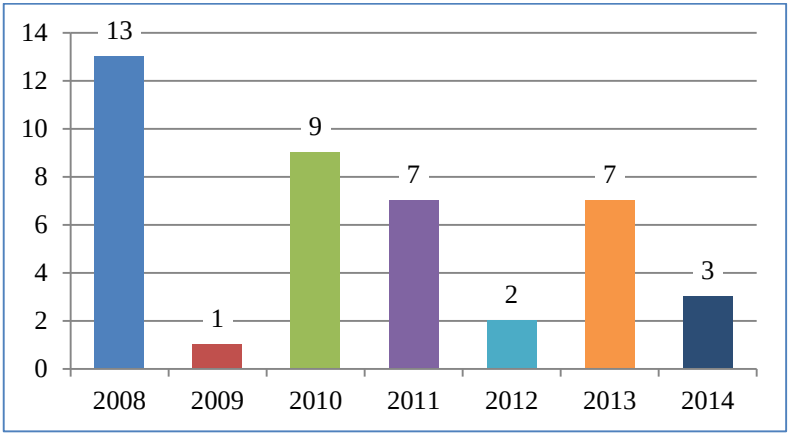
In step 3 – Synthesis the inferences about the theme are constructed and, then, condensed into reports (FERENHOF; FERNANDES, 2013).

3.1.4 Quantity of publications per year

Since KBUD is a new theme in the literature, the first papers on this subject were published in 2008.

Of the 13 papers published in 2008, 7 were written or co-written by Tan Yigitcanlar while the other 6 papers were written by different authors.

Figure 6 - Quantity of publications per year.



Source: Research data, 2014.

From 2008 and 2013, Yigitcanlar has published a total of 20 papers: 7 in 2008; 1 in 2009; 4 in 2010; 3 in 2011; 2 in 2012 and 1 in 2013. The only papers published on this subject in 2009 and 2012 were written by him.

3.1.5 General data on the research portfolio

Based on the 42 papers found on the Scopus database, the following premises on each topic of Table 1 are presented:

- Around the world today 25 different authors are studying KBUD. Of the 42 papers identified in this study, Tan Yigitcanlar is accountable for 16; this shows the relevance of such author to the subject of this thesis proposal. The 3 repeated authors are Yigitcanlar, T; Sarimin, M; and, Perry, B. The two latter authors have one paper each. Two (2) authors have written papers on their own: Tan Yigitcanlar and B. Perry.Tan Yigitcanlar has written 6 of the 16 works by a single author, whereas B. Perry has written 1 paper. The remaining 9 papers were written by different authors, namely: M. Bulu; P. Daffara; Marjaneh Farhangi; P. Heywood; László, Z. K; Lizcano, A. S.; Van Wezemael, J. E.; Zhao, P. and Zolnik, E. J.

Table 2 - General data on the research.

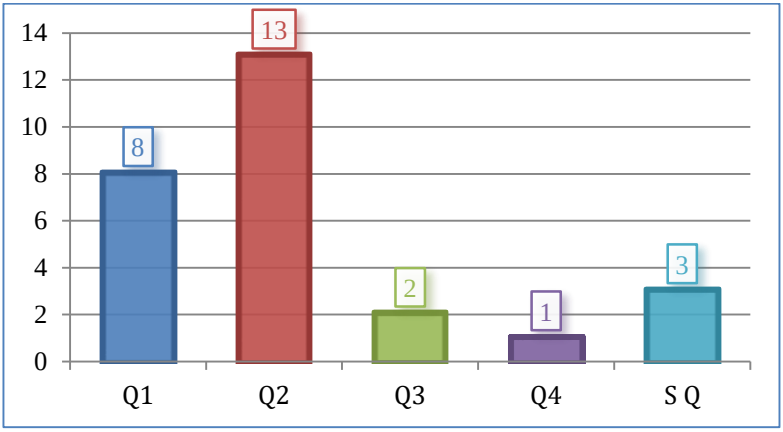
General Data on the Research Portfolio	Quantity of papers
1. Number of authors	25
2. Number of papers by Tan Yigitcanlar	15
3. Number of repeated authors	3
4. Number of papers written by a single author	16
5. Number of authors who wrote more than one paper as a single author	2
Total	42

Source: Research data, 2014.

3.1.6 Quality of publications

The SCImago Journal & Country Rank is a portal that gathers scientific journals and the indicators of developed countries on the information available from the Scopus® database (Elsevier BV). These indicators may be used to assess and analyse scientific domains (SCIMAGO, on line).

Figure 7 - Quality of publications.



Source: Research data, 2014.

The Q1, Q2, Q3 and Q4 quartiles determine the level of importance of the journals according to the Scopus database. This indexation is acknowledged worldwide.

Of the total 42 papers, 27 met the quality requirements to be selected. The number of papers selected from Q1 and Q2 Journals add up to 21 works. Of the 8 papers ranked as Q1, 6 were written by Tan Yigitcanlar. The Q1 journals are: *Expert Systems with Applications* (3); *Journal of Knowledge Management* (2), *European Planning Studies* (1) and *Cities* (2), all of which are published in England.

Among the 13 papers classified as Q2, 3 were written by Tan Yigitcanlar, 2 by M. Sarimin and Tan Yigitcanlar; and the remaining 8 by other different authors.

The Q2 *journals* are *Built Environment*, from England (1); *International Journal of Knowledge-Based Urban Development*, from Switzerland (11) and *Asia Pacific Viewpoint*, from England (1).

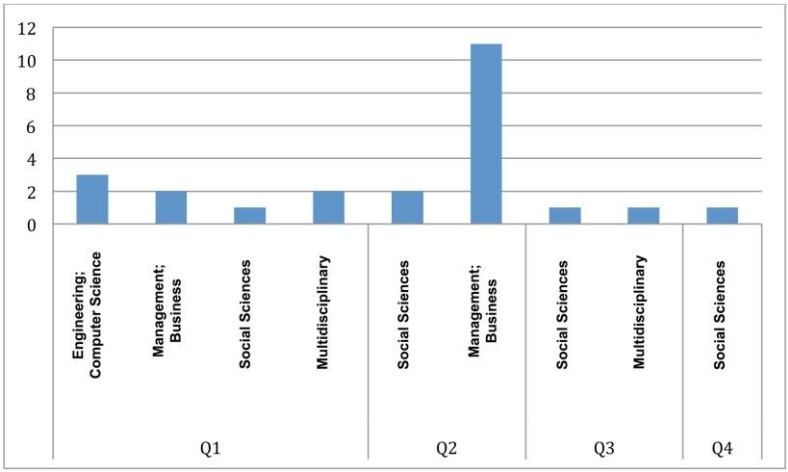
Of the 15 papers whose quality was not found, 13 are from *IGI Global*; 1 from *Edward Elgar Publishing Ltd.*, and 1 from *2013 13th International Conference on Computational Science and its Applications.*

The Q3 papers are from England and Romania while the Q4 papers are from Hungary.

3.1.7 Journal Category

The Journal category was based on the Scimagojr portal that includes the journals and country scientific indicators developed from the information contained in the Scopus® database (Elsevier B.V.) (SCIMAGO, on line).

Figure 8 - Journal Category.



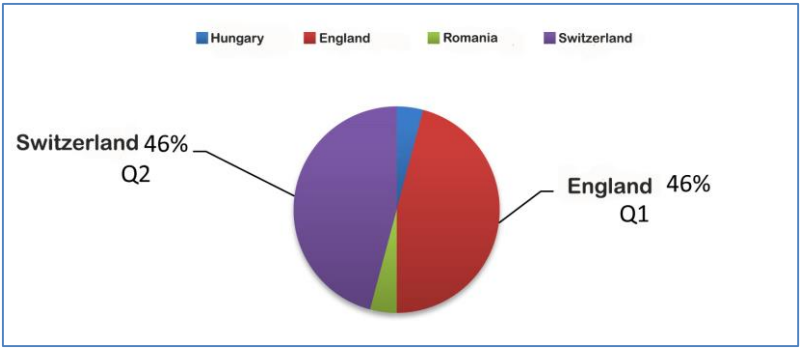
Source: **www.Scimagojr.com**. 2014

The Management and Business Journal stands out in the Q2 category, with 11 papers. Among the Q1 papers, 2 are in the Multidisciplinary category, which are aligned with the Graduate Program of the EGC/UFSC.

3.1.8 Quantity of Journals per country

This analysis is relevant since we realise that only two countries that have Q1 and Q2 journals are publishing works on KBUD. This shows an opportunity for publication in the years to come.

Figure 9 - Quantity of Journals per Country.



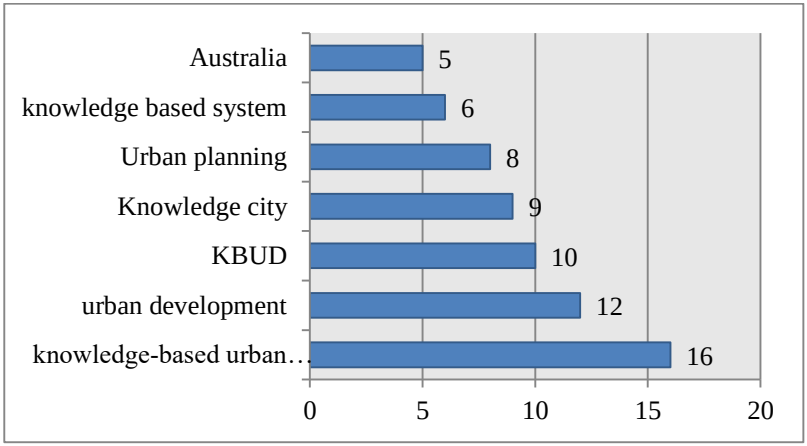
Source: Research data, 2014.

England and Switzerland are the countries that have published the most papers on the subject. The papers published in Q1 Journals are from England, whereas Switzerland publishes the most Q2 journals. It is worth mentioning that the USA, which top the world rank of publications, are not accountable for KBUD publications.

3.1.9 Keywords of the portfolio of papers

In all, 252 key words were found in the 42 papers gathered from the databases used in this study. The term *knowledge-based urban development* was mentioned 16 times whereas KBUD was mentioned 10 times. This analysis shows the influence of researcher Tan Yigitcanlar on the subject.

Figure 10 - Most frequent keywords.



Source: The author, 2014.

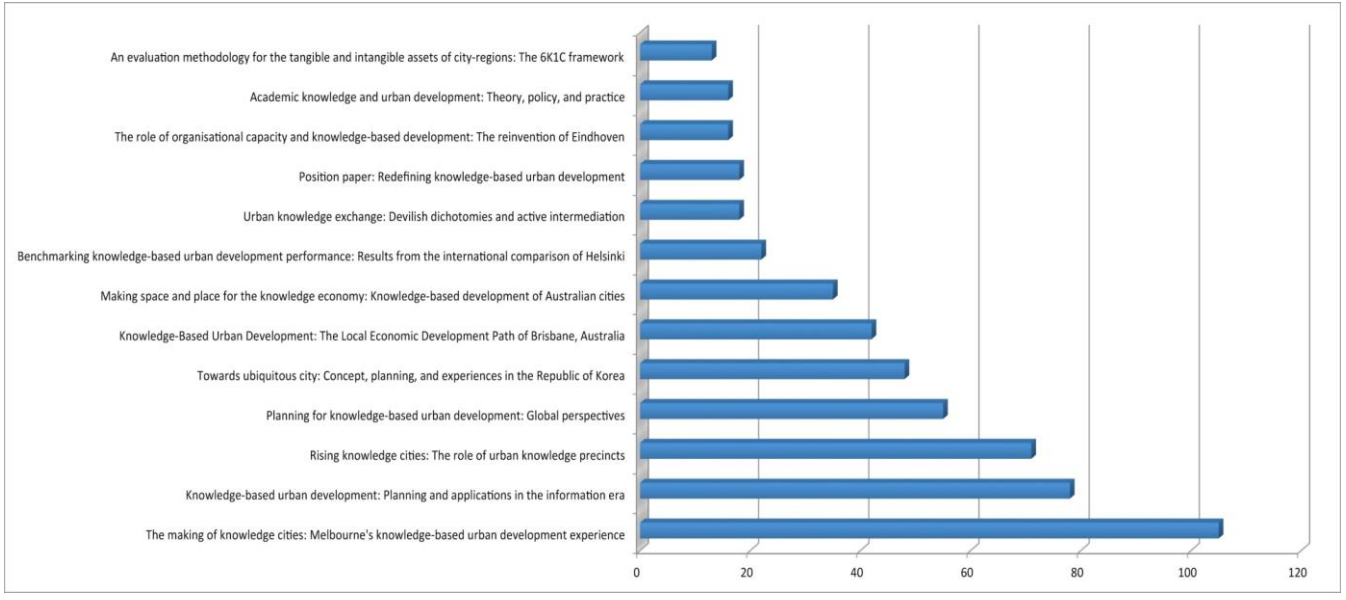
Another outstanding issue is the fact that countries and city names appear as key words, such as Australia (5), Barcelona (3), Brisbane (3), Beijing (2), Melbourne (2) and Victoria/Australia (2).

3.1.10 Number of citations per papers

The four most cited papers are written by Tan Yigitcanlar, three of which are from 2008 and one from 2009. The said papers are listed below:

- Cited 105 times: *The making of knowledge cities: Melbourne's knowledge-based urban development experience*. Authors: Yigitcanlar, Tan; O'Connor, K.; Westerman, C., 2008;
- Cited 78 times: *Knowledge-based urban development: Planning and applications in the information era*. Authors: Yigitcanlar, Tan; Velibeyoglu, K.; Baum, S. 2008
- Cited 71 times: *Rising knowledge cities: The role of urban knowledge precincts*. Authors: Yigitcanlar, Tan; Velibeyoglu, K.; Martinez-Fernandez, C. 2008 e;
- Cited 55 times: Planning for knowledge-based urban development: Global perspectives. Authors: Yigitcanlar, Tan, 2009.

Figure 11 - Number of citations per paper.



Source: The author, 2014.

3.1.11 h Index of journals

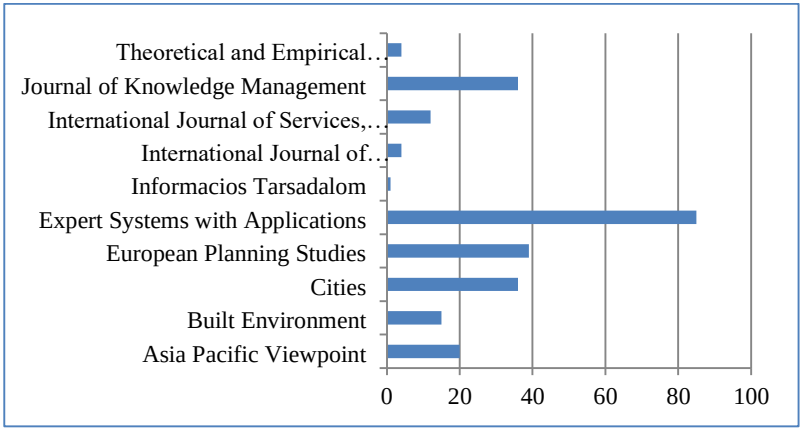
The impact factor and the h index of the journals are set according to the SCImago Journal & Country Rank portal, which comprises researchers of several Spanish universities and allows assessing more than 15 thousand titles from the Scopus database.

To Ruiz, Greco and Braile (2009, p. 275), the impact factor of scientific journals is

> one of the existing bibliometric tools and is primarily set to assess the scientific production of authors, the quality of publications and presumably classify the scientific journals found in the *Journal Citations Reports from the Institute for Scientific Information*.

The h index, on the other hand, is another bibliometric index that aims to quantify the productivity and the impact of scientists based on their most cited papers, estimating the productivity and the impact of one scientist or even a group of scientists (RUIZ; GRECO; BRAILE, 2009).

Figure 12 - h index of the papers.



Source: Research data, 2014.

Figure 12 shows the h index of journals found in this study. This assessment concerns the years 2013, its latest evaluation. Of the 42 papers of the portfolio analysed, 8 journals were in the first quartile (Q1)

and 13 in the second quartile (Q2), 2 in the third quartile (Q3) and only 1 in the fourth quartile (Q4).

Barbetta (2007) explains that quartile is a measure based on data order, which divides the highest impact factor publications into four equal parts – thus, quartile – arranging the 25% highest values in the upper quartile (Q1) and the 25% lowest values in the lowest quartile (Q4). This means that the papers that appear in the presented portfolio were published in highly productive scientific journals that matter to the community. Chart 7 shows the journals included in this study. The following journals were not cited: *A/Z ITU Journal of the Faculty of Architecture, Australasian Journal of Regional Studies* and *Local Economy (Routledge).*

The conducted analyses contribute to establishing relationships and significance between the search terms, thus collaborating to a better understanding of the state-of-the-art of scientific research on the theme knowledge-based urban development.

3.2 RESEARCH METHODOLOGICAL PROCEDURES

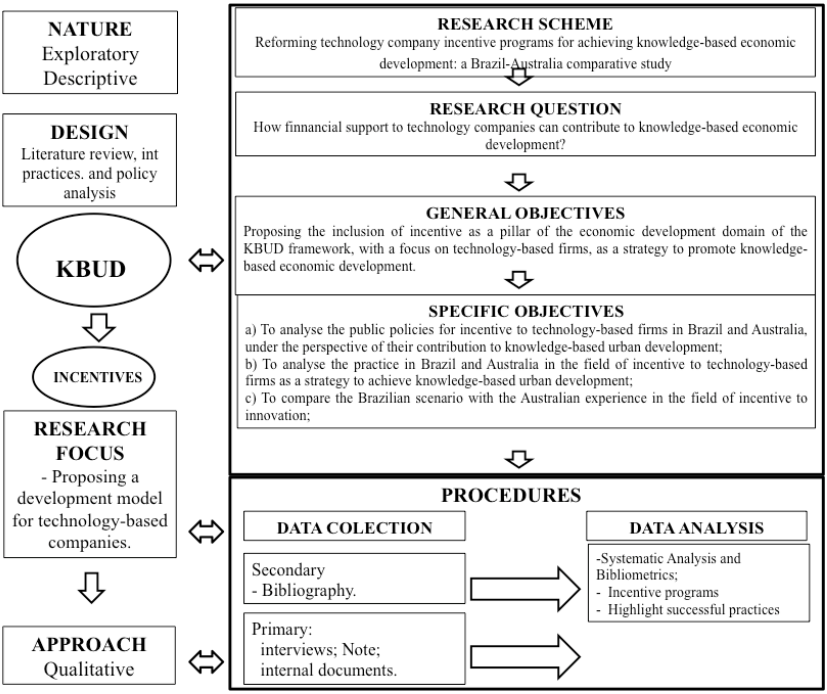
This chapter is dedicated to the methodological procedures to be applied in the study and is subdivided into two sections: (*i*) methodological framework; (*ii*) framework construction procedures, based on specific objectives. This chapter will cover the analysis category and the data-gathering tool.

3.2.1 Methodogical Framework

The methodological framework is meant to explain the choices for conducting this study. Figure 13 shows this study's design in order to present the choices made in this thesis.

As for its objective nature, this is an exploratory-descriptive study. It is exploratory, because it sought to understand KBUD and KBED. This paper seeks to deepen the understanding of incentives to tech firms and how it can contribute as foundation for promoting KBUD and KBED.

Figure 13 - Methodogical framework.



Source: The author, 2014.

The exploratory research process is made possible by the interaction of technology parks decision-makers and the experience of international life in a region within the KBUD and KBED parameters. The literature review, international practices and literature analysis are also exploratory, for they generate the understanding of the importance of incentives to tech firms in the KBUD and KBED context.

This research is descriptive since, in the literature review, it conducts a critical analysis of what has been published on KBUD and KBED, and for proposing a new framework.

As to the nature, this is an exploratory-descriptive study. The research is set to investigate the KBUD and KBED reality, and Australia has internationally renowned cases, apart from being the world centre for KBUD and KBED researches. This study allows for an investigation that preserves the characteristics of organisations at work (YIN, 2005), and the researcher can deepen aspects that influence the performance and articulation of KBUD and KBED.

As for data gathering, this study uses primary and secondary data. Primary data are collected through interviews, observations and document analysis (RICHARDSON, 2008). This study used primary data (interviews) provided by the decision makers in trade associations and government, as well as investors and development banks. It also used documents and legislation on the issue. Secondary data were obtained from selected papers through searching international journals in the database.

When it comes to addressing the problem, this is a qualitative study. It is qualitative because it is set to examine complex and strictly particular situations, where subjectivity is more present and the aim is to understand social and human activity (RICHARDSON, 2008). This qualitative study is set to examine and reflect on the perceptions of decision makers.

3.2.2 Framework Construction Procedures

The theoretical-methodological proposition is set to contribute to the KBUD Framework by adding incentives to the economic domain as one of the pillars for knowledge-based economic development.

After analysing the public policies, survey and interviews, this thesis aims to add to the public policies of both countries with suggestions for improvement.

3.3 THEORETICAL-METHODOLOGICAL RESEARCH

This section is meant to present the theoretical-methodological research by showing the search into the Scopus database. The analysis used the longitudinal term *KBUD.* The proposed themes for the transversal search are aligned with the technology sector, where the author has worked since 2004. This study aims to add to both the academia and the society, by looking for gaps in the literature. The terms used in the transversal search are: *innovation* (12), *economic development* (14), *technology parks* (1), *science parks* (0), *innovations parks* (3), *urban innovation* (11), *technol* innovation* (11), *social development* (10) *urban development* (14), *intellectual capital* (1), *social capital* (5), *incentives* (2) and *competitive* (1). The numbers in parentheses show the number of papers associated with each term.

Frame 2 - The results of transversal searches.

KBUD	Innovation	Economic Developers	Technological Parks	Scientific Parks	Innovation Parks	Urban Innovation	Technol* innovation	Social Development	Urban Development	Intellectual Capital	Social Capital	Incentives	Competitive
Number of articles	12	14	1	0	3	11	11	10	14	1	5	2	1
Duarte, F., Sabaté, J. 22@Barcelona: Creative economy and industrial heritage - a critical perspective -2013		X						X	X				
Cabrita, M.D.R., Cruz-Machado, V., Cabrita, C. Managing creative industries in the context of knowledge-based urban development -2013	X	X				X	X	X	X	X	X		
Farhangi, M. Moving Esfahan toward knowledge-based urban development: The role of knowledge workers' needs -2013	X	X			X	X	X						
Sarimin, M., Yigitcanlar, T. Towards a comprehensive and integrated knowledge-based urban development model: Status quo and directions -2012	X	X				X	X						
Yigitcanlar, T. Position paper: Redefining knowledge-based urban development -2011		X											

(cont.)

KBUD	Innovation	Economic Developers	Technological Parks	Scientific Parks	Innovation Parks	Urban Innovation	Technol* innovation	Social Development	Urban Development	Intellectual Capital	Social Capital	Incentives	Competitive
Number of articles	12	14	1	0	3	11	11	10	14	1	5	2	1
Sarimin, M., Yigitcanlar, T. Knowledge-based urban development of multimedia super Corridor, Malaysia: An overview -2011	X	X			X	X	X						
Shrestha, K.K., Mahjabeen, Z. Civic science, community participation and planning for knowledge-based development: Analysis of Sydney Metropolitan Strategy -2011	X	X				X	X	X	X		X		
Benneworth, P., Hospers, G.-J., Jongbloed, B., Leiyste, L., Zomer, A. The 'science city' as a system coupler in fragmented strategic urban environments? -2011	X	X				X	X	X	X			X	X
Perry, B., May, T. Urban knowledge exchange: Devilish dichotomies and active intermediation -2010	X	X				X	X	X	X			X	
Fernández-Maldonado, A.M., Romein, A. The role of organisational capacity and knowledge-based development: The reinvention of Eindhoven -2010	X	X				X	X	X	X		X		

(cont.)

KBUD	Innovation	Economic Developers	Technological Parks	Scientific Parks	Innovation Parks	Urban Innovation	Technol* innovation	Social Development	Urban Development	Intellectual Capital	Social Capital	Incentives	Competitive
Number of articles	12	14	1	0	3	11	11	10	14	1	5	2	1
Silberberger, J., Van Wezemael, J., Paisiou, S., Strebel, I. Spaces of knowledge creation: Tracing 'knowing in action' in jury-based decision-making processes in Switzerland -2010	X	X				X		X	X				
Yigitcanlar, T. Making space and place for the knowledge economy: Knowledge-based development of Australian cities -2010	X	X	X		X	X	X	X	X		X		
Velibeyoglu, K., Yigitcanlar, T. An evaluation methodology for the tangible and intangible assets of city-regions: The 6K1C framework -2010	X	X				X	X	X	X		X		
Yigitcanlar, T., Velibeyoglu, K., Baum, S. Knowledge-based urban development: Planning and applications in the information era -2008		X						X	X				
Hamilton-Jones, J., Svane, T. The e-temple: Online reflective diaries using a virtual learning environment -2004	X						X						

Sources: The author, 2014.

Therefore, this chapter is structured as follows: (*i*) Evidence on the main gaps found in the literature about this subject and (*ii*) Proposal of an incentive framework to technology firms as a strategy to promote KBUD.

3.3.1 Evidence on the main gaps found in the literature about the subject

In the literature review on KBUD and KBED presented in frame 2 above, some gaps are evident for new studies. The terms *technology parks (1), science parks (0), innovation parks (3), intellectual capital (1), incentives (2)* and *competitive (1)* turned out as shown in parentheses.

The author identified a study opportunity concerning incentives, since the search using the term incentives returned only two papers.

3.3.2 Proposal for an incentive framework to technology firms as a form of support to promote knowledge-based urban development

Based on the KBUD framework proposed by Yigitcanlar (2011), introduced in the theoretical foundations of this study, a gap was identified concerning incentives. Therefore, this thesis researched and analysed in detail the economic development domain of the framework. The new KBED framework proposes including incentive as one of the pillars for generating KBED.

4 TECH-FIRM INCENTIVE SCHEMES

This section will present the system of incentives for innovation in Brazil and Australia. This study focuses on the innovation-related structures of governance of both countries and their existing incentive programmes.

After analysing the federal government structure of both countries, their incentive programmes will be compared. This comparison aims to gather and highlight the positive aspects of each country so this can be taken as good practice.

From this chapter was developed the article: Incentivizing Innovation: A Review of the Brazilian Federal Innovation Support Programs.

4.1 BRAZILIAN INCENTIVE SCHEME

In the last decades, the country has cared more for science and technology. It has structured laws, incentive offices and funding sources in order to become more competitive through incentive and innovation. In addition, small and medium-size firms have been given government subsidies and incentives for research and development (ARAÚJO, 2012).

The expenses on Research, Development and Innovation in Brazil's economy, in relation to the GDP, have grown from 1% in the year 2000 to 1.13% in 2008 and the growth was more effective in 2007 and 2008. Brazil lies behind countries of the OECD, which spend on average 2% of their GDP on R&D&I (KANNEBLEY; PORTO 2012).

This section will demonstrate how Brazil has been structuring and promoting innovation by creating specialised offices and public policies. This section will also present the flowchart of the Brazilian government, including offices that promote innovation in the country.

Brazilians started to realise how important science and technology policies were for the development of the country in the 1990s, when the promotion of technological innovation became explicit and more objective in Brazil's public policies. Nevertheless, the companies, which are the key to the processes and agents of innovation, are not yet integrated into the system of science, technology and innovation (VIOTTI, 2008).

Viotti (2008, p. 2) divided the period of science and technological policies in Brazil into three phases.

> The first, extending from approximately 1950 to 1980, called 'In search of development through growth'. The second, corresponding to the last two decades of the 20th century, called 'In search of development through efficiency'. The last phase, which initiated around the turn of the century and is still under way, is 'development through innovation.'

The Brazilian Incentives schemes intend to demonstrate the evolution of the public policies on incentives for innovation.

Brazil is a developing country and the 7th economy in the world. With an area of 8,515,767 km2 – the fifth largest country on the planet – its GDP for 2014 was estimated at 3,073 trillion dollars. For being a developing country and for facing many education-related challenges, the country is ranked 77 in per-capita income and stands in the 79th place in the HDI world ranking (WIKIPEDIA, 2015).

In order to reach a better position in such rankings, Brazil has sought to improve its public policies on incentives to business innovation. When compared to the OECD member countries, Brazil had a late start in setting an incentive framework; however, the country has been working hard in the last decades to give support to innovative businesses and become more competitive in the international market (IPEA, 2012).

4.1.1 Governance of Innovation in Brazil

This study will describe the evolution of the public policies on incentives for innovation. It will highlight the most recent policies and their impacts – such as (i) *Política Industrial, Tecnológica e de Comércio Exterior* (Industrial, Technological and Foreign Trade Policy – PITCE); (ii) *Política de Desenvolvimento Produtivo* (Production Development Policy – PDP); (iii) *Plano de Ação em Ciência, Tecnologia e Inovação* (Action Plan for Science, Technology and Innovation – PACTI); (iv) *Plano Brasil Maior (Bigger Brazil Plan*); and (v) *Estratégia Nacional de Ciência, Tecnologia e Inovação* (National Strategy for Science, Technology and Innovation – ENCTI) –, their direct and indirect support measures, and their institutions.

The university system in Brazil took off after WWII. The year of 1950 saw the creation of the *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* (Coordination for the Improvement of Higher Education Personnel – CAPES), and in 1951 the *Conselho Nacional de*

Desenvolvimento Científico e Tecnológico (National Council for Scientific and Technological Development – CNPq) was created (ARAÚJO, 2012).

The *Empresa Brasileira de Pesquisa Agropecuária* (Brazilian Corporation of Agricultural Research – Embrapa) started in 1973. At that time, research centres connected to state-run companies were created, such as the *Centro Técnico Aeroespacial* (Technical Aerospace Centre – CTA), subordinated to the *Empresa Brasileira de Aeronáutica* (Brazilian Aeronautics Company – Embraer), the *Centro de Pesquisas e Desenvolvimento Leopoldo Américo Miguez de Mello* (Leopoldo Américo Miguez de Mello Research and Development Centre – Cempes), subordinated to Petrobras, and the *Centro de Pesquisa e Desenvolvimento em Telecomunicações* (Telecommunication Research and Development Centre – CPqD), subject to Telebras. In 1967, the *Financiadora de Estudos e Projetos* (Financier of Studies and Projects – FINEP) was created; it is today an important Brazilian incentive and innovation office (ARAÚJO, 2012, ABDI 2013).

In 1979 Brazil was hit by the second oil crisis and had to face indebtedness and trade balance deficit. During the so-called lost decade, the priorities of the economic policy were to stabilise macro-economy and stop the deterioration of the balance of payments. Thus, due to budgetary cuts, the country did not invest on scientific and technological infrastructure (VIOTTI, 2008).

In 1985 Brazil created the *Ministério da Ciência e Tecnologia* (Ministry of Science and Technology – MCT), which in 2011 was renamed *Ministério da Ciência, Tecnologia e Inovação* (Ministry of Science, Technology and Innovation – MCTI). The creation of this ministry was an important step for Brazil's S&T. Today the MCTI is responsible for important agencies such as the CNPq and FINEP, which aim to drive national competitiveness by means of incentives for innovation. The objective of this policy is to transform the sector into a strategic component of Brazil's social and economic development, by providing the fair distribution of benefits to all society (ARAÚJO, 2012).

In 1990, the science and technology policy was meant to absorb, adapt and propagate imported technology, by direct means, through licences and other agreements, or through technology incorporated into machinery, equipment and systems, with the aim to increase the level of productivity and competitiveness. Industrial policies should be

horizontal, meeting the demands of all sectors, without electing specific priorities (IPEA, 2012).

According to Viotti (2008, p. 8-9), five aspects of science, technology and innovation policies of this period must be stressed:

- Focus on elementary education (at least in the official rhetoric, because higher education and the academy continued to grow in the period and their budgets were not reduced, quite the opposite);
- Change of the intellectual property regime, through the adoption of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS), of the World Trade Organisation (WTO), with satisfactory results concerning the number and relevance of agreements on technology transfer;
- Speedy dissemination of productivity and quality control practices; of which the search for certifications from the International Organisation for Standardisation (ISO) and the *Programa Brasileiro de Qualidade e Produtividade* (Brazilian Quality and Productivity Programme – PBQP) are archetypical;
- Dissemination of technology parks and incubators as a way to create clusters of innovative firms and stimulate the entrepreneurial spirit among students and professors in universities and research centres; and
- Emergence of innovation as a goal of the science and technology policy, even if this came to become more evident in a future moment.

According to studies of the *Instituto de Pesquisa Econômicas Aplicadas* (Institute of Applied Economic Research – IPEA), about the last item – the emergence of innovation as a goal of the science and technology policy – the pro-innovation political discourse brought about improvements in terms of the S&T policy in the 1990s with the creation of Sector Funds. Economic activities such as electricity, telecommunications, oil extraction, and others, would provide a stable

funding source for research and development (R&D) in 14 strategic sectors, apart from two special funds with the aim to promote the interaction between universities and firms, and the improvement of the research infrastructure in universities and research centres (IPEA, 2012).

With these sources and resources, part of the funding for R&D would not be subject to budgetary cuts any longer, and the management and decisions concerning resource allocation should be made by tripartite councils, composed of representatives of the academic area, government and companies.

Funding for S&T through Sector Funds has grown in the last years and represents one of the most important tools for the innovation policy in Brazil.

4.1.2 Innovation Incentives Schemes in Brazil

Next, the programmes of incentive for innovation that form Brazil's innovation system will be described:

4.1.2.1 Política Industrial, Tecnológica e de Comércio Exterior (Industrial, Technological and Foreign Trade Policy – PITCE)

Política Industrial, Tecnológica e de Comércio Exterior (Industrial, Technological and Foreign Trade Policy – PITCE), launched in 2004. It kicked off the third period in the history of incentives and innovation in Brazil. PITCE was an attempt of industry-oriented policy based on innovation and, in this sense, was different from the traditional industrial policies of the 1960s and 1970s – which focused on the expansion of physical capacity – and diverged from the focus on competitiveness of the 1990s – which, in turn, was not bound to any clear industrial policy (ARRUDA; VERMULM; HOLLANDA, 2006).

PITCE had five main objectives: to strengthen innovation in the firms (and explicitly acknowledge the firms as a locus of technological innovation); *ii*) to increase the exports of high technology and strengthen the competition in international markets; *iii*) to promote industrial updating and modernisation; *iv*) to increase the companies' production scale; and *v*) to develop some specific fields of research – pharmaceuticals, semiconductors, software, capital goods (considered strategic options) and nanotechnology, biotechnology and biomass/renewable resources (considered areas to anticipate the future). Brazil's government has also created a new governmental agency, the

Agência Brasileira de Desenvolvimento Industrial (Brazilian Agency for Industrial Development – ABDI) to be the coordinating and executive office of PITCE (ARAÚJO, 2012).

Concerning technological innovation, PITCE has brought about two important improvements:

- ***Lei de Inovação*** (Innovation Law), 2004. It aims to increase the economic efficiency and the development and diffusion of technologies, so that the level of activity and the competition in the international market have greater inducing potential. This Law aims to stimulate the cooperation between universities and businesses, as well as generate technological innovations capable of increasing national competitiveness. To fulfil its goals, this Law is based on three principles: *i*) constituting a favourable environment to strategic partnerships between universities, technological institutes and businesses; *ii*) stimulating the participation of science and technology institutions in the process of innovation; and *iii*) promoting innovation in the company (ARRUDA; VERMULM; HOLLANDA, 2006; ARAÚJO, 2012). One important point is that this Law – for the first time in Brazil – provided for the direct grant to R&D companies in a non-refundable way, and also enabled government purchases to be oriented by technological criteria.
- ***Lei do Bem*** **(the Good Law)**, 2005. After this Law was introduced into Brazil's public policies, the country has been acknowledged as one of the most generous in terms of tax incentives for innovation (IPEA, 2012, 2015). This Law allows companies to deduct twice as much the worth of expenses on R&D off a Company's Income Tax Return and the *Contribuição Social Sobre o Lucro Líquido* (Social Contribution on Net Profit – CSLL); it provides a 50% discount on the IPI (Manufactured Products Tax) on purchasing R&D machinery and equipment; full depreciation and accelerated depreciation of equipment and intangible goods for R&D; full reduction of the income tax rate for shipments abroad for the registration and maintenance of trademarks and patents; 20% credit (in 2008) and 10% credit (from 2009 to 2013) of the withheld income tax for shipments under contracts of technology transfer, when they're registered at INPI (National Institute of Industrial Property) (MCTI, on line).

The private sector is more and more using these incentives: in 2008, the MCTI estimates that innovation-related tax breaks were over R$ 1,5 billion or 18.1% of the cost of innovation projects that used the incentives of *Lei do Bem* (MCTI, on line).

The direct support to innovative companies has also developed due to the growing revenues of Sector Funds (MCTI, on line).

As a result of *Lei do Bem*, both the direct support to innovation in the form of credit and grants and indirect support in the form of tax incentives have grown through budgets for innovation, which makes Brazil also one of the most generous countries when it comes to the general support to innovation in relation to GDP (ANPEI, 2015).

The ratio between direct and indirect support is 40%-60%, but indirect support is expected to grow even more since tax incentives will be more and more used by businesses (ARAÚJO, 2012).

Concerning the incentives set by the Innovation Law and the Good Law, 1.1% of innovative industries have taken advantage of these benefits; among the companies with more than 500 workers 16.2% have. Then, it can be concluded that the challenge lies in taking the innovation policies to smaller businesses (MCTI, on line).

Incentives may be divided into tax incentives and grants. Tax incentives are broadly used by developed countries to increase expenses on R&D&I, as is the case of Canada (1944), USA (1954) and Australia (1986) (KANNEBLEY; PORTO, 2012).

4.1.2.2 Política de Desenvolvimento Produtivo (Production Development Policy – PDP)

Política de Desenvolvimento Produtivo (Production Development Policy – PDP), substituted Pitce in 2008 and amplified the extent of its predecessor, by including more sectors among the priorities for policies and support; however, its core was not changed. Innovation was defined as one of the elementary pillars for economic growth. The objectives of innovation were: *i*) to increase R&D to 0.65% of the GDP; and *ii*) to double the number of patent filing by Brazilian firms in Brazil and triple filings abroad, also in 2010. Due mainly to the global economic crisis that started the same year the plan was launched, the goals of the PDP were not reached (ARAÚJO, 2012).

An important progress of the Pitce/PDP was to demand that Brazilian states have their State Laws of Innovation, as a way to promote the partnerships between FINEP and the *Fundações de Amparo*

à Pesquisa (Research Support Foundations) of each state under the *Programa de Apoio à Pesquisa em Empresas* (Company Research Support Programme – Pappe), which is a grant programme (ARAÚJO, 2012).

Demanding that Brazilian states formulate local policies of S&T was an important factor for decentralising the technological development in the country.

4.1.2.3 Plano de Ação em Ciência, Tecnologia e Inovação (Action Plan for Science, Technology and Innovation – PACTI)

Plano de Ação em Ciência, Tecnologia e Inovação (Action Plan for Science, Technology and Innovation – PACTI), started in 2007. The action plan provided for public investments on Science, Technology and Innovation (ST&I) equivalent to US$ 11 billion between 2007 and 2010. About innovation in the companies, its three basic goals were: *i*) structuring the *Sistema Brasileiro de Tecnologia* (Brazilian Technology System – SIBRATEC), a great "network of all networks" of research institutions to support technological development, with approved investments worth R$ 470 million; *ii)* increasing the percentage of researchers working in companies to 33.5% in 2010 (actual number was 26.3% in 2005); and *iii*) increasing the ratio of innovative firms that benefit from government support to 24% (actual number was 18.8% in 2005) (ARAÚJO, 2012; ABDI, 2013).

In fact, the ratio of innovative firms supported by the government raised from 18.8% in 2005 to 22.3% in 2008. Funding for purchasing machinery and equipment (14.2%) is the number 1 form of government support to innovative firms. The least sought for were the tools of grants (0.5%) and cooperative projects of R&D in partnership with universities or research institutes (0.8%) %) (IPEA, 2012; ABDI 2013).

The absolute number of researchers working in firms dropped by 10% between 2005 and 2008. In 2008, 45 thousand researchers were employed in companies in Brazil; whereas in Germany and South Korea this number reaches 180 thousand, 492 thousand in Japan and over 1 million in the USA (ARAÚJO, 2012).

Another survey conducted in 2011 by the The Atlantic Century II: Benchmarking USA and EU Innovation and Competitiveness shows that in Brazil there are 1.5 researchers in companies for every one thousand employed people, whereas the average in OECD member countries and BRICS countries is 6.3. Finland ranks 1st and Australia

ranks 12th: 16 and 9 researchers for every thousand workers, respectively. Among the listed countries, Brazil is ahead of South Africa, Malaysia, Mexico and India. About the small numbers in Brazil, one of the causes may be the university reformation carried out by the Government between 2003 and 2012 with the *Plano de Reestruturação e Expansão das Universidades Federais* (Plan for Restructuring and Expanding Federal Universities – Reuni), which opened many places in public universities and made the academic career more attractive to young researchers (IPEA, 2012, ABDI 2013).

4.1.2.4 Plano Brasil Maior (Bigger Brazil Plan)

Plano Brasil Maior (Bigger Brazil Plan), started in 2011 with a set of initiatives to support and protect the productive sector, especially the industry. Its reach was broader than its predecessors. *Plano Brasil Maior* is subject to the Ministry of Development, Industry and Foreign Trade (MDIC) and presents two sets of actions. The first may be considered a development of former plans and listed ten goals for 2014. These goals concern added investment, investments on R&D, industrial added value in Brazil, skilling up the workforce in the industry, and efficient use of energy. The second set of actions combineed tools of support to competitiveness, such as increasing funding of the *Banco Nacional de Desenvolvimento Econômico e Social* (National Bank for Economic and Social Development – BNDES), reducing federal indirect taxes, such as the Imposto sobre Produtos Industrializados (Manufactured Products Tax – IPI), and tax substitution for specific segments, as a defence measure. This part of the Plan is more similar to an initiative of support for the competitiveness of Brazil's productive sector than a structured plan, with goals, priorities and tools defined from the moment it was launched (IPEA, 2012, ABDI 2013).

The *Plano Brasil Maior* is a challenging one, since for it intends to: i) support inclusive economic growth in an adverse economic context; ii) exit the international crisis in a better position than it was when it started, which would result in a structural change of the status of the country in the world economy (MCTI, on line).

For these challenges to be reached, the Plan focuses on innovation and the intensification of production in Brazil's industrial park, in order to achieve gain based on productivity (MCTI, on line).

The Plan adopts important measures of relieving taxes on investments and exports to start facing the appreciation of the exchange

rate. Other measures aim to offer more credit and improve the regulatory framework of innovation, to strengthen the commercial defence and expand tax incentives, as well as simplify funding to add national value and competitiveness to productive chains.

***TI Maior* (More IT)** is the plan conducted by the MCTI. It lies within the *Plano Brasil Maior*, conducted by the MDIC. The plan focuses on the technology sector and devises the *Certificação em Tecnologia Nacional em Software e Serviços* (Software and Services National Technology Certification – CERTICS). It also creates the national programme of start-up acceleration, named Startup Brasil. This programme subsidised accelerators all over the country, in order to promote innovation and entrepreneurship, making Brazil a global player in the ICT sector – with products and services of high added value – and also placing the country as an innovation hub in Latin America (MCTI, on line).

Another big concern of the programme is the formation of qualified professionals to meet the technological demand. For this reason, a programme called *Brasil Mais TI* (Brasil Plus IT) was created within *TI Maior*, aiming to reduce the lack of labour in the sector.

In order to leverage the competitiveness of national companies, the *Programa TI Maior* created international hubs as to offer a global workforce, promote the relationship with new markets, and give access to local and international intelligence. The hub helped integrate initiatives and created spaces in international target markets, as described below (MCTI, 2013):

- Asia (China, Japan, India, Korea, Singapore and Indonesia), concerning business knowledge, innovation (market and partners), service centres and start-ups.
- USA and Canada with a focus on the market and new partners for innovation, niches such as the web, mobile, B2C and finances; takeovers and internationalisation of companies and start-ups.
- Latin America (Mexico, Colombia, Argentina, Chile, Peru and other niches), for the distribution of software and platforms, takeovers and internationalisation, and service partnerships.
- Europe (Eastern Europe, Spain, Portugal, Germany, England), on partnerships, service centres and innovation (market and partners).
- Africa, new business knowledge, internationalisation and innovation (Market and partners).

Finally, the *Programa TI Maior*, with the aim to attract global research centres, and to bring international development firms to Brazil. Its intention is to include the country in the global chains of R&D and its goal is to connect advanced research to generate products that can compete not only in Brazil, but also in the international market (MCTI, 2013).

Brazil will mobilise its productive force to innovate, compete and grow. The big mighty market, the government purchasing power created by inclusive policies, the extensive energy resources to be explored, the young workforce and business creativity are institutional advantages; these are formidable natural and social resources to develop a "Bigger Brazil" (MCTI, 2011).

4.1.2.5 Estratégia Nacional de Ciência, Tecnologia e Inovação (National Strategy of Science, Technology and Innovation – ENCTI), 2012 to 2015

The federal government associated the production development plan – *Plano Brasil Maior* – with the scientific and technological development plan – the Encti 2012-2015. According to the MCTI, responsible for the Encti, the main guidelines for the strategy are: *i*) to give support to innovations in the production sector as a way to reduce the technological gap in comparison with developed countries; *ii*) to train and qualify human resources for innovation; *iii*) to give support to the sectors that concentrate more knowledge; *iv*) to promote clean production; and *v*) to use the State's purchasing power to promote innovation (ARAÚJO, 2012).

Encti also listed the priority programmes, in the area of Information and Communications Technologies (ICTs); Pharmaceuticals and Healthcare Industrial Complex; Oil and Gas; Defence Industrial Complex; Aero-spatial; Nuclear; Frontiers to innovation (Biotechnology and Nanotechnology and new materials); Green Economy Incentive (Energy, Biodiversity, Weather changes and Oceans and coastal zones) and ST&I for Social Development (programmes to popularise ST&I and improve scientific teaching, productive inclusion and social technology, assistive technologies, those directed to the social inclusion of disabled people, and technologies for Sustainable Cities). For the execution, Encti will count on R$ 74.6 billion, to be shared by MCTI (R$ 29.2 billion), other ministries – including the *Ministério da Educação e Cultura* (Ministry of Education

and Culture – MEC), *Ministério do Desenvolvimento, Indústria e Comércio Exterior* (Ministry of Development, Industry and Foreign Trade – MDIC) and the *Ministério da Defesa* (Ministry of Defence – MD), with R$ 21.6 billion, federal public companies (BNDES, Petrobras and Eletrobras, with R$ 13.6 billion), and State Research Support Foundations (R$ 10.2 billion) (ARAÚJO, 2012).

The policies presented so far are strategic for the country and help find a way for the sources of incentive and development banks. Brazil also has incentive lines to structure technology parks and incubators, through the *Programa Nacional de Apoio às Incubadoras de Empresas e aos Parques Tecnológicos* (National Programme of Support to Company Incubators and Technology Parks – PNI) (ANPROTEC, 2014).

The MCTI works together with the *Associação Nacional de Entidades Promotoras de Empreendimentos Inovadores* (National Association of Entities Promoting Innovative Entreprises – ANPROTEC) which represents technology parks and incubators, as well as with the *Sistema Brasileiro de Apoio às Micros e Pequenas Empresas* (Brazil's Micro and Small Businesses Support Service – SEBRAE), which has been very active to provide incentive and qualification to Brazilian incubators, so that they follow a more mature management model and can provide better support to their incubated firms.

The FINEP has been providing great help to Technology Parks, by means of calls, so as to boost their competitiveness through their structures, training their workers and enabling them to get to know good international practices (ARAÚJO, 2012).

4.1.3 Governance structure of the innovation policy in Brazil

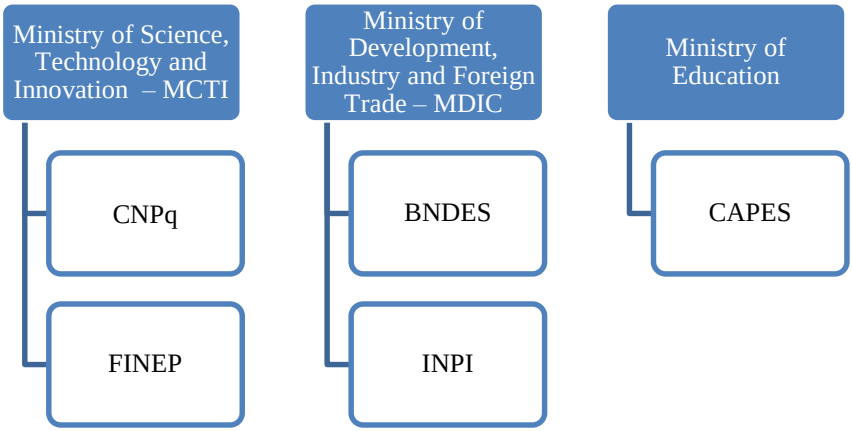
Designing and implementing innovation is carried through three ministries.

- MCTI has its innovation agency (FINEP) and a research incentive agency (CNPq). FINEP and CNPq operate in close cooperation; the first by funding firms and research institutions; the second by providing scholarships to students and researchers. As far as innovation budgeting is concerned; this is the most important ministry (ARAÚJO, 2012).
- MDIC and its agencies - BNDES and ABDI. The MDIC also comprises the *Instituto Nacional de Metrologia, Qualidade e*

Tecnologia (National Institute of Metrology, Standardisation and Industrial Quality – Inmetro) and the *Instituto Nacional de Propriedade Industrial* (National Institute of Industrial Property – Inpi). This thesis will cover the role of BNDES and INPI in more detail (ARAÚJO, 2012).

- *Ministério da Educação* (Ministry of Education – MEC) and CAPES, whose objective is to provide support and funding, and evaluate higher education in Brazil.

Figure 14 - Governance of Innovation in Brazil.



Source: The author, 2015.

Innovation policies and their implementation are distributed among different governmental offices. Some coordinating and decision-making offices are responsible for resource allocation.

The governance structure of innovation policies is still incipient but developing; however, Brazil still lacks well-set terms, responsibilities, goals and field of activity, especially in relation to the MDIC and the MCTI and their associated offices (BOTELHO, 2010).

The design and formulation of innovation policies in Brazil generally lack previous studies to provide a background for the government's intervention. Many supporting programmes are launched with no previous study about the demand and needs of the productive or academic sector. This way, some goals of the industrial policy resemble more a wish list than a set of structured goals strictly related to the

necessary measures to achieve them. Sometimes public policies prevail (ARAÚJO, 2012). The integration between the government and trade associations – which represent companies – and universities is more and more important in this process so that public policies and incentive programmes are successful in reaching their goals.

Brazil's innovation policy is the supply-sided kind of policy; the gap between supply of and demand for innovation policies may be growing. The budgets for innovation-oriented public policies are also growing; however, the innovative effort of the private sector has not followed through (ARAÚJO, 2012; MRE, 2013).

The lack of previous studies added to the increase in innovation budgets result in a programmatic activism on the side of the policy makers: innovation support programmes are systematically launched, with no regards to the real need, demand, objectives and interactions with the existing programmes (ARAÚJO, 2012).

Botelho (2010)[11] *apud* Araújo (2012) defends the idea that in Brazil there are "many policy measures erratically seeking for few innovators", with much juxtaposition and with much room for departmental competition.

It is evident that there is a competition among the various actors in the government, so they can show how effective they are to their Ministries. It is important to mention that incentive does not cater to the needs of companies; businesses are commonly left unattended by incentive calls. Brazil is full of innovative firms; however, not all of them are ready to claim these resources because of excessive bureaucracy. When the firm knows the way and learns how the system works, it eventually uses these incentives more than once. All these difficulties have made way for the rising of professionals specialised in contributing with firms by writing down projects. Nevertheless, these professionals are well- paid which makes the benefit less attractive.

Brazil has a few forms of supporting innovation, such as: S&T infrastructure, tax incentives and direct support (IPEA, 2012; MRE, 2013). Although innovation incentive lines are broadly disseminated, many firms still do not know they exist and do not care to know about them. Further on the result of a survey conducted by ABES in 2013 will be demonstrated. This survey meant to better understand the perception of Brazilian firms of the incentive lines offered by the federal government.

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[11] BOTELHO, A. *Inno-policy trendchart*: innovation policy progress report – Brazil 2009. União Europeia, 2010.

The support to company innovation may be given directly, through loans under more favourable conditions, or grants; or through indirect support, in the form of tax incentives, as previously demonstrated. Direct support to firms is driven to priority sectors elected by the government.

Still, these instruments may be combined, as in the case of projects funded through special conditions but that demand the participation of universities as a counterpart. Through this combination, the attempts to integrate universities and businesses. Apart from enjoying the benefit of becoming more competitive by means of innovation, firms obtain tax reduction to hire PhDs.

> University-business relations, which demonstrates an awareness of the need for regional research performers to improve knowledge commercialisation and to create knowledge that is applicable to the needs of the economy (HUGGINS; STRAKOVA 2012, p. 968).

About S&T infrastructure, the government has given support to it by means of technological parks and incubators, adjusting the spaces so they can be shared; another goal is to improve the use of equipment.

Financial measures to support innovation are possible through tax incentives – which reduce the cost of R&D through proportional discounts on tax, tax credits, accelerated depreciation and other measures – or through direct subsidies – destined to reduce the difference between the social and public marginal return of innovation projects (BID, 2012).

Incentives for innovative firms have become a global tendency, since they have some advantages that make them attractive to the policy makers: *i*) they are flexible, since the decision about the innovation development and how much will be spent is up to the businesses; *ii*) they do not discriminate sectors; and *iii*) they are readily available to businesses, apart from having low administrate cost to the government (ARAÚJO, 2012).

Tax benefits are still frowned upon in Brazil since when it comes to innovative firms small businesses are left out, because the Law adopts the criterion that the benefit should reach firms that use actual profit, which is typical of medium-sized companies. Another issue is that tax incentives tend to stimulate the execution of more profitable, less risky

and short-term innovation projects. Thus, projects of high social relevance to be carried out for a longer term, subject to more uncertainty and likely to have more intense spillover effects are left out (ARAÚJO, 2012).

Even with all the criticism presented above, Brazil may be considered one of the most generous countries in terms of tax incentives to innovation (ARAÚJO, 2012).

Grants promoted by FINEP sponsor innovation in firms in priority areas determined by the federal government. Businesses are granted financial resources by responding to the publication of a public call. These funds must be managed according to Law 8.666, which is strict and provides for the way funds may be spent (FINEP, on line).

In addition, CNPq organises incentive calls, most of them with the aim to place researchers in companies. CNPq's main incentive line to innovative businesses is the RHAE *Pesquisador na Empresa* (Researcher in the Company). The grant in this case comes in the form of scholarships, and funds are provided straight to the grantee. The company will manage the resource credit, will select researchers and will issue a final report on the activities carried out by the fellow during the project.

Resources originating from scholarships are important to leverage innovative firms whose major cost concerns labour. However, values pre-set by CNPq concerning the fellow's professional and academic training are below market values, which makes it very difficult for a businessman to hire. Businessmen will try to negotiate with researchers and guarantee that the scholarships are implemented.

In some cases incentive calls are made jointly by FINEP and CNPq, both of which are offices under the MCTI umbrella.

FINEP has set some subsidized loans, such as *Finep 30 dias* (Finep 30 days) in 2013, which may be considered the new model policy framework for the financial support to innovation projects in Brazil. The new methodology aims mainly to cut the red tape off access to credit: projects submitted by companies are to be analysed within 30 days.

Finep Inovacred: whose goal is to offer funding to businesses with a yearly (or annualised) gross operating revenue of up to R$ 90 million, to be used in the development of new products, processes and services, or to improve the existing ones. It can also be used in marketing innovation or organisational innovation with the aim to improve competitiveness on a regional or national level. This support is being granted in a decentralised way, through financing agents who

operate in their own states or regions, assuming the risks of the operations (FINEP, on line).

By the end of 2014, Finep launched one more financing line called Finep Inovacred Express for micro and small companies, as well as start-ups. This line aims to support innovation in firms with a yearly gross operating revenue of up to R$ 16 million, through a R$ 150 thousand loan, maximum. In this case no counterpart is due and the loan may be paid off within 4 years, including a waiting period. The 16 registered agents to operate the Inovacred, which grant funding from R$ 150 thousand to R$ 10 million, are those responsible for the operation of the new line. Unlike other decentralised programmes by Finep (Inovacred and Tecnova), there is no need to present a detailed project to claim a loan (FINEP, on line).

Finep Inova is an incentive source jointly developed with BNDES Inova. This programme focuses on innovative businesses and comprehends priority sectors for the federal government. This programme focuses on priority areas of aero-defence, agribusiness, energy, oil, health, sustainability and telecommunications.

By joining forces, several areas of the government work together in sectors that are especially interesting for them. For example, Inova Energia operates together with BNDES and the *Agência Nacional de Energia Elétrica* (Brazilian Electricity Regulatory Agency – Aneel). Different offices participate in other lines, such as Inova Health, Inova Oil, Inova Agribusiness, among others.

Nevertheless, the company must fill up a form and prove that they lie within some of the categories proposed by the line. This line is extremely relevant to the start-up movement in Brazil, since this kind of business cannot get loans very easily.

Historically, Finep has worked some incentive lines that have contributed to Brazil's economic development, such as the *Programa Juro Zero* (Zero Interest Programme), which offers credit for innovation at zero interest rates, demands no actual guarantees and sets the payback to 100 instalments. This programme is dedicated to micro and small business (MPEs) operating in strategic sectors of the PDP. Apart from *Juro Zero*, there is Prime – *Programa Primeira Empresa Inovadora* (First Innovative Business Programme): this programme supports innovative firms up to two years old through direct subsidies for 12 months. These are ongoing programmes, since firms had a payback deadline to meet, but they are not open for new applications. They were substituted through the incentive lines that were previously presented.

Another important Brazilian incentive agent is the *Banco Nacional de Desenvolvimento Econômico e Social* (National Bank for Economic and Social Development – BNDES), a federal public company, created in 1952. The Bank is the main long-term financing source for investors in any area of economy, with a policy that includes social, regional and environmental geographic areas.

In their 2009/2014 Corporate Plan, BNDES elected innovation, local and regional development and socio-environmental development as the most important aspects of economic incentives in the current context, which must be promoted and emphasised in all enterprises funded by the Bank.

The Bank has been investing on the Prosoft line, with a focus on medium-sized software companies, which do not borrow any less than 1 million reais. Another important line is the BNDES Inova, – an important cooperation between Finep and BNDES and other governmental institutions – which aims to support the increase of competitiveness through investments in innovation that are part of the firm's business strategy, such as continuous or structured actions towards the innovation of products, processes and/or marketing, and the improvement of skills and technical knowledge in the country. This line focuses on priority areas of aero-spacial defence, agribusiness, energy, oil, health, sustainability and telecommunications.

In 2014, BNDES launched a new incentive line called *MPME Inovadora* jointly with ABES. The objective of this line is to raise competitiveness of micro, small and medium-sized firms (MPMEs, in Portuguese), by funding investments needed to introduce innovations to the market, in combination with other actors in the *Sistema Nacional de Inovação* (Innovation National System), promoting continuous actions to improve their products and/or processes, as well as enhancing skills, structure and technical knowledge.

Apart from easy credit, the programme also offers more attractive interest to businessmen, at the rate of 6.5% a year to be paid back in up to 120 months with a 48-month waiting period. This line was launched jointly with regional banks and regional trade associations that represented businesses in the technology sector. Funding starts at 300 thousand reais and is not accessible to start-ups. Thus, Finep Inovacred Express can complement some aspects of BNDES's MPME Inovadora.

This line started as a pilot in the south of the country worth 300 million reais, and also in São Paulo, worth more 300 million. In 2015 the programme will be expanded to the Northeast and Southeast regions

of the country. These regions were chosen for having a higher concentration of software companies and structured poles.

Another way of subsidising credit to innovative firms is through the BNDES card. Each card has a limit of R$ 1 million (firms may have up to four cards), and may be used to pay for capital goods, equipment, software, certification, conformity assessment, intellectual property, R&D and other innovation-related expenses. In addition, the card limit may be used as guarantee in FINEP's programmes. The cards are available to companies with annual earnings up to R$90 million.

Since it is a development bank, BNDES does not work with non-refundable funds, just like Finep and CNPq. However, the Bank sponsors Brazil's innovation through subsidised taxes, a longer payback time and reduced demands of actual guarantee from businessmen.

With regard to investment funds, BNDES operates on the market through venture capital funding participation, as by providing venture capital for investments. The Bank also has a seed capital programme, called CRIATEC.

Finep also has its own fund jointly with other investment funds and has been supporting and training businesses through regional partners to participate in venture capital rounds. This movement has been strengthening in the country, even though it is a recent initiative.

In 2000 the *Associação Brasileira de Private Equity e Venture Capital* (Brazilian Association of Private Equity and Venture Capital – ABVCap) was created. It is a non-profit organisation that aims to promote the development of long-term investment in the country in modalities within the concepts of private equity, venture and seed capital.

Even with the broad range of programmes exposed aiming to sponsor innovation, Brazilian companies still find it difficult to have access to public funding.

In order to protect innovations developed in the country, Brazil counts on INPI, created in 1970, under the MDIC umbrella.

INPI is responsible for the improvement, dissemination and management of Brazil's concession and protection of intellectual property rights for the industry. It registers trademarks, industrial design, geographical indication, computer software and circuit topography. It also registers patents and legalises franchise contracts and the several modalities of technology transfer.

It is an important office for Brazil's economic development; it serves micro, small, medium-sized and large companies and also individual entrepreneurs.

INPI has been working to provide quality service in a quicker and simplified way; historically the process has been slow enough to discourage innovative businessmen to register their innovations. Many Brazilian businessmen refer to countries where innovation protection works quicker and less bureaucratically, such as the USA.

However, Brazil has been striving to support innovative firms. In the beginning of 2015, Brazil's Congress passed the Provisional Measure 663/14, which raised by R$50 billion the limit of resources to be transferred from the federal government to the BNDES and to Finep. With this new cap, benefits granted through low interest rates to state-owned companies total R$ 452 billion from November 2009 to December 2015.

Another positive expectation concerns the transfer of the *Fundo para o Desenvolvimento Tecnológico das Telecomunicações* (Fund for the Technological Development of Telecommunications – Funttel), which made available R$176 million to Finep, an amount that will be loaned to Brazilian small and medium-sized businesses to invest in the research and development of new technologies.

Other sectors of the economy will also be covered by the existing opportunities, such as the IT companies and firms that provide solutions in the area of urban mobility, infrastructure and logistics, healthcare – if in the area of computerisation of medicines and well-being –, as well as agriculture and cyber safety. Energy – both renewable energy and pre-salt oil technology – is still important and allows the technological progress of the country as a whole.

However, the president of Finep, claims that to merely start raising the investment rate, the volume of resources applied by Brazil in innovation has to double in the next four years. He also states that public expenditure in this new area – without considering the participation of the private business sector – would have to exceed the R$ 25 billion invested between 2011 and 2014 to reach about R$ 50 billion still in this four-year period. This scenario could help the investment rate in the Country to leave the current uncomfortable position of about 17% of the Gross Domestic Product (GDP) (FINEP, on line).

4.1.4 Summary of Brazilian Incentives Schemes

Incentive offices created to support Brazilian innovation are relatively recent: CNPq was created in 1951, BNDES in 1952, Finep in 1967. MDIC dates back to 1960 and finally MCTI was created in 1985 (ARAÚJO, 2012).

Brazil already had important incentive programmes for the development of the country when in 2004 it started to offer governmental incentive for the innovation of private companies (ARAÚJO, 2012).

The programmes created to make Brazil more competitive, as far as technological innovation is concerned, are considerably recent, as can be seen in the frame below:

Frame 3 - Brazilian Policies.

Year	Programme	Aims
2004 – 2008	**PITCE -** Industrial, Technological and Foreign Trade Policy	▪ Lei de Inovação (Innovation Law), 2004. ▪ Lei do Bem (Good Law), 2005.
2008 – 2010	**PDP -** Production Development Policy	▪ Decentralised federal programmes into the states through the Pappe programme. ▪ It followed up to PITCE with a different name.
2007 – 2010	**PACTI –** Action Plan for Science, Technology and Innovation	▪ Creation of SIBRATEC; ▪ Increase in percentage of researches working in companies; ▪ Increase in the ratio of innovative firms that benefit from government support

Year	Programme	Aims
2011 – 2014	**Plano Brasil Maior** (Bigger Brazil Plan) ***TI Maior*** **(More IT)**	▪ Software and Services National Technology Certification – CERTICS; ▪ Creates the national programme of start-up acceleration, named Startup Brasil; ▪ *Brasil mais TI* (Brasil Plus IT), programme for the formation of qualified professionals; ▪ Created international hubs; ▪ Attracts global research centres.
2012 – 2015	**ENCTI** – National Strategy for Science, Technology and Innovation –	▪ Support to innovations in the production sector; ▪ Trains and qualifies human resources for innovation; ▪ Support to the sectors that concentrate more knowledge; ▪ Promotes clean production; and ▪ Uses the State's purchasing power to promote innovation.

Source: The author, 2015.

Brazil has fostered innovation through laws and mechanisms to leverage and guarantee businesses' competitiveness. This incentive to innovative businesses comes by means of incentive calls for grants and also through refundable programmes at attractive rates, so that the funds can be used in the research and development of new products and/or services. Financing also supports the access to the national and international markets and other necessary items for the companies to grow.

The frame below presents a summary of the funding offices with their respective incentive lines. Only active programmes will be listed, that is, those which can still be reached.

Frame 4 - Innovation Programmes.

Main business innovation incentive offices	Programme	Company Profile
FINEP	Inovacred	Credit with a focus on micro, small and medium-sized businesses. This support is granted in a decentralised way, through financing agents that operate in their own states or regions, assuming the risks of the operations.
	Tecnova	Grant; focus on micro and small businesses, with support from state partners.
	Finep 30 dias Inovação	Credit, focus on medium-sized and big companies.
	Inovacred Express	Credit, micro and small business.
	Economic Subvention	Grant for micro, small, medium-sized and big companies.
CNPq	RHAE – Pesquisador na empresa	Focus on micro, small and medium-sized technology companies.
BNDES	Prosoft	Focus on medium-sized software companies.
	MPME Inovadora	Focus on micro, small and medium-sized innovative companies. This support is granted in a decentralised way, through financing agents that operate in their own states or regions, assuming the risks of the operations.
FINEP / BNDES	INOVA	Focus on priority areas of aero-defence, agribusiness, energy, oil, health, sustainability and telecommunications. The whole line, small and medium-sized innovative companies.

Source: The author, 2015.

According to what has been exposed, Brazil possesses several lines to support the innovation of micro, small and medium-sized

companies, as a way to guarantee national competitiveness. However, when compared to developed countries, it is clear there is still a lot to be accomplished (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2015).

Tax reduction for innovative firms is a mechanism that has been more and more used by OECD member countries; it deserves a closer look from Brazilian rulers. This kind of incentive is more democratic and cheaper for the country, since the analysis does not need so many professionals. In addition, the process is not so bureaucratic, which is a positive aspect for the businesses (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2007).

4.2 AUSTRALIAN INCENTIVE SCHEME

The Australian government is seeking to improve the use of innovation as a tool to achieve global competitiveness. Today the country promotes innovation internally but the export of new technologies is still little (COMMONWEALTH OF AUSTRALIA, 2014).

As a result of the awareness about such challenges, innovation is object of constant public attention in Australia. It is a consensus in society that the only way for the sustainable growth of the country's economy is to increase the competitiveness of individuals and businesses. If well trained, they will be able to keep enjoying the great opportunities created by having moved the axis of global economy onto their geographical surroundings; otherwise, general perception is that competition will be equally devastating.

With this idea in mind, in the 2011-2012 fiscal year the government invested AU$ 10 billion in science, research and innovation. The resources were granted to the Department of Industry - Australian Innovation System (AIS), an open network of public and private organisations that produce and disseminate knowledge and practices that add economic, social or environmental value to Australian products and services.

According to the Australian Innovation System Report 2014, Australia is clearly concerned about investing in innovation and running the risks associated with launching a new product or process or offering a new service in order to export innovation and thus be more competitive in the global market.

Australia is a developed country and a member country of OECD. It is the 12th biggest economy in the world and the sixth largest country with an area of 7,692,024 km2. Its estimated GDP in 2014 was 1.482 trillion dollars. As a developed country, it ranks 5th in terms of per capita income. As far as HDI numbers are concerned, in 2013 Australia took the 2nd position, with a score of 0.933 (very high). It is noteworthy that Australia's population is 23,707,800 making the country only the 51st most populated in the world (WIKIPEDIA, 2015).

For Australia to be in such a world ranking level, 60% of the productivity growth in the country derived from intangible capital investments – that is, skills development, design and organisational improvements and spill over effects. It is curious, though, that, when compared to the population of other OECD member countries, Australians are twice as likely to invest in machinery and equipment than investing in intangibles (MRE, 2013).

A general characteristic of innovation in Australia is the tendency to concentrate efforts to consolidate the competitive advantages of sectors such as mining and livestock, as opposed to investments that lead to opening new foreign markets. However, it is possible to spot AIS' outcomes of tangible and intangible innovations that achieved international projection in several sectors in the last years.

Australia is always altering its legislation in order to be ahead of world trends. Below is a demonstration of how Australia has organised its incentive sources to support innovation. According to the OECD one world trend is the support to innovation through tax reduction, the path most used by Australia to accelerate business competitiveness (ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 2012).

From the chapter of Australian Innovation System and the Australian Firms - Awareness on Incentive Schemes was developed the article: Australian Innovation Ecosystem: A Critical Review of the National Innovation Support Mechanisms.

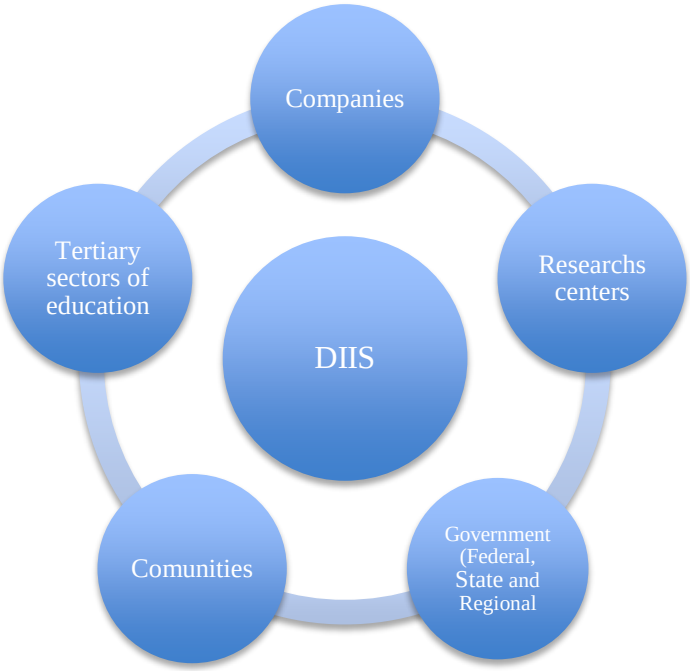
4.2.1 Governance of innovation in australia

To better understand how the Australian Innovation System works, each incentive institution or office will be addressed below, as well as their role in the country's innovation policy.

Department of Industry, Innovation and Science. It is equivalent to a ministry in Brazil. The mission of this Australian direct

administrative office is to connect businesses, research offices, tertiary sectors of education, (national, state and territorial) governments, and society at large (AUSTRALIAN GOVERNMENT, 2015 **www.industry.gov.au**, on line).

Frame 5 - Department of Industry, Innovation and Science.



Source: The author, 2015.

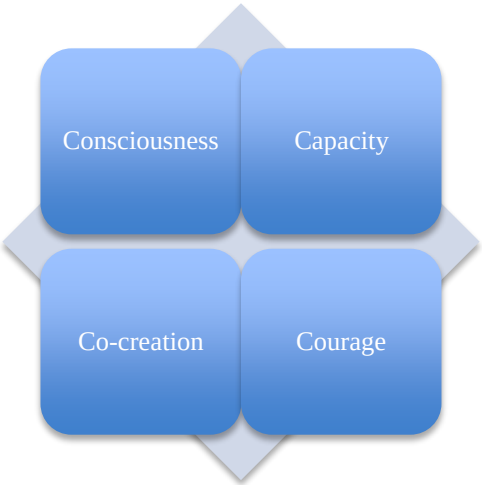
Its main objective is to sponsor and support productivity growth in Australia by means of developing human capital. This department has a seat in several councils in order to promote these networks, especially the Australian Public Services Innovation Action Plan.

The Innovation Compact and Innovation Action Plan see their steps, as crucial for the future. The aims of the plan are to: *i*) recognise innovation as a process that can and should be systematically pursued; *ii*) involve the user and the citizen in the design and development of services and policies; *iii*) Pursue open processes that encompass a wide range of experience and expertise; *iv*) Generate results through involvement utilising partnerships and collaboration; *v*) Facilitate the

creativity inherent in organisations, and welcome tests, pilots and experiments; *vi*) Recognise risk as an inherent part of innovation; *vii*) Promote and celebrate innovation successes; *viii*) Acknowledge that not all innovation will succeed, but that we can learn from failures; *ix*) Use procurement to spur the generation and uptake of innovative solutions and *x*) Be accountable for delivering and implementing the Action Plan and further initiatives. (AUSTRALIAN GOVERNMENT, 2015 www.industry.gov.au).

The Action Plan focuses on the following four action areas: *i*) developing an innovation **consciousness** with the APS, *ii*) Building innovation **capacity**, *iii*) Leveraging the power of **co-creation** and; *iv*) Strengthening leadership so there is the **courage** to innovate at all levels. Initiatives associated with each action area are outlined overleaf APS INNOVATION ACTION PLAN, 2011. (AUSTRALIAN GOVERNMENT, 2015 **www.industry.gov.au**, on line).

Figure 15 - Areas of the Action Plan.



Source: The author, 2015.

The Australian Research council (ARC) is the main assistance office of the Australian government for the investment on research and training in all fields of science, including social and human sciences. It is also responsible for mediating the relation between researcher communities and the industry, government, non-profit organisations and the international community. ARC manages *i*) the linkage Projects

scheme, *ii*) the National Competitive Grants Program (NCGP) and *iii*) the Excellence in Research for Australia (ERA) initiative.

i) The Linkage Projects scheme aims to set up or develop strategic long-term research alliances between higher education institutions and other organisations, including the industry and users; to increase the scope and focus of researches in National Research Priorities; to sponsor opportunities for researchers to develop internationally competitive researches in cooperation with organisations out of the higher education sector; and produce a national network of world-class researchers to meet the broadest demands of the AIS. The Linkage Projects scheme has a similar role to that of CAPES and CNPq in Brazil.

ii) The National Competitive Grants Programme (NCGP) is one of Australia's major investment mechanisms for research and development. This program grants scholarships for basic and applied research, apart from funding research training in all academic areas except clinical medicine and dentistry. This incentive mechanism may be compared to CNPq.

iii) The Excellence in Research for Australia (ERA), in turn, is the programme for evaluating the quality of researches conducted by the higher education institutions of Australia. This can also be compared to one of the fields of action of CAPES in Brazil. The ERA aims to guarantee the excellence of the conducted investigations. This office publishes, for example, a comparison between the level of researches carried out in the country with international standards in each field. (ARC, 2015).

The incentive offices presented above are incentive sources to develop knowledge, associated with research scholarships for the formation of researchers, and with the universities. The ARC aims to integrate researchers and industry.

The Commonwealth Scientific And Industrial Research Organisation (CSIRO), created by the Science and Industry Research, aims to offer innovative solutions to the industry, society and the environment through the development of cutting-edge science.

It is noteworthy that the organisation employs 6,500 workers and researchers, distributed into 57 centres all over Australia, which are dedicatet to four programmes: *i*) National Research flagships; *ii*) core Research and Services; *iii*) Science Outreach: education and scientific publishing; and *iv*) National Research Infrastructure: national facilities and collections (CSIRO, 2015).

i) The National Research flagships are multidisciplinary partnerships for large-scale research that use the international-level expertise to serve the national priorities. The programme started in 2003 and is one of the biggest efforts Australia has ever put into researching, with a total investment of over 1.5 billion dollars in the 2010-11 fiscal year. The sectors that receive support are: climate adaptation, minerals down under, energy transformed, preventive health, food futures, sustainable Agriculture; future Manufacturing, water for a healthy country, wealth from Oceans and light Metals (AUSTRALIAN INNOVATION SYSTEM, 2014);

ii) The Core Research And Services Program comprises a series of research portfolios that do not match the flagships. In 2010-11, five CSIRO research groups managed 12 portfolios, in the fields of energy, environment, food, health, life sciences, information sciences, manufacturing, materials and minerals (CSIRO, 2015);

iii) The Science Outreach: Education And Scientific Publishing is a set of science education programmes for primary and secondary school students and teachers, as well as the general public. The maintenance of the CSIRO Discovery Centre in Canberra is part of this programme (CSIRO, 2015);

iv) National Research infrastructure: National Facilities And Collections is the CSIRO programme responsible for the administration of two kinds of research infrastructure: National Research facilities and National Biological collections.
Apart from these two kinds of infrastructures, CSIRO also comprises 30 other research installations, such as the Australian Resources Research Centre (in Perth) and the High Resolution Plant Phenomics Centre (in Canberra), and more than 30 collections of national importance, including the National Tree Seed Collection, the National Soil Archive and the Cape Grim Air Archive (CSIRO, 2015).

Apart from being home to this lot of researchers with a focus on research, Australia counts on the Australian Chief Scientist, who provides high-level independent counselling to the Prime Minister and

other ministers on issues related to science, technology and innovation. The person in position is a defender of Australian science world-wide and disseminates to the community and to the government the importance of science, research and empirical evidence. The is also a spokesman for science to the public in general, with the aim to promote the understanding, contribution and pleasure of science as well as evidence-based reasoning (CHIEF CIENTIST, 2015).

Accounting Tools Online (ATO) is the government office that regulates the main form of incentive for innovation in Australia. This incentive takes place through tax reductions, which will be discussed in more detail still in this chapter (ATO, 2015).

4.2.2 Innovations Incentive Schemes in Australia

Innovation Australia is an independent office created to help the Australian government to manage programmes of innovation and risky investment programmes designed to support industrial innovation, such as: Clean Technology Food And Foundries Investment Program; Clean Technology Innovation Program; Clean Technology Investment Program; Climate Ready; Green Car Innovation Fund; Re-Tooling For Climate Change; And Renewable Energy Development Initiative (Redi); R&D Tax Concession (including the R&D Tax Offset and 175% Premium (incremental) Tax concession); R&D Tax Incentive; Commercialisation Australia Program (CA); Commercialising Emerging Technologies (COMET); Commercial Ready (including Commercial Ready Plus); Industry Cooperative Innovation Program (ICIP); and R&D Start Program; (AUSTRALIAN GOVERNMENT, 2015).

There are some venture capital programmes as well: innovation investment fund (IIF); innovation investment follow-on fund (IIFF); Early stage Venture capital limited Partnerships (ESVCLP); Venture capital limited Partnerships (VCLP); Pooled development funds (PDF); Pre-seed fund (PSF); and Renewable Energy Equity fund (REEF). (AUSTRALIAN GOVERNMENT, 2015).

The Prime Minister’s Science, Engineering And Innovation Council (PMSEIC) is the eminent advisory body for counselling the government about scientific and technological developments. It is presided by the Prime Minister and composed by ministers, the Chief Scientist and a hand-picked group of experts. (AUSTRALIAN GOVERNMENT, 2015).

With all the attention the country has been giving to innovation, in 2009 the Australian government launched a 10-year reformation agenda with the aim to make Australia more competitive (Powering Ideas: An Innovation Agenda For The 21st Century). Although this is just part of what occurs in the field of innovation, knowing the priorities and goals of this agenda may help identify a certain tendency of future development of this issue in the country.

The innovation agenda is based on the assumption that there are two action fronts to strengthen the AIS: strengthening its constituents (businessmen, public managers, researchers, workers and consumers) and strengthening the connections among these parties.

With this in mind, the Australian government has adopted seven National Innovation Priorities to guide its innovation policies. All priorities are considered equally important and complement the Australian National Research Priorities, as follows:

- Public research funding to support high-quality research that addresses national challenges and opens up new opportunities.
- Building a strong base of skilled researchers to support the national research effort in both the public and private sectors.
- Incentive to cutting-edge industries, securing value from the commercialisation of Australian research and development.
- More effective dissemination of new technologies, processes, and ideas to increase innovation across the economy, with a particular focus on small and medium-sized enterprises.
- Encouraging a culture of collaboration within the research sector and between researchers and industry.
- More involvement of Australian researchers and businesses in international collaborations on research and development.
- Joint work of the public and private sectors in the innovation system to improve policy development and service delivery (AUSTRALIAN GOVERNMENT, 2015).

Until 2020 the government wants to have a National Innovation System in which:

- The country clearly articulates national priorities and aspirations to make the best use of resources, drive change, and provide benchmarks against which to measure success;

- Universities and research organisations attract the best minds to conduct world-class research, fuelling the innovation system with new knowledge and ideas;
- Businesses of all sizes and in all sectors embrace innovation as the pathway to greater competitiveness, supported by government policies that minimise barriers and maximise opportunities for the commercialisation of new ideas and new technologies;
- Governments and community organisations consciously seek to improve policy development and service delivery through innovation; and;
- Researchers, businesses and governments work collaboratively to secure value from commercial innovation and to address national and global challenges. To measure the progress of AIS concerning priorities and objectives (AUSTRALIAN GOVERNMENT, 2015).

Australia has been stimulating businesses to invest in innovation through tax reductions for research and development, according to the Australian Government Department of Industry.

The R&D Tax Incentives is a broad-based, market driven programme accessible to all industry sectors. It provides a targeted tax offset to encourage more companies to engage in research and development (R&D Tax Incentive, 2012).

4.2.3 Summary of Australian Incentives Schemes

The Australian programmes of incentive to businesses are concentrated in a single government portal named Business. On this portal, entrepreneurs find all information necessary to start a business as well as hints to guarantee the success of their enterprise. The portal's address is **www.business.gov.au/Pages/default.aspx**.

The portal has a Grants and Assistance area, with several incentive programmes. These programs are aimed at businesses of various sizes, in order to generate productivity, competitiveness and create new jobs (BUSINESS, **www.business.gov.au**, on line).

These programmes include incentives for research and development, support for small businesses, tax and duty concessions, and assistance for industries in transition. They support invention and technology development in businesses by fostering collaboration

between industry and researchers (AUSTRALIAN GOVERNMENT, 2015).

Entrepreneurs' Infrastructure Programme - The Entrepreneurs' Infrastructure Programme is the Australian Government's major initiative to promote business competitiveness and productivity at the firm level. It is part of the Australian Government's new industry policy provided for in the Industry Innovation and Competitiveness Agenda. This Agenda is part of the Economic Action Strategy of the Australian Government; it unites and develops other economic reforms in order to foster Australia's strengths and promote business opportunities. (AUSTRALIAN GOVERNMENT, 2015)

The Entrepreneurs' Infrastructure Programme counts on a national network of over 100-experienced private sector advisers and it offers support to businesses through three components:

- Business Management, which provides support for business to improve and grow;
- Research Connections, which promotes the collaboration of small and medium businesses with the research sector as a way to develop new ideas with commercial potential; and
- Accelerating Commercialisation, which helps entrepreneurs, researchers, start-ups and businesses face key challenges when trading new products, processes and services (AUSTRALIAN BUSINESS, 2015).

The Programme uses quality facilitators and advisers with expertise in the industry, to ensure that businesses receive all necessary information to better their competitiveness and productivity. The Programme focuses primarily on providing information — rather than financial assistance — so entrepreneurs can find solutions to their problems (AUSTRALIAN GOVERNMENT, 2015).

The support offered to businesses includes advice from experienced people from the private sector, co-funded grants to trade new products, processes and services, funding to help businesses grow, and connection and collaboration opportunities (AUSTRALIAN GOVERNMENT, 2015).

Industry Skills Fund – Growth Stream; the $476-million Industry Skills Fund is a key component in the Industry

Innovation and Competitiveness Agenda of the Australian Government and will provide up to 200,000 training places and support services over four years (AUSTRALIAN GOVERNMENT, 2015).

The fund prioritises SMEs, including micro businesses, and is delivered through the single business service, which favours the access to essential information for all Australian businesses (AUSTRALIAN GOVERNMENT, 2015).

The fund offers assistance to the industry so it can invest in training and support services, as well as develop innovative training solutions. The fund will help form a highly skilled workforce that can have access to new opportunities due to business growth, and that can adapt to rapid technological change (AUSTRALIAN GOVERNMENT, 2015).

Innovation and R&D - The R&D Tax Incentive aims to boost competitiveness and improve productivity across the Australian economy by: i) encouraging industry to conduct R&D that may not otherwise have been conducted; ii) providing business with more predictable, less complex support; and iii) improving the incentive for smaller firms to engage in R&D (AUSTRALIAN GOVERNMENT, 2015).

The R&D Tax Incentive replaces the R&D Tax Concession for R&D in income years commencing on or after 1 July 2011. The R&D Tax Concession continues to be administered for R&D in income years commencing prior to 1 July 2011.

The R&D Tax Incentive provides benefits as two core components:

- A 45% refundable tax offset (equivalent to a 150% deduction) for eligible entities with a turnover of less than $20 million per annum, provided they are not controlled by income tax exempt entities.
- A non-refundable 40% tax offset (equivalent to 133% deduction) for all other eligible entities. Unused non-refundable offset amounts may be able to be carried forward to future income years (AUSTRALIAN GOVERNMENT, 2015).

In order to give special attention to the technology sector and considering that the tax benefit is open to all sectors, software

is subject to the same eligibility tests as other forms of R&D, with the exception of certain software activities, which are excluded for being a core R&D activity. This exclusion covers activities related to the development, modification or customisation of software where the software is for the dominant purpose of internal administration by the entity (or connected entities or affiliates) for which it was developed, modified or customised.

Software for 'internal administration' includes management information systems and enterprise resource planning software that is for use in the day-to-day administration of a business.

The software exclusion does not apply to software developed in-house that is of an applied nature, forming an integral part of an electrical or mechanical device (such as home appliances or industrial equipment).

Generally only R&D activities conducted in Australia or the external Territories qualify for the R&D Tax Incentive. However, in certain circumstances, R&D activities conducted overseas may also qualify.

A company intending to claim a tax offset for R&D activities conducted overseas must apply to Innovation Australia for a decision (called a 'finding') about the eligibility of these overseas activities. Innovation Australia can issue a finding that overseas activities are eligible for the R&D Tax Incentive where it is satisfied that:

1. The activities are eligible as core or supporting R&D activities. Innovation Australia will be satisfied of this if the company has obtained an advance finding stating that the activities are eligible.
2. The activities to be conducted overseas have a significant scientific link to core R&D activities conducted in Australia that are registered or reasonably likely to be conducted and registered;
3. The activities cannot be conducted in Australia due to one of the following reasons: i) conducting it requires access to a facility, expertise, or equipment not available in Australia; ii) conducting it in Australia would contravene a law relating to quarantine; iii) conducting it requires access to a population (of living things) not available in Australia; or iv) conducting it requires access to a geographical or geological feature not available in Australia.

4. The total expenditure on the activities conducted or to be conducted overseas in all income years is less than the total expenditure on certain R&D activities conducted or to be conducted in Australia in all income years.

The application should be made in the first income year that the overseas activities are conducted as it comes into force at the start of that income year. The application can also be made in advance of the company conducting the activity outside Australia. The application cannot relate to activities conducted in previous income years.

The Commonwealth Government also provides financial support for private firms to conduct innovation projects. Nevertheless, there is less evidence that such investment — about $1 billion every year — is justified by the extra innovation it helps produce.

The largest Commonwealth Government support for private sector innovation is the R&D tax credit. The largest 3% of innovative firms rake in sixty percent of the credit – over $1 billion per year. Nonetheless, there is little evidence that this tax credit substantially increases the amount of actual R&D activity in large firms.

By contrast, there is good evidence that improving the framework conditions for innovation, particularly by reducing the corporate tax rate, would have a significant impact on innovation in the long-run. A lower corporate tax rate encourages foreign direct investment, which in turn increases innovative activity and encourages the diffusion of ideas from other countries.

Australia would probably see more innovation – and increase living standards accordingly – if the R&D tax credit for large firms and much of the direct support for private firm innovation were redirected into funding a reduction in the corporate tax rate of up to 1.5%.

Whereas governments should support innovation, they should ensure that public money is invested where it makes the biggest difference.

4.3 BRAZIL AND AUSTRALIA COMPARISON

Australia and Brazil are very similar countries when it comes to weather and geographic area, and both countries are known for their natural beauties. One big difference between them, though, is that Australia is a developed country, with a strong focus on the education of its people, high-quality public schools and several universities among

the best-ranked in the world; whereas Brazil is a developing power where investments on education are little, public schools are weak and poorly equipped, and teachers are underpaid. Only two of Brazil's universities are listed among the world's top institutions (THE WORLD UNIVERSITY RANKING, 2014-2015).

Innovation and productivity are supported with a highly educated workforce, so education has become an important component of economic success. In the high education attainment global ranking, Australia occupies the 9th position with a 41,7% score and Brazil occupies the 40th position with a 11% score (ATKINSON; ANDES, 2011).

Australia's population is as little as 10% of that of Brazil; it is actually nearly the population of the great São Paulo, making the country only the 51st most populated in the world. Brazil's GDP is twice as big as Australia's. As far as the 2013 HDI world ranking numbers are concerned, in 2013 Australia took the 2nd position, with a score of 0.933 (very high) whereas Brazil took the 79th place, with the score of 0.744 (high).

Brazilians are creative and entrepreneurial and have profited from the focus the country has been putting on innovation, especially their programmes of incentive for innovation in small-sized businesses. On the other hand, not many of the country's universities are ranked among the best in the world mainly because of reduced infrastructure and number of publications. Universities are associated with business incubators and they give support to innovative entrepreneurship. Many start-ups are conceived by a group of friends from university and derive from their senior research project.

One barrier to entrepreneurship in Brazil is excessive bureaucracy: it takes too long to go through all the steps necessary to start a business; registering products and hiring personnel are among other difficult processes (WORLD BANK, 2014).

Australia is ranked 11th whereas Brazil is in 116th position when the subject is entrepreneurship and opening a business (WORLD BANK, 2014). In Australia, processes are very simple and automatic and the citizen's time is respected; one does not need to prove they are righteous people's words are taken as true. At the same time, volunteer work is highly regarded by the community at large.

Australia prioritises elementary education and the government indeed offers high-quality schools, which can be compared to the best private schools in Brazil. This generates an educated population that will

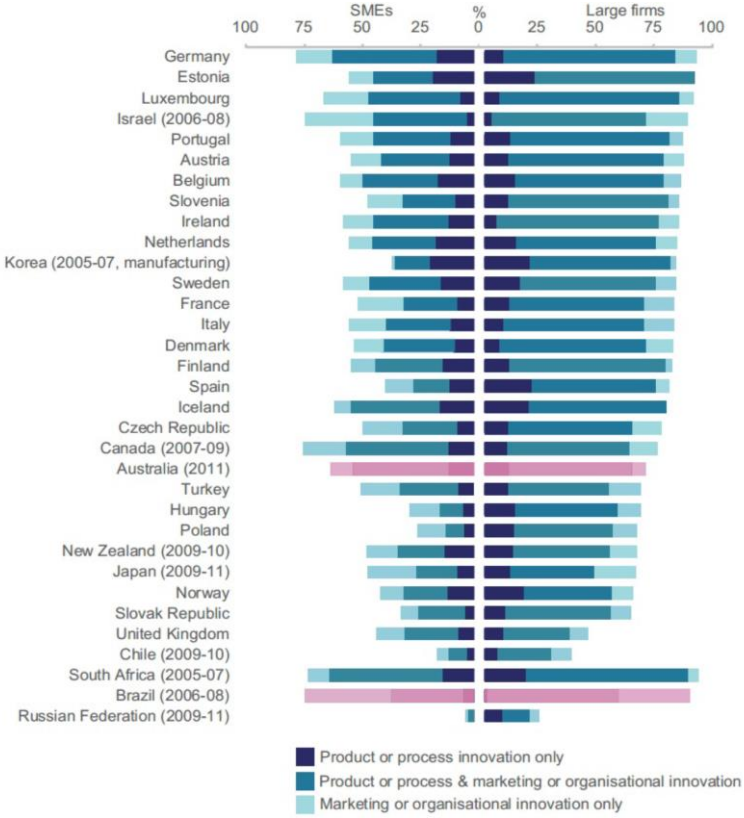
protect their own people, respect common public spaces and will not take advantage of others. Labour is expensive and valued in all areas; therefore, cost of living is high.

Summarizing, Brazil has realised the importance of incentive for innovation and has been giving support for companies to become more competitive. The country has identified many strategic areas.

In recent years Australia has lost competitiveness. However, the government is aware that it is necessary to change and is investing in innovation. Mining was for many years the central focus of the Australian government; it still gets a lot of attention, but the need to diversify is now felt. Australia has several regional incentive programmes designed to meet the needs of each region in the country. Nevertheless, the major national programme is the incentive through tax reduction (AUSTRALIAN INNOVATION SYSTEM REPORT, 2014).

Brazil has provided more support to innovative firms than Australia and has worked on different ways to support innovation. According to the Commonwealth Government, Department of Industry and Science, the Australian Innovation System Report (2014), Australia's support is still poor, although the importance of innovation to generate competitiveness is acknowledged.

Figure 16 - Innovation types by firms size, 2008 – 2010.



Source: AUSTRALIAN INNOVATION SYSTEM, 2014.

This poor culture and low awareness of innovation strategy, in association with an average to poor management performance, has been argued to explain Australia's middle to low performance on innovation, particularly collaborative world-first innovation (AUSTRALIAN INNOVATION SYSTEM, 2014).

Some of the points that hinder a more innovative system, presented in the report, are: a) poor networking and collaboration, b) poor levels of venture and private equity capital investment in innovation, c) some fragmented and/or obstructive government policies or regulations such as tax treatment of employee share schemes, government procurement of innovation and low incentives for research commercialisation/collaboration in the public research sector, d) a small

geographically isolated economy dominated by small businesses and/or lifestyle entrepreneurs that are seeking local competitive advantage through cost reduction rather than pushing the innovation frontier to capture world markets through value creation, e) poor business culture of innovation and risk aversion in Australia, exacerbated by an ageing population and f) relatively poor business management capability and underinvestment in innovation and related activities (AUSTRALIAN INNOVATION SYSTEM, 2104).

One of the fronts on which Brazil has been working is that of support to incubated businesses through incentive calls; one programme for start-ups. The lines which might be called vertical, such as health, energy, oil and gas, education, security, telecommunications, are below the innovation hat.

In Brazil there is a concern of serving companies of different sizes. It is also important that programmes be complementary. However, the structure to design, launch, maintain and follow up to the programmes with a focus on innovation is big and expensive, making the maintenance cost for the country a high one.

Australia's incentives for innovation focus on two programmes: R&D Tax Incentives and Entrepreneur Infrastructure Program. R&D tax incentives also exist in Brazil through the *Lei do Bem* (Good Law) and *Lei da Inovação* (Innovation Law); however, Brazilian firms poorly use it.

In Australia, incentives are presented through a portal, a hotline or an online chat. The public barely has access to the people who work on the development of programmes.

In Brazil, businesses benefit from incentives to innovation through grant calls or credit at attractive interest rates; to be able to raise this money, firms must submit a project, which will show the company's level of innovation and what its competition is. Apart from introducing the team that will take part in the project the firm must demonstrate that the public funding will be used to generate competitiveness in national and international levels and that it will help create jobs.

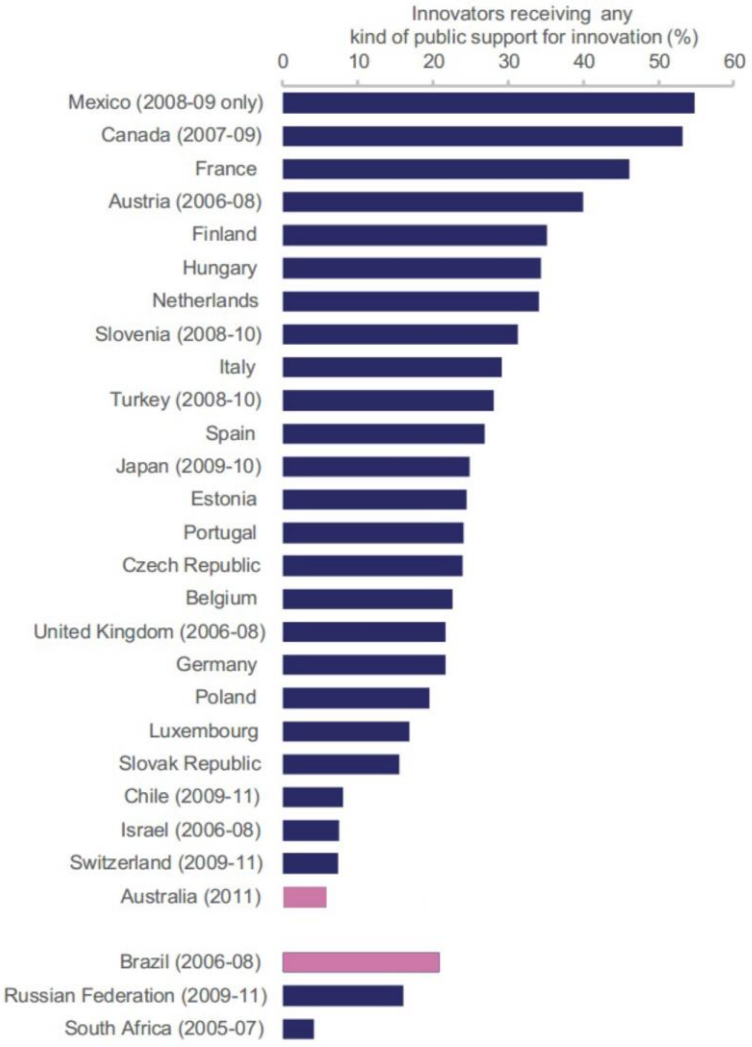
Brazil has been promoting start-ups through accelerators, incubators and programmes to develop Technology Parks. There is a relation and integration with worldwide networks that deal with this issue, such as the International Association of Science Parks (IASP). The *Associação Nacional de Entidades Promotoras de Empreendimentos Inovadores* (Brazilian Association of Science Parks and Business Incubators — ANPROTEC) promotes missions every year

with a focus on disseminating good international practices between technology parks' managers and incubators, as well as governmental managers.

The support to start-ups comes through specific programmes and grant calls; the Brazilian government is sharing the risk with the businessmen. When it comes to governmental incentives to innovation, Australia gives emphasis to the quality of labour: the country has programmes to develop skills in order to attract talents. Brazil has been using the same practice.

Australian industry needs to invest in innovation across all domestic and exporting sectors as one of several key strategies to lift long-term total factor productivity and ultimately maintain its high standard of living. The scale and impact of innovation appears to be hampered by a poor management culture of innovation and collaboration, and shortages in a range of skills (AUSTRALIAN INNOVATION SYSTEM, 2014).

Figure 17 - Firms receiving public support for innovation, 2008 – 2010.



Source: AIS Report, 2014

Whereas Australia's level of competitiveness for innovative products in the international market has been considered low by the AIS report (2014), the countrys figures go along those of OECD member countries.

As for Brazil, although the country has improved substantially in the last decade through innovation-oriented public policies and programmes, it still seeks to become more competitive in the domestic market so as to reduce imports and be accepted in the international market; Brazil's government has been promoting this at the global innovation centres.

Both countries realise the importance of prioritising investments in innovation, generating quality job opportunities and contributing to knowledge-based economic development, which brings positive results to the society, the government and the academy.

4.4 AGREEMENTS BETWEEN BRAZIL AND AUSTRALIA

As of March 2012 Brazil and Australia started conversations during the visit of the Chief Executive of the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Ms. Megan Clark to Brazil.

The visit was important not only to strengthen the bilateral relations between Brazil and Australia in the field of scientific and technological cooperation but also to pave to way for joint operations of CSIRO and Brazil's agencies and firms other than EMBRAPA, with which CSIRO has signed a Memorandum of Understanding (MRE, 2013).

The new areas of joint operation could be, for example, preventive health (especially control and treatment of diabetes and obesity, in which CSIRO has great expertise) as well as healthcare of populations living in remote areas (CSIRO developed alternative methods to diagnose and treat these populations, by using information technology resources).

Another bilateral programme between both governments is the Science Without Borders (*Ciência Sem Fronteiras*), which has attracted much interest on the Australian side. At least three university associations (Group of Eight – GO8; Australian Technology Network of Universities – ATN, and Universities Australia – UA) have visited Brazil since the launching of the programme, having signed memorandums with the *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior* (Coordination for the Improvement of Higher Education Personnel – CAPES) and/or the *Conselho Nacional de Desenvolvimento Científico e Tecnológico* (National Council for Scientific and Technological Development – CNPq), in order to send

undergraduate students and researchers to renowned higher education and research institutions of Australia. It is estimated that at least one thousand Brazilian fellows will benefit from study and research programmes in Australia (MRE, 2013).

Another important agreement on science, technology and innovation between Brazil and Australia is about to be finalised. The cooperation modalities provided for in the agreement are: (a) development of joint scientific and technological research programmes, work plans and projects that include supplying research material and equipment, according to the necessity of both parties; (b) interchange of students, scientists, researchers, specialists and scholars; (c) interchange of information in the field of science and technology by electronic (and other) means; (d) organisation of seminars, conferences and workshops in the field of science and technology in areas of mutual interest; (e) joint identification of problems in science, technology and innovation and the application of knowledge resulting from them; and (f) other modalities of cooperation in science, technology and innovation, as mutually agreed by both parties (MRE, 2013).

In June 2012, Rio de Janeiro was home to the first official visit of an Australian head of government to Brazil. On that occasion, Brazil's and Australia's heads of state announced the elevation of their bilateral relations to the level of Strategic Partnership. The leaders acknowledged the impact of bilateral relations on the incentive for innovation in both countries, such as the next cooperation agreement on science, technology and innovation between Brazil and Australia; and the memorandums of understanding signed between GO8 and CAPES and those between ATN and CAPES and CNPq.

Besides, they identified potential for the cooperation and investment in areas such as renewable energy, biofuel, mining, oil and gas. Both sides are interested in discussing central issues of mutual interest and joint actions in multilateral institutions. The priority areas of dialogue and cooperation are education (Science Without Borders programme on Brazil's side, and the Australian Awards on the Australian side), and science and technology.

Australia has several initiatives of incentive for innovation. The growing quality of universities (five of which – University of Melbourne, ANu, University of Queensland, University of Sydney and University of Western Australia – are listed among the world's top 100 in the last Ranking of World universities by the Shanghai Ranking Consultancy) and research centres (such as the CSIRO), combined with

the solid quality of primary and secondary schools (although declining in relative terms, when the rise of education quality in countries of the Asian surroundings is taken into consideration) are undoubtedly the best components of the favourable environment to keep Australian economy competitive.

The efficacy of the other efforts is, however, sometimes questioned by the labour government itself. Prime Minister Julia Guillard announced in August 2012, for example, that fiscal incentives to businesses that invest in R&D (Research and Development Tax Incentive) may be reduced. In terms of relative performance, data show that the capacity of AIS in three out of four measured areas is in general above average or near the average of the other OECD countries.

Australia's research capacity and basic skills are rated from “moderate to good” in relation to the OECD average, particularly in the university and technical school sectors. These data suggest that Australians can be creative, seek solutions and generate new ideas also in a “moderate to good” way.

Business conditions in Australia also perform well when compared to other OECD countries. The setting for entrepreneurship is considered one of the most favourable in the world. However, Australia's performance on the issue of collaboration between organisations for innovation is still below OECD average, even if collaboration is relatively high in the domestic sphere, especially in the case of small and medium-sized businesses.

For this, the country may reduce – through calls – taxes to firms that develop joint work, since using resources for innovation is generally positive and it is on average or above average of OECD country members. Although resources for innovation are above OECD member countries average, venture capital investment on seed/start is still below OECD average, which shows there is a field of investment for the Australian government (AUSTRALIAN INNOVATION SYSTEM, 2014).

5 FIRMS AWARENESS ON INCENTIVES

This chapter will demonstrate the surveys carried out in Brazil and Australia. In order to understand how well Brazilian and Australian businessmen know innovation incentives, a survey was developed covering the federal incentive source in both countries.

In the case of Brazil, the survey was sent out by the Brazilian Association of Software Firms (ABES – *Associação Brasileira das Empresas de Software*, in Portuguese), which is a national, private non-profit institution. The survey was e-mailed to firm owners and directors, in order to warrant more precise answers.

In Australia, the survey was sent out by AIIA (Australian Information Industry Association), which is a national, private non-profit institution, and by the Cooperative Research Centres Association (CRCA). The survey was e-mailed to businessmen and directors of technology-based firms. In order to guarantee more responses, Australian entrepreneurs were found at LinkedIn, as already demonstrated in the chapter dedicated to the research methodology of this thesis.

This is a multiple-choice survey which – considering firm owners will respond it – takes only 3 (three) minutes to be answered. The questions of the surveys applied in both countries are equivalent and the alternatives reflect the reality and government programmes of Brazil and Australia.

5.1 BRAZILIAN FIRMS – AWARENESS OF INCENTIVES SCHEMES

This survey was applied as a way to understand how aware Brazilian businessmen are of incentives to innovation. It was conducted through ABES' Department of Innovation and Incentive — of which the researcher is a member —, with the aim to understand the extent of innovative firms' awareness of public policies on innovation.

Based on the results of this survey, BNDES and ABES created a new programme to support innovative firms, called *MPME Inovadora*. Businessmen lack awareness of incentives. So, in order to warrant business competitiveness, both regional incentive partners and regional business partners were brought into the programme so they could be closer to firms, with the intention to make the credit line successful.

Because it was to be answered by businessmen, this is considered a simple and objective survey (ABES, 2013).

Brazil has launched new programmes to support innovation at firm level. These programmes have been made public through seminars at national and regional trade associations.

The survey was conducted in August/September 2013 by ABES with their associate companies. The survey was made available through the Survey Monkey website but hard copies were also sent out.

ABES surveyed their associate companies on Innovation and Incentive Resources, with the aim to assess the software firms' perception of these important mechanisms.

The survey was sent out to 975 associate companies, located all over Brazil's territory. Three hundred and twelve firms (about 32%) answered the questions. Two hundred nineteen responses came in through Survey Monkey whereas 93 were answered in hard copy. In order to work with the statistics, the analysis of this thesis is to consider only the answers submitted through Survey Monkey, which corresponds to a return of 22.5%; however, little were final results altered.

In order to increase the rate of responded surveys those firms that would fill out the questionnaires were entered into a draw to win a laptop computer (total of two) given away by ABES.

The five questions of the survey, their answers and analysis are presented below.

Question 1: Are you aware that there are refundable, non-refundable and subsidised resources that your business can use for innovation and research and development (R&D)?

All surveyed firms answered this question. 119 claimed to know about the available resources whereas 100 declared not to know about the incentive lines.

Although this may seem a balanced result, it is remarkable that after so many years of dissemination of this issue almost half of the companies in this sector still do not know this sort of resource is available.

Anyway, it is clearly demonstrated that the entities responsible for these funds still have a long way to go about dissemination. They have to create forms to stimulate and attract companies in this sector to use the available incentives.

Table 3 - Brazil: Awarenes of resources for innovation.

Are you aware that there are refundable, non-refundable and subsidised resources that your business can use for innovation and research and development (R&D)?	Absolut Total	Relative Total
Yes	119	54.34%
No	100	45.66%
Total	219	100.00%

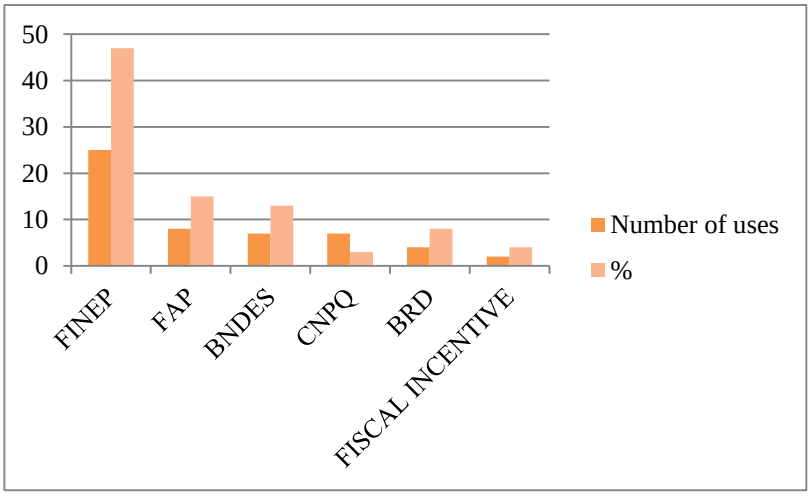
Source: The author, 2015.

Question 2: Has your company ever used these types of resources for innovation and development?

Of the 119 firms that claimed to know this type of resources, only 30 (25%) have declared they have used some.

On the other hand, of these 30 firms that have used the resources, on average each firm has used the available resources more than one time, which demonstrates that firms are interested; perceive the importance of such mechanisms; and repeat the operation. The resources used are shown below:

Figure 18 - Results of the survey question 2.



Source: ABES, 2013.

The remaining 219 firms that claimed to never have used these resources justified it as follows:

Table 4 - Brazil: Resources for innovation and R&D.

Has your company ever used these types of resources for innovation and development?	Absolut Total	Relative Total
Yes	30	13.70%
Not interested	12	5.48%
Have tried but not been successful	47	21.46%
Do not know about it	107	48.86%
Other reasons	23	10.50%
Total	219	

Source: The author, 2015.

Considering the 48.86% that answered they “do not know about it” and 10.50% that checked “other reasons”, we may and must arouse the interest of 59.36% of the firms to the available innovation lines available on the market.

Twenty-three firms have checked “other reasons” for not using the lines. The specific reasons were:

Question 3: If you have tried but have not been successful, please indicate the reasons

To evaluate the reasons why firms that have tried reaching these resources were not successful, the answers of 47 firms that claimed not having reached such resources were analysed. They came up with the following:

Table 5 - Brazil: Have tried but not been successful.

If you have tried but have not been successful, please indicate the reasons	Absolut Total	Relative Total
Complex process	19	40.43%
Lack of orientation	20	42.55%
Process was turned down	22	46.81%
Could not find an adequate line	10	21.28%
Lack of information	14	29.79%
High cost	11	23.40%

If you have tried but have not been successful, please indicate the reasons	Absolut Total	Relative Total
Lack of an internal team	12	25.53%
Lack of guarantees	8	17.02%
Other (Please specify)	1	2.13%
Total	47	

Source: The author, 2015.

The first three causes (Process was turned down, Lack or orientation, and Complex process) are accountable for 61 occurrences.

Another remarkable aspect is that 47 firms gave 117 reasons, which shows that each firm has had, on average, 2.5 reasons for not being successful.

When comparing these results with the answers of firms that have never tried to access this type of resources, many reasons coincide, such as “bureaucracy”, “complex process”, “lack of information”, “lack of guarantees” and “lack of internal team”.

Question 4: For what purpose is your firm interested in this type of resource?

In total, 196 firms answered this question. They could check more than one application they were interested in.

Table 6 - Brazil: Type of resource purpose.

For what purpose is your firm interested in this type of resource?	Absolut Total	Relative Total
Not interested	12	6.12%
Working capital	72	36.73%
Machiney and equipment	31	15.82%
Infra-structure	47	23.98%
Research and development	151	77.04%
Marketing / sales /fairs	91	46.43%
Internationalization	45	22.96%
Other (Please specify)	7	3.57%
Total	196	

Source: The author, 2015.

It is remarkable that 77% of the firms checked Research and Development as the most important destination for the incentive resources, which strongly indicates that firms search for innovation to grow. In addition, 46% of the surveyed firms seek resources to market their products, which demonstrates that they understand that innovation is materialised when it reaches the market.

Another noteworthy aspect is that 23% of the firms demonstrated interest in internationalisation and exportation.

Question 5: Please, indicate on which incentive programmes you would be interested in applying in future.

One hundred and ninety -six firms answered this question. They could check more than one line they were interested in.

Table 7 - Brazil: Incentive programmes to apply in the future.

Please, indicate on which incentive programmes you would be interested in applying in future.	Absolut Total	Relative Total
Not interested	8	4.08%
APEX	48	24.49%
BNDES	141	71.94%
CNPq	76	38.78%
FINEP	131	66.84%
SEBRAE	82	41.84%
Desenvolve SP	82	41.84%
Regional Developments Banks	70	35.71%
Private Funds	72	36.73%
Research Support Funds	88	44.90%
Other (Please specify)	3	1.53%
Total	196	

Source: The author, 2015.

This question shows the interest of firms in federal incentive programmes. BNDES (a developmenbt bank), Finep (a financier with subvention programmes) and CNPq (an office that integrates universities and firms) are those that stand out when it comes to

incentive for innovation. Sebrae is a national office, however, its action is in the regional level towards micro and small firms. Sebrae also stood out at a 42% mark.

Desenvolve SP is a programme for the state of São Paulo alone and it was mentioned by 42% of the respondents, which is a high figure since it is a state programme. Apex was mentioned by 24%, which is a good number, considering that it is a federal office that incentivises Brazilian export.

In the case of the FAPs (Research Support Foundations), which are also regional and integrate universities and firms, their number is also noteworthy: it was mentioned by 45% of the firms interested in seeking resources in the future.

5.2 AUSTRALIAN FIRMS - AWARENESS ON INCENTIVE SCHEMES

This survey was conducted through AIIA and CRCA; in addition, direct contact was made with firm owners through LinkedIn, with the aim to understand the extent of innovative firms' awareness of public policies for innovation.

This survey intends to add information to the Australian innovation system, by showing firm owners' views as to the existing incentives. Results obtained were informed to the federal government and to trade associations that represent ICTs.

In Australia, the survey was conducted from May 2015 to August 2015, by AIIA, CRCA with their associate companies. The survey was made available through the Survey Monkey website and contacts were using LinkedIn. In Australia feedback time was longer due to the difficulty in reaching firm owners. The details of the survey can be found in the methodology section of this thesis.

AIIA and CRCA surveyed their associate companies on Innovation and Incentive Resources with the aim to assess the software firms' perception of these important mechanisms.

In order to increase the rate of responded surveys, the entrepreneurs of those firms expected to fill out the questionnaires were contacted through LinkedIn.

The six questions of the survey, their answers and analysis are presented below.

Question 1 - Are you aware that Australia has an Industry Innovation and Competitiveness agenda?

Table 8 - Australia: Industry innovation and competitiveness agenda.

Are you aware that Australia has an Industry Innovation and Competitiveness agenda?	Absolut Total	Relative Total
Yes	38	50.67%
No	37	49.33%
Total	75	100.00%

Source: The author, 2015.

In the last 15 years, public policies focused on innovation incentive in Australia have lost strength. As a consequence the Australian government has launched an innovation agenda in order to warrant firm growth and to offer support to new firms.

This question was designed to capture the entrepreneurs' awareness of this agenda, considering that this is the government's plan for the next years.

Of the 75 firms that responded to the survey, 38 claim to know the government's agenda and 37 claim they are unaware of it. Although the number is balanced, considering that it is a relevant issue for the development of innovative firms, firm owners should be more aware of governmental programmes and seek more information about them.

Little does the Australian government use trade associations to disseminate its programmes and plans. The government's website as a source of information is considered to be a good enough source of information. It is also believed that it is the businessmen's duty to find out about programmes and support to which they are entitled.

Question 2 - Are you aware that there are refundable, non-refundable and subsidised resources that your business can use for innovation and research and development (R&D)?

Table 9 - Australia: Awarenes of resources for innovation.

Are you aware that there are refundable, non-refundable and subsidised resources that your business can use for innovation and research and development (R&D)?	Absolut Total	Relative Total
Yes	47	63.51%
No	27	36.49%
Total	74	100.00%

Souce: The author, 2015.

This question was responded by 74 firms and was skipped by another one. Forty-seven claimed to know about the available resources whereas 27 declared not to know about the incentive lines.

The number of firms (63.51%) that know about the availability of federal incentive programmes to innovation is relevant, considering that Australia makes little use of trade associations and barely conducts presentations to firms on this topic.

The survey shows that, although the number is relevant when compared to the little effort put on promotion, the government must focus on spreading the word about its sources of incentive and public policies.

Question 3 - Has your company ever used these types of resources for innovation and research and development (R&D)?

This question was answered by 68 firms and skipped by other 7. The alternatives listed federal programmes of incentive for innovation. It was also possible to check the answer “other” with an option to specify the programme the entrepreneur had used.

Table 10 - Australia: Resources for innovation and R&D.

Has your company ever used these types of resources for innovation and research and development (R&D)?	Absolut Total	Relative Total
Never Used	37	54.41%
Tax Deduction – Innovation R&D	24	35.29%
Entrepreneurs – Infrastructure Programme	3	4.41%
Industry Skills Fund	0	0.00%

Has your company ever used these types of resources for innovation and research and development (R&D)?	Absolut Total	Relative Total
The Linkage Projects Scheme	2	2.94%
The National Competitive Grants Program (NCGP)	2	2.94%
The Excellence in Research for Australia (ERA)	1	1.47%
Other (Please specify)	9	13.24%
Total	68	

Source: The author, 2015.

More than half of the firms that answered the questionnaire (54.41%) do not use the incentive sources, including tax incentives, which is a flagship of the Australian government programme.

R&D Taxes Incentives is the main programme, used by 35.29%; the programme is considered simple and not very bureaucratic by government officials since it can be applied for online.

The Entrepreneurs – Infrastructure Program comes in third, used by 4.41%. This is a four-pillar line that contributes to the commercialisation of generated goods/services.

Lines such as The Linkage Projects Scheme (LPS), The National Competitive Grants Program (NCGP) which are university-related programmes reached a very low rate of responses, 2.94% each.

The Industry Skills Fund programme did not produce any answer (0%). The explanation why no one checked this programme in this question is given by the Australian government itself: since the name of the programme was changed by the new administration, entrepreneurs did not recognise it when it was renamed.

This question gave respondents the choice to include other incentive lines in the field other/specify. Nine answers came up: Export Market Development Grants/Austrade (EMDG), Accelerating Commercialisation, Commercialisation Australia Early Stage Grants, state programmes such as the Canberra Innovation Network, Commercial Ready and Climate Ready. These programmes were not originally listed as alternatives in this question since they are not federal programmes with focus on innovation.

Question 4 - If you have tried but have not been successful, please indicate the reasons.

Although Australia is not a very bureaucratic country – ranked 11th among the least bureaucratic in the world –, entrepreneurs believe that government programmes are bureaucratic. The alternative Complex application process/Bureaucracy was checked by 47.06% of the respondents. This question was answered by 34 firms and skipped by other 41.

Two other answers to this question are worth a mention, each one checked by 23.53% of the respondents: the lack of personnel to prepare the application and the high cost in application preparation. The cost of labour in Australia is very high and the incentive programme is not attractive since Australians believe the process is bureaucratic.

The lack of information about the programmes and the lack of guarantees were answered by 17.65% of the respondents. It is important to emphasise that this question allowed multiple answers.

Table 11 - Australia: Have tried but not been successful.

If you have tried but have not been successful, please indicate the reasons.	Absolut Total	Relative Total
Application found irrelevante	2	5.88%
Lack of motivation and knowledge	2	5.88%
Complex application process / Bureaucracy	16	47.06%
Lack of information avaiable	6	17.65%
Lack of personnel to prepare the application	8	23.53%
Inadequate / No incentive program	5	14.71%
High cost in application preparation	8	23.53%
Lack of required guarantess	6	17.65%
Other (Please specify)	12	35.29%
Total	34	

Source: The author, 2015.

The specific reasons for answering “other”, with 35.29% are:

1. Registered Research Agency went into administration, and ATO penalised my application; 2. Each successive programme gets smaller and smaller and the ROI is such I cant be bothered any more; 3. Have not tried; 4. No time to apply as being a small start-up company, 5. Not tried; 6. Commercialisation Australia "need for funding" criteria is hard to meet; 7. Requirements on matching funding are "impossible" to

meet. You have to show you have matching funds but why the funders of matching funds cannot meet the whole cost. You cannot use future sales for matching funds; 8. Unaware of what options were available and how to prepare a successful submission; 9. Not applied for; 10. Not know and 11. I have not tried

Question 5 - For what purpose is your firm interested in this type of resource?

This question is useful to guide legislators that design public policies because it shows the actual current need of firms. This question was answered by 67 of the surveyed firms, and was skipped by other 8 firms.

Support for Research and Development tops the list of needs (62.69%); Marketing, Sales and Fairs comes in second which demonstrates the importance of support to the commercialisation of goods.

These data reinforce innovative firms' needs of human capital and knowledge. These firms differ from the traditional industry, whose capital is guaranteed by machinery and equipment.

Therefore, to the technology sector, labour is specialised and highly costly. Incentive to the research and development of products and services is important in order to guarantee the continuous process of innovation in the firm, very often anticipating the needs of the market. Of all respondents, 46.27% checked the incentive to commercialisation.

Internationalisation comes in third (32.84%). This is an interesting fact; this alternative completes the top two demands: since Australia is a vast country with little population, internationalisation is an important aspect for sending products and services out to foreign markets.

Australia has no development bank, so businessmen turn to investment funds for financial resources. Inflation rates are low in the country and traditional banks operate at low interest rates. Working Capital comes in fourth in the survey; it was checked by 29.85% of the respondents.

Respondents could check more than one answer in this question.

Table 12 - Australia: Type of resource purpose.

For what purpose is your firm interested in this type of resource?	Absolut Total	Relative Total
Research and development	42	62.69%
Marketing / sales /fairs	31	46.27%
Working capital	20	29.85%
Internationalisation	22	32.84%
Infrastructure	9	13.43%
Machiney and equipment	9	13.43%
Not interested	5	7.46%
Other reaons (Please specify)	3	4.48%
Total	67	

Source: The author, 2015.

The specific reasons presented as “other” (with 4.48%) are:

1. Innovation and entrepreneurship - no-one calls it 'R&D' in start-ups!; 2. Developing Intellectual Property in emerging areas such as Cloud Technologies and 3. Engaging young innovators and students!

Question 6 - Please indicate on which incentive programmes you would be interested in applying in future.

This is another answer that can guide the federal government and contributes to designing policies, since it demonstrates the firms' expectations towards the incentive lines they intend to use in the future.

Of the total 75 firms, 62 answered this question 13 firms skipped it.

R&D Tax Incentive is still the government's master programme, according to the results for question 3. Answered by 54.84% of the respondents, Entrepreneurs Program comes in second, although this programme was checked by 4.41% in question 3. This shows that it is little used at the moment but entrepreneurs are interested in knowing it better.

Private Funds comes next, checked by 30.65%, which shows that it is possible to integrate investment funds and firms through trade associations, by organising Seed and Venture Forums.

As mentioned before, in question 3 the programme focused on Skills Funds programme was not used (0% of responses), for the

programme name was changed by the new administration. However, since 25.81% of the firm owners' checked this answer, it demonstrates an interest in using it in the future.

The same occurs with the Australian Research Council line, that reached a 25.81% rate of interest and demand by firm owners. Nevertheless, these days it is used by only 1.47%.

A reasonable number of entrepreneurs (12.9%) did not show interest in having access to incentive lines. It can be noticed that firm owners - who should dedicate time to it just like they dedicate time to clients - do not consider the benefit of incentive, through programmes such as the R&D Tax Incentive, which is a fiscal incentive.

The open-ended field "other/specify" originated 12.9% of suggestions of state programmes, commercialisation and exportation, as well as feelings about the programmes and disbelief in the government: comments were, as written by respondents:

1. Accelerating Commercialisation, QLD State Grants; 2. Would not bother unless totally reformed to take into account available resources of start-ups; 3. The Entrepreneurs Program is hopeless & full of all the wrong organisations; I am not the person responsible for this within the company, so I am not able to speculate; 4. I'd love this information to be disseminated properly!; 5. Commercialisation Australia; 6. Too much bureaucracy, and therefore a waste of time. Also, I do not trust the government to choose who to give the grant to. Would only be interested in automatic self selection grants; 7. EMDG and; 8. Do not know enough about them to decide.

Respondents could choose more than one alternative.

Table 13 - Australia: Incentive programmes to apply in the future.

Please indicate on which incentive programmes you would be interested in applying in future.	Absolut Total	Relative Total
Not Interested	8	12.90%
Skilles Fund	16	25.81%
Entrepreneurs Program	34	54.84%
R&D Tax Incentives	35	56.45%
Private Funds	19	30.65%
Australian Research Council (ARC)	16	25.81%
Other (Please specify)	8	12.90%

Total	62

Source: The author, 2015.

5.3 SUMMARY OF THE CHAPTER

When it comes to firm owners' lack of knowledge about federal government's lines of incentive for innovation, both countries Brazil and Australia are similar.

Nevertheless, in Brazil the government uses trade associations to offer seminars on incentive lines; it is a way of being closer to firms and using only one interlocutor per region or even in the whole country.

Although the integration of trade associations and the Brazilian government may still improve, it is much greater to what happens in Australia these days. Since Brazil's population is 10 times as large as Australia's, it turns out that communicating its incentive programmes is a greater challenge; therefore, arrangements also need to be greater.

The Australian government's view is less paternalistic; it considers that it is the businessmen's duty to search for information. Therefore, entrepreneurs are prompted to search for info on the government's website, which is very well structured. Nevertheless, personal communication and relationship with the government is difficult.

As to public policies to offer incentives to innovative firms, Brazil is ahead, sharing the risk with the entrepreneur to develop innovative products and services. In Australia the most successful programme is the R&D Tax Incentive, which is a fiscal incentive programme.

In Brazil, federal public policies stimulate the integration between universities and companies, which involves calls for specific subventions to this end. It is an important way of integrating researchers and those who own the knowledge to innovate through operating firms. This integration is little in Australia, where the focus of universities and government is on the production of goods. There is little integration of universities and companies, which explains the low rates of adhesion to incentive programmes in connection with firms.

The surveys in both countries show that apart from creating public policies, governments must promote their use to guarantee the success of programmes, generating the economic development they mean to create.

In order to be more effective, the creation of these policies must reflect the companies' needs. This can be done together with trade associations – which are a means to reach firms and communicate the government's new programmes to them –, considering that one problem perceived in both countries through the surveys is the lack of knowledge of innovation incentive programmes.

An entrepreneur needs to learn how to find the most appropriate incentive line to their firm, to try to understand each incentive line and to benefit from these services.

CONTRIBUTION OF INCENTIVES SCHEMES TO FIRMS PERFORMANCE AND KNOWLEDGE ECONOMY

Structured interviews were carried out both in Brazil and Australia. The interviewees are people from the federal government (total of six), representatives of national trade associations (total of six), and entrepreneurs that were granted government incentive (one from each country).

The questions were based on the survey conducted with the companies, shown in the previous chapter. The same questions were asked both to government and association people, in order to obtain different points of view towards one single issue.

In order to validate the results:

Part of the interview consisted of a validation of the results of the survey conducted with the companies; the perception of both government and associations will be presented in this chapter.

In order to make interviewees more comfortable as to treat the themes more deeply, they were told that their identity would not be revealed.

In Brazil, interviewees were invited to participate through a relationship/social network, which made acceptance easier. Previous knowledge of who the key people are and of each institution’s role in developing the incentive for innovation contributed to the survey.

In Australia, searching the people with a suitable profile to be interviewed took longer since it depended on contact through LinkedIn or introductions promoted by the interviewees themselves. Of the seven interviewees in Australia, four agreed to participate through social network and three were introduced by a person who was contacted before. A number of invitations were turned down because this is a delicate issue in Australia.

One interview was done face to face while all the others were conducted via Skype or telephone due to the long distances and to the difficulty of setting an appointment. The people chosen for the interview were from different cities, both in Australia and in Brazil.

This chapter will present the standpoint of the government, trade associations and businessmen in Brazil and Australia. In order to better detail the issue, the aforementioned people's viewpoints will be displayed question by question.

The table below lists the questions posed to all government and association interviewees.

Frame 6 - Questions posed to the interviewees.

Q.1	What can be done to prepare a more effective innovation policy?
Q.2	How can firms' awareness be increased? And what can be done to promote the use of incentives by the firms?
Q.3	What are the most popular and the least popular programmes, and why?
Q.3.1	What can the government do to better integrate universities and companies in order to become more innovative?
Q.3.2	For Australia - Do you consider the EMDG as a programme supporting the innovation policy, and why?
Q.4	How do you interpret the reasons of unsuccessful applications and what can be done to help firms?
Q.5	How do you interpret the purpose of incentive use, which area in your view supports the innovation the most, and why?
Q.6	How do you interpret the potential of specific incentive programmes, and whether any of these programmes need further funding or support, and why? Are there any up coming plans to improve the innovation policy further?
Q.7	How do you evaluate the overall survey findings?
Q.8	Do you think the survey findings represent a correct and reliable picture of firms' perspective on innovation incentives?

Source: The author, 2015

5.4 FINDINGS FROM BRAZIL

After getting to know the Brazilian public policies, people from the government, of different national development institutions, were invited to take part in the interviews. Their viewpoints and suggestions for improvement to the Brazilian innovation system add great value to this thesis interview.

5.4.1 Brazilian government perspective

The professionals that contributed to this chapter by taking part in the interviews represent important national offices of incentive for innovation.

The selected people are decision makers and contribute to the development of public policies.

This is an anonymous interview, so the respondents' identity will not be revealed.

Frame 7 - Brazil: Government's Perspective – Interviewees.

Interviewee's position	Interviewee's identification by the answer
Coordinator – Innovation Policies	Interviewee 1
Science, Technology and Innovation Secretary	Interviewee 2
Chief of Department	Interviewee 3

Source: The author, 2015.

BRA.GOV.Q1. What can be done to prepare a more effective innovation policy?

Most of the interviewees agree on the issue that Brazil has good innovation policies, but they need to be me more perennial and not to change along with government changes. Additionally individual views of the interviewees are provided below.

Interviewee 1: The government needs to find a focus, generally speaking, regardless of the amount of public resources available, which will never be enough to assist everyone. However, if we set our focus on, say, IT, which is a transverse issue, it would take little effort to be successful.

Brazil has several funding agencies and all of them lack focus; we must prioritise some areas. The national policy defines some twelve

priority areas and we are not efficient in all these areas. He believes that we are doing fine, we are almost there. What we need is an innovation system that takes priorities, sets goals and that is able to reach these goals before changing the focus.

Interviewee 2: Brazil is going through hard times, let us not talk about it. Public policies have lost their credibility, but this is a circumstance.

One aspect concerns education. People must be ready for innovation-focused public policies. We are changing but we are still a long way from that. The concept today is to become a public servant, have stability; we do not educate people to become entrepreneurs and innovate. Brazilian education needs to incorporate entrepreneurialism, risk and innovation.

We must stimulate the educational process so that good students may find their own way. We are moving towards that but the process is still slow.

Public policies must be more transparent, perennial and objective, so that the businessmen can be more confident, so that businessmen realise that the government really wants to help. One example, businessmen are not confident about the Good Law. A thousand companies benefit from the Good Law today but there should be thousands of companies.

Brazil has good public policies; we have several mechanisms. The country is well supplied. However, for policies to be effective they need to be perennial, they must deliver unquestionable legal security.

The public power must be generous to attract innovative companies. After that, things can be tightened up a bit. We need to introduce public policies in a simple way.

Interviewee 3: In his opinion, the public policy for innovation must be perennial. We need mechanisms to prevent public policies from changing along the years. We need more continuity and predictability. Nowadays what we see is that the public policies created in the last ten years are being reversed. Not having public policy is bad, but changing what we already have is even worse.

Another important issue is the clarity of the rules; that is, what you can and what you cannot do. Some businessmen are afraid to benefit from the Good Law, because they start getting reviewed and audited. The Good Law does not help those who are investing in R&D; it only supports those who are already making money. In this case, this law does not help start-ups.

Public policies must be perennial, predictable and clear.

Brazil is very timid, we are very economical; we do not have aggressive policies of non-refundable funding and investment in companies.

The country is very big, public policies need to be techonology-driven; the system now is so broken up, and countering that would the best for the country.

Brazil has good innovation policies, but needs to me more perennial and do not change with government.

BRA.GOV.Q2. How can firms' awareness can be increased? And what can be done to promote the use of incentives by the firms?

The survey results show that half of the companies do not know the government's incentive lines for innovation. This question is meant to identify what can be done to help propagate these incentives and make them more effectively used. The transparency and simplicity of public policies is an important factor to make companies refer to these incentives. Individual views of the interviewees are provided below.

Interviewee 1: Notably, awareness is lacking. Companies do not know all the funding institutions, even offices such as the Ministry of Science, Technology and Innovation. Not even the government knows the programmes they develop. The problem lies on the side of those who are supplying funding as much as on the side of the companies, who are trying to reinvent the wheel.

The government must look for institutions that may congregate companies and share information. Information should be passed as a whole, working as a single country, and not only from a specific office. Events must be better coordinated so as to improve the information of what is available for each sort of company.

Interviewee 2: Brazil believes that innovation is important to make companies more competitive. Companies are suffocated with taxes, the "Brazil Cost", and Brazilian bureaucracy. Companies lack time and resources to plan innovation.

Today it is much more important for a Brazilian company to have a good administrative department and a good legal department to allow going through such uncertainties and difficulties. Companies realise that return is more efficient when they place their resources in these areas rather than innovation.

Companies are concerned with reducing costs. The government needs to make their share of effort, showing society that their struggling to provide more infrastructure and give society more support.

The companies that can live with frustrations are more prepared to invest in innovation. The government needs to favour companies that want to create new and different things. It doesn't make sense if the government supports traditional companies that do not invest in innovation on the premise that they generate jobs, such as the automotive industry, which little innovative.

One way of increasing the credibility of the government among innovative companies is giving them support.

About the Good Law, another example, the company's benefit only comes if it is profitable at the end of the year. An innovation process can not be checked every year, the period must be longer. If the company is placing its resources in R&D but it did not reach the market that year, consequently, there was no profit and so the company is penalised and does not get the incentives provided for in the Law. This should be different. The government does not provide support when the company needs it the most.

Promoting the use of incentives to the companies is very easy. The government promotes itself a lot. The government should use successful cases as example and promote the companies that stand out.

It is the government's role to open the market for Brazilian companies abroad.

One example of how to use Brazilian resources for innovation: in recent years, because President Dilma Rousseff's telephone was bugged, and since this has become a sovereignty issue, the government has stimulated IT and communication firms; Brazil organised a big event on communication security.

Next comes the need to be faster. When our president says she wants to meet with president Obama to discuss IT and telecommunication, she is promoting this sector, and little do we include Brazil in the international innovation agenda.

Innovation is done with a bold attitude and individual self-confidence. The individual needs to be brave and confident.

Technological development is made with information and knowledge. Scientific knowledge is very important. Brazil is good at scientific knowledge, however, little do our business sector use this knowledge.

Interviewee 3: This is done through relationship and advertising. The advantages and disadvantages of using programmes must be transparent. When the policy is steady, it is clearer for the entrepreneur.

BRA.GOV.Q3. What are the most popular and the least popular programmes, and why?

The speakers' statements show that long-term programmes are more effective and more popular. Calls for incentives are important, but they turn out to be too specific. Individual views of the interviewees are provided below.

Interviewee 1: In my opinion, the most popular programme – especially because I have see it in the media many times – is the BNDES card. I do not know if it is effective, but it always comes to mind. Another programme with a good reach was Startup Brasil. Again, I do not know how effective it is… the government working for small companies.

Some examples of the least popular programmes are Tecnova, which is a joint programme with the Research Support Foundations (Fundações de Amparo a Pesquisa – FAP), which is a subsidised resource; I have not seen anything about it in the media. The result has been good in some states, but very bad in some others. Employees change constantly at the FAPs, and their formal education level is not very high, so information is lost.

Inovacred is more popular now as it has grown a lot. The area of investment is not very popular, so people don't know about it, they don't know it exists.

Intervieweed 2: The most successful programmes are those that try to shorten the distances to generate good business. A recent example of an innovation development programme is the subsidies provided by BNDES and Finep. Embrapii is beginning and achieving success.

Brazil has not time to do with Embrapii what was done with Embrapa, that is, building its 47 units. Therefore, we are registering good scientific institutions and also Embrapii communities. The most important programme is the one that joins companies and scientific communities.

Finep is working with the Research Support Foundations, which know the regions and the companies.

The least popular programmes are those whose rules are not well set. The programmes the government subsidises with the aim to make the life of companies easier, but does not stimulate competitiveness. The

government's support is bad for the company in the medium- and long-term, because it does not stimulate innovation, neither does it help the company be more competitive.

Other less popular programmes are those that the government does not manage to meet the requirements mentioned before, such as legal security, transparency and simplicity.

Interviewee 3: Among the most popular, the Good Law and the IT Law get good comments. Credit for innovation.

The least popular are those small and limited calls; they are pointless. It is a very specific action and the generated results are not clearly shown.

BRA.GOV.Q.3.1 What can the government do to better integrate universities and companies in order to become more innovative?

Government members who were interviewed think that this issue is important, that Brazil possesses public policies for that, but that the country needs to advance. Universities must seek more joint projects and catch up with companies, since very often the duration of a project is not compatible with the innovation created. Individual views of the interviewees are provided below.

Interviewee 1: One of the things that slow down innovation in Brazil is that scholars think about science for science's sake and companies do not believe that this will suit them. The government should adopt the project's eligibility criteria; companies that are integrated with universities.

Tecnova boosts this integration between universities and companies. The problem is that we have little resource for this programme.

Interviewee 2: One concern is the issue of bureaucracy; the government supervises the process more rather than the product. The public polices should aim at the result. When there is too much normalisation involved, we all lose. We must focus on the result and provide the means through public policies so that it is possible.

It is necessary to simplify the processes; there is much to be improved. The government must analyse the rules and try to simplify them, and believe more in the relationships. One must not say how relationships must be defined, and processes must not be controlled.

Interviewee 3: This is a very difficult question. It is an attempt to join three very different cultures. This problem is all over the world. Bringing more professionalism to the universities, a business culture, a

culture or access to the market. Besides that, showing what a business culture is like at universities.

The government can set this goal for the universities: to build a relationship with companies. Today universities are assessed on the amount of publications they have.

BRA.GOV.Q4. How do you interpret the reasons of unsuccessful applications and what can be done to help firms?

In this question, the interviewer gave the interviewees some options, such as complex application process / bureaucracy; lack of information available; high cost in application preparation; inadequate / no incentive programme; application found irrelevant; lack of motivation and knowledge; lack of personnel to prepare the application and lack of required guarantees.

The interviewees' opinion is that the process should be simpler and less bureaucratic; that the government can also reduce the demand for collaterals from companies and be more willing to share the innovation-related risk.

Interviewee 1: Projects do not need to work. That is what innovation is like. To us a project does not have to be successful. The obligation of companies is to use the resources the best way, according to the project.

The success factors are associated with the company's capacity to reach the biggest number of variables possible, especially in the technical aspect. The most detailed this description in the project, the better the chances of success.

Bureaucracy is not a problem for the success of the project. The lack of access to resources for not having actual guarantees was the main issue. Unfortunately, we experience this situation of lack of confidence; it is part of our culture. In Brazil the company has to prove to be 130% capable of lending money whereas in other countries there is more trust. This is a structural problem, though. In the IT area it is way more complicated.

Interviewee 2: These points that were made are really relevant. We make things very bureaucratic and very complex. We should be simple, we should leave complexity to the technological challenge. When we go simple, information comes more easily because interpretation and legal security are made easier.

The country has a great variety of public policies; I would focus on improving these public policies, considering that they are already well-known.

Lack of personnel is a critical factor; it is associated with productivity, which is low, because of the education system. The interlocutor, many times, is underskilled, not that this is his fault, but rather because he lacks formal education. We are talking about lacking skills and talents that were discovered in some people.

About actual guarantees, in my opinion the government did not have to ask for such thing.

Interviewee 3: What I consider the most important is not on the list. Most applications are turned down because they are way too ambitious. Projects are underdetailed as we lack people who are able to prepare projects.

If the company is healthy, then the actual guarantee can be waived, but you can't run too many risks.

BRA.GOV.Q5. How do you interpret the purpose of incentive use, which area in your view supports the innovation the most, and why?

Question 5 is meant to understand what the government and associations think that firms need. If the government will design a new policy, then what do they think will be necessary to the companies. In this question the interviewer gave interviewees some options, such as Marketing, Sales, Fairs; Research and Development (R&D); Working Capital; Machinery and equipment; Internationalisation and Infrastructure.

About the support to research and development, all interviewees agree that every aspect is important and must get support; however, others consider that the market-related areas must be on the companies, as can be seen below:

Interviewee 1: Research and Development; this is what we realise makes a difference in the company. We do not invest in infrastructure.

We support marketing, sales and fairs and accessories. However, we consider them accessories. The project core must be aligned with the research and development of products and new processes that will generate innovation. We do not support working capital.

Interviewee 2: The fundamental things are those linked to research and development, machinery and equipment. However, in my opinion, all the items mentioned are important. The government should

focus on the final question. However, when you have a good product, the company will eventually succeed.

The most important is the capacity to generate an innovative product and this is only possible if people invest in research and development. I repeat, I believe they are all important, but first and foremost the focus should be on R&D.

I support the incentives to purchase machinery and equipment; they actually make products come to life.

The incentive must be open for companies to organise themselves. The companies need to be ready for R&D and our government gives them this kind of support. The government support for purchasing machinery and equipment must be associated with R&D.

Interviewee 3: All areas are important, it is important that all of them get support, including the generation of the idea and the generation of the product and making the market. It all starts at R&D, but it comprises machinery and equipment, working capital, etc.

Innovation is only worth it if it makes the market; it is important to support it all. Internationalisation presents a high market risk, and then this makes him a bit reluctant about it.

BRA.GOV.Q6. How do you interpret the potential of specific incentive programmes, and whether any of these programmes need further funding or support, and why?

The interviewees believe the country is very big and that priority areas must get special treatment. They also agree that the country has good public policies for innovation. The system must be fed with more financial resources for science, technology and innovation. Brazil invests less of its GDP in ST&I than other countries of similar size. Individual views of the interviewees are provided below.

Interviewee 1: Back to the first question, we need to identify the priority policy, then the country could make a difference in some sectors. The Inova Brasil programme, launched by the president in March 2013 aimed to integrate institutions and programmes of a specific sector.

In fact no programme was integrated, we ended up assisting companies individually, working together with BNDES at the public calls, but after that, each institution took their project and ran it independently, just like other programmes. The new thing was working together. In order to achieve bigger gain, we should integrate

programmes and funding sources more and analyse the results later. Little do we measure the impact of these programmes on society.

Resources are not enough; demand is always bigger than supply. At Finep and in Brazil, there is a difference in the allocation of resources to innovation. The interesting thing is that the public sector in Brazil puts in more resources for innovation than the private sector. There is no movement to improve the innovation policies in Brazil.

Interviewee 2: Brazil is a vast and very populated country and its economy is strong. It needs to expand the reach and we have to irrigate the system; we need to amplify our actions; we need to work in many areas, to act in several areas. The country has many different interests.

Brazil needs to increase the amount of resources it puts in R&D and make companies put in more resources in R&D as well. Brazil must stimulate the private sector to invest more in R&D, and this is done through incentives, by stimulating companies to invest in R&D.

The innovation policy in Brazil must be broadened and transverse. The Brazilian innovation system is very good, such as the scientific initiation programme. The country needs to increase the scale and more resources in the system.

Interviewee 3: These Brazilian programmes were designed out of good intentions. Their potential depends on how much time and resources will be put in the programmes.

We always have many plans for the new innovation policies. We manage to be more agile when it only depends on ourselves. However, when we need stakeholders, many times we can't manage to make it happen. These interrelationships with stakeholders are more difficult and we need local agents.

We need to develop suitable incentive mechanisms so that the other end (the regional partner) can realise the political reason. We work with motivating the development and the regional partner at times is not only seeking development. We need to align goals and the partner needs to realise what he will get out of it.

BRA.GOV.Q7. How do you evaluate the overall survey findings?

This question aimed to assess the interviewee's opinion about the survey that was responded by the companies, in order to validate the results and the survey itself.

Interviewee 1: The interviewee commented about each survey question as below:

Survey Question 1 – Many people don't know about development sources. Communication is only valid when you publish the news and the receiver responds. Eventually we are not effective; we do publish the news, but we're not effective.

Survey Question 2 – This is very bad. Wow!

Survey Question 3 – I am glad Finep comes ahead. That is impressive, I like it!

Survey Question 4 – I agree, I guess this is it. Really, information needs to reach the client; businessmen also need to know how to seek information. And we need to make sure we are understood; we need to communicate better.

Survey Question 5 – This is the weak spot: communication and information.

Survey Question 6 – This is cool; this survey is very good.

Interviewee 2: I am surprised at the result of the first question. This is a very high number. It is really strange and surprising.

About question two, these numbers are bad. Long process, and this is very bad and unacceptable. Interesting as I have tried and never managed to get it. This is very interesting. This survey is important to improve public policies. I am surprised that there is no need to buy machinery and equipment. It seems that the company wants to use a broader resource, because the company must have a marketing and sales policy. I guess this is not associated with innovation; that must be a natural process. From what I gather, this is a company problem, and not the fact that they have an innovation-focused product. I do not agree with this. The company must focus on marketing and sales. This is a company role, not the government's.

About Survey Question 5, I like what I see. It is well balanced.

I guess Survey Question 6 is OK. I like to see these results.

Interviewee 3: The results are bad. The lack of knowledge is amazing. The process is really complex. To make the process simpler, a lot would have to be changed, starting with audits. Since we are responsible for individuals, it turns out we are less attracted to risk. It turns out that companies are less reactive; they would rather just wait.

BRA.GOV.Q8. Do you think the survey findings represent a correct and reliable picture of firms' perspective on innovation incentives?

This question is meant to learn the government's viewpoint and validate the results to the survey sent out to companies, as shown below.

Interviewee 1: Yes, it does. I really like the survey and the interview. The need for capital is evident in this survey; that doesn't show at Pintec.

Interviewee 2: I can not fight the facts or reality but I am surprised, especially at number 1 and the lack of knowledge on the side of companies.

Good survey. It can help public policies, especially the results to question 3 for businessmen show the reasons why they did not take resources. Amazing.

Congratulations on your survey. The country needs people who are willing to do studies as yours that will add to public policies.

Interviewee 3: Yes, indeed. I don't see anything here that isn't true.

5.4.2 Brazilian associations perspective

The interviewees that contributed to this chapter are people who do or did represent national trade associations, two of whom are also businessmen. All institutions are private; however, they are active with the public area by demanding policies, legislation and other needs.

This is an anonymous interview, so the respondents' identity will not be revealed.

Frame 8 - Brazil: Association's Perspective – Interviewees.

Interviewee's position	Interviewee's identification by the answer
Vice President at a National Software Association	Interviewee 4
President at National TIC Association	Interviewee 5
President at a Venture Capitalist Group	Interviewee 6

Source: The author, 2015.

BRA.ASS.Q1. What can be done to prepare a more effective innovation policy?

This question is meant to understand what can be improved in Brazil's public policies. What stands out from the responses below is the suggestion to decentralise, incentivise companies through incubators, foundations and universities, so that resources are closer to institutions

that communicate with each other and know the companies in their regions. Individual views of the interviewees are provided below.

Interviewee 4: The country needs be less bureaucratic, design simpler programmes and processes, which includes opening a company. The government must be ready for most of the innovative projects to go wrong; this must be part of the investment cost in innovative companies.

Interest rates are very high and financial companies earn a lot of money – in other countries they do not make that much – and this must change in Brazil.

Interviewee 5: For public policies to be more effective, they need to be better communicated. Companies do not know everything they are entitled to, both in the national and state level.

Brazil is very inclined towards industries; policies are directed that way. Policies should be more directed to software. We barely have public policies for services. The government is not familiar with software and services.

This unbalance stalls the administrative process for the evaluation of software and service projects. The government needs to move faster and reduce bureaucracy. The assessment of projects and programmes should be more economy-related than procedural.

I don't think there is an entrepreneurial bias in innovation projects because the public administrator is not trained for that. There is a serious communication gap when it comes to the use of resources and the administrative part of a project, which turns out to be very costly.

Interviewee 6: Public policies cannot be so contaminated by short-term political interests.

Not even the government, which has participated in investment funds and made a lot of money from that, showed support to a new long-term investment fund. They seek the short-term political impact. Today we only have bigger investment funds and we don't work with small companies because we lack government support.

The country has a regulation platform, the tax platform can be improved a bit, but this is not a problem. There is something else that can be done for the innovation-focused public policies to be more effective: they cannot be in the hands of politicians that are thinking about the next election; they must be given back to technical staff that know about it, so they can develop long-term policies.

Brazil has a lot of talents among its technical body, in the incubators, in foundations, people who are into this universe. What must be done is give these talents more autonomy, not subordinate these

people to public entities managed by politicians. In the case of Brazil, we have seen progress in the last 15-20 years; we have been able to show that the government profits from that and that it is worth investing in companies. However, in my opinion, this won't work while entities that can incentivise innovation are associated with political movements and groups that are looking forward to the next election.

More autonomy and capital must be driven to the private-academic interaction. More money has to be given to foundations, to the national office that promotes incubators. It is necessary to select incubators that develop their skills well and then give them more autonomy.

The political power is destroying Brazil's innovation system. A new Minister of Science & Technology has been chosen; however, there was no discussion on the skills needed for this position, on his ideas for the sector. Nothing was discussed. What counted was his political party, his ministry's budget and if he will be able to rake in the votes of congressmen to approve whatever the government wants to. Technology, health and education have become budgets to be negotiated through politics in Brasília (the capital of Brazil). This didn't use to happen 15 years ago. Brazil has to give it back to scientists, educators and those who incentivise technology and innovation. Existing public policies that work won't be effective this way.

The new ministry of science and technology has stated in one interview that he will read about the Innovation Law. This law was exhaustively discussed by incubators, the academia, the government and investment funds. The new ministry does not know the latest law concerning innovation in the country, which is preposterous. The policies already exist, but they are being neutralised by politics.

BRA.ASS.Q2. How can firms' awareness can be increased? And what can be done to promote the use of incentives by the firms?

The survey shows that many companies are not aware of the government's incentive lines for innovation. This question is meant to identify what can be done to help propagate these incentives and make them more effectively used.

The interviewees think that this is a problem in small companies; it is not typical of big companies. They think bigger companies are aware of the incentives for innovation. One way of improving the use of these incentives is to show cases of success and transform companies

into innovative cells, to decentralise and be closer to small companies. Individual opinions are shown in detail below:

Interviewee 4: I don't think it's a marketing case. One good idea is to promote simple cases of success of incentive programmes, and also discuss cases that were not successful.

Small companies know they are entitled to some incentive, but do not claim them. Big companies have a specific department for that. Cases of success will be propagated by word of mouth. Today word of mouth goes the opposite way: businessmen say the process is long and bureaucratic and that it's not worth claiming these funds.

I don't like the crowd-funding system very much. It is now becoming a bit more bureaucratic; it didn't use to be quite so.

Interviewee 5: There must be communication. The government must “sell” its programmes. Companies also must seek for the available opportunities. This problem doesn't exist in big companies because they are aware of the incentive programmes for innovation.

Interviewee 6: I think companies are highly aware; I don't think there is an awareness gap. So, increasing awareness shouldn't be a priority. What happens is that companies lack of resources. In the current situation, for one reason or another, the tax and labour burden on companies that make investment in innovation a slippery ground. Today, companies' profits are taken by tax and labour cost; companies' cash flows are robbed by ancient tax schemes that do not incentivise investment. Awareness is not lacking.

The country must adopt tax flexibility so that investment in innovation can catalyse cash flow and not the other way around. In other countries you can deduct twice as much of what was spent in innovation from your tax return. In Brazil it is the opposite: companies are discouraged to invest. Today companies do not have exceeding resources and when they do, it is better to seek an international partner and develop abroad and then bring innovation into the local market. Awareness is not the issue.

To incentivise companies to use these benefits, the country needs to release the resources from the beginning in order to free companies' cash flow. Today we are going the opposite way, for the government wants to raise taxes. In the last 15 years, Brazil has used a model in which the government invests and companies don't, unlike countries such as the UK, the USA, in which companies are the cell where investment originates. In Brazil's current policy, the government will be the incentiviser while the model remains as it is, that is: the company

pays taxes for the government to invest. Nothing can be done to make innovation come from companies. The government has other problems as those I've mentioned, such as deadlines, elections, etc. I'm not even talking about corruption; this is not my point. Much before I knew what corruption does, I knew the system was infeasible.

The best example of innovation agent is Korea. They are able to create innovation in mature industries such as the car industry, which shook up the German car industry, for they use companies as innovation cells.

The Brazilian model uses companies as cells to collect money and then the government invests in innovation. In my opinion, this model doesn't work; it is archaic and far from intelligent. In our current model there is no room for companies to invest in innovation.

BRA.ASS.Q3. What are the most popular and the least popular programmes, and why?

One of the interviewees sounded more pessimistic and the other saw the big picture, as an ecosystem.

The innovation system was discussed, such as incentive laws and the national programme for supporting incubators and technology parks. Consideration was given to what is currently working and what is not doing fine in the country, and to the contributions of this study. The individual responses are below.

Interviewee 4: In my opinion there is no popular programme.

Interviewee 5: I think that the Tax Incentive Law, the Good Law and the BNDES Programme – Prosoft – are well known.

The Embrapii is unknown, for it is a new one.

Interviewee 6: In my opinion this is all an ecosystem. We need more public and private initiatives, venture capital movements, entrepreneurship clusters, an interface with the academia and universities on one end and with the capital market on the other end. The ecosystem can only work properly when all the links are minimally functional. The Brazilian system has been massacred in the last years.

The Anprotec incubator system is a winner to me. The concept of entrepreneurial university – as a place generating new company cells – already exists and I trust it. Another existing link – that must be strengthened, though – is the Bovespa Mais, which is the interface with the capital market.

The Inovar is an intermediate programme, because it lasts longer than an election term. Then, short-term interests annihilate the programme.

The most efficacious programmes are in the Anprotec system, with incubators and technology parks; the Inovar programme, which bridges the gap between capital market studies of Bovespa Mais and Venture Capital, Seed Capital and Angel Capital, provided they are free from the political interest in the next election. These programmes are good enough. I would add the Innovation Law, which nobody cares about, for there is no political advantage. These programmes must be more integrated; there must be more financial resources to that.

The Brazilian government has been directing less money to that. Today, the government picks big companies in which to invest. This is the wrong thing to do. We don't need to create many new things.

BRA.ASS.Q.3.1 What can the government do to better integrate universities and companies in order to become more innovative?

For the associations, there is a timing gap between companies and universities. Deadlines are incompatible with the deadlines of companies and of the market. Universities need more autonomy and resources to work with companies. Individual views of the interviewees are provided below.

Interviewee 4: Universities have to promote innovation at companies. The problem today lies in universities, which do not supply what companies need and when they do it is very complicated, very bureaucratic and very expensive.

Universities must be humble and ask the industry what it needs. Today universities work through foundations; it is a way to better pay professors. These foundations are the mechanism they use to financially motivate professors. These foundations move in sync with the academia and not with companies; their price is high, too. My experience as a businessman with a foundation was not good; high cost and a long development time.

Finep does not support research for research's sake, either; it does not want to run the risk.

Interviewee 5: This problem is very big and complex. We have two big problems, the formation of human capital according to the interests of the industry and the university-company integration.

This model of investment programmes to generate technology through ICTs and support foundations is a bit strange. This is because

universities are far from the companies, while institutes turn out to be more integrated.

Basic research lacks rhythm. Few programmes in basic research are aligned with the future demands of the market. Innovation in Brazil is directed to software and service.

Interviewee 6: Results stimulate results. The government can step away. It must provide money to universities and free the cash flow for companies to be more innovative. The government must allow universities, companies and incubators to work, by providing resources, but not operationalise them. In other reference countries, the presence of the government is not noticed.

BRA.ASS.Q4. How do you interpret the reasons of unsuccessful applications and what can be done to help firms?

In this question, the interviewer gave the interviewees some options, such as complex application process / bureaucracy; lack of information available; high cost in application preparation; inadequate / no incentive programme; application found irrelevant; lack of motivation and knowledge; lack of personnel to prepare the application and lack of required guarantees.

The interviewees' opinion is that all listed items are causes of failure, including the lack of speed of incentive offices, which is not listed above.

In a broader view, the development framework is wrong. The system needs to be decentralised for these programmes' resources to be closer to companies. Entities could be more proactive and less bureaucratic. The problems that were mentioned are a consequence of the existing framework. Individual responses are presented below.

Interviewee 4: Lack of collaterals is number one for small ICT companies.

If the government wants to do something, it must be aware that many projects will fail. In addition, it cannot blame the failing businessman; failure must be understood as a lesson learnt.

In my opinion, the most serious problems have been mentioned. Complex process, much bureaucracy, lack of information, high cost of project preparation, inadequate programme, lack of motivation and knowledge, lack of personnel to prepare projects. I would add lack of speed on the part of development offices.

Interviewee 5: In my opinion, the first three apply: I think BNDES is an inadequate programme for they only serve big companies;

lack of personnel. It is a little of everything, but all of them are reasons. Small companies depend greatly on making their business viable; they need bigger, fast, quick support. They need programmes with these characteristics, such as the angel investors in the USA.

Private investors know that only one company out of 10 that got investments will actually make it. Public administrators do not show such a vocation, they are not trained and they don't have such a reach. Public administrators are accountable as individuals, and this is a big obstacle in my opinion.

Interviewee 6: The model is all wrong. All companies in Brazil must refer to the BNDES in Rio De Janeiro. The process will be naturally bureaucratic. Funding money should be decentralised down the chain; the money should be available locally, through foundations, incubators, universities etc. There should be mechanisms for the cash to be able to flow down to the end, then you can lose all the bureaucratic processes.

Today the government collects and makes its choices, and to make choices it has to be bureaucratic, because it centralises it all. An office that centralises it all will always create bureaucracy. Then, of course that some people will not work properly, perhaps some people will deviate the money. It could start as a dropper and then raise the ticket to those who do it well and then comes natural selection. I don't believe that a centralised government does it always right. The BNDES shouldn't be funding companies directly, it should be funding local programmes.

Even the BNDES as a funding agent is a bureaucracy-making agent. Many times it kills companies; the bank condemns companies to never-ending bureaucracy. It would be better to draw the funds away from the BNDES and closer to companies. The flow must be decentralised for it to work.

When you have an innovative model aligned with a bureaucratic process where the interests are not aligned, in the case of a BNDES investment fund, the civil servant will not be accountable for the success or failure of a programme.

Today, complaints are about the working mechanisms, but it's the framework that is actually wrong.

BRA.ASS.Q5. How do you interpret the purpose of incentive use, which area in your view supports the innovation the most, and why?

This question is meant to understand what the government and associations think that firms need. In this question the interviewer gave interviewees some options, such as Marketing, Sales, Fairs; Research and Development (R&D); Working Capital; Machinery and equipment; Internationalisation and Infrastructure.

Interviewees think all aspects are important. Projects must be assessed case by case. Some interviewees demonstrated the importance of funding for products/services to make it to the market. For having a perspective of big companies, another interviewee shows the importance of funding for internationalisation, focus on the international market, as below:

Interviewee 4: In my opinion, companies need working capital and resources for the commercial area, because businessmen of the technology sector are good at developing products but they have a hard time selling them. The commercial area is the one that needs the most support. The government can also offer support to companies through tutoring, with qualified professionals. Counselling to those who are starting is very important. The government should offer more support to accelerators and incubators, always based on merit.

The government must support the entrepreneur and invest in the company, even if the company does not make money yet. The government must know that many companies will close down. In case the company/product fails, it is important that the government not take that businessman as a loser, which is what happens these days.

Interviewee 5: Since we're talking about innovation programmes, this is very connected to the development of products and services. Marketing, sales and fairs shouldn't get support.

Machinery and equipment... I believe this is more connected to modernising companies. The funding mechanisms for machinery and equipment must be improved. Machinery and equipment for infrastructure, such as optical fibre, semiconductors, pharmaceutical equipment must be funded by the government. Especially for IT: networks, cloud computing and data centres.

It is very important to support programmes for internationalisation; this includes marketing and sales, and go-to-market for companies to have bigger chance of success.

Interviewee 6: Brazil is very different; it is difficult to make choices. Choices should be made considering the programmes, to begin as tests.

All listed items are important; they have to be evaluated case by case.

Research and development are important, all these are necessary. Every project will have to show its needs. Development on its own is not enough, the product needs to make the market.

BRA.ASS.Q6. How do you interpret the potential of specific incentive programmes, and whether any of these programmes need further funding or support, and why?

An important point made by one of the interviewees is that the country already possesses good incentive programs; that these existing programs need to be decentralised and scaled up with more resources. Individual answers are listed below.

Interviewee 4: The government must offer more support to programmes towards small and medium-sized companies, which are the ones that hire the most people.

Interviewee 5: We need more financing and support, but I can not be very precise. I guess the country must be careful about the violation of landmark rulings.

Interviewee 6: Brazil has good programmes but it can not scale them up. We usually stop halfway "there".

It is not necessary to create more programmes; the existing ones need to be scaled up; the local agents that are more successful must be strengthened, generating natural selection.

The innovation poles must have financial autonomy, with long-term resources, and they need be supervised every 2 or 3 years. I believe that decentralising and scaling up are key words to this issue.

BRA.ASS.Q7. How do you evaluate the overall survey findings?

This question was meant to assess the interviewee's opinion about the survey that was responded by the companies, in order to validate the results and the survey itself.

Interviewee 4: It is common to achieve innovation and not manage to sell it.

This financial support must set a tolerant due date. Cases such as Facebook, Google and WhatsApp would never have existed in Brazil. Note that until now WhatsApp, acquired by Facebook in October for more than U$ 20 bi, still has no revenues (revenue was U$ 10 mi in Oct 2014).

Interviewee 5: Abes has a large number of associates; many companies may not have a focus on innovation. The results to a survey conducted by Abes must be more reliable than the reality of the country.

Survey Question 1 - I cannot evaluate the answer to this question.

Survey Question 2 - Lack of awareness is the major problem to incentive programmes for innovation. The other problems are process-related, bureaucracy.

Survey Question 3 – It is all a process problem. There is too much administration, not really bureaucracy. The Brazilian state is very directive in what it does.

Survey Question 4 - I guess these questions are aligned with the profile of Abes associates. They are smaller software companies that don't use infrastructure. Internationalisation is for bigger companies. Working capital is more for private investors, unless the Brazilian government has a risk-driven credit line.

Survey Question 5 – The survey is what it is. We have to acknowledge the demand and seek what can be done to improve.

Interviewee 6: Survey Question 1 – In my opinion the centralised framework leads to this, to lack of knowledge on the part of companies; incentive offices are away from businessmen. It is a centralising policy.

Survey Question 2 – I don't believe in innovation centralised in CNPq, BNDES and Finep; the effect will be erratic. If information is not passed on, the money won't, either. You have to motivate the whole chain a lot.

What do banks know about innovation? I don't think that innovation money must go through a bank. Banks think about credit, risks, collaterals, and all this goes the opposite way of innovation. An innovative project does not have a predictable cash flow.

Information is not passed on, and when it does it is hard to be used. The model is wrong.

Survey Question 3 – This money is lent as a credit agent. You also must consider that at times companies are not so good. The programme must be demanding and for just a few, really. People must seek qualification to grow. It is natural that it is selective, limited and that only a few can achieve it. But this must be done through an innovation filter and not by bureaucracy.

Survey Question 4 – This money must be hard to get, otherwise bad people will use it. There must be resources for the people to design

a project, with more consistent projects. I'm not surprised at the responses.

Survey Question 5 – I'm not surprised. I see that the sample is made of starting companies; they are after seed capital. They are not in the execution phase.

It is natural for a company that already has a product to use these resources to scale up the product before a new product is launched.

Survey Question 6 – I have no comment about it.

BRA.ASS.Q8. Do you think the survey findings represent a correct and reliable picture of firms' perspective on innovation incentives?

This question is meant to validate the results to the survey conducted with Brazilian companies from the interviewees' point of view. Their answers are below.

Interviewee 4: Yes, I believe this survey represents the reality at companies.

Interviewee 5: The survey is very well designed and well stratified. One way to improve it would be set up a filter for the results to be listed on the size of company – small, medium and big – to guide public policies.

Interviewee 6: I'm not surprised at these results. They reflect the model we have today.

Those who lend the money do not understand much about innovation. They are credit-oriented. Programmes are way too centralised with little incentive to innovation. At times a businessman that is more innovative does not get the resources and another one who is more of a bureaucrat and fills up spreadsheets as desired gets the money. In the system, we have businessmen who are not innovative at all, but they specialise in raising money.

Programmes are way to centralised and offer little incentive to innovation.

5.4.3 Brazilian entrepreneur perspective

The entrepreneur is chosen to be interviewed are the ones that works in the technology sector and knows a lot about incentive lines for innovation. His company went through an incubation process, achieved funding to be developed and was funded by the government many times. The company has raised 6 million reais in 11 years of existence. It has 12 employees and grosses 2 million Reais a year.

The company also makes use of tax incentive through laws and has nearly a 15% discount off taxes through PPB and ICMS benefits. The company has a high administrative cost to cope with projects' steps and tax benefit procedures.

Question 1: What can be done to prepare a more effective innovation policy?

Using the Florianópolis model, we have been given support for entrepreneurship since college. It's been 30 years since universities first associated with the market through incubators. The company was set up through cheaper government financial support.

When I graduated from university, the structure for entrepreneurship was ready. I got a lot of information, tax benefits, which makes a lot of difference. Getting grants on your curriculum and a project is awesome for developing companies. Refundable money is important, however, it requires collateral, which makes it difficult for starting companies.

How can you convince someone to be an entrepreneur? Nowadays the government policy crushes the entrepreneur; the government goes against entrepreneurship when the supply is high and offers stability to professionals.

There should be a government policy funding innovative entrepreneurship. I was given the Empretec from the Sebrae, Santa Cataina State which is an entrepreneurship-focused training. That makes all the difference.

Today there's a big gap separating calls from common people. Some type of connection is missing of how to make companies benefit from incentive resources.

These days, there is a government policy focused on energy; policies have a goal and this is essential; public policies must have a focus. Today we talk to those who understand the issue and manage the money. I believe that the other areas should also be like that.

Question 2: How can firm’s awareness be increased? And what can be done to promote the use of incentives by the firms?

I always question this information. I've been to one event that was more of a limited communication; however information was lacking. Today, because I am in one association, I end up getting informed about resources, but were I not in one trade association, the company would miss out on such information.

There are different levels of information. The programme, the programme's benefits, and the rules. Many times it is difficult to understand and also know how to meet all the requisites; it is multilayered.

Incentive cash is very expensive, from the beginning of the project up to the accountability phase.

Question 3: What are the most popular and the least popular programmes, and why?

What can the government do to better integrate universities and companies in order to become more innovative?

The university is closed around the people who are there and it needs to be renewed. Professors have businessmen for thieves, as if they were going to steal projects from the labs and take them to the market. At UFSC, mechanical engineering is market-driven. I've seen many companies be created at universities and be criticised. The mixture is complicated, but you can't say it is bad.

Aneel – Brazilian Electricity Regulatory Agency – is giving support to basic research, applied research and experimental development; however, it noticed that this did not generate a product to the market. Then Aneel started to give support to the *Cabeça de Série, Lote Pioneiro* and *Produto Para o Mercado* programmes [Top of the Series, Pioneer Lot and Product to the Market, respectively, in free translation], but this is recent. The biggest volume of resources was invested in the initial phases. The problem is with technology transfer. I don't think it is the role of the researcher to industrialise the project.

Something similar is happening to a project we have started. The professor sought us for us to industrialise a product he researched and a technology he developed. This is highly innovative. In this case, the professor will have the right to intellectual proprietorship and we are also defining the royalties to those who worked in the research.

The researcher does not see the distance between having the technology and making the product reach the market. For the product to make the market, the relation between basic research and the product reaching the market is 20 times as much; this is what Aneel considers.

Because resources are more scarce, researchers are now seeking for companies more to keep their projects going.

Question 4: How do you interpret the reasons of unsuccessful applications and what can be done to help firms?

In this question, the interviewer gave the interviewees some options, such as complex application process / bureaucracy; lack of information available; high cost in application preparation; inadequate / no incentive programme; application found irrelevant; lack of motivation and knowledge; lack of personnel to prepare the application and lack of required guarantees**.**

The company has been granted 16 incentive projects; this year we have made our best project in the sense of technology, of how to see the market and also for better understanding the problem the company is set to solve. Today we have a working method to raise resources; we look for the sources and partners according to our strategic planning.

We apply the PDP process – Product Development Process –, which I studied in my Doctoral studies. One person in the company also studied PDP in his Master's studies. We have published a paper on the methodology of development of Anprotec projects. The project has grown stronger with this methodology, for it involves understanding the market. Because we had the methodology our project turned out to be the best.

It is necessary to know how to raise resources. It is necessary to understand what calls are interesting to the company. The company needs to know the state-of-the-art of the area it is in and take a stand. Who can incentivise this project? In the case of our company today it is Aneel that offers incentive to the energy sector.

After raising the money, the next step is knowing how to execute the project.

Execution includes project management and product management. Consultants design projects, but they don't have the application perspective. Methodology and product development also must be written down.

When there's incentive, accountability costs money. I know businessmen who had to return resources for they did not spend the money according to the project. Today our company can participate in projects, without the risk of being turned down because we have mastered the method.

Raising the money, executing the project and accountability must be aligned; the company will run a risk in the project. Eventually, the product makes the market, which is important for the company as a business. In my opinion all this process – raising, executing, accountability and taking the product to the market – needs a method.

I think the government is transparent when it comes to calls; you can't get funding through networking. I share the idea that big companies have some advantages.

In our company's current situation, being able to raise money from Aneel, this relationship is important, like the process of selling a product. You have to go down the technical and the political path, but it is a very interesting process; it is open to all. Your project must be aligned with Aneel's. You need to have good projects and the network; they both go hand in hand. Our company never achieved a Finep project; I never understood their criteria. CNPQ is very transparent; we got resources when we were very small, we were just starting. For Fapesc, however, networking is important; many people say that. These comments concern the past government.

All the items you listed in this question are an issue. However, I believe that this type of resource cannot be too free. When you use the financial resources of the company, there is a gain concerning due dates, agility in the process. It is difficult to use public resources and reduce bureaucracy.

Question 5: How do you interpret the purpose of incentive use, which area in your view support the innovation most, and why?

This question is meant to understand what the government and associations think that firms need. In this question the interviewer gave interviewees some options, such as Marketing, Sales, Fairs; Research and Development (R&D); Working Capital; Machinery and equipment; Internationalisation and Infrastructure.

They're all important. I'll talk about the area I'm in. Everybody's talking about crisis, but in the energy area there is money left. I don't see a crisis. Perhaps we need fewer rules, more tolerance in the projects. Last year Aneel turned down 50% of the projects and companies had to cope with that.

5.4.4 Brazil interviews summary

Brazil is the seventh economy and the fifth largest country in the world. The country's population adds up to over 200 million. Due to its diversity, large size and population, it is necessary to focus more on priority policies and government programmes for developing and supporting innovation. Resources are scarce and the themes are extensive. Today, the country invests less than 1% of its GDP in

innovation, which is not enough to equally cover all important areas for economic development.

The Brazilian government believes in the importance of innovation to generate competitiveness; however, resources must be amplified significantly. The country must focus more on education in order to teach people about entrepreneurship, how to be innovative and more willing to take up risks.

By incentivising innovative entrepreneurship the country is sharing the risk with entrepreneurs. However, the government thinks that the country can do more, because so far this has been a timid movement. In the government person's viewpoint, the demand for collateral from companies can be reduced, therefore, making the access to credit for smaller companies easier.

Public policies and government programmes must be long-lasting, simpler, transparent and objective. The relationship between government, companies and universities could use more confidence.

The promotion of incentive programmes for innovation may be done through success cases, which can demonstrate the importance of incentive to company growth. Today the government boasts a lot about its deeds. Another way of promoting and better propagating the current lines could be by better integrating the incentive offices, such as Finep, CNPq and BNDES, showing what is available to each company niche.

The government considers the incentive through subvention calls a momentary action of low impact. The country must seek more long-lasting programmes so they can be more popular. Today entrepreneurs are concerned: the programmes need to be designed with longer deadlines than four years; therefore, with a more technical than political bias.

Long-term programmes are the most popular ones. Short-term programmes do not have the reach and promotion time necessary for companies to adhere. Among the incentive forms of the Brazilian system, it may be said that Brazil supports the university-company relationship through public calls; however, interviewees consider that the academia must catch up with companies' speed; the academic time is not aligned with deadlines and technological innovations, which makes integration for the generation of innovative development decline.

Another form of incentivising small companies and start-ups is through incubation, which has been pointed out as a success system. Incubators have potential to be more autonomous in the process of picking companies and lending resources to the incubated companies.

The selection process of incubators must be done on merit and results must be measured every two years.

Tax incentive was a recurrent topic in the interviewees' responses, which demonstrates it is a good incentive option. However, companies do not use it as much as they could. Legislation is flawed but it can be mended. In addition, tax incentive has been pointed out as a way to free companies' cash flow so they can invest more in innovation. Today, big companies end up finding international partners and developing abroad at a lower cost.

Finally, Brazil must decentralise incentives for innovation and work with incubators and regional trade associations. One of the interviewees considers that the centralised system is wrong and must be changed. In case the country chooses to work in a decentralised way with regional partners, the cost of the government's bureaucracy in each programme tends to drop, and regional associations and institutes would be more autonomous and recognised.

5.5 FINDINGS FROM AUSTRALIA

Australia needs to improve its mechanisms to promote innovation. Today the country loses entrepreneurs to other OECD member countries, which attract entrepreneurs and bright minds. The government needs to share the innovation risk with the innovative businessman, who is an agent of economic development (SCHUMPETER, 1982).

This survey aims to assist Australia’s innovation system. Strong and weak points of innovation-oriented public policies will be appointed.

5.5.1 Australian government perspective

The selected people are decision makers who know a lot about innovation-oriented public policies. They agreed to contribute to this study; they reckon the country has a great potential and needs to change in order not to lose global competitiveness.

The government must be more open to work in association with partners and to discuss a new innovation agenda.

The table below demonstrates the profile of the government professional who were invited to participate in the interviews.

This is an anonymous interview, so names will be kept secret.

Frame 9 - Australia: Government Perspective – Interviews.

Interviewee's position	Interviewee's identification by the answer
Senior Policy Officer	Interviewee 1
Science Innovation Policy	Interviewee 2
Government Administration Professional	Interviewee 3

Source: The author, 2015.

AUS.GOV.Q1. ***What can be done to prepare a more effective innovation policy?***

According to answer one of the interviewees, the perspective of the government is that Australia needs to improve the innovation policy as a whole.

Interviewee 1: Government should start with an entrepreneur's process turned to innovation since elementary education. Emphasis to the STEM programme focuses on science, technology, engineering and maths.

Having public policies so that businessmen can have better support to manage their companies; many firms just about survive these days. Skilling up people within the community about innovation and about the whole kind of business plan, such as development activity, developer value proposition, knowing who the customer is, who the supplier is, what the return to market is, what the finances of the business are.

Australia should focus on technology and high value-added goods and services, improving access to capital – innovation investment funds, tax incentives for the entrepreneurs and to investor, as well as capital games for the entrepreneurs.

Australia needs to give support to the innovative companies, by accelerators and co-working spaces. Government money can be highly effective by supporting those types of businesses and those types of institutions. A kind of mixture between private industry, but they're fostering all the new growth underneath.

Government needs to make sure that someone with a good idea can access people they need to know and that they can make their business idea when it's highly risky at the very beginning and very

challenging that they just can make it easier. The government can create seed capital and venture capital forums.

Improving international networks, this point applies to all countries. Entrepreneurs in Australia need to go to overseas in order to get the global market. So, the problem is, in Australia, entrepreneurs go overseas and this is good for them, but it's not good to the country that never has the ecosystem develop and that is the big challenge in the long run for building and restructuring the economy towards small technology focus.

In the case of Australia, the entrepreneurs often get investment from overseas. The problem is, because they go to a branch office of a big company, they do not do so much research and development and the entrepreneurs do not have all the decision-making expertise of the managers, the managers in Australia are basically salespeople.

In order to build that innovation ecosystem, Australia needs to have people who are high-level executives, making decisions in Australia, in order to have more of those people that are able to go and get jobs in other young companies and build the whole ecosystem.

For interviewee 1, Australia needs to tie all things together, skills and training, education from the base focus on innovation, improving access to capital, supporting accelerators and co-working spaces and international network to be an effective innovation policy. Government needs to be very strong, the decisions reflect its belief that innovation is important in the economy.

Interviewee 2: Australia can improve the business environment in general, not necessarily just adding the programmes but doing things to support export, or cutting down regulations; the clinical trials were trying to make them faster, trying to get the state governments to work together. Australia needs to create an innovative environment as a whole. It is a whole set of things that need to be done that is not just one policy. Australia is a Federation and runs by states, and each state has a different way of business operation within the federation. State Governments might have standards that are different.

Australia has a policy problem, the grant programmes change, either just their names or the programme themselves. The government needs to keep them the way they are rather than they changed or stopped them. So in terms of innovation policy they'd rather have something that stays in, that doesn't change.

Interviewee 3: The Australian Government put about 8 billion dollars into research funding in 2015; the majority of that goes directly

to Universities to support their research. One billion goes to common scientific and industrial research organisations (CSIRO), which does more industry-related research. Less than 1 billion goes directly to fund research in companies through tax concession and there is and array of smaller grant programmes, which provide funding to small companies to do research.

There is a lot of money going into support and innovation in Australia. The problem is that Australia has very little industrial innovation coming out. Then, the country is very strong on basic science but weak on the commercial development of new products to take advantage of that big investment.

To improve the effectiveness of the Australian government innovation policy, the government needs to focus on that gap between basic research and the market. That is getting insights out of the laboratory and into the market place. That is what Australia is weak at, there are very few programmes bridging that gap.

Ideally, research should be done in firms, really close to the market, so the research can be commercially-oriented, meeting market needs. This way, it is more likely to lead to commercial innovations than the research done in universities by academics that have no contact with the market.

AUS.GOV.Q.2 ***How firms' awareness can be increased? And what can be done to promote the use of incentives by the firms?***

According to question two of the interview, the perspective of the government shows that they need to stop changing programmes and their names in order to be more effective and increase firms' knowledge regarding these incentives.

Interviewee 1: Government needs to signal that innovation is important; they can bring together all of the packages that the government does for innovation and have one point of contact. Today the government has this thing called "single business service", that is, all the government programmes that are focused towards industry support and incentives are all in one spot. This website and call centre make it really easy to small businesses.

To promote the use of incentives by the firms, just make them effective; try not to change the names of them too often. You have to make it financially rewarding for the businesses to use the incentives. If you just give some skills training, they are probably not going to come.

Interviewee 2: Companies need to know what support they can gain access to, as they know how to develop a business, their market, competition, skill base and what they sell. The Government is trying to communicate. Interviewee 2 informed that in some sectors, companies are disappearing, and they are only just surviving. And a lot of that is probably poor management, poor skills, timing, back luck, maybe the technology is not that good. There are so many reasons. So I don't know what the government can do to provide more information.

Interviewee 3: The problem with some of the smaller grant programmes is that the government chops and changes these programmess and once the programmes becomes well-known the government decides it is costing too much money and they split that into smaller programmes. The Government should allow more continuity in the nature of the grant programmes. Nowadays, the government's concern is regarding the results coming out from the firms that use these programmes, which have been disappointing.

AUS.GOV.Q3. ***What are the most popular and the least popular programmes, and why?***

Concerning this question, 2 of 3 people from the government say that the most popular programme is the R&D programme, which is a fiscal incentive that Australia wants to cut down on.

The interviewer gave some options to the interviewee, such as Tax Deduction Entrepreneurs; The National Competititve Grants Program (NCGP); Export Market Development Grants/Austrade (EMDG); Industry Skills Fund; The Linkage Projects Scheme and The Excellent in Research for Australia (ERA).

Interviewee 1: Australia's challenge is improving the linkages between universities and businesses.

Interviewee 2: R&D Tax Incentives is good, because people understand it, they use it, it obviously works for most people and it is very generous programme. The problem is that anyone can use it.

The other thing is that there is no money upfront. Companies need money upfront to do the work before they can offset through the tax incentives. Some of them are too immature for venture capital investments.

Interviewee 2 does not know about the least popular programme, but understand the issues with universities in Australia is that when you are integrating universities and companies. For the interviewed, integrating universities and companies to try to shoot the universities to

collaborate more with businesses. And universities by and large are moving that way. The problem is that universities are many things to many people. In Australia one of the biggest exports is international education. International students account for 40% of the income. So that is where government makes their money.

Academics in Australia do not get benefits or incentives from aligning with a companies, it does not help career development.

Interviewee 3: The most popular innovation programme as government support of the CSIRO, which is very famous, it has been in Australia for 50 years or more and is very respected. The second most popular must be Tax concession for R&D. It's extremely popular among larger companies, basically multinational companies.

The least popular, there were innovation policies introduced by the previous government to support climate change research and adaptation. Because of the change of governments you could call them unpopular, companies dislike.

The smaller the programme the more narrowly focused it is on a particular area of research, the less popular it would be to companies. Companies, likes more freedom to be able to use their funding the way they see fit and not necessarily be driven by government priorities.

AUS.GOV.Q.3.1 ***What can the government do to better integrate universities and companies in order to become more innovative?***

The interviewees think that the system is wrong and must be changed for a a better integration between universities and firms, and that research must be market-oriented, according to the answers below:

Interviewee 1: Incentive goes to the academics. So that is boosting the commercial returns from research. In the moment, in the whole world the university academics are promoted on their academic papers, so they spend most of their time writing papers to get published in good journals, doing high quality research. The problem is that it is a different priority than working with a business, because they will have different questions. So one of the things they are looking at is changing the way that universities promote staff using some metrics from whether or not academics work with businesses. It is hard because how do you change that bit of society, academics are already really busy and stressed out, working really long hours. If you say “you are going to work with this business, doing something that is kind of related to what you do, but not really”, it is a hassle.

Interviewee 2: Regarding developing skills, there are no problems with taxpayers money supporting or assisting people to develop professional skills.

A lot of companies come and say that the government should be training people to just fit right into what they need in their companies. It is important to train people who will get jobs and will stay in their jobs, and I think that universities and the government have to be thinking about that. But I also think the industry has their share of responsibility.

Interviewee 3: That is a key challenge. This goes down to the heart of the problem that we have in Australia. How to ensure that research in universities is more oriented to market needs? And then, those companies have an easy access to the research and bring it to the market place.

One arrangement should be encouraging academic researchers to create small business to commercialise their own research in the market base. This has been tried. It is had successes, as in the case of Gardasil, a vaccine to prevent cervical cancer in women which was developed by a professor in an Australian medical science institute. He subsequently set up his own company and he is now supplying Gardasil to the global market.

The best way to go is to reach collaboration between universities and companies. You may either have universities hosting firm employees in their research labs, or you can have an academic to conduct a research in a private company lab. So if something does arise, if there is a breakthrough with commercial potential you can hand that over to the company to bring it to market place. Of course there would need to be intellectual property arrangements to ensure that the company properly compensates the university and rewards the academic researchers for the intellectual effort they put in.

AUS.GOV.Q.3.2. ***Do you consider EMDG - Export Market Development Grants as a programme supporting the innovation policy, and why?***

The government people that design innovation-focused public policies think that the EMDG is not an innovation-oriented programme but a connection would make companies know more about this programme.

This question was necessary because the EMDG programme does not focus on Innovation and was not included in the thesis, but the programme appears in the answers to the survey sent to the companies.

With the perception of the interviewees, the interviewer decided not to include the EMDG programme in the Australian Innovation System scheme.

Interviewee 1: I do not know much about the EMDG programme, but the feeling is that it is like for bigger organisations.

Interviewee 2: I do not know about export market development grants. The understanding is that in the innovation process they might be a good link for people to know better how to open new markets, like China, for example.

I think that anybody would say that innovation is global, so if you're not looking towards the global market, just forget it.

Interviewee 3: EMDG is not really an innovation policy. The point of the EMDG scheme is to help small and medium enterprises establish on export markets. They may bring innovative products to the world market but they do not need to be innovative. They could be selling bullwhips and have access to the EMDG. It is not confined to innovative companies. It's a good programme and popular one, though.

AUS.GOV.Q4. ***How do you interpret the reasons of unsuccessful applications and what can be done to help firms?***

In this question, the interviewer gave the interviewees some options, such as complex application process / bureaucracy; lack of information available; high cost in application preparation; inadequate / no incentive programme; application found irrelevant; lack of motivation and knowledge; lack of personnel to prepare the application and lack of required guarantees.

Project quality is a relevant issue. Being successful depends on having a relationship with government people, according to the answers below.

Interviewee 1: Interviewee 1 asked if the interviewer knows about the term additionality and explains the meaning of the term: in some strict sense the government only wants to divide resources to businesses if they do extra economic activity, if they are already going to do some project then they do not want to provide the money, the government does not want to subsidise the business to do that activity that companies are going to do anyway.

The Government wants to make sure that they are pushing the firm over the edge to make a decision to invest some capital in some innovative thing.

A business needs to grow, to go to the next level and this is what the government can do to help firms and then maybe they will explain there is R&D tax incentives, there is the entrepreneurs programme. The other reason why people do not get support is that they do not articulate in the application, but they have a growth prospect, that they are going to be able to employ new people and grow their business. Maybe companies just expect the government to give them money.

Venture capital is only for a small portion of businesses that need investment. This is mainly for businesses with high growth potential because they need to be able to offset losses from all the other businesses, which is one of the challenges we have. Venture Capitalist say Australia is growing but it is not that big but then there are also debt mechanisms to get capital.

Interviewee 2 has reviewed some applications for a number of programmes, and it seems like people do not write it in a way that a government servant would understand it. They do not fashion it to fit in the government's agenda. There are companies that do it all the time, they need someone who can understand the government, who can write the application in a way that the government will relate to. That is what big companies do. Many of the applications fall down on that. That is a big issue, but it is a very easy one to overcome.

I think that companies do not realise that the government's public servants like talking to companies. So, firms need to talk to the government, understand what it wants and align with that.

Interviewee 3: These grant programmes are competitive and the level of interest in the programme is always greater than the funding available. There will always be winners and losers in the grants process. These factors that you have listed here may be relevant.

I would suggest more important consideration is the quality of application and how closely it matches the selection criteria that the government has issued to all companies, to show them what the standards are. It could be that companies are missing out because they do not have a particular innovative project, or it is judged not to have commercial application or the company may lack business skills to be able to succeed. This is up to the department when they are assessing the applications.

The fact that a company application fails may not reflect the factors that you have listed. It might just be that there are better projects available for the government to fund with that money.

AUS.GOV.Q5. ***How do you interpret the purpose of incentive use, which area in your view supports the innovations the most, and why?***

Question 5 is meant to understand what the government and associations think that firms need; if the government will design a new policy, then what they think will be necessary to the companies. In this question the interviewer gave interviewees some options, such as Marketing, Sales, Fairs; Research and Development (R&D); Working Capital; Machinery and equipment; Internationalisation and Infrastructure.

Interviewee 1: The Government should go and solve the problems where there are big gaps in the economy. So for instance, marketing and sales, each individual business might not have the resources to do that. That is market capability to do that.

They can employ someone to work in marketing and sales. So I do not think it is the government's role to pay for that. But that said, things like R&D and working with universities... that is an area where there is market failure in a sense, because the universities have this information and they do not want to supply it because they have different incentives. So there is a role there for the government to solve that market failure for the public good.

From the list it would be R&D, capital, internationalisation, machinery and equipment, infrastructure and then sales would be at the bottom.

Interviewee 2: Infrastructure is a huge thing, actually. Support for infrastructure, certainly in the biotech sector. One of the biggest issues that has been identified time and again is that they do not have access to scaling up products for clinical trials or pre-clinical testing.

That seems to be the biggest gap in the R&D process. A lot of that funding is again government funding. I think it is always an issue. It is not about the money, it is about better using public infrastructure.

Then again it is bringing Universities into it because most of the infrastructure is based in the universities to allow businesses to access it. The Government may not need to build more infrastructures; it might be about access to it.

Interviewee 3: Marketing, Sales, Fairs – definitely not eligible to deserve support under innovation programmes, they are not innovation activities. They could refer to the EMDG. Research and Development (R&D) – yes, a big tick here! This is the main programme. Working Capital – no, not eligible for support under innovation programmes.

Machinery and equipment – it would only be considered eligible

for support if it was new machinery required to conduct research. If it is just a routine standard machine used by a firm in its daily production, no. Internationalisation - no and Infrastructure - no. The Government will not give money for these kinds of needs.

AUS.GOV.Q6. ***How do you interpret the potential of specific incentive programmes, and whether any of these programmes need further funding or support, and why?***

This question is meant to understand what the government and associations think about the programs in the future. The interviewer gave some examples, such as Entrepreneurs Programme; R&D Tax Incentives; Skills fund; Private Funds; Australian Research Council (ARC) and Export Market Development Grants/Austrade (EMDG).

Interviewee 1: The most obvious thing is that the businesses will really only come if it makes financial sense for them, If they get money, then they will be interested in it. If they just get someone to network with then maybe they are not so interested, in general. Obviously some people wanna do that but in general it has to come down to money, things like R&D tax incentive, and export market development grants.

There are gaps, market failure, so like those researchers in business, like connecting researchers... it is not just money, it is valuable money. 50,000 dollars is not very much money in the business, but 50,000 dollars worth of "that" guy's time in that research institution who knows a a lot of the technical answers to your questions, that is worth way more that 50,000 dollars if you can make the relationship work.

If the relationship does not work you know you get the wrong person and he is not interested in helping your business, firms just want the 50K then it is useless. So it is all about that kind of added value, above the money.

Regarding the up coming plans to improve the innovation policy further, the government wants to improve the innovation ecosystem, but we are not allowed to say anything.

Interviewee 2: Regarding the potential of the programmes, the government should not change the R&D Tax Incentives, because it is a good incentive and everybody feels it is a good one. Programmes should target some kinds of incentives, providing upfront money to companies that need to go and buy business services or run some tests.

There is a proposal coming out about the manufacture incentive, where firms get a tax incentive if they manufacture in Australia. There is

a programme in the US doing the same thing. They are actually bringing that in through legislations and policy.

Regarding the Australian programmes, the entrepreneurs one is very much about business management, it is about helping people to be business safe, not about commercialising something.

Interviewee 3: The Entrepreneurs programme has a great potential, which is addressing the gap between research and the market. It is a rather small programme that could be usefully scaled up to bring research to market.

Also, the R&D Tax Incentive is a great programme. It is market-driven, companies that satisfy the OECD definition of R&D are entitled to apply for tax incentive regardless of the area that they are doing the research. It is not directed by government obsession.

Skills fund: that is not really specifically a research and development programme. This is not research, it is just basically skills required to run a manufacturing business. Private Funds, talking about venture capital and financing investments by start-up companies, or small and medium companies in commercialising innovation, there is a huge market gap in private funding for commercialising investment. They have a very small venture capital market compared to the USA, it is inadequate, proportionally speaking.

Australian Research Council (ARC), there is too much money going to them and it is wasted on non-commercial application research. They fund research in universities across all fields. They pour excessive money into the latest trendy topic.

The ARC is not industry-driven, not commercially-oriented. They pour money into, for example, post-collonial history of the third world, which has no commercial application. As far as innovation is concerned this is just a waste of money.

Export Market Development Grants/Austrade (EMDG), it is not really an innovation programme.

AUS.GOV.Q7. ***How do you evaluate the overall survey findings?***

Regarding this question, the interviewer started to validate the survey answered by the companies. So, the interviewer invited the interviewees to read the results from the surveyed companies.

Interviewee 1: It is interesting.

Interviewee 2: Interesting that people do not know about government programmes.

Interviewee 3: Interviewee 3 made a comment on each survey questions, as below:

Survey Question 1 – That's probably accurate, because about only 50% of the Australian companies are involved with innovation. The others do not do it, so there is no reason to know about government programmes to that.

Survey Question 2 – It sounds reasonable because they are probably thinking of the R&D tax concession, which is well-known. It sounds fair.

Survey Question 3 – Never used any programmes, yes, that confirms what I said earlier, that half the companies are innovative; Tax deduction, yes, it is the best known programme. Entrepreneurs, yes, it is a small new programme; Industry skills funds, I do not know which government runs it. I have not heard of it before. It is certainly not innovation-related. I think there is a problem there with the name of the programme that could be wrong. That is correct.

Survey Question 4 – I would say those responses sound about right. What the companies may not be seeing is that the reasons for application to succeed or be rejected may relate to these issues. It may relate more to the quality of the research and of the company and the commercial potential.

The most interesting response is number two "programmes becoming successfully smaller and the return on the investment is getting low".

Survey Question 5 – That would be EMDG. You have to put the EMDG under a government agency, like AusTrade, it is not an innovation programme. Working capital, very naughty. If they are applying for innovation funding to support working capital, well that is fraudulent. The grant will not be successful and if it is, they will probably have to refund that.

Internationalisation: that will have to relate to the EMDG scheme. Machinery and Equipment, (they) would only be eligible if it is innovative activity not general production. The other two alternatives, they sound legitimate uses of innovation funding.

Survey Question 6 – Entrepreneurs programme, very popular, as popular as the R&D Tax Incentives, that is interesting. Skills Fund, the previous response, about awareness, about Skills Fund returned 0% answers and now 26% of the companies say they want to apply for it in the future. It could be a new programme I do not know of, that would explain why none of the companies have used it in the past, but you

wanna make sure there is actually Skills Fund. ARC, the only business sector that is likely to receive grants of the ARC is the medical research.

AUS.GOV.Q8. ***Do you think the survey findings represent a correct and reliable picture of firms' perspective on innovation incentives?***

This question validated the companies' survey with the interviewees, to confirm that they agreed with the results, since 75 companies replied to the survey.

Interviewee 1: Comments on each question of the Companies' survey.

Survey Question 1 considers the results not too bad. It is not great but... So you know there is some politics there. But your data is quite interesting.

Survey Question 2 – Everyone knows about tax incentives. It is a good number.

Survey Question 3 – Program Schemes. That is interesting. So, most people have used tax incentive, firms do not know much about the others. Entrepreneurs in Construction Program is pretty young as well, offerings to Start-ups, maybe there is not very much there for Start-ups, maybe it is like Small and Medium Companies that can actually help.

Survey Question 4 – It is quite hard, 47% "because the application process is complicated". The government is pretty bureaucratic. The way they decide is through this checklist process, it is typical government; it does not surprise me that there is debate.

Yes, high cost. I guess that is people... labour cost. It takes a long time to do it. But I agree that the complex process is the biggest drawback.

Survey Question 5 – R&D sure, but like sales and marketing. It is interesting.

Maybe companies do not understand what internationalisation means, maybe you need to write export marketing. That is interesting. The answers match my kind of understanding.

Survey Question 6 – There are only 3 things they can get. R&D tax incentives, entrepreneurs programme and export market development grant. I guess they can try to get a linkage grant or industrial research transformation programme grant from the ARC but that is a kind of different type of industry innovation policy. The fact that they want the entrepreneurs programme is just because that is all there is.

It does not surprise me that it is quite low, private funds, that it is kind of, everyone wants to raise money. But that does not surprise me, because it is all there is. When this government came to power in 2013 they made a very concrete decision to abolish all the labour party policies, all the policies that were already there and then reduced the amount of money and then rebranded as something else and made sure they are all under one thing/ under one name: Entrepreneurs Program.

The Government was critical of Labour who would just come out with a new programme (one after another). So there was kind of Enterprise Connect, then there was Commercialisation Australia. This government wanted to streamline it, make it simpler, which is to me an irrelevant thing to do, because if you go down the route of finding out what incentives are out there, you can understand 3 or 4 programmes. It is just an ideology.

Your survey is correct, that is what it is. There is only the entrepreneurs' programme and the tax incentive. Inside the entrepreneurs programme there are three types, three programs within the entrepreneurs programme: 1. Connecting Researches; 2. Accelerating Commercialisation and; 3. Business Management Skills. The interviewee gave a suggestion to break it out in the survey to find out which parts of that entrepreneurs' programme people know about and they are interested in applying for.

Interviewee 2: I am surprised at the number of businesses that do not know about the programmes and policies. If firms are working in innovation and R&D and they do not know about the R&D tax incentives then I find that completely strange. The first thing that companies from a research and R&D sector should do is find out what is available to start off or get someone do it for you. It would be interesting to know the breakdown of who these companies are. I can't say whether it is correct.

Interviewee 3: The interviewee suggested to separate the EMDG and the Skills Fund from general innovation programmes; they are from a different nature than the strictly innovation funds, and the answers they give you may be relevant in respect of those programmes but they are not relevant in an innovation survey.

And then you have got to consider the two perspectives, one is the company's perspective in why catch funding, as blaming the government for complex application processes. And then there is the government's perspective, that has a competitive evaluation of 100 applications in order to make 50 grants on the basis of quality.

Regarding Survey Question 8, yes, there is some interesting results here.

5.5.2 Australian associations perspective

People invited to participate in the interviews know a lot about incentive and innovation. These people know the government and their programmes and what it takes to guarantee what innovative companies need to achieve competitiveness in the national and global levels.

The table below shows the profile of the professionals interviewed. The selected entities are national entities and they work with companies that seek innovation.

This is an anonymous interview, so names will be kept secret.

Frame 10 - Australia: Associations Perspective – Interviews.

Interviewee's position	Interviewee's identification by the answer
Senior Policy Officer	Interviewee 4
Chief Executive	Interviewee 5
Executive Director	Interviewee 6

Source: The author, 2015.

According to question one, the perspective of the national associations is that Australia needs to define what innovation is at first.

AUS.ASS.Q1. ***What can be done to prepare a more effective innovation policy?***

Australia's innovation output is alone, despite having the right fundamentals for innovation, the country has got a public research spending, which is relatively decent/high compared to other OECD countries. The advantages are not appearing, the outcomes from research spending being transformed into marketable products in the industry as compared to other countries that compete with Australia.

One of the major reasons for this is the lack of culture for innovation in Australia. The lack of tolerance for business risk of failure is still really low, and this is reflected in the fact that there's a general reluctance of talented people to transfer from the tertiary education sector to the private sector organisations.

The main recommendation of interviewee 4 to the government is that Australia must have a more informed and systematic approach to building innovation in the country.

Interviewee 4: To improve innovation the government should focus on infrastructure and knowledge, more collaboration; focus on education and skills, appropriate funding, regulation of policy that is supportive and competitive, culture for innovation. All of these can't be done on their own. There must be a systematic and coordinated approach.

Interviewee 5: To link the companies with the government, as the biggest buyer of material and services. That would attract a lot more companies to look directly for government research funding and that would link small companies.

Interviewee 6: Australia needs to have a national conversation about innovation, involving as many people as the government can.

Innovation is very diverse, then the innovation policy has to encompass diversity whereas at the moment they are trying to pick winners, a small number of industries. The big problem is that nowadays the government is trying to pick winners and they do not know if these companies will be successful. To select the companies, they do it on a political basis, not a business basis.

AUS.ASS.Q2 ***How can firms' awareness be increased? And what can be done to promote the use of incentives by the firms?***

In their responses to this question, interviewees claim that firms lack innovation-related culture. Responses also show that firms will know any one development programme if it is a good one, as is the case of the R&D Tax Incentives. Individual views of the interviewees are provided below.

Interviewee 4: There are two issues. The first is that Australia has to overcome this lack of culture for innovation in order to increase the innovative outputs, which means promoting things that have worked previously and it also means that the government must lead by example by adopting more innovative ways of delivering their services.

The second step is to have more collaboration between firms and universities and the government. So, collaboration increases their capacity to create and absorb knowledge, it develops new access to skills, it reduces cost, eliminates duplications, economies of scale and basically more access to potentially expensive and scarce resources. There are a lot of reasons why collaboration should be encouraged.

Interviewee 5: Australia needs more individual researchers, it needs to make more effort to get out and talk to companies more often; companies need to be aware, more forward-looking to seeking out opportunities with research institutions; and there are very high requirements for matching funds, there are too many programmes overly concerned with the matching arrangements and for this reason many companies cannot qualify to participate in some programmes. And if they look at one programme and do not qualify, they do not go looking for other programmes.

Interviewee 6: The big issue with government programs is that they never spend all the money they have got. This cannot be right if they do not spend all the money they have got for incentives, which means that businesses are not getting all the opportunities they can. And the market system for incentives is not working. The tax system is the best.

The government cannot promote it if the incentive is wrong, it is like trying to sell something that nobody wants. If you have the right incentive you do not have to promote and everyone will know about it quickly. So, programmes are not aligned with what companies need. It's about the correct incentives.

The thing is that if the incentive were good, people would find it anyway. Since incentives are so complicated and small and competitive that people do not bother. They have to change the application to get people interested. It has to be broad-based like the R&D incentive. It cannot be complicated and then you get people involved in the conversation.

The big finding is that half the people are not involved in the conversation. The government is now focusing at smaller and smaller target industries and they are just leaving people out of the conversation, and that is a problem, it is the people who are left out of the conversation.

AUS.ASS.Q3. What are the most popular and the least popular programmes, and why?

The interviewer gave the interviewees some options, such as Tax Deduction; Entrepreneurs; The National Competititve Grants Program (NCGP); Export Market Development Grants/Austrade (EMDG); Industry Skills Fund; The Linkage Projects Scheme and The Excellence in Research for Australia (ERA).

Interviewee 4: The R&D Tax Incentives is the main Government mechanism to encourage innovation in Australia. The problem right now is that the government is proposing reduction, which goes against the global trend to increase R&D investment as a way to boost economic growth. Other countries, such as Hong Kong, Singapore, Italy and France have all increased their R&D tax incentives in recent years.

The government just needs to commit to a more competitive R&D tax scheme, which means that there can't be more changes to the R&D tax incentives (because in the last few years there have been chops and changes). So, certainty for companies around the tax is very important.

The Australian Bureau of Statistics data reveals that business spending on R&D in Australia is low compared to other countries, so a further reduction would make this worse.

The least popular programmes, one of the areas that we found to be the least utilised is the Free Trade Agreements or benefits in Free Trade Agreements. Those trade agreements that we negotiate are meant to help Australia's exports, but that is not really being used and a lot of small and medium-sized companies do not even know that these benefits might be available to them.

The Australian Information Industry Association - AIIA supports more innovative-guided programmes. There is a couple of things the government can do to improve that, by developing more innovation hubs, and one of its main advantages is that it centralises information and knowledge.

Interviewee 5: Australian programmes, the Entrepreneurs Program really is not understood because it has only just started. Commercialisation Australia has been severely changed too many times.

Many of the programmes commented upon have suffered significant changes over the last 5 years (change of governments) and companies have not kept up. There has not been a consistent approach to innovation in the policy sense in the federal level for 5 years now.

The government keeps announcing programmes but they are not ready to go or cannot consult on the programmes whereas companies want to be informed about the programmes when these are ready to go so that they can apply.

About the least popular one, the Growth Centres are the least understood at the moment. There are five of them, only one is currently operational, but they have been talked about for almost a year, but they

are not well understood. For companies the excellence in research in Australia is not relevant.

The most popular for companies is probably the Export Market Development Grant. The EMDG for those who are entering export markets is easy to understand and you do not have to apply, it is a closed-base system. Firms check their eligibility and get the money.

Other programmes are more competitive, the Tax deduction you can only use if you make little money, so very early innovative companies can access it, many companies do not understand the current system because it is been fiddled with a lot in the last 5 years. Entrepreneurs may know the name of the programme but they may not know the current situation, eligibility criteria or if there's a lot of money available, that sort of thing.

Regarding the Entrepreneurs programme there has been a lot of publicity but little money involved. The Government needs to be more transparent about how much money is available and when the money will be made available. If companies think the chance of getting the funding is high then they put a lot of effort in it, but if chances are little, they do not put a lot of effort in it.

There have been long delays of the current government in announcing the outcomes of their initiatives, and this has contributed to a lot of the uncertainty in the industry, just an example, the Advance Manufacturing Cooperative Researches, it has taken months to be announced, and half the companies have moved on, and committed their money elsewhere. It is not just the programme; it is how it is administered.

Interviewee 6: The most popular is the R&D tax concession. The least popular are competitive programmes, where 20 companies apply but only two of them get it.

AUS.ASS.Q.3.1 What can the government do to better integrate universities and companies in order to become more innovative?

Interviewee 4: While the proposals in the Vision for a Science Nation paper related to integrating STEM experts across the industry, business and public sectors are sensible, it is disappointing that the proposals lack detail. This is what the government can do:

1. Identify what motivates people with STEM skills to work with business and vice versa. But this must be supported with a clear commitment to work with businesses and research to develop and recommend successful framework for collaboration.

2. Incentives for researchers and business are misaligned and this is a barrier to commercial returns being realised. The current system incentivises universities to focus on research publications rather than commercial applications. Current practices typically 'lock' intellectual property in universities.

3. Similarly, the business environment can hamper research collaboration – short business planning cycles and risk aversion can limit the extent to which businesses seek research collaboration opportunities. Businesses, understandably, are primarily focused on their own commercial strategy, therefore research opportunities need to be appropriately targeted to engage business properly. This misalignment – with researchers focusing on research excellence and businesses focusing on commercial outcomes can lead to many missed opportunities.

4. The Cooperative Research Centres Programme is a good start for collaboration. However the lack of well-structured or permanent information sources available to participants in the innovation system combined with the absence of innovation hubs that provide a focal point to bring together the relationships and resources they need to innovate are symptomatic of the bigger issue in an innovation system that lacks formal and effective collaboration frameworks.

Interviewee 5: Australia has the Block Grants Scheme: the government gives additional funds to universities on the basis of what they win in the national competitive grants programme. We have argued and now governments have agreed that programme is skewed against this industry money coming into the universities. So the number one is to improve the block grant arrangements to eliminate this disadvantage to the industry.

Interviewee 6: The Government has to change the incentive system for universities. Universities have the wrong incentive system. It is not about the businesses.

AUS.ASS.Q.3.2 Do you consider EMDG as a programme supporting the innovation policy, and why?

This question is controversial with both the government and associations. The association respondents think that the EMDG is not an innovation-oriented programme, although innovative firms that want to export use it; therefore, it must be considered a programme that supports innovation. Individual responses are below.

Interviewee 4: The EMDG should be considered an innovation policy. We support the EMDG, the barriers our members find to export are actually quite common among other industries.

Nowadays, Australia has five specific issues identified as barriers to export:

1. There is a trend for ICT companies to move overseas rather than export their services from Australia. The reasons for this include there is a perceived more favourable treatment of innovation startups overseas.

2. More generous are the opportunities overseas.

3. Better access to relevant skills, perceived access to more funding, including venture capital funding, and a higher tolerance for business risk and innovation overseas. In Australia a successful ICT service export capacity really depends on the existence of a strong domestic ICT services market. This fundamentally requires a more systematic joined-up approach to innovation that needs to encompass these key areas that I have identified.

4. There is a barrier to exports, reduced government support through AusTrade is also quite a big barrier to exports.

5. Lack of clarity regarding Free Trade Agreement is another barrier.

Interviewee 5: The EMDG is not directly an innovation policy, it is an export or trade policy, but it tends to go to innovative companies that are starting up. It is involved with innovation because if you are going into an international market you have to be more innovative than if you are just in a domestic market. So, it is more an industrial support programme, but it is an important one because it still encourages innovation. It is a very good programme.

Interviewee 6: The EMDG is an innovation policy, because innovation is about growth, and export development is about growth, so getting companies to export is a big innovation policy. Interviewee 6 absolutely agrees with that.

AUS.ASS.Q4. How do you interpret the reasons of unsuccessful applications and what can be done to help firms?

In this question, the interviewer gave the interviewees some options, such as complex application process / bureaucracy; lack of information available; high cost in application preparation; inadequate / no incentive programme; application found irrelevant; lack of

motivation and knowledge; lack of personnel to prepare the application and lack of required guarantees.

Interviewee 4: Members of the association have not reported any specific problem with the application process. However there are improvements that the government can make, like making the application process more streamlined, making it easier to access, user-friendlier.

Interviewee 5: There is not enough time to help firms to start with, many of those who were not successful in seeking government funding have very little idea why they were not successful, I would say it is a different view of what innovation is. They might be looking at internationalisation or market research as the next critical step for their company, but it is the government that will make the judgement whether they may access this programme, for they may not be sufficiently innovative.

Therefore, they file the application aiming at a different trajectory. I would argue they know probably more than anyone else what is good for their company and what is next and it tends to be whether the people judging the application see that as fulfilling the criteria or not.

Interviewee 6: The biggest reason is that there are not enough places, 20 firms apply and 5 win; 15 firms do not get the money. There are only 5 successful applications, a small number. If you promote more innovation to firms and you get 1,000 firms that want to be innovative and apply you still only have 5 winners. Based on the list you've provided: it's inadequate. There's nothing there. You don't waste you time doing application if your chances are small. The means of competition is wrong.

AUS.ASS.Q5. How do you interpret the purpose of incentive use, which área in your view support the innovation most, and why?

Interviewees think that the area that needs to get the most incentive is research and development, and that programmes must be long-lasting, as can be seen in their individual answers below.

Interviewee 4: The reason why R&D Tax Incentive is the most used is historical, the R&D Tax incentive has always been around, so, it is easy for companies to use it and to encourage that. The other reason may be that until recently innovation and ICT were not in the government's agenda and it is really only now that we are seeing a lot of work being done in relation to promoting ICT and noticing the

economic prosperity that comes with innovation. It is starting to emerge now.

Interviewee 5: That is government procurement. If the government needs a data base solution for a government department, at the moment they do not take any risk and they go to big established companies, as IBM.

The best way would be require that the government send a minimum of, 30% of their contracts to small innovative Australian companies. This way you are establishing a market and helping them innovate.

The British Government is doing this in recent times and the US government has done it since 1992. The Defence Dept. in the US supports small American businesses, and that results in a lot of spin-off companies coming out of universities to try and make technology work and turn it into a product.

The incentive there is not that you get government money, you get a government customer eventually. If the innovation is successful you have already got your first customer. That is a really good policy.

In Australia we have got a problem with innovation and capability within companies. If I had limited dollars so I would do something like an Industrial Research Program for small businesses and more training in innovation and entrepreneurialism to improve the situation; another thing would be improving the environment for start-ups companies.

In Australia, we are very slow adopting that change and even the changes that I contemplated earlier are very small investments, which is creating a problem for companies that have too many shareholders. So we are both slow and our proposals for credit source seem quite poor.

In Australia the bankruptcy laws are too harsh. We do not have anything similar to Chapter 11 in the US. In here, if you go bankrupt, it is the end of the line. It is hard to file for bankruptcy and then start up again.

Interviewee 6: The purpose of an incentive should only be for Research and Development (R&D), it should not be for other things. It should all be on R&D.

AUS.ASS.Q6. How do you interpret the potential of specific incentive programmes, and whether any of these programmes need further funding or support, and why?

The government has been reducing innovation development policies. Some programmes have limited resources while others have more than enough money; the government communication is poor or the development programme lacks structure. Individual responses are below:

Interviewee 4: They definitely support more specific incentive programmes. The main issue that we need is a more informed and systematic approach to building innovation in Australia. The Government can do that by focusing on issues such as insfrastructure, knowledge, collaboration, promoting education and skills, having better funding platforms, having good regulation and policy that supports innovative solutions, having a culture that also supports innovative solutions.

Today, the government is decreasing the innovation policy, unfortunately. At the Commonwealth-level innovation policies, it is going the opposite way, the trend is actually to reduce innovation policy, unfortunately. But there might be some innovation grants available through different states and territories.

There is some work that is being done at the DTO (Digital Transformation Office), recently established by the Federal Government, which is focused on leveraging the productivity benefits and the economies of scale that you can get through a digital economy. Innovation falls under digital economy, so there is quite a lot of work being done in that space, which could partner this sort of innovation.

Interviewee 5: Innovation programmes around the world are not completely different. You may learn something from a programme in a foreign country and adapt it to Australia. You do need to have an Australian version. You do not have to think up a new programme for Australia.

Most new policies in innovation in those countries mentioned, plus Japan and Taiwan, are aiming towards more centres and team building and building groups and collaboration. It is important that Australia organise collaborations as much as possible, not only entirely Australian, but also international collaboration. We are 2% of the world's scientific output and we have to access the other 98%.

The Government can have the policy but it must fund it properly, or it could be in danger of having too many programmes that are underfunded.

Regarding the upcoming events for the innovation policies, the Minister of Education has appointed a committee to look at changing the

Block Grant Incentives. I think that will result in a change to the Block Grant System in this year, 2015.

Interviewee 6: The entrepreneurs' programme has never spent all the money that is allocated. Perhaps the programme is wrong or the marketing is wrong; The R&D Tax Incentive is too small, it needs to be bigger; Skills fund is fine, not a problem; Private Funds are fine; Australian Research Council (ARC), that's part of the university system, and that is wrong because it is aligned to publication and not to delivering real innovation; and the Export Market Development Grants/Austrade (EMDG) are just too small, companies need more of them.

AUS.ASS. Q7. How do you evaluate the overall survey findings?

The interviewees were not very surprised at the survey results; however, the fact that 50% of the firms are not involved with innovation is seen as a great problem.

The results of programmes for improving labour training also stand out since this is a critical factor for the development of the technology sector. The demand for qualified employees rises every year and this will prevent technology firms from growing. Individual comments are below:

Interviewee 4: Comment on the results of each question of the Companies survey.

Survey Question 1: It is not surprising that nearly 50% of businessmen know there is an innovation agenda. That is good. More people know about R&D Tax Incentives.

Survey Question 2: That is surprising. It seems that tax deduction is the most popular form of money that helps R&D. It is consistent to our major finding. It is interesting that companies are really aware of the other grants available. I guess it is consistent with our finding with the Free Trade Agreements, because you get quite a few benefits from these Free Trade Agreements, and lots of small and medium-sized firms we work with are not aware that this exists. Obviously education and knowledge about these grants and more promotion is important.

Survey Question 4: I think that is right. There is a lot of bureaucracy within the government. There is a lack of innovative culture within government. It is difficult to register products, government programmes cannot be paid for online through an AmEx card, you have to use VISA or Mastercad. This is one example of an ineffective online administrative process.

I am not surprised they have reported difficulties with the application here as well.

Regarding the high cost in application and preparation. Yes, generally there is high duplication, as well. I would like to see a more streamlined approach rather than having to apply again for the next grant or next year. That would be beneficial.

According to the specifications mentioned in the question, the interviewee agreed with that. The number 4, “no time to apply” as being a small start-up company is something that we've heard quite often. It's important that the government make it as streamlined and simple as possible for S&Ms to engage. The government is obviously a big customer to ICT firms, and this would be a good opportunity for S&M companies but what happens is that firms end up interrupting the process of application due to high administrative costs and time costs.

Survey Question 5: R&D comes at the top again. The results are not surprising. The second most sought after type of funding is Marketing and Sales and Fairs. As I mentioned earlier, one of the disturbing findings is that although Australia has the right fundamentals for innovation we are not producing good innovative outputs that can be marketable. That makes sense to me.

Survey Question 6: It is disappointing that Skills Fund is so low. Only 26% of people are interested in it. One of the issues in Australia is that people who come out of Universities with relevant skills today are mostly going overseas. More disturbing is the trend of dropouts in ICT courses. Quite a few people start but not all of them finish. Developing skills and expertise for Australia is important.

Interviewee 5: It is disappointing that companies do not know more of what is going on but I was not surprised. Why would people in small companies who are always so very busy know details of the federal government programmes available, when they have changed so much in the last few years?

It is up to the government to do more to make sure people know about the funding opportunities, rather than expect companies to keep up at the moment.

Interviewee 6: The biggest problem is that 50% of the businesses are not involved in the conversion about innovation; half the businesses do not know what is going on. And it does not matter what the program is, half of the businesses are not involved. That is all you need to talk about out of this survey.

AUS.ASS.Q8. Do you think the survey findings represent a correct and reliable picture of firms' perspective on innovation incentives?

The interviewees agree with the results of the survey responded by firms. They make a few more comments about public policies for innovation and point out that the 0% result for Skills Fund is due to the fact that businessmen do not know the programme because its name has been recently changed, which has been happening quite often in Australia and is considered a political issue. Individual responses are below.

Interviewee 4: In relation to what I think of the survey and your goals and objectives of your PhD, I think they are quite well.

Yes, I think the survey questions are fine, the most interesting bit for me is the innovation, grants and programmes that not a lot of people are actually aware of; it makes a good starting point because it sort of makes a strong argument to the government, that they need to have more focus in developing and promoting these programmes.

Interviewee 5: - I do not think you have got a skewed [result].

I think your percentages are upright. I think you could rely on these findings. Some publications might be interested in publishing your results when they are ready (like Policy Quarterly).

Businessmen spend the day thinking about their business and not about what the government can give them.

Some of the programmes must be available more frequently, rather than once a year, perhaps 3 or 4 times a year so companies can access them more regularly. It is all about raising awareness, but the government is not ready to do anything to the companies, the government advertises programmes virtually at the wrong time, they announce when they have started something but... I think that would be an accurate reflection of the current level of interest. The interviewee stated that this study made an important point and proved it.

I think Australia lacks that level of entrepreneurialism in universities, to knock on businesses' doors and talk to them. We're very good when we've got something that we want to sell them, very specifically, but we're not very good at the early phase of developing of what would be interesting for the companies.

Interviewee 6: I agree with the survey. The biggest problem is that 50% of the businesses are not involved in the conversion about innovation; half the businesses do not know what is going on. And it does not matter what the program is, half of the business are not involved. That is all you need to talk about out of this survey.

Industry Skills Funds got 0% of answers. The Government changes the names of the programmes; it is a terrible thing to do. They change name, change programme, change this and that. If you are busy, you just do not bother. Coca Cola, McDonald's, Google, they do not change their names. You've got to keep it simple. There has been too much change and confusion with programmes.

To finish off the structured questions section of the interview, some extra questions were made; the most relevant ones are demonstrated below.

Since Australia does not possess a development bank, some questions were made as to collect the interviewees' perception on the importance of this agent of innovation support.

Extra Question 1: Regarding development banks, what do you think about then?

Interviewee 1 says they are a good idea; they are a good way to be able to separate the state from those institutions. That creates much better governance structures, the challenge that we have got in Australia is that as an ideology, this government does not particularly think that governments should take a role in the economy, like the government's taking equity in business. I cannot see the Prime Minister agreeing to that sort of industry policy and in here that is what an investment bank does. It takes their equity;Interviewee 1 continues to talk about Australia's economy. Australia has big challenges ahead, like our Export profile is very narrow along with the rest of the world we have got the whole technology in these job crises….and we have also got a problem with our trade balance, and we have also got a problem with the whole idea that we are not going to be able to sell coal very much in the future, and Iron but it is also the idea that our industry base is quite narrow.

Association 4 – Our association supports more targeted funding to innovation. We think there are a couple of innovative funding platforms that the government can better leverage. What you have mentioned is one of those, so banks providing cheaper forms of lending is one alternative.

There are also low rates of venture capital investment, so encouraging venture capital is one area, crowd funding, development banks providing microfinancing. So more targeted capital funds for the private sector to focus more on innovation. We definitely support more

innovative funding platforms, thorough venture capital, companies or even through the crowd funding type of initiative.

Association 5 - We do not have anything like that, except the Clean Energy Finance Corporation under the Carbon Tax Policy, but it is in dispute. The Government would like to shut it down and give the money back to taxpayers. It has been a disaster in policy terms. This is the problem of introducing innovation policies that are contested. You need to try very hard to get bi-partisans support at a political level; companies will not engage if they think that the next government is going to change things and in Australia governments change every 3 years, so the stability of the policy is as important as the policy itself.

In the USA the Small Business Industrial Research Scheme was put in place in 1992 and it has not changed, it has just grown. It is still very active.

In Germany the Fraunhofer Institutes are very successful; they have not changed much in 50 years. It is a very stable policy. In Germany you have 15-year commitments, so it does not matter if the government changes.

In Britain when the Conservative Party came to power it isolated innovation from the big government cuts. They tried to grow the innovation space, so they do not differ much from the opposition.

In Australia, the policy space is contested, and it is a problem.

Some questions were asked in order to better understand the incubation system.

Extra Question 2: Do you know if universities in Australia have incubators?

Government 3 – I guess it is a great idea... incubators and science parks that encourage clustering. It works in the USA, there are examples of clustering innovative firms around a leading university and they are excellent at commercialising their research. It is a very good initiative but it does not necessarily depend on the movement of scientists of academia out into the market.

Extra Question 3: What do you think about the incubators and accelerators in the university?

Association 6 – It is called a pimple on an elephant. When the system is wrong, you do not incentivise the professors and you put an accelerator there, to help change the system and the system is wrong. They are fine but they are very small and insignificant. A university has

thousands of professors and the accelerator has 1 or 2. It is nice to talk about, but it is insignificant. You have tens of thousands of businesses out there and you may have 20 or 50 in an accelerator. The numbers are too small.

Extra Question 4: Does Australia believes in an incubators system?

Association 6 - It is not that we do not believe in it, it is just that the system does not encourage it. You have to break the system, change it, to encourage it. There are a lot of incubators, accelerators, and start-ups now but the system is against them. If they change the system, there will be lots of accelerators. And the university system is wrong.

You have to get knowledge out of the universities and take it out to the companies and there is no incentive to the universities to do that. It is in the government's hands, they can change it.

5.5.3 Australian entrepreneur perspective

The entrepreneur was interviewed via Skype. The chosen entrepreneur was successful in obtaining resources for innovation.

The entrepreneur demonstrates there was cooperation with the government so that the company received the incentive for innovation.

The interviewee explains how the company works and the process to obtain grants from the government. Our company is a computer security firm for the mass market, our product blocks phishing and malware. It started in 2012. I applied for a Commercialisation Skills and Knowledge fund and the main reason why I applied is that I am a techie and I did not have anyone helping do the business side. So I needed help to find someone to hire to do business. They could not give me free help, but I could apply for the money, which I did not need because I already had the money, so I applied anyway and was lucky.

So far I have won ten awards, then it means that our product is awesome and everybody understands that it is important so it is easy to get a grant. It was a matched thing as well. They gave 50 thousand and I had to put 20 thousand of my own.

But I was really interested in having access to the network. It got me a case manager. He works on helping us do stuff. He is a government employee so he is paid for by the federal government to work for a bunch of people and we are one of them.

Question 1: Did your company need to be innovative to receive the money?

Innovation seems to help. It took me 10 years to think of an awesome way to make money. I wanted to figure out something that could be sold to every single internet user and more than once. I think it is innovative, I got a grant pay which proves I was the first one to think about solving the problem of phishing and malware to prevent computers to be broken into. The market's enormous and it is easy to understand. The fact that we have won 10 prizes shows that people believe in that.

Question 2: What do you think about the process, is it bureaucratic?

The paperwork is completely insane. To get those first 50 thousand I had to do weeks of paperwork, and I have to do financial reports every quarter for the next 5 years and lots of other stuff.

For a business that is doing a start-up time is really valuable, so that 50K is just not worth the amount of time you need to put in. For the 500,000 dollar grant, paperwork was just extreme, the application process was a lot more complicated. It is really strict. The mechanism for this grant is that we can only pay companies that are registered in Australia, which means that about 30% of all the money will be wasted on taxes.

Question 3: Don't you need to apply for the R&D tax incentives?

Since our business is oversees, our customers are oversees and our expenses are oversees, it would not make sense because the amount of money we would get would be the same we would have to spend on taxes, not to mention the time and effort to apply.

Question 4: Did you go to an incubator or something like that when you started off?

I started by myself. In the year 2000 I had an idea for an email business that just runs itself and makes money. So I had the money and the employees and I just started doing something else. It wasn't really a big change.

Question 5: What did you study?

I am Bachelor in Applied Science from QUT.

Question 6: Are you in any association?

We joined AIIA last Wednesday. I was in AIIA but I decided not to renew the membership. AIIA runs the iAwards and I talked to them if they would let us have discounts on a booth to do a demonstration of our products at the national awards show and they gave us more than we asked for. That was super nice of them. The iAwards gave us a lot of publicity. Awards are very important; they open a lot of doors and put us in contact with a lot of people.

Question 7: How much Money have you got?

We got a 50,000 dollar grant 3 years ago and then the 500,000 dollar grant a month ago.

Question 8: How many employees do you have?

We have got 5 employees, perhaps another 5 part-time.

Question 9: Are you based on the US also?

There is two ways of making money in this industry of security stuff. One you make something that people pay for or you make something awesome that another company wants to buy and in the second case you need to have an account in the USA, for many reasons, including the security of the buying company. We are an American company as well as an Australian one.

Question 10: Are entrepreneurs moving out of Australia to go the USA?

Yeah, the employee share option stuff in Australia is completely screwed up. It has got a bit better now, but before that they used to tax you as soon as you got an employee share. From the employee's point of view, your employer was giving you this piece of paper that cost nothing and even so you had to pay a lot of taxes for that. It was really dumb. In America only when the employee sells the share will they have to pay taxes.

Question 11: What do you think that the rest of the world could learn from Australia in terms of support for innovative businesses?

If you are not Australian you will have more trouble finding support here. The best thing Australia has is our lifestyle. If you are an employee working for a high-tech company, you can make a choice about making a lot of money and living in a shitty place in America or

make less money and have a nice lifestyle in Noosa, on the beach. People who understand that are not just smart workers; they are smart about everything.

5.5.4 Australian interviews summary

Summing up the interviews, according to the viewpoints of the government, associations and entrepreneur, there must be more talks among these parties in order to create a policy focused on company results towards their growth and the generation of economic development for the country.

The government needs to listen more and understand what the actual needs of companies are; it needs to change its business framework in its universities in order to integrate and join research and market, therefore generating economic value.

Australia's public policies have stagnated for 15 years. The new prime minister is talking a lot about innovation and suggests changes in the public policies.

It is important that policies and innovation-oriented programmes be long-term ones, without changes of names or programmes themselves every time the government changes. The entrepreneur can barely understand all the changes and keep interested in achieving government support.

Another issue is the lack of transparency. The selection process for companies to obtain government incentives must be more transparent. This gives the process more credibility and makes the entrepreneur believe that s/he can obtain the resource/incentive.

Bureaucracy was an outstanding item. Although processes do not seem to be bureaucratic, the businessman shows that the process is nearly insane, especially the process of reporting the use of resources.

It is necessary to integrate universities and businesses. For this, the focus of researches must be changed; today, they are based on publishing academic papers. In addition, Australia's university structures could be shared with companies, mainly the laboratories and research centres. Universities are incentivised to collaborate with the industry to develop the commercial potential of their research.

Little does the Australian government support innovation and entrepreneurialism centres such as incubators, accelerators and technology parks. Public policies towards that go the opposite way of those of OECD member countries, which are well involved in the matter

and participate of international networks that debate the economic development by means of these actors that support innovative companies.

The Australian government has a good education system, starting from elementary education. The country forms entrepreneurs; however, it loses them to countries that are backing up innovation and risk. This is a big issue that must be taken care of, for the country needs to retain qualified labour through incentives rather than treat this subject as a natural one.

Since the Australian market is small in terms of population, the government must support exports, so that innovative products have access to the international market.

6 FINAL CONSIDERATIONS AND DISCUSSION

This study aimed to address the following thesis question: How can financial support provided to technology companies contribute to knowledge-based economic development?

In order to investigate this issue, first of all, a thorough literature review was carried out searching for the terms Knowledge-Based Urban Development, Knowledge-Based Economic Development, their respective initials (KBUD and KBED), and Innovation Incentives.

The literature review identified the Knowledge-Based Economic Development Framework, developed by Prof. Tan Yigitcanlar, which uses four pillars, namely, knowledge, creativity, innovation and competition, as a way to generate knowledge-based economic development.

The study then identified the public policies on innovation in Brazil and Australia and compared them to those of other OECD member countries.

In Brazil, programmes and legislations focused on economic development through incentive to innovative firms is a recent event. The government has – since 2004 – been able to give support to private firms through incentive calls. This support was important for developing technology firms as a whole.

Although the country has developed innovation in the last years, it is still timid when compared to the whole percentage allotted to ST&I: today, the resources allotted to innovation are below 1% of the GDP. The country needs a closer look into innovation for it to take the global market; it needs to stimulate innovation through fiscal incentives and to be more aggressive in moments of crisis.

The countries in this study have a potential to raise their investment towards incentive for innovation. Brazil has good incentive policies; however, the country needs simpler and clearer processes and it needs more resources.

Brazil has been facing an issue with its public accounts due to corruption in the current government. In an attempt to equalise its accounts, investments in innovation will be affected.

In September 2015, the Brazilian government published a provisional measure that suspends the fiscal incentives of the Good Law for the 2016 fiscal year. The country is then doing the opposite it has to do in terms of investments to generate economic development.

OECD member countries are more and more providing incentives to firms through fiscal incentives, which are direct, democratic and less bureaucratic for the countries and their firms. Tax reduction incentive generates lower operational cost for the country.

In order to improve and facilitate the public-private relations in researches and innovation, a new Brazilian ST&I national was voted. This code is under the coordination of the National Forum of Managers of Innovation and Technology Transfer (*Fórum Nacional de Gestores de Inovação e Transferência de Tecnologia* – Fortec), with trade associations, Research Support Foundations and Higher Education Institutions. These actions contribute to the development of the country.

Australia has a fiscal incentive framework that works and is the most used incentive form in the country. In the last years, Australia has lost competitiveness and the government knows it is necessary to invest in innovation. Mining used to be the focus of government investments.

Australia has experienced a lack of innovation culture; however, this seems to be changing, since for the new Australian government will focus on innovation. Australia has a new prime minister since 15 September 2015, Mr. Malcolm Turnbull. He used to invest in innovative firms and will support the development of start-ups in the country. This political change may take Australia to a new position, making the country more competitive and innovative in the international scenario.

After a month in office, the new prime minister started with a policy event, integrating start-ups, venture capital funds, accelerators and other components of the innovation ecosystem. He issued a document with the new strategic policy initiatives and new development. In addition, seven Australian organisations will receive government funding of $ 14.2 million in order to development and be more innovative. The Entrepreneurs Programme Commercialisation Grants have been offered to a further 24 Australian companies, to push their innovation ideas into the global marketplace, and new grants have been created for New South Wales, South Australia and Tasmania States; in order to be more competitive and create new jobs.

The new prime minister will face several challenges. Today little does the Australian government incentivise technology parks, incubators and accelerators. Most of the times it is the private companies that incentivise these environments as a business model. Australian universities are mostly public and are ranked among the world's best; however, it is a source of income to the country. There is no integration between universities and companies. There are great laboratories and

research and development centres in the country, but they are devoted to academic research with no relation with the business world.

The Brazilian government cares to promote accelerators, incubators and technology parks in the country as a way to be closer to the companies in each region where innovation is incentivised. In the global context, the Brazilian government also promotes the integration of parks and incubators supporting missions to international events and the participation of corporate managers in world-famous technology parks. Government members also participate in these missions and this integrates government staff and trade association representatives. This has not been seen in Australia.

After this analysis and more in-depth consideration towards incentive sources in both countries, a survey was sent out to businessmen in the technology sector in order to learn and understand how these incentives are being used and perceived by such companies, which, based on their nature, tend to be innovative.

The results to the surveys conducted both in Australia and Brazil show that more than creating public policies governments must assure that policies are actually used in order to guarantee the success of programmes, which will eventually generate the economic development they intend to create.

The surveys exposed a common problem in both countries, namely, that businesses are not aware of the existing innovation incentive programmes. Trade associations can be used to bridge this gap and to publicise the government's new programmes; the more the policies are able to reflect what the companies need, the more effective these policies will be.

Real entrepreneurs need to know that it is up to them to look for the most appropriate incentive line to their firm; in other words, they need to understand each incentive line and choose the one that offers more benefits to their company.

With regards to the risk of investing in innovative firms, Australia looses its entrepreneurs to other countries such as the USA, Canada, and some Asian countries those incentivise new innovative firms. The country does not share the innovation-related risk with entrepreneurs. In Brazil there is more support for startups through incentive programmes. In Brazil, the number of firms that participate in the innovation and entrepreneurship ecosystem rises every year.

Having collected and processed the responses to the survey, the next step involved interviewing government people, trade associations

people, and businessmen who have used government financial support for research and development. This thesis shows the importance of incentive to innovation for countries to be more competitive in the international market.

The figures in this study's tables show that countries that invest and promote innovative entrepreneurship are ahead in technological terms; they are developed, generate value, replace imports and start to export their technologies – which contributes to the trade balance –, and generate jobs and income of high added value.

Brazil's government believes that innovation is important to generate competitiveness; however, the amplification of resources is necessary. One important focus the country must have is on education: people need to be taught about entrepreneurship, how to think in an innovative way and how to face risk.

Promoting innovative entrepreneurship means sharing the risk with entrepreneurs. In addition, since initiatives of this kind are still just a few, the government believes that the country can do more. In the government person's opinion, the government could reduce the demand for collateral from companies, which would make credit more accessible for smaller companies.

Public policies and government programmes must be planned to be long-lasting, simpler, transparent and objective. Also, there could be more confidence in the relationship between government, companies and universities.

Success cases could be used to promote incentive programmes for innovation; these cases can show how important incentive is to company growth. Today the government promotes its actions a lot, but a way of better publicising its current credit lines could be to better integrate incentive offices, such as Finep, CNPq and BNDES, and show each company niche what is available to it.

The government considers that incentive through subvention calls is a low-impact momentary action. The country must work on programmes that last long enough for them to become popular. This is also one of the concerns of entrepreneurs today, since programs seem to be designed to last a government term, that is, about four years. Entrepreneurs would like programs to have a more technical – rather than political – bias.

Whereas the most popular programs are long-term ones, short-term programs are not promoted adequately, nor do they have the adequate reach for companies to adhere. Brazil supports the university-

company relationship through public calls. Nevertheless, interviewees believe that the speed of companies is much greater than that of universities. If universities do not take deadlines and technological innovations into consideration, the integration for the generation of innovative development tends to decline.

A further way of promoting small companies and start-ups is through incubation, which has been identified as a success system. Incubators are likely to be more autonomous in the process of picking companies to be incubated and lending resources to them. Incubators must use merit in their selection process and results must be assessed every other year.

Brazil should decentralise incentives to innovation, work with incubators and regional trade associations. One of the interviewees thinks that the centralised system is inadequate and needs be changed. In case the country chooses to work in a decentralised way with regional partners, the cost of bureaucracy in each programme tends to drop; in addition, there would be more autonomy and recognition to regional associations and institutes.

As for Australia, it is possible to conclude from the interviews that the government needs to listen more and understand the actual needs of companies. The government needs to change its business framework in its universities so as to bring research and market together, and therefore generate economic value.

After 15 years of stagnation in Australia's public policies the new prime minister is now talking about innovation and suggests changes.

It is important that policies and innovation-oriented programmes be long-term ones; their names – or the programs themselves – cannot change every time the government changes. In the current scenario, entrepreneurs can hardly understand all the changes to be interested in achieving government support.

Another issue that was brought up is the lack of transparency. The selection process for companies to obtain government incentives must be more transparent. Transparency gives the process more credibility, consequently, entrepreneurs will believe they can actually obtain the resource/incentive they are applying for.

Bureaucracy really stood out in the speech of the Australian entrepreneur. Even though processes do not seem to be bureaucratic at first, the businessman describes the process as insane, especially in the phase of reporting the use of resources.

Universities and businesses need to be more integrated and this begins with a chance in the focus of researches. Nowadays, researches focus one major goal: publishing academic papers. Moreover, the structure of Australian universities could be shared with companies, especially laboratories and research centres. Universities are supposed to collaborate with the industry in order to develop the commercial potential of the researches they conduct.

The Australian government does not support innovation and entrepreneurial centres – such as incubators, accelerators and technology parks – as much as it could. Australian public policies on that issue do not go along those of other OECD member countries, which are well involved in the matter and participate of international networks that debate economic development by means of actors that support innovative companies.

The education system in Australia is a good one, from its very elementary education. However, entrepreneurs formed in the country are lost to countries that offer more support to innovation and risk. This is a big issue that deserves attention since government incentives could help keep skilled labour in the country.

Australian has got a small population and – consequently – a small market; therefore, the government must foster exports, so that innovative products can reach the international market.

After all, how can financial support provided to technology companies contribute to knowledge-based economic development? The analysis, survey and interviews on both Brazilian and Australian public policies show that it is important that innovation incentive programmes be permanent and long-lasting; that they have simple regulation and be reliable to firms.

The programmes must last longer than a political term and they must be managed on a technical basis so political issues do not affect them. The incentive programmes that had their names changed for political reasons are less popular and, consequently, are less used by firms.

Tax-incentive innovation incentive programmes, such as the R&D Tax Incentive in Australia and the Innovation Law (Lei de Inovação) in Brazil, are considered important programmes. In Australia, such incentive is a popular programme; however, in Brazil few firms use it. The new law must be improved and the country must offer support so for this incentive to reach more firms.

This study leads to the conclusion that incentive to innovation must be perennial, transparent, simple and direct, and a possible way to compromise all these requirements is tax incentive.

Subvention programmes are important for economic development; however, the government does not measure their results. Measuring is necessary, as much as supporting all the areas in a firm, with a special focus on research and development and, consequently, it is necessary to take the research to the market, which is considered an obstacle to innovative firms.

Programs must be complementary so that different forms of government support do not compete with each other. The programs must be decentralised for them to have a longer reach; their results must be measured every two years.

As to the KBED Framework, after all studies and analyses, this thesis recommends that **incentives** be added as the fifth pillar of knowledge-based economic development.

This doctoral thesis research was limited to federal innovation-focused public policies both in Brazil and Australia that contribute to the development of firms in the technology sector through subsidised credit, grants, and tax incentives. Therefore, this study did not cover incentive sources and tax incentives in either state or municipal levels.

This study was also limited to innovative firms in the technology sector both in Brazil and Australia. Consequently, innovative firms with a focus on other sectors are not part of this analysis. The firms that participated in the surveys by responding to questionnaires are members of trade associations with national representation either Brazil or Australia.

For future studies we suggest adding incentives to the economic development domain of the KBUD framework. We also suggest that a study be carried out using knowledge as the basis for the four pillars, namely, creativity, incentives, innovation and competitiveness.

As to the framework upon which this study was based — and which suggests the creation of a KBUD agency to orchestrate and integrate several institutional leaderships —, we suggest that a study be carried out to investigate how this agency may contribute to economic development, its role as an orchestrator, and if this agency may contribute to boost Brazil's innovativeness and competitiveness internationally.

Finally, we suggest a study on Brazil's innovation-oriented tax incentive laws that compares them to those of OECD member countries;

the aim is to make Brazilian innovative firms more competitive through tax incentives by means of a less bureaucratic and quicker process for this credit to be used by innovative entrepreneurs, who, after all, detain knowledge and contribute to knowledge-based economic development.

REFERENCES

ABDI. *Indústria e Desenvolvimento*: Instrumentos de Política Industrial no Brasil Evolução da Legislação Brasileira de Apoio ao Desenvolvimento da Produção: Problemas e Desafios para Melhoria. 2012, v. 1. Available in: <http://www.abdi.com.br/Estudo/Industria_e_Desenvolvimento_PBM.pdf>. Accesses in**:** 1st Mar 2015.

ABES. *Pesquisa ABES*: recursos para inovação e fomento. 2013. Available in: <http://central.abessoftware.com.br/Content/UploadedFiles/Arquivos/Estudos%2C%20Pesquisas%20e%20Pareceres/resultado-pesquisa-abes-inovacao-2013.pdf>. Accessed in: 29th Mar 2015.

ANPROTEC. *Estudo de Projetos de Alta Complexidade*: indicadores de parques tecnológicos / Centro de Apoio ao Desenvolvimento Tecnológico. Ministério da Ciência, Tecnologia e Inovação. BrasÍlia: CDT/UnB, 2014. Available in: <http://www.anprotec.org.br/Relata/PNI_FINAL_web.pdf>. Accessed in: 15th Mar 2015.

ARAÚJO, B. C. Políticas de apoio à inovação no Brasil: uma análise de sua evolução recente. In: *Texto para discussão 1759*. Instituto de Pesquisa Econômica Aplicada. Rio de Janeiro: Ipea, 2012.

ARRUDA, M.; VERMULM, R.; HOLLAND, S. *Technological innovation in Brazil: the industry in search of global competitiveness*. Sao Paulo: National Association of R&D of Innovative Companies, 2006.

ATKINSON, R.; ANDES, S. *The Atlantic Century II*: bechmarking EU & US innovation and Competitiveness, 2011.

AUSTRALIA. AUSTRALIA'S CHIEF SCIENTIST. Available in: <http://www.chiefscientist.gov.au/about/the-chief-scientist/>. Accessed in: 15th Mai. 2015.

AUSTRALIA. ACCOUNTING TOOLS ONLINE (ATO). Available in: <http://www.accounting.com.au/tax-returns.html>**.** Accessed in: 17th Mai. 2015.

AUSTRALIA. COMMONWEALTH SCIENTIFIC AND INDUSTRIAL RESEARCH ORGANISATION (CSIRO). Available in**:**

<http://www.csiro.au/en/About/Our-impact/Reporting-our-impact/Annual-reports/11-12-annual-report/Part2/Program-4>. Accessed in: 17th Mai. 2015.

AUSTRALIAN GOVERNMENT DEPARTMENT OF INDUSTRY. *The R&D Tax Incentive*, 2014. Available in: <http://www.business.gov.au/grants-and-assistance/innovation-rd/RD-TaxIncentive/Program-Information/Pages/default.aspx>. Accessed in: 2nd Apr. 2015.

BARBETTA, P. A. *Estatística aplicada às ciências sociais*. 7. ed. Florianópolis: UFSC, 2007.

BAUM, S.; O'CONNOR, K.; YIGITCANLAR, T. The implications of creative industries for regional outcomes. *International Journal of Foresight and Innovation Policy*, v. 5, n. 1, 2, 3, 2009.

BENEFIELD, L. E. Implementing evidence-based practice in home care. *Home Healthcare Nurse* (Baltimore), v. 21, n. 12, 2003.

BENNEWORTH, P.; Charles, D. University spin-off policies and economic development in less successful regions: learning from two decades of policy practice. *European Planning Studies*, v. 13, n. 4, 2005.

BOTELHO, A. *Inno-policy trendchart: innovation policy progress report* – Brazil, 2009.

BOTELHO, A. *Mini country report*: Brazil, 2011. Accessed in: 17th Feb. 2015.

BOTELHO, L. L. R.; CUNHA, C; MACEDO, M. O método da revisão integrativa nos estudos organizacionais. *Gestão e sociedade*. Belo Horizonte, v. 5, n.11, maio/ago., 2011.

BRASIL. MINISTÉRIO DAS RELAÇÕES EXTERIORES. *Mundo afora: políticas de incentive à inovação*. Brasília, n. 10, 2013. Available in: <http://dc.itamaraty.gov.br/publicacoes/mundo-afora-no-10-politicas-de-incentivo-a-inovacao>**.** Accessed in: 2nd Apr. 2015.

BRASIL. MINISTÉRIO DE CIÊNCIA, TECNOLOGIA E INOVAÇÃO. *TI Maior*: programa estratégico de software e serviços de tecnologia da informação, 2013. Available in: <http://central.abessoftware.com.br/Content/UploadedFiles/Arquivos/Inova

ção%20e%20Fomento/25_04_13%20Programa%20Estratégico%20de%20Software%20e%20Serviços%20de%20TI.pdf>**.** Accessed on: 10th Mar. 2015.

BRASIL. MINISTÉRIO DE CIÊNCIA, TECNOLOGIA E INOVAÇÃO. Available in: http://www.mcti.gov.br**.** Accessed in: 12th Mar. 2015.

BURTON-JONES, A. The knowledge supply model: a framework for developing education and training in the new economy. *Education and training*, v. 43, n. 4/5, 2001.

CARLSON, D.H.; THUROW, T.L.; JONES, C.A. Biophysical simulation models as foundation of decision support systems. In: STUTH, J. W.; LYONS, B.G. (Ed.). *Decision support systems for the management of grazing lands*: emerging issues. Paris: Unesco, 1993.

CARRILLO, F. (Ed.). The century of knowledge cities. *Knowledge cities:* approaches, experiences and perspectives. New York: Butterworth-Heinemann, 2006.

CARRILLO, F. Capital cities: a taxonomy of capital accounts for knowledge cities. *Journal of Knowledge Management*, v. 8, n. 5, 2004.

CARRILLO, F. Capital systems: implications for a global knowledge agenda. *Journal of Knowledge Management*, v. 6, n. 4, 2002.

CLARK, T. The knowledge economy. *Education and training*. v. 43, n. 4/5, 2001.

COMMONWEALTH OF AUSTRALIA, DEPARTMENT OF INDUSTRY, INNOVATION AND SCIENCE. *Australian innovation system report*, 2014. Available in: <http://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/Documents/Australian-Innovation-System/Australian-Innovation-System-Report-2014.pdf> Accessed on: 12nd Apr. 2015.

_____. *Australian innovation system report*, 2015. Available in: <http://www.industry.gov.au/Office-of-the-Chief-Economist/Publications/Documents/Australian-Innovation-System/Australian-Innovation-System-Report-2015.pdf > Accessed on: 12nd Apr. 2015.

_____. *Highlights*, 2014. Available in: <http://www.industry.gov.au/innovation/reportsandstudies/Documents/AIS-Highlights-2014.pdf> Accessed on: 12nd Apr. 2015.

COOKE, P.; LEYDESDORFF. L., (2006). Regional Development in the knowledge-based economy: the construction of advantage. *Journal of Technology Transfer*. 2006.

DAVENPORT, T.H. *Thinking for a living:* how to get better performance and result from knowledge workers. Boston: Harvard Business School Press, Massachusetts, 2005.

DURMAZ, B., YIGITCANLAR, T.; VELIBEYOGLU, K. Creative Cities and the firm industries. *The Open Journal of Urban Studies*, v. l, n. 1, 2008.

ERGAZAKIS, K.; Metaxiotis, K.; PSARRAS, J. An emerging pattern of successful knowledge cities' main features. In: CARRILLO, F. (Ed.): *Knowledge cities:* approaches, experiences and Perspectives. New York: Butterworth-Heinemann, 2006.

ERGAZAKIS, K.; METAXIOTIS, K.; PSARRAS, J. Towards knowledge cities: conceptual analysis and success. *Journal of knowledge management*, v. 8, n. 5, 2004.

FERNANDES, R. F; HOFFMANN, M.; FEUERSCHUTTE, S.G. Fatores organizacionais que afetam a inovação: análise de um potfólio de artigos. In: *XVI SEMEAD Seminários em Administração*, 2013.

FERENHOF, H. A; FERNANDES, R.F. *Passos para construção da Revisão Sistemática e Bibliometria*. Available in: <http://www.igci.com.br/artigos/passos_rsb.pdf>. Accessed on: 25th Jun. 2015.

FINEP - *Financiadora de Estudos e Projetos*, 2015. Available in <http://www.finep.gov.br>. Accessed in 5th Mar. 2015.

FLORIDA, R. *Cities and the Creative Class*. New York: Routledge, 2005.

FLORIDA, R. *The rise of the creative class and how it's transforming work, leisure*. 2002.

FRANE, A. *et al. The challenges of sustained development*. Budapest: Central European University Press, 2005.

GOEDHUYS, M.; VEUGELERS, R. Innovation strategies, process and product innovations and growth: firm-level evidence from Brazil. *Structural change and economic dynamics*, v. 23, n. 4, 2012.

GONZALEZ, M.; ALVARADO, J.; MARTINEZ, S. A compilation of resources on knowledge cities and knowledge-based development. *Journal of Knowledge Management*. v. 8, n. 5, 2005.

GRAHAM, S; MARVIN, S. *Telecommunications and the city:* electronic spaces, urban places. London: Routledge, 1996.

HEYWOOD, P. The place of knowledge based development in the metropolitan region'. In: YIGITCANLAR, T.; VELIBEYOGLU, K.; BAUM, S. (Ed.). *Creative urban regions.* Hershey: Information Science Reference, 2008.

HOWELLS, J. Tacit knowledge, innovation and economic geography. *Urban Studies*, v. 39, n. 5–6, 2002.

HUGGINS, R.; IZUCHI, H. Regional benchmarking in a global context: knowledge, competitiveness and economic development. *Economic Development Quartely*, v. 23, n. 4, 2009.

HUGGINS, R.; IZUSHI, H. Knowledge-based development in leading regions across the globe: an exploratory analysis of the co-evolution of resources, capabilities and outputs. *Urban studies*, v. 50, n.5, 2013.

HUGGINS, R.; STRAKOVA, L. Knowledge-based economic development in emerging regions: policy issues and implications in the Balkan Peninsula. *Regional studies*, v. 46, n.7, 2012.

HUGGINS. R. The growth of knowledge-intensive business services: innovation, markets and networks. *European Planning Studies*, v. 19, n. 8, 2011.

JACOBS, J. *The Economy of Cities.* New York: Vintage, 1969.

JACSO, P. As we may search: comparison of major features of the Web of Science, Scopus and Google Scholar citation-based and citation-enhanced databases. *Current Science*, v. 89, n.9, 2005.

JOHANNESSEN; J.A.; OLSEN, B.; OLAISEN; J. Aspects of innovation theory based on knowledge-management. *International Journal of Information Management*, v.19, n. 2, 1999.

KANNEBLEY, S.; Porto, G. *Tax incentives for research, development and innovation in Brazil.* Sao Paolo: Inter-American Development Bank, 2012.

KING, B.; KEATING, M. *Knowledge worker quotient.* New York: Expansion Management, 2005.

KLOPPER, R.; LUBBE, S.; RUGBEER, H. The matrix method of literature review. *Alternation*, Cape Town, v. 14, n. 1, 2007.

KNIGHT, R. *Knowledge-based development: policy and planning implications for cities*. 1995.

KNIGHT, R. Knowledge-based development: the challenge for cities. In: YIGITCANLAR, T.; VELIBEYOGLU, K.; BAUM, S. (Ed.). *Knowledge-based urban development:* planning and applications in the information era. Hershey: IGI Global, 2008.

LANCASTER, F. W. *Indexação e resumos*: teoria e prática. Brasília: Briquet de Lemos, 2004.

LASZLO, K.; LASZLO, A. Fostering a sustainable learning society through knowledge-based development. In: *50TH Annual Meeting of the ISSS*. 9-14 Jul 2006. Sonoma State University, USA, 2006.

LOR, P. J.; Britz, J.J. Is a knowledge society possible without freedom of access to information? *Journal of information science*, v. 33, n. 4, 2007.

MARQUES, Jamile Sabatini; YIGITCANLAR, Tan; COSTA, Eduardo Moreira da. Incentivizing Innovation: A Review of the Brazilian Federal Innovation Support Programs. *Asia Pacific Journal of Innovation and Entrepreneurship (APJIE)*, Shanghai, v. 9, n. 1, maio 2015. Available in: <http://eprints.qut.edu.au/86561/>.

MARQUES, Jamile Sabatini; YIGITCANLAR, Tan; COSTA, Eduardo Moreira da. Australian Innovation Ecosystem: A Critical Review of the National Innovation Support Mechanisms. *Asia Pacific Journal of Innovation and Entrepreneurship (APJIE)*, Shanghai, v. 9, n. 2, ago. 2015. Available in: <http://eprints.qut.edu.au/91574/>.

MARTINEZ, S.D. A comparative framework for knowledge cities. In: CARRILLO, J. (Ed.), *Knowledge cities*: approaches, experiences and perspectives, Butterworth-Heinemann, 2006.

MENDES, K. D. S.; SILVEIRA, R. C. C. P.; GALVÃO, C.M. Revisão integrativa: método de pesquisa para a incorporação de evidências na saúde e na enfermagem. *Texto Contexto Enfermagem*, Florianópolis, v. 17, n. 4, 2008.

METAXIOTIS, K.; CARRILLO, J.; YIGITCANLAR, T. (Ed.) *Knowledge-based development*, 2010.

METCALFE, S.; RAMLOGAN, R. Competition and the regulation of economic development. *The quartely Review of economics and finance*, 2006.

NAM, C.W. Corporate tax incentives for R&D investment in OECD countries. In: *International Economic Journal*, v. 26, n. 1, 2011.

NGUYEN, T. *Knowledge economy and sustainable economic development*, 2010.

NOBRE M, B. W. *Prática clínica baseada em evidência*. Rio de Janeiro: Elsevier; 2006

NOBRE, M; BERNARDO W. *Prática clínica baseada em evidência*. Rio de Janeiro: Elsevier; 2006.

NONAKA, I.; TAKEUCHI, H. *The knowledge-creating company*: how japanese companies create the dynamics of innovation. Okford: Oxford University Press; 1995.

NONAKA, I.; TAKEUCHI, H. *Criação de conhecimento na empresa*. Rio de Janeiro: Campus, 1997.

NONAKA, I.; TAKEUCHI, H.; UEMOTO, K. A theory of organizational knowledge creation. *International journal of technology management*, v. 11, n. 7-8, 1996.

NONAKA, I.; TOYAMA, R.; HIRATA, T. *Managing flow*: a process theory of the knowledge-based firm. Palgrave: McMillan, 2008.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT. *Oslo Manual*. The Measurement of Scientific and Technological Activities: Using Patent Data as Science and Technology, 2005. Available in: < http://www.oecd.org/sti/inno/2367580.pdf. > Accessed on: 25th Feb. 2015.

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT. Innovation and growth rationale for an innovation strategy, 2007. Available in: <http://www.oecd.org/science/inno/39374789.pdf >. Accessed on: 16th Mar. 2015

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT. *The knowledge-based economy.* Paris: OECD Publications, 1996. Available in: <http://www.oecd.org/sti/sci-tech/1913021.pdf >. Accessed on: 16th Mar. 2015

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT. *The OECD innovation strategy*: getting a head start on tomorrow. Paris: OECD Publications, 2010. Available in: <http://www.keepeek.com/Digital-Asset-Management/oecd/science-and-technology/the-oecd-innovation-strategy_9789264083479-en#page2>**.** Accessed on: 15th Mar. 2015

POLIT, D. F.; BECK, C. T. Using research in evidence-based nursing practice. In: POLIT, D. F.; BECK, C. T. (Ed.). *Essentials of nursing research. Methods, appraisal and utilization.* Philadelphia: Lippincott Williams & Wilkins, 2006.

RICHARDSON, R. J. *Pesquisa social, métodos e técnicas*. 3ª ed. São Paulo: Atlas, 2008.

RUIZ, M. A.; GRECO, O. T.; BRAILE, D. M. Fator de impacto: importância e influência no meio editorial, acadêmico e científico. *Revista brasileira de cirurgia cardiovascular*, v. 24, 2009.

SANTOS, N. dos. Gestão do Conhecimento Organizacional. Florianópolis: UFSC, 2012. [apostila]

SARIMIN, M.; YIGITCANLAR, T. Towards a comprehensive and integrated knowledge-based urban development model: status quo and directions. *International journal of knowledge-based development*, v. 3, n. 2, 2012.

SCHUMPETER, Joseph A. *Teoria do desenvolvimento econômico*. São Paulo: Abril Cultural, 1982.

SCImago. SJR — SCImago Journal & Country Rank. Available in: <http://www.scimagojr.com>. Accessed on: 15th Mar. 2015.

SMITH, H.; BAGCHI-Sen, S. University–industry interactions: the case of the UK biotech industry. *Industry and Innovation*, v. 13, n. 4, 2006.

THE WORLD UNIVERSITY RANKING, 2015 -2015. Available in: <https://www.timeshighereducation.com/world-university-rankings/2015/world-ranking#!/page/0/length/25 >. Accessed on 27th Mar 2015.

VIOTTI, E. Brazil: from S&T to innovation policy? The evolution and the challenges facing Brazilian policies for science, technology and innovation. *Paper presented at the Globalism Conference*, Mexico City, 2008.

WINDEN, W.; BERG, L. *Cities in the knowledge economy: new governance challenges*. Rotterdam: European Institute for Comparative Urban Research, 2004.

WORLD BANK. Doing Business 2014: Understanding Regulations for Small and Medium-Size Enterprises (Compreendendo as Regulamentações para Pequenas e Médias Empresas). Washington, D.C.: Grupo Banco Mundial, 2013. Available in: <http://portugues.doingbusiness.org/~/media/GIAWB/Doing%20Business/Documents/Annual-Reports/Foreign/DB14-minibook-portuguese.pdf>. Accessed on: May. 1st 2015.

YIGITCANLAR, T. Making space and place for the knowledge economy: knowledge-based development of Australian cities'. *European planning studies*, v. 18, n. 11, 2010.

YIGITCANLAR, T. Planning for knowledge-based urban development: global perspectives. *Journal of knowledge management*, v. 13, n. 5, 2009.

YIGITCANLAR, T. Position paper: benchmarking the performance of global and emerging knowledge cities. *Expert systems with applications*, v. 41, n. 12, 2014.

YIGITCANLAR, T. The making of urban spaces for the knowledge economy: global practices. In: AL-FURAIH, I *et al*. (Ed.). *Knowledge cities:* future of cities in the knowledge economy, Selangor: Scholar Press, 2007.

YIGITCANLAR, T., O'CONNOR, K.; WESTERMAN, C. The making of knowledge cities: Melbourne's knowledge-based urban development experience. *Cities*, v.25, n. 2, 2008.

YIGITCANLAR, T.; BAUM, S.; HORTON, S. Attracting and retaining knowledge workers in knowledge cities. *Journal of knowledge management*, v. 11, n. 5, 2007.

YIGITCANLAR, T.; BULU, M. Dubaization of Istanbul: insights from the knowledge-based urban development journey of an emerging local economy. *Environment and planning A*, v. 47, n. 1, 2015.

YIGITCANLAR, T.; FACHINELLI, A.C. Foreword in proceedings of the fourth knowledge cities world summit. In: *The World Capital Institute*, 26–27 October, Bento Gonçalves, Brazil, 2011.

YIGITCANLAR, T.; LÖNNQVIST, A. Benchmarking knowledge-based urban development performance: results from the international comparison of Helsinki. *Cities*, v. 31, 2013.

YIGITCANLAR, T.; LONNQVIST, A.; SALONIUS, H. Analysis of a city-region from the knowledge perspective: Tampere, Finland. *VINE*, v. 44, n. 3, 2014.

YIGITCANLAR, T.; MARTINEZ-FERNANDEZ, C. *Making space and place for knowledge production:* socio-spatial development of knowledge community precincts, 2010.

YIGITCANLAR, T.; VELIBEYOGLU, K. Knowledge-based urban development: the local economic development path of Brisbane, Australia. *Local Economy*, v. 23, n. 3, 2008.

YIGITCANLAR, T.; VELIBEYOGLU, K. *Queensland's smart state initiative:* a successful knowledge based urban development strategy? 2008.

YIGITCANLAR, T.; VELIBEYOGLU, K. Knowledge-based strategic planning. In: *3rd International Forum on Knowledge Asset Dynamics*, Matera, 2008.

YIGITCANLAR, T.; VELIBEYOGLU, K.; BAUM, S. *Knowledge-based urban development: Planning and applications in the information era*. 2008.

YIGITCANLAR, T.; VELIBEYOGLU, K.; MARTINEZ-FERNANDEZ, C. Rising knowledge cities: the role of urban knowledge precincts. *Journal of knowledge management*, v. 12, n. 5, 2008b.

YIN, R.K. *Estudo de caso***:** planejamento e métodos. 3. ed. Porto Alegre: Bookman, 2005.

APPENDICE A – Summary in Portuguese

1 INTRODUÇÃO

Nesta tese busca-se apresentar: (*i*) a contextualização do tema de pesquisa e a importância do fomento às empresas de base tecnológica para alavancar o desenvolvimento urbano baseado no conhecimento; (*ii*) o problema de pesquisa; (*iii*) o objetivo geral e os objetivos específicos; (*iv*) a justificativa que aborda a relevância, originalidade, ineditismo do estudo e aderência ao programa; (*v*) a delimitação da pesquisa; e, (*vi*) a estrutura do projeto de tese.

1.1 CONTEXTUALIZAÇÃO

O *framework* de Desenvolvimento Urbano Baseado no Conhecimento - DUBC, descrito por Yigitcanlar e Lonnqvist (2013), está dividido em quatro pilares, isto é, quatro grandes domínios de desenvolvimento: (*i*) Econômico; (*ii*) Sociocultural; (*iii*) Urbano-ambiental; e (*iv*) Institucional. A presente tese busca propor a inclusão de fomento como pilar do domínio de desenvolvimento econômico do *framework* de DUBC. Esta proposição dá-se ao fato de que o de fomento às empresas de base tecnológica é importante para gerar inovação e competitividade como estratégia para a promoção do Desenvolvimento Econômico Baseado no Conhecimento – DEBC.

Nesta tese, abordar-se-á o domínio de desenvolvimento econômico como elemento de destaque, o qual tem como base o conhecimento, a competitividade, a criatividade e a inovação. Adicionalmente, pretende-se demonstrar a importância do crédito para o empresário inovador, incluindo o fomento como um dos pilares do desenvolvimento econômico.

As empresas de base tecnológica serão foco deste estudo, considerando que são inovadoras e necessitam de conhecimento. Este perfil de empresa tem o conhecimento como recurso estratégico, pois a inovação exige a criação de um novo conhecimento para ser gerada (JOHANNESSEN; OLSEN; OLAISEN, 1999).

Tal propósito é convergente com a visão de que uma empresa de base tecnológica tem maior capacidade de absorção de conhecimento para gerar inovação e abrir novos mercados, obtendo melhor desempenho financeiro (SANTOS, 2012).

Vale frisar que o compartilhamento do conhecimento aumenta o potencial competitivo das organizações em decorrência do fato de que o conhecimento é um fator de produção que se expande quando é compartilhado (NONAKA; TAKEUSHI, 1997).

A Gestão do Conhecimento (GC) é caracterizado por atividades e processos que promovem o conhecimento organizacional para o aumento da competitividade por meio do melhor uso e da criação de fontes de conhecimento individuais e coletivas (SANTOS, 2012). A GC vem envolvendo o meio acadêmico e organizacional, tanto na teoria como na prática, sendo que a maioria das organizações continua tendo sérias dificuldades em entender e gerenciar o conhecimento como recurso (NONAKA; TOYAMA; HIRATA, 2008).

O empreendedor inovador precisa ter um conhecimento sobre o tema que pretende inovar, a fim de criar um novo produto ou serviço, que inclui o segmento de mercado empresarial desejado. Ao falar sobre fomento à inovação é importante que o conhecimento seja mencionado. O conhecimento é um recurso estratégico para empresas de base tecnológica, uma vez que a inovação depende de novos saberes, a fim de ser gerada (MATHEWS, 2003).

Assim, nesta tese, procurar-se-á propor a inclusão de fomento (crédito) no domínio de desenvolvimento econômico proposto no *framework* de DUBC, descrito por Yigitcanlar e Lonnqvist (2013). É importante salientar que os termos fomento e incentivo, foram tratados como palavras sinônimas. Na literatura o termo apoio também é utilizado como sinônimo para referenciar o fomento e o incentivo à inovação.

Com base no exposto, considerou-se a importância do crédito para o empreendedor inovador. Este tema é abordado pelo austríaco Joseph Alois Schumpeter que publicou em 1911 a Teoria do Desenvolvimento Econômico.

Schumpeter (1982) trata os ciclos econômicos nos períodos de prosperidade e recessão econômica, comuns no processo do desenvolvimento capitalista. O autor relaciona os períodos de prosperidade ao empreendedor inovador que, ao criar novos produtos, é imitado por empreendedores não inovadores, que investem recursos para produzir e plagiar os bens criados pelo empresário inovador. A relação entre inovação e a criação de novos mercados dá início a uma mudança econômica, gerando novas necessidades e desejos de consumo. A importância do crédito para a inovação é como uma onda de

investimentos de capital que ativa a economia, gera prosperidade e aumenta o nível de emprego.

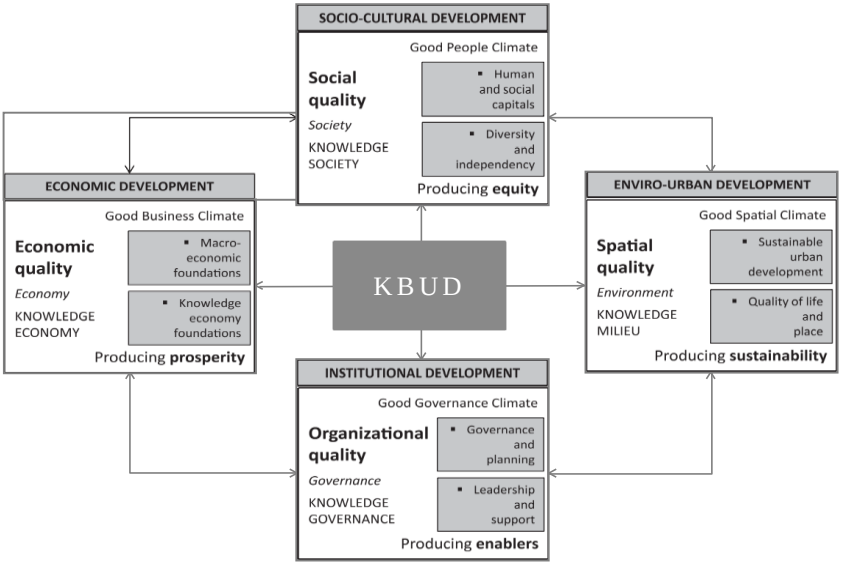
O Desenvolvimento Urbano Baseado no Conhecimento - DUBC tem como base a ênfase no papel do conhecimento como propulsor dos processos de geração de riqueza e desenvolvimento sustentável, propondo processos de transformação das cidades/sociedades em cidades/sociedades do conhecimento, tendo como elemento central a promoção da capacidade de atrair, gerar, reter e fomentar a criatividade, o conhecimento e a inovação (KNIGHT, 1995; YIGITCANLAR, 2011).

Segundo Knight (1995), o surgimento de uma sociedade global do conhecimento e a importância crescente da chamada economia do conhecimento requer que o planejamento urbano, até então focado em planejamento de espaços físicos e atração de ativos tangíveis (terra, capital e trabalho), incorpore meios e crie estruturas capazes de melhor gerir (gerar/reter/disseminar) ativos intangíveis (conhecimento, inovação).

Por outro lado, o DUBC é um novo "paradigma" de desenvolvimento da era do conhecimento que procura proporcionar prosperidade econômica, sustentabilidade ambiental, ordenamento sócio-espacial justo e boa governança para cidades. Este novo conceito busca o desenvolvimento de uma cidade propositadamente planejada para incitar a produção e a circulação de conhecimentos de uma maneira ambientalmente preservada, segura, socialmente justa e bem administrada (YIGITCANLAR, 2011).

O *framework*, descrito por Yigitcanlar e Lonnqvist (2013) e apresentado abaixo, demonstra os pilares do DUBC. Nele podemos observar os respectivos termos em inglês são: *Knowledge-Based Urban Development – KBUD* e *Knowledge-Based Economic Development – KBED*, conforme demonstrado abaixo.

Figura 1 - KBUD (DUBC) Framework proposto por Yigitcanlar e Lonnqvist (2013).



Fonte: Yigitcanlar and Lönnqvist (2013).

O foco desta tese encontra-se no domínio do desenvolvimento econômico baseado no DEBC, o qual consiste em termos econômicos, como o Conhecimento, a Competitividade, a Criatividade e a Inovação.

Além disso, este estudo tem como objetivo demonstrar a importância do crédito ao homem de negócios inovadores, incluindo o fomento como um dos pilares do desenvolvimento econômico.

1.2 PERGUNTA DE PESQUISA

Considerando o contexto explanado, emerge a pergunta de pesquisa que orienta o desenvolvimento desta tese:

Como o apoio financeiro concedido às empresas de tecnologia pode contribuir para o desenvolvimento econômico baseado no conhecimento?

1.3 OBJETIVOS DA PESQUISA

Nesta subseção apresenta-se o objetivo geral e os objetivos específicos a serem alcançados nesta tese.

1.3.1 Objetivos Gerais

Propor a inclusão de fomento como pilar do domínio de desenvolvimento econômico do *framework* de DUBC, com foco nas empresas de base tecnológica como estratégia para a promoção do desenvolvimento econômico baseado no conhecimento.

1.3.2 Objetivos específicos

Para alcançar o objetivo geral desta tese foram estabelecidos os seguintes objetivos específicos:

a) analisar as políticas públicas de fomento às empresas de base tecnológica no Brasil e na Austrália, sob a ótica de sua contribuição ao desenvolvimento urbano baseado no conhecimento;

b) analisar as práticas no Brasil e na Austrália no campo de fomento às empresas de base tecnológica como estratégia para o desenvolvimento urbano baseado no conhecimento;

c) comparar a realidade brasileira com as práticas australianas no campo de fomento à inovação.

1.4 JUSTIFICATIVA PARA A CONDUÇÃO DA PESQUISA

A justificativa para a realização da pesquisa será construída por meio de argumentos quanto à relevância, originalidade, ineditismo e a demonstração de aderência da tese ao programa de Pós-Graduação de Engenharia e Gestão do Conhecimento – EGC.

1.4.1 Relevância

A presente pesquisa é relevante, pois apresenta contribuições teóricas e práticas. A contribuição teórica é evidenciada pela revisão da literatura realizada em relação ao Desenvolvimento Urbano Baseado em Conhecimento, Desenvolvimento Econômico Baseado no Conhecimento, Australia Incentives e tech* comp* e innovation e o mesmo em relação a Brazil Incentives, usando tech* comp* e innovation. A pesquisa foi feita em Janeiro de 2015 na base de dados

Scopus e também nos acessos da base de dados da Universidade de tecnologia de Queensland - QUT.

A relevância dá-se pelo impacto que esta tese pode gerar para as políticas públicas de fomento e para as empresas de base tecnológica brasileiras, o que irá contribuir com o desenvolvimento e competitividade das empresas inovadoras em âmbito nacional e internacional, com a pesquisa científica e com a sociedade.

Com relação a pesquisa científica, foram publicados dois artigos no Asia Pacific Journal of Innovation and Entrepreneurship (APJIE), ambos relacionados a tese. O primeiro artigo foi sobre o sistema de inovação brasileiro, intitulado Incentivizing Innovation: A Review of the Brazilian Federal Innovation Support Programs. O artigo Australian Innovation Ecosystem: A Critical Review of the National Innovation Support Mechanisms foi o segundo artigo, nele foi tratado o sistema de inovação australiano e a perspectiva dos empresários do setor tecnológico.

A contribuição prática é percebida pela proposição da inclusão do fomento como estratégia para a promoção do desenvolvimento econômico baseado no conhecimento no *framework* de KBUD. O trabalho é relevante à medida que se percebe na literatura científica a necessidade de novas pesquisas sobre *Knowledge-Based Urban Development*, *Knowledge Economic Development* uma vez utilizando a base de dados da *Scopus*, abordando como palavras de busca *Technology Parks, Scientific Parks*, *Incentives e Competitive*, foram identificadas lacunas.

A escolha do tema com foco em economia dentro do *framawork* KBUD, vem da vivência prática da autora por trabalhar com empresas inovadoras que buscam o fomento como forma de alavancar os seus negócios.

Em pesquisas anteriores sobre um programa de fomento para empresas inovadoras, chamado Programa Juro Zero, do qual a autora foi a coordenadora no estado de Santa Catarina, tinha como objetivo fomentar a pesquisa, o desenvolvimento e a inovação no estado. Os resultados gerados pelo programa e demonstrados na pesquisa veem a contribuir com a relevância do fomento para o desenvolvimento econômico. Empresas que obtiveram recursos do Programa Juro Zero em Santa Catarina, Brasil, além crescer acima da média nacional, algumas delas receberam aporte de capital internacional.

Com o intuito de contribuir com o desenvolvimento das empresas inovadoras por meio de políticas públicas para a geração do

desenvolvimento econômico do país, a autora buscou aprofundar-se neste tema por meio desta tese.

1.4.2 Originalidade

O *framework* de KBUD descrito por Yigitcanlar (2011; 2013), é composto por quatro grandes domínios de desenvolvimento (*i*) econômico; (*ii*) sócio-cultural; (*iii*) urbano-ambiental; e, (*iv*) institucional.

Nesta tese, o foco de pesquisa e análise está no domínio de desenvolvimento econômico, o qual tem como base no Conhecimento, na Competitividade, na Criatividade e na Inovação.

A originalidade da tese é a inclusão do fomento para as empresas de base tecnológica no domínio de desenvolvimento econômico.

A identificação dessa lacuna na literatura permite argumentar que o trabalho é original, pois se utiliza de uma abordagem qualitativa quanto ao aspecto de exploração dos dados. A pesquisa contou com envio de questionários para empresários do setor tecnológico por meio de entidades de classe com representatividade nacional do setor tecnológico. As perguntas utilizadas foram as mesmas nos dois países, porém as respostas estão relacionadas as linhas de fomento e realidade de cada região.

Houve também uma abordagem qualitativa quanto as entrevistas estruturadas com governo e entidades de classe com representatividade nacional e empresários que se beneficiaram das fontes de fomento. Após o término das entrevistas houve uma validação dos resultados dos questionários respondidos pelas empresas. Na maioria dos casos os entrevistados confirmaram os resultados apresentados.

Na análise da literatura, encontrou-se lacunas que esta tese buscará atender, demonstrando a importância da inclusão do fomento como parte do domínio de desenvolvimento econômico no *framework* proposto por Yigitcanlar, T. (2011, 2013).

Nesta tese buscou-se a proposição da inclusão de fomento como pilar do domínio de desenvolvimento econômico do *framework* de DUBC.

1.4.3 Ineditismo

O presente estudo é inédito quanto à proposição de um modelo de fomento às empresas de base tecnológica como estratégia para a promoção do desenvolvimento urbano baseado no conhecimento.

Na literatura internacional, o termo *KBUD – Knowledge-Based Urban Development* vem sendo estudado desde 2008 por vários autores, destacando-se o pesquisador Dr. Tan Yigitcanlar, o qual demonstra no domínio do desenvolvimento econômico quatro pilares: conhecimento, competitividade, criatividade e inovação, os quais estão atrelados às empresas de base tecnológica, porém identificou-se a lacuna da necessidade do fomento como um dos pilares para o desenvolvimento econômico.

Na análise da literatura identificou-se esta lacuna, que a presente tese pretende pesquisar, demonstrando a importância da inclusão do fomento como parte do domínio de desenvolvimento econômico no *Framework* proposto por Yigitcanlar (2011; 2013).

1.4.4 Aderência ao EGC

Adicionalmente as variáveis de relevância, originalidade e ineditismo, justificam-se a presente pesquisa em função de sua contribuição e aderência ao Programa de Pós-Graduação em Engenharia e Gestão do Conhecimento, a qual se propõe a: (*i*) estudar modelos internacionais de fomento para empresas de base tecnológica, na ótica de contribuir com o desenvolvimento econômico baseado no conhecimento; (*ii*) ser aderente ao EGC permeada pela linha de pesquisa da gestão do conhecimento da sustentabilidade; (*iii*) ter relevância social, pois o desenvolvimento urbano baseado no conhecimento congrega aspectos da importância crescente da chamada economia do conhecimento e a geração, retenção e disseminação de ativos intangíveis; e (*iv*) contribuir para o desenvolvimento de políticas públicas que irão impactar a sociedade nas esferas econômica, social e científica.

1.5 DELIMITAÇÃO DA PESQUISA

É importante salientar que as delimitações apresentadas são intrínsecas ao tipo de pesquisa que se pretende realizar. A realização deste estudo qualitativo requer a análise documental de políticas

públicas nacionais atuais voltadas ao fomento das empresas de base tecnológica; do questionário construído e das entrevistas realizadas, nos dois países. Foram analisadas as políticas públicas nacionais do Brasil e da Austrália. Os questionários foram enviados aos empresários do setor tecnológico nos dois países por meio de entidades de classe com representatividade nacional e que representam o setor de Tecnologia e Inovação. As respostas dos questionários foram validadas ao final de cada entrevista. As entrevistas estruturadas foram feitas com representantes de entidades de classe, governo federal e empreendedores que captaram recursos de fomento à inovação.

O estudo será delimitado às leis nacionais, voltadas às empresas de base tecnológica de micro, pequeno e médio porte. Portanto, ao se tratar do tema fomento nesta tese deve-se entender que ele está limitado às linhas de crédito com juros subsidiados, editais de subvenção econômica, tanto financeira como na forma de bolsas de incentivo, assim como o fomento por meio de impostos federais e recursos advindos de fundos de investimento, que também serão apresentados como forma de fomentar a inovação.

Há uma delimitação referente à revisão sistemática de literatura realizada. O processo de busca descrito no Capítulo Referencial Teórico restringe-se aos artigos publicados em periódicos que tenham acesso livre ao texto completo por meio do próprio periódico ou por meio do acesso ao portal de periódicos da CAPES, ou pela busca direta de periódicos na base de dados *Scopus* e na base de dados da Universidade de Tecnologia de Queensland (QUT).

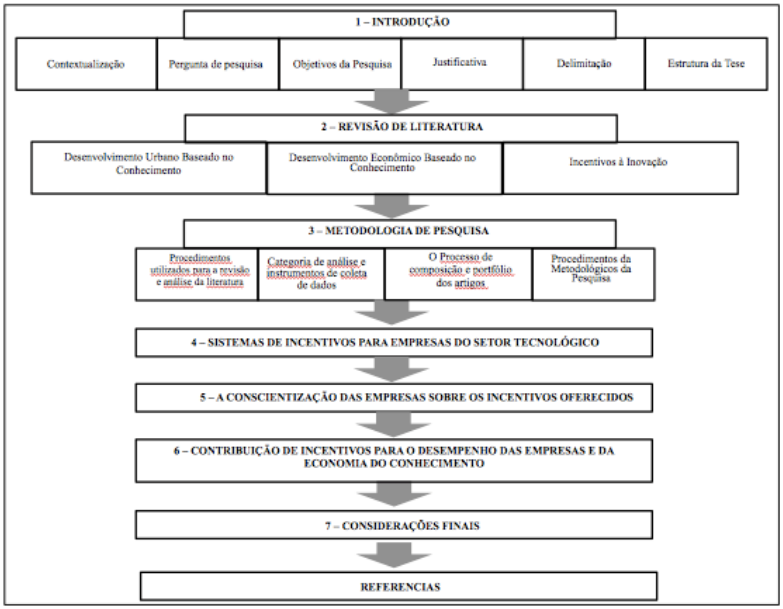
As buscas foram feitas até janeiro de 2015. As alterações nas legislações foram avaliadas nas considerações finais desta tese.

1.6 ESTRUTURA DE TESE

Esta tese é composta por sete capítulos, a saber: (*i*) Introdução; (*ii*) Revisão da literatura; (*iii*) Metodologia; (*iv*) Sistemas de incentivos para empresas do setor tecnológico; (*v*) A conscientização das empresas sobre os incentivos oferecidos; (*vi*) Contribuição de incentivos para o desempenho das empresas e da economia do conhecimento, e; (*vii*) Considerações finais.

A Figura 2 abaixo mostra a estrutura desta tese, que incide sobre os incentivos à inovação para geração do desenvolvimento econômico baseado no conhecimento.

Figura 2 - Estrutura de Tese.



Fonte: Elaborada pelo autor, 2015.

2 REVISÃO DE LITERATURA

A revisão da literatura revela uma lacuna que esta tese busca suprir, demonstrando a importância do fomento para as empresas inovadoras, como forma de gerar desenvolvimento econômico baseado no conhecimento.

Uma revisão da literatura foi realizada buscando os termos *Knowledge Based Urban Development*, e *Knowledge Based Economic Development*, com as respectivas iniciais (KBUD e KBED), e *Innovation Incentives*.

A revisão da literatura identificada do *framework* de Desenvolvimento Econômico Baseado no Conhecimento, desenvolvido pelo Prof. Tan Yigitcanlar, que utiliza quatro pilares: o conhecimento, a criatividade, a inovação e a concorrência, como uma forma de gerar desenvolvimento econômico baseado no conhecimento.

O estudo identificou, em seguida, as políticas públicas em inovação no Brasil e na Austrália e comparou-os com outros países membros da OCDE.

De acordo com a revisão de literatura, pode-se perceber que há um *gap*, a qual esta tese se propõe a preencher demonstrando a importância do fomento para as empresas inovadoras, afim de gerar desenvolvimento econômico baseado no conhecimento.

Os países da OECD são os mais referenciados na literatura e chama a atenção que na maioria dos casos os países adotam incentivos na forma de redução de impostos, quase não é abordado o incentivo por meio de subvenção econômica. Os artigos produzidos com foco no modelo brasileiro de fomento acabam por mencionar os programas com subvenção econômica.

A literatura ressalta a importância do conhecimento para a geração da inovação. Ela chama a atenção para as universidades como propulsoras do desenvolvimento econômico e a importância da integração entre universidades e empresas para gerar inovação. Todo este processo traz como resultado o desenvolvimento econômico com empresas mais competitivas, inovadoras, criativas e baseadas no conhecimento.

O governo também é mencionado como elemento chave, desenhando as políticas públicas conforme a necessidade do país e em harmonia com as empresas inovadoras, estas políticas devem se manter atuais e devem estar integradas com entidades de classe e outros atores que trabalhem em prol do desenvolvimento econômico e geração de riqueza.

A revisão da literatura demonstra a importância da inclusão do fomento para geração do desenvolvimento econômico, a fim de gerar competitividade. As habilidades como conhecimento, criatividade e inovação são fatores que já pertencem ao empresário inovador. Com a inclusão do fomento, o governo pode impulsionar por meio de políticas públicas, a competitividade empresarial, tornando o país também mais competitivo.

3 METODOLOGIA DE PESQUISA

O capítulo referente a metodologia de pesquisa está subdividido em três seções: (*i*) Procedimentos utilizados para a revisão e análise da literatura; (*ii*) Categoria de análise e instrumentos de coleta de dados; e, (*iii*) Procedimentos metodológicos da pesquisa.

3.1 PROCEDIMENTOS UTILIZADOS PARA A REVISÃO E ANÁLISE DA LITERATURA

Para desenvolver a pesquisa a partir dos procedimentos de revisão sistemática e bibliometria, buscou-se a orientação do modelo de Ferenhof e Fernandes (2013), que propõe três fases com seu respectivo conjunto de atividades de sistematização e desvendamento da produção científica de um determinado tema. São elas: a definição do protocolo da pesquisa, a análise e a síntese, conforme detalhamentos expostos na figura abaixo:

Figura 3 - Fases e atividades da Revisão Sistemática e Análise e Síntese dos Dados.

Fonte: Adapatdo de Ferenhof e Fernandes (2013).
Disponível <**http://www.igci.com.br/artigos/passos_rsb.pdf**> Acesso em 28/08/2014.

A revisão sistemática e bibliométrica deste documento tem como objetivo mapear a produção científica sobre o tema DUBC. Trata-se de uma busca de caráter descritivo, delimitada de forma longitudinal, uma vez que se estudou a produção acadêmica do referido tema ao longo dos anos de 2008 a 2014.

A presente seção objetiva apresentar a pesquisa teórico-metodológica demonstrando a busca na base de dados *Scopus*. Utilizou-se para esta análise o termo *KBUD* como longitudinal. Os temas propostos para a busca transversal estão alinhados com o setor

tecnológico, o qual a pesquisadora trabalha desde 2004 e pretende agregar tanto para a academia quanto para a sociedade buscando as lacunas na literatura. As terminologias utilizadas para as buscas transversais são: *innovation* (12), *economic development* (14), *technology parks* (1), *scientific parks* (0), *innovations parks* (3), *urban innovation* (11), *technol* innovation* (11), *social development* (10) *urban development* (14), *intellectual capital* (1), *social capital* (5), *incentives* (2) e *competitive* (1). Os números apresentados nos parênteses referem-se ao número de artigos que cada termo está relacionado.

O detalhamento do portfólio dos artigos está detalhado na tese com as seguintes subseções:

Fase 1 – Definição do Protocolo da Pesquisa – Nesta fase abrange a elaboração de um conjunto de regras e parâmetros de configuração do processo, determinando as características de acordo com sua necessidade.

Fase 2 – Bibliometria - Na fase da bibliometria, de acordo com Ferenhof e Fernandes (2013), as referências sobre o tema são construídas e, então, condensadas em relatórios.

Fase 3 – Síntese – nesta última fase as conclusões sobre o tema são construídas e, então, condensadas em relatórios. (FERENHOF; FERNANDES, 2013).

3.1.1 Quantidade de publicações demonstradas por ano

Como o tema DUBC é considerado novo na literatura, os artigos começaram a ser publicados em 2008.

Dos 13 artigos publicados no ano de 2008, 7 tem autoria e co-autoria de Tan Yigitcanlar. Os outros 6 artigos são de diferentes autores.

O autor Yigitcanlar publicou nos últimos seis anos um total de 20 artigos, sendo: 7 artigos em 2008; 1 artigo em 2009; 4 artigos em 2010; 3 artigos em 2011; 2 artigos em 2012 e 1 artigo no sexto ano (2013). Nota-se que nos anos de 2009 e 2012 os únicos artigos publicados neste tema são do autor em referência.

3.1.2 Dados gerais do portfólio de pesquisa

Com base nos 42 artigos encontrados na base de dados Scopus, apresenta-se a seguinte premissa de cada tópico:

1. Hoje tem-se no mundo 25 diferentes autores pesquisando sobre o tema DUBC.

2. O autor Tan Yigitcanlar é responsável por 16 dos 42 artigos indicados pela pesquisa. Tal fato destaca a relevância do autor frente ao tema estudado pela presente tese.
3. Quanto à quantidade de autores que se repetem, são 3: Tan Yigitcanlar, T. Sarimin, M. e Perry, B. Os dois últimos dispõem de um artigo cada um.
4. Tan Yigitcanlar se destaca na quantidade de artigos produzidos por um único autor, sendo que dos 16 documentos com essa característica, ele produziu 6 e o autor B. Perry desenvolveu 1 artigo, enquanto os 9 artigos restantes foram compostos por diferentes autores: M. Bulu; P. Daffara; Marjaneh Farhangi; P. Heywood; László, Z. K; Lizcano, A. S.; Van Wezemael, J. E.; Zhao, P. e Zolnik, E. J.
5. São 2 os autores que escreveram os artigos como únicos autores: Tan Yigitcanlar e B. Perry.

3.2 CATEGORIA DE ANÁLISE E INSTRUMENTOS DE COLETA DE DADOS

O quadro apresentado abaixo apresenta um detalhamento das categorias de análise e instrumentos de coleta de dados, por meio de seus dos objetivos específicos.

Quadro 1 - Categoria de análise e instrumentos de coleta de dados.

OBJETIVOS ESPECÍFICOS	CATEGORIA DE ANÁLISE	INSTRUMENTOS DE COLETA DE DADOS
1. Analisar as políticas públicas de fomento à inovação no Brasil e Austrália sob a ótica de sua contribuição ao DUBC	Políticas públicas voltadas a fomentar a inovação.	Análise por meio eletrônico e documental.

OBJETIVOS ESPECÍFICOS	CATEGORIA DE ANÁLISE	INSTRUMENTOS DE COLETA DE DADOS
2. Analisar as práticas no Brasil e na Austrália no campo de fomento à inovação às empresas do setor tecnológico como estratégia para o DUBC.	Análise das políticas públicas nos dois países.	Usar referencial teórico e análise das políticas públicas. Observação *in loco* sobre a experiência internacional na Austrália. Visitas a órgãos de fomento.
3. Comparar a realidade brasileira com a experiência australiana no campo de fomento à inovação.	Fazer um comparativo entre as políticas públicas do Brasil e da Austrália para propor a inclusão de fomento como pilar do domínio de desenvolvimento econômico do *framework* de DUBC.	Evidenciar as práticas de sucesso que geram o DUBC. Análise de programas de fomento às empresas de base tecnológica que contribuíram para o DUBC. Enviar pesquisa para as empresas de base tecnológica nos dois países. Estruturar entrevistas com associações de representatividade nacional, pessoas de governo e empresários do setor. Identificar os casos de sucesso que geram o DUBC

Fonte: Elaborado pelo autor, 2015

O Quadro 1 demonstra o caminho trilhado pelo pesquisador para atingir os objetivos específicos desta tese.

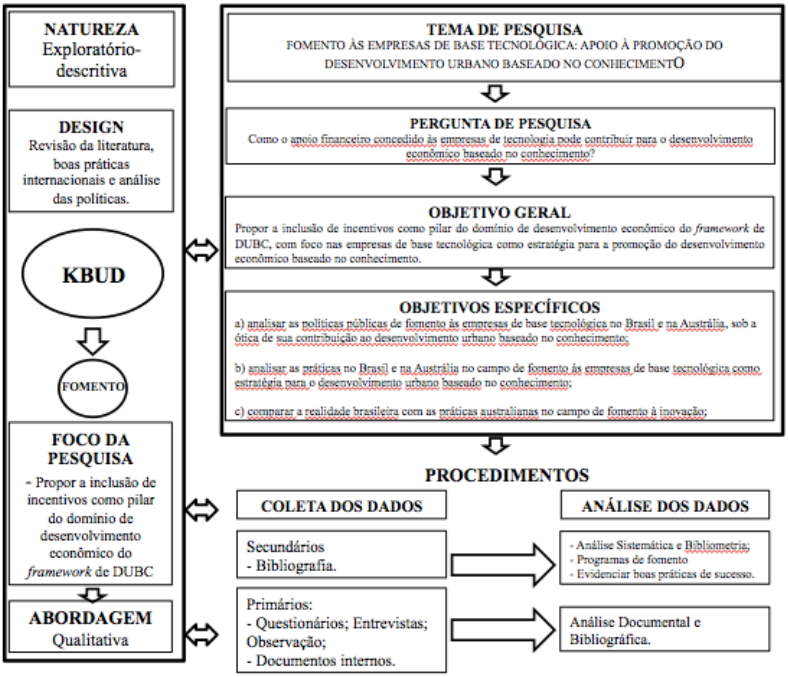
3.3 PROCEDIMENTOS METODOLÓGICOS DA PESQUISA

O capítulo referente aos procedimentos metodológicos a serem aplicados nesta pesquisa está subdividido em duas seções: (*i*) Enquadramento metodológico; e, (*ii*) Procedimentos para identificação do *gap* de pesquisa e inclusão do pilar fomento no domínio econômico.

3.3.1 Enquadramento Metodológico

O enquadramento metodológico tem o objetivo de esclarecer as escolhas quanto à realização da pesquisa. Na Figura 4, apresenta-se o *design* da pesquisa que busca apresentar as escolhas realizadas nesta tese.

Figura 4 - Design da pesquisa.



Fonte: Elaborado pelo autor, 2015.

No que se refere à natureza do objetivo o estudo se caracteriza como exploratório-descritivo. Exploratório, pois buscou construir

entendimento sobre o DUBC. O presente trabalho busca aprofundar o entendimento do fomento para empresas de base tecnológica e como poderá contribuir como alicerce para a promoção do DUBC.

O processo da pesquisa exploratória é possível a partir da interação entre os decisores de parques tecnológicos e da experiência de vivência internacional em região considerada estar dentro dos parâmetros do DUBC. A revisão da literatura, práticas internacionais e análise da literatura também se caracterizam como exploratória, pois geram o entendimento da importância do fomento para empresas de base tecnológica no contexto do DUBC.

Descritivo no momento em que, na revisão da literatura, faz uma análise crítica do que já foi publicado sobre DUBC e na proposição da inclusão do fomento no *framework* apresentado.

A pesquisa é pautada na investigação da realidade do DUBC, sendo que a Austrália tem *cases* reconhecidos internacionalmente e é o berço mundial de pesquisa sobre DUBC. O estudo permite uma investigação que preserva as características das organizações em funcionamento (YIN, 2005), e o pesquisador consegue aprofundar em relação aos aspectos que influenciam no desempenho e articulação do DUBC.

Em relação à coleta de dados, a pesquisa faz uso de dados primários e de dados secundários. Dados primários são colhidos diretamente em campo por meio de entrevistas, observação e análise de documentos (RICHARDSON, 2008). Na presente pesquisa, foi utilizado como dados primários questionários com empresários do setor tecnológico, por meio de entidades de classe, com representatividade nacional do setor tecnológico. As perguntas utilizadas foram as mesmas nos dois países, porém as respostas estão relacionadas às linhas de fomento de cada região.

Também como dados primários, foram feitas entrevistas com os decisores de entidades de classe e governo, investidor e bancos de fomento e também se utilizou de documentos e legislação sobre o tema.

Os dados secundários utilizados foram os artigos selecionados por meio do processo de busca realizado em periódicos internacionais a partir de banco de dados.

No que se refere à abordagem do problema, a pesquisa pode ser caracterizada como qualitativa. É qualitativa quando decide examinar situações complexas e estritamente particulares, em que a subjetividade é mais presente e se procura entender atividades sociais e humanas (RICHARDSON, 2008).

A pesquisa qualitativa que se apresenta neste estudo decide examinar e refletir sobre as percepções dos entrevistados, os quais são decisores e formadores das legislações de fomento à inovação nos dois países e também representantes do setor tecnológico empresarial. Houve também a validação e análise por parte dos entrevistados dos resultados apresentados na pesquisa feita com os empresários.

3.3.2 Procedimentos para Identificação do Gap de Pesquisa e Inclusão do Pilar Fomento no Domínio Econômico.

Na revisão de literatura sobre *KBUD* apresentada no Quadro 2 da tese, entitulado "The results of transversal searches" (vide pagina 85), ficam evidenciadas algumas lacunas para novas pesquisas. Os termos *technology parks (1), scientific parks (0), innovations parks (3), intelectual capital (1), incentives (2) e competitive (1)* aparecem como demonstrado nos parênteses.

A oportunidade de pesquisa percebida pela autora foi identificada quanto ao fomento que apareceu na busca com o termo *incentives* em apenas dois artigos.

Após identificar a necessidade da inclução do fomento no *framework* de DEBC, foram feitas pesquisas no Brasil e na Austrália por meio de questionários. O intuito da aplicação destes questionários era de conhecer o quanto os empresários brasileiros e australianos conheciam do fomento para a inovação. A pesquisa foi desenvolvida englobando as principais fontes de fomento federal, nos dois países.

No caso do Brasil, a pesquisa foi enviada pela ABES – Associação Brasileira das Empresas de *Software*, instituição nacional, privada e sem fins lucrativos. Os e-mails utilizados para envio da pesquisa são de donos das empresas e diretores, garantindo uma maior assertividade nas respostas. Foram recebidos 219 respostas aos questionários.

Na Austrália, a pesquisa foi enviada pelo AIIA – *Australian Information Industry Association*, instituição nacional, privada e sem fins lucrativos e pelo *Cooperative Research Centres Association* (CRCA). Os e-mails utilizados são de empresários e diretores de empresas de base tecnológica, conforme já demonstrado na metodologia de pesquisa desta tese (vide página 127). O retorno dos questionários preenchidos foi de 75.

A pesquisa é objetiva, com um tempo de resposta de 3 (três) minutos, levando em consideração que seria respondida por

empresários. As perguntas se equivalem nas pesquisas aplicadas pela ABES e AIIA. Nas opções de resposta foram consideradas a realidade e os programas governamentais de cada país.

A proposta teórico-metodológica se propõe a contribuir com o *framework* de KBUD/DUBC com a inserção do fomento no domínio econômico como um dos pilares para o desenvolvimento econômico baseado no conhecimento.

Após análise das políticas públicas, pesquisas, aplicação de questionários e realização de entrevistas, esta tese busca agregar as políticas públicas dos dois países com sugestões de melhorias.

Para tal, listam-se a seguir algumas lacunas encontradas na literatura sobre o tema, que justificam a proposta da inclusão do fomento às empresas de base tecnológica como estratégia para a promoção do DUBC.

- A falta na literatura do fomento à inovação para promoção do desenvolvimento econômico baseado no conhecimento.
- A necessidade e a importância do fomento, conforme apresentado por Schumpeter (1982), para o empreendedor inovador e a importância deste para geração do desenvolvimento econômico.
- Países desenvolvidos que fomentam a inovação são mais competitivos e geram o desenvolvimento econômico.

4 SISTEMAS DE INCENTIVOS EMPRESAS DO SETOR TECNOLÓGICO

No Brasil os programas e legislações com foco no desenvolvimento econômico por meio do fomento às empresas inovadoras é recente. A partir de 2004 é que o governo pode apoiar as empresas privadas por meio de editais de fomento. Este apoio foi importante para o desenvolvimento das empresas e do setor tecnológico como um todo.

Embora o país tenha fomentado a inovação nos últimos anos, o montante ainda é tímido se comparado ao percentual alocado em CT&I. Hoje, os recursos alocados à inovação estão abaixo de 1% do PIB. O país necessita de um olhar atento a inovação para que o mesmo conquiste o mercado global de competitividade, precisa estimular a inovação por meio de incentivos fiscais e ser mais agressivo em momento de crise.

A Austrália tem um modelo de incentivo fiscal que funciona e é a forma de fomento mais utilizada no país. Nos últimos anos a Austrália perdeu competitividade, o governo tem conhecimento da necessidade de investir em inovação. A mineração vinha sendo o foco de investimentos no país.

Na Austrália o fomento à inovação têm foco em dois programas, chamados *R&D Tax Incentives* e *Entrepreneur Infrastructure Program*. O *R&D Tax Incentives* também existe no Brasil na forma da Lei do Bem e da Lei da Inovação. Entretanto, esses dois programas não são muito utilizados por empresas brasileiras.

5 A CONSCIENTIZAÇÃO DAS EMPRESAS SOBRE O INCENTIVO OFERECIDO

Após análise e uma consideração mais profunda das fontes de fomento em ambos os países, um questionário foi enviado a empresários do setor de tecnologia com vistas a conhecer e compreender como o fomento está sendo usado e percebido por essas empresas, as quais, por sua natureza, tendem a ser inovadoras.

Os questionários aplicados nos dois países mostram que além de criar políticas públicas, os governos devem promover seu uso e garantir o sucesso dos programas, gerando o desenvolvimento econômico que eles almejam criar.

Para serem mais efetivas, as políticas criadas devem refletir as necessidades das empresas. Isso pode ser feito junto a entidades de classe, que são um meio de chegar às empresas e comunicar a elas os novos programas do governo, considerando que um problema percebido em ambos os países, por meio das pesquisas, é a falta de conhecimento de programas de fomento à inovação.

Um empreendedor precisa aprender como encontrar a linha de fomento adequada à sua empresa; deve buscar compreender o funcionamento de cada linha de fomento e como se beneficiar desses serviços.

6 CONTRIBUIÇÃO DE INCENTIVOS PARA O DESEMPENHO DAS EMPRESAS E DA ECONOMIA DO CONHECIMENTO

Uma vez coletadas e processadas as respostas à pesquisa, o passo seguinte envolveu entrevistar representantes do governo, de entidades de

classe e empresários que já fizeram uso de apoio financeiro do governo para pesquisa e desenvolvimento. Esse trabalho mostra a importância do fomento à inovação para que os países sejam mais competitivos no mercado internacional.

Algumas das contribuições apontadas nas entrevistas são destacadas a seguir:

O governo brasileiro acredita na importância da inovação para gerar competitividade, entretanto, os recursos devem ser ampliados significativamente. O país deve focar mais em educação para ensinar as pessoas sobre empreendedorismo, bem como a serem inovadoras e mais dispostas a encarar riscos.

Ao incentivar o empreendedorismo inovador, o país está compartilhando o risco com os empreendedores. No entanto, o governo pensa que o país pode fazer mais, uma vez que até o momento esse tem sido um movimento tímido. Na perspectiva do representante do governo, pode-se reduzir a exigência de que as empresas apresentem garantias reais, facilitando, com isso, o acesso de pequenas empresas ao crédito.

As políticas públicas e programas de governo devem ser mais duradouros, mais simples, transparentes e objetivos. A relação entre governo, empresas e universidades deveria implicar maior confiança.

A divulgação de programas de fomento à inovação pode ser feita por meio de casos de sucesso, os quais podem demonstrar a importância do incentivo para o crescimento das empresas.

Hoje, o governo faz propaganda das suas ações. Outra maneira de promover e propagar melhor as atuais linhas poderia ser integrar melhor os órgãos de fomento, como Finep, CNPq e BNDES, demonstrando quais incentivos estão disponíveis a cada nicho de empresas.

O fomento por meio de editais de subvenção é considerado pelo governo uma ação pontual de baixo impacto. O país deve buscar programas mais duradouros para que eles possam se tornar mais populares. Hoje os empreendedores encontram-se preocupados, pois os programas necessitam ser desenvolvidos com prazos maiores do que quatro anos, portanto, com um viés técnico em vez de político.

Os programas mais populares são os mais duradouros. Os programas de curta duração não possuem o alcance e tempo de promoção necessários para que as empresas possam aderir a eles. Entre as formas de incentivo do sistema brasileiro, pode-se dizer que o Brasil apoia a relação entre universidades e empresas por meio de editais. Entretanto, os entrevistados consideram que a academia deve

acompanhar a velocidade das empresas, uma vez que o tempo acadêmico não está alinhado aos prazos e inovações tecnológicas, o que faz com que a geração de desenvolvimento inovador decline.

Outra maneira de incentivar pequenas empresas e *startups* é a incubação, que foi apontado com um sistema de sucesso. Incubadoras possuem potencial para serem mais autônomas no processo de escolha de empresas e de empréstimo de recursos às empresas incubadas. O processo de seleção de incubadoras deve ser feito com base no mérito e os resultados devem ser medidos a cada dois anos.

O Brasil deveria decentralizar os incentivos à inovação, bem como trabalhar com incubadoras e entidades de classe de representação regional. Um dos entrevistados considera que o sistema centralizado é equivocado e deve ser alterado. Caso o país escolha trabalhar de um modo decentralizado com parceiros regionais, o custo da burocracia do governo em cada programa tende a cair, e então as associações e institutos regionais seriam mais autônomos e reconhecidos.

Em relação à Austrália, a conclusão tirada das entrevistas, é de que o governo precisa escutar mais e entender as reais necessidades das empresas. É necessário mudar o modelo de negócios das universidades para integrar e unir a pesquisa ao mercado e, portanto, gerar valor econômico.

As políticas públicas da Austrália estão estagnadas há 15 anos. Entretanto, o novo primeiro ministro está falando bastante sobre inovação e sugere mudanças.

É importante que as políticas e os programas orientados à inovação sejam perenes, sem que seus nomes – ou mesmo os próprios programas – sejam alterados a cada troca de governo. O empreendedor mal consegue compreender todas as mudanças e manter-se interessado em conseguir apoio do governo.

Outra questão é a falta de transparência. O processo de seleção para que as empresas obtenham incentivos do governo deve ser mais transparente. Isso dá mais credibilidade ao processo e faz com que o empreendedor acredite que pode obter o recurso/incentivo.

A burocracia é um item alarmante. Embora os processos não pareçam ser burocráticos, o empresário Australiano entrevistado mostra que o processo é quase insano, especialmente a fase de prestação de contas do uso dos recursos.

Faz-se necessário integrar universidades às empresas. Por isso, o foco das pesquisas deve ser mudado: hoje, as pesquisas visam a publicação de trabalhos acadêmicos. Além disso, as estruturas das

universidades australianas poderiam ser compartilhadas com empresas, principalmente os laboratórios e centros de pesquisa. As universidades são incentivadas a colaborar com a indústria para desenvolver o potencial comercial de suas pesquisas.

O governo da Austrália pouco apoia a inovação e os centros de empreendedorismo tais quais as incubadoras, aceleradoras e parques tecnológicos. As políticas públicas a isso relacionadas vão na direção contrária àquelas dos países membros da OCDE, países esses que estão bem envolvidos no assunto e participam de redes internacionais que debatem o desenvolvimento econômico por meio desses atores que apoiam as empresas inovadoras.

7 CONSIDERAÇÕES FINAIS

Este estudo teve o objetivo de responder a seguinte pergunta de pesquisa: Como o apoio financeiro concedido às empresas de tecnologia pode contribuir para o desenvolvimento econômico baseado no conhecimento?

Primeiro fez-se uma revisão da literatura com base nos termos *Knowledge-Based Urban Development, Knowledge-Based Economic Development*, suas respectivas iniciais (*KBUD* e *KBED*), e *Innovation Incentives*.

A revisão da literatura evidenciou o *Knowledge-Based Economic Development Framework* (Framework de Desenvolvimento Econômico Baseado no Conhecimento), desenvolvido pelo Prof. Tan Yigitcanlar, que utiliza quatro pilares, a saber: conhecimento, criatividade, inovação e competitividade, como forma de gerar desenvolvimento econômico baseado no conhecimento.

O estudo, então, identificou as políticas públicas de inovação no Brasil e Austrália e as comparou àquelas de outros países membros da OCDE.

Os países objetos desse estudo têm potencial para elevar seus investimentos em fomento à inovação. O Brasil possui boas políticas de incentivo, entretanto o país necessita de processos mais simples e mais claros, além de mais recursos.

O Brasil vem enfrentando um problema um deficit em suas contas públicas. Na busca de uma equalização em suas contas os investimentos em inovação serão afetados. Em setembro de 2015 o governo brasileiro publicou uma medida provisória que suspende os incentivos fiscais da Lei do Bem para o ano base de 2016, porém esta

medida provisória não foi votada para que houvesse esta alteração, permanecendo assim o incentivo para as empresas inovadoras no ano de 2016.

Países membros da OCDE estão fomentando cada vez mais as empresas por meio de incentivos fiscais, os quais são diretos, democráticos e menos burocráticos para os países e para as empresas. O incentivo por meio da redução de tributos, gera um menor custo de operação para o país.

Com o intuito de melhorar e facilitar as relações público-privado em pesquisa e inovação, um novo código nacional de CT&I brasileiro foi votado. Este código está sendo coordenado pelo Fórum Nacional de Gestores de Inovação e Transferência de Tecnologia – (FORTEC), junto a entidades de classe, FAPs e Instituição de Ensino Superior (IES). Estas ações contribuem para o desenvolvimento do país.

A Austrália demonstrou uma falta da cultura para inovação, porém este quadro parece que será alterado, pois houve mudança no governo australiano, o qual terá um foco na inovação. A Austrália tem um novo primeiro ministro desde 15 de setembro de 2015, o Sr. Malcolm Turnbull. Ele costumava investir em empresas inovadoras e apoia o desenvolvimento de *startups* no país. Esta mudança política pode colocar a Austrália em novos patamares, sendo um país mais competitivo em âmbito internacional.

O novo primeiro ministro australiano iniciou seu mandato com um evento sobre políticas, integrando *startups*, fundos de capital de risco, aceleradoras e outros componentes do ecossistema da inovação, e publicou um documento com as novas iniciativas de políticas estratégicas e desenvolvimento após o primeiro mês de governo: no *Defence Technology*, sete organizações australianas receberão financiamento do governo da ordem de A$ 14,2 milhões para fomentar o desenvolvimento e para impulsionar a inovação; enquanto isso o *Entrepreneurs Programme Commercialisation Grants* foi oferecido a outras 24 empresas australianas para posicionar suas ideias inovadoras no mercado global. Além disso, novos financiamentos foram ofertados em New South Wales, South Australia e na Tasmania; para incentivar a competitividade e criar novos empregos.

Hoje o governo australiano pouco fomenta parques tecnológicos, incubadoras e aceleradoras de empresas, na sua maioria são entidades privadas que fomentam estes espaços como um modelo de negócios. As universidades são na maioria públicas e estão no *ranking* entre as universidades que se destacam mundialmente, porém é uma fonte de

renda para a Austrália. Não há integração universidade empresa, o país tem grandes laboratórios e centros de pesquisa e desenvolvimento, mas estão voltados à pesquisa acadêmica e não empresarial.

O governo brasileiro promove ações para fomentar as aceleradoras do país, incubadoras e parques tecnológicos, a fim de estar mais próximo das empresas em cada região que fomenta a inovação. Em âmbito internacional, o governo brasileiro também fomenta a integração de parques e incubadoras apoiando missões a eventos internacionais e a participação de gestores a parques tecnológicos de reconhecimento internacional. Representantes do governo também participam destas missões, com isto há uma integração entre governantes e representantes da classe empresarial.

Com relação ao risco de investimento em empresas inovadoras, a Austrália perde seus empreendedores para outros países como Estados Unidos, Canadá e alguns asiáticos que fomentam empresas nascentes e inovadoras. O país não corre o risco da inovação junto ao empreendedor. No Brasil há um maior apoio para as *startups* por meio de programas de fomento. O número de empresas que participam do ecossistema de inovação e empreendedorismo cresce a cada ano.

Os números mostrados na Figura 17, denominada "Innovation types by firms size, 2008 – 2010" da tese (vide página 120), mostram que países que investem e promovem o empreendedorismo inovador encontram-se à frente em termos tecnológicos. Estes países são desenvolvidos, geram valor, substituem as importações e passam a exportar suas próprias tecnologias (o que contribui para a balança comercial favorável), além de gerar emprego e renda de alto valor agregado.

O governo australiano possui um bom sistema de educação, a partir do ensino fundamental. O país forma empreendedores, entretanto, perde para países que oferecem apoio à inovação e ao risco. Essa é uma questão importante que deve ser abordada, uma vez que o país necessita reter a mão de obra qualificada por meio de incentivos em vez de tratar esse assunto com se fosse natural.

Como o mercado australiano é pequeno em termos de população, o governo deve apoiar as exportações, para que os produtos inovadores possam ter acesso ao mercado internacional.

Como o apoio financeiro concedido às empresas de tecnologia pode contribuir para o desenvolvimento econômico baseado no conhecimento? A análise, a pesquisa e as entrevistas sobre as políticas públicas do Brasil e da Austrália mostram que é importante que os

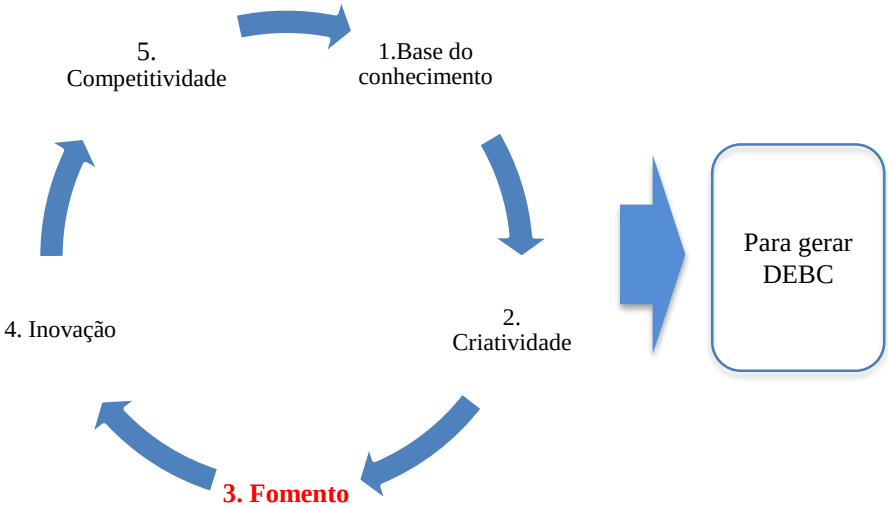
programas de incentivo à inovação sejam permanentes e duradouros, e que tenham uma regulação simples e transmitam confiança às empresas.

Os programas devem durar mais do que um mandato político e devem ser administrados com base no quesito técnico para que não sejam afetados por questões políticas. Os programas de incentivo que tiveram seus nomes alterados por questões políticas são menos populares e, consequentemente, são menos usados pelas empresas.

Os programas de incentivo à inovação com incentivo fiscal, tais quais o *R&D Tax Incentive* australiano e a Lei de Inovação brasileira são considerados programas importantes. Na Austrália, tal incentivo é um programa popular, entretanto, no Brasil é usado por poucas empresas. A nova lei deve ser aprimorada e o país deve oferecer apoio para que esse incentivo alcance mais empresas.

Com relação ao *framework KBED*, após todos os estudos e análises, essa tese recomenda a adição de incentivo como quinto pilar do domínio de desenvolvimento econômico baseado no conhecimento, como ilustra a Figura 5.

Figura 5 - Desenvolvimento econômico baseado no conhecimento (DEBC).



Fonte: Elaborada pelo autor, 2015.

Esta tese limitou-se a pesquisar as políticas públicas com foco em inovação em âmbito federal no Brasil e na Austrália que contribuem para o desenvolvimento das empresas do setor tecnológico por meio do crédito subsidiado, subvenção e também pelo incentivo fiscal, sendo assim as fontes de fomento e incentivos fiscais estaduais e municipais não foram consideradas neste estudo.

Houve também uma limitação quanto as empresas inovadoras com foco no setor tecnológico do Brasil e da Austrália, as empresas inovadoras de outros setores não fazem parte desta análise.

As empresas que participaram das pesquisas por meio de questionários são as associadas das entidades de classe que representam o setor em âmbito nacional no Brasil e na Austrália.

Sugere-se para futuras pesquisas a implementação da inclusão de fomento no *framework* de DUBC no domínio do desenvolvimento econômico; sugere-se, também, um estudo em que o conhecimento sirva de base para os pilares de criatividade, incentivos, inovação e competitividade.

Quanto ao *framework* que serviu como alicerce deste estudo e o qual sugere a criação de uma agência de DUBC como orquestrador e integrador de várias lideranças institucionais, sugere-se uma pesquisa de como esta agência poderá contribuir com o desenvolvimento econômico, qual o seu papel como orquestrador e se esta agência poderá contribuir com o Brasil para que sejamos mais inovadores e competitivos internacionalmente.

E por fim, sugere-se um estudo das leis brasileiras de incentivo fiscal, comparadas a países membros da OCDE, com foco em inovação, para que as empresas inovadoras brasileiras se tornem mais competitivas por meio de incentivo fiscal, com um processo menos burocrático e maior agilidade para que estes créditos sejam utilizados pelos empreendedores inovadores, os quais têm conhecimento e contribuem para o desenvolvimento econômico baseado no conhecimento.