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Innovation Systems in European Countries: A SWOT Analysis

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Abstract

The purpose of this research is to identify the strengths, weaknesses, opportunities and threats (SWOT analysis) of innovation systems models and their potential use worldwide. After a literature review, the authors studied five European case studies, which are described and analyzed along key dimensions derived from the case studies. The results highlight the similarities and differences between the countries. This study adds new and useful knowledge for both academics and practitioners who are interested in systems innovation. In addition to providing original guidance and suggestions, the paper also provides recommendations to implement successful adoption of the innovation systems strengths. The authors' conclusion is that adaptation of innovation systems leads to 1) Industry Networking 2) Platform for Policy Decisions 3) High technology innovation 4) Government is an active player as Stakeholders and 5) To support the growth of the economy.

Keywords: Innovation, Economic growth, Case study, Entrepreneurial firms.

1. Introduction

European countries working towards 21st century to sustainable economy through fosters technological innovation and industrial renewal and supporting the regional development through job creation (Allen and Rahman, 1985; Similor and Gill, 1986; Allen and McCluskey, 1990; Mian, 1996; Allen and Levine, 1986; Mian, 1997; Thierstein and Wilhelm, 2001; Roper, 1999). Additionally, the innovation is an essential tool and driver for future growth by improving array of elements such as the quality of the education, strengthening the research performance, promoting innovation and knowledge transfer, making full use of information and communication technologies, and ensuring that innovative ideas can be turned into new products and services that create growth, quality jobs and help address European and global societal challenges (EC, 2010; White House, 2010; EURP, 2010; EBN, 2010; EC, 2010 and Joseph and Eshun, 2009).

The objective of this paper is twofold: 1) to discuss and analyze the landscape of innovation systems 2) to discuss and analyze the adaption of successful five European case studies and 3) to identify the strengths, weaknesses, opportunities and threats of innovation systems model (a SWOT analysis).

2. Literature review

The innovation systems defines as the combination of all the elements affect on the development and used of innovations such as economic, social aspect, political aspect, organizational aspect, institutional aspect or others (Edquist, 1997). The second definition of innovation systems as an array of development and diffusion of new technologies complies with the government's implication policies to influence the innovation process (Metcalfe, 1995). The third definition of the innovation system as the process of supporting R&D efforts with institutions interactions to obtains the innovative performance of national firms (Nelson, 1993). Fourth definition of the innovation system as all elements of the economic structure and the effect of institutional setup in learning such as searching and exploring (Lundvall, 1992). Last definition of the innovation system as the institutions interaction between public and private sectors through the process of new technologies (Freeman, 1987).

Many international organization playing an active role to promote policies that will improve the innovation systems around the world such as in the United states level UNCTAD, World Bank and IMF (Sharif, 2006) and in Europe level European Commission and Organization for Economic Co-operation and Development (OECD) (OECD 1997; 1999). In addition, the OECD (1999) indicates the innovation systems play a role in shaping internationalisation of innovative activities and active tool for globalised economy by analysing country policy of the innovation process. Moreover, the implication of innovation

systems to support political and policy aspects to the innovation process and implement the economy policies (Edquist, 1997).

BIC, 2012 present the Innovation as main aspect of the business innovation center (BICs) at the level of innovation by supporting the start-ups firms. The European business and innovation (EBN) indicate the percentages of the groups of innovation as divided in Europe to three groups such as technological innovation 51.49 %, nontechnological innovation 38.34% and non-innovation 10.16%. The figure1 show technological innovation in BIC. Moreover, the BICs supported 2491 companies and 666 requested patents for companies and entrepreneurs with total granted 307 patents. Figure 1 shows the number of clients companies supported, number of patents requested and number of patents granted.

Freeman and Soete (1997) indicate the characteristics of US national system of innovation in the late 19th and 20th century: 1) No feudal barrier to trade and investment; slavery abolished 1865; capitalist ideology dominant, 2) Railway infrastructure permits rapid growth of very large national market from 1860s onwards, 3) Shortage of skilled labour induces development of machine intensive and capital intensive techniques, 4) Abundant national resources exploited with heavy investment and big scale economies, 5) Mass production and flow production as typical US techniques, 6) Strong encouragement of technical education and science at federal and state level from 1776 onwards, 7) US firms in capital intensive industries grow very large and start in-house R&D, 8) US productivity twice as high as Europe by 1914, and 9) Major import of technology and science through immigration from Europe.

Freeman and Soete (1997) indicate the Characteristics of British innovation system in the 18th and 19th century 1) Strong links between scientists and entrepreneurs, 2) Science has become a national institution, encouraged by the state and popularised by local clubs, 3) Strong local investment by landlords in transport infrastructure (canal and roads, later railways, 4) Partnerships of organisations enable inventors to raise capital and collaborate with entrepreneurs, 5) Profits from trade and services available through national and local capital markets, 6) Invest in factory production especially in textiles, 7) Economic policy strongly influenced by classical economics and in the interests of Industrialization, 8) Strong efforts to protect national technology and delay catching up by competitors, 9) British productivity per person about twice as high as European average by 1850, 10) Reduction or elimination of internal and external barriers to trade, and 11) Dissenters' academes and some universities provide science education. Mechanics trained in new industrial towns on the part-time basis.

Luc Soete, Bart Verspagen and Bas ter Weel (2009) indicate five main points of innovation systems: 1) The notion of innovation systems approach plays an important role in the contemporary economic performance and innovation performance as well as on the economic theory. 2) Although there is broad agreement in the innovation systems literature about this and other broad issues, there remain important differences in the ways that different scholars are using the notion of an innovation system. In fact, the distinction between national, regional and sector-based systems also adds to diversity in the literature. 3) The innovation systems literature has led to five main insights: the importance of a broader set of innovation inputs than just R&D, the importance of institutions and organisations, the role of interactive learning, leading to a dynamic perspective rather than a static allocative one, the role of interaction between agents, and, finally, the role of social capital. 4) Innovation systems offer the policy maker a tool for analysing innovation processes and influencing them, without the strong restriction of innovation policy to market failures that characterises the mainstream approach. 5) Finally, the innovation systems approach has managed to obtain a strong position in the literature and in policy circles also innovation systems has become a phenomenon that is most often analysed in a qualitative way, or using an indicators scoreboard approach (Soete, Luc, Bart Verspagen & Bas ter Weel, 2009).

Additionally, Hart (2009) summarized five points of outcomes: 1) Sources of Innovation, 2) Institutions and organizations, 3) Interactive Learning, 40 Interaction, and 5) Social capital in the following in the text will be extended discussion of the innovation system outcomes.

First, Pavitt's (1984) indicate the sources of innovation the first innovation databases at the Science Policy Research Unit of Sussex University. Also, the statistical agencies provide systematic data collection of innovation this lead to various countries carried the innovation surveys such as European Community Innovation Surveys (CIS) all these successive innovation surveys provide fact for the innovative firms and data bank of innovation for R&D and non-R&D innovation (Mairesse and Mohnen, 2010).

Second, institutions are essential elements in the innovation system and can shape the interaction of the innovation process (Nelson and Winter, 1982). However, the organizations are the identification of tangible and legal aspect facilitate through the process innovation process. There are different types of institutions such as formal vs. informal, basic vs. supportive and hard vs. soft (Edquist and Johnson 1997).

Third, learning by interacting is an important element in the innovation process to produce the new and economic useful knowledge, and it is required the continuous learning in order to adapt to challenges. The interactive learning provides a link between theories and concepts of innovation systems and human resource management systems and labor market institutions and the economy (Arundel, et. al., 2007; Bercovitz and Feldmann, 2006).

Fourth, interactive is essential elements in the innovation process the interactive nature of innovation, combined with the non-market-based nature of the institutions to increase the possibility of successful innovation to prevent the failure innovation performance due to a lack of coordination between the parties involve the innovation system (Steinmueller, 2010).

Finally, innovation is an important element in the improvement and growth of social capital income. The Innovative successful projects produce patents with high innovation outcomes patents as well as higher innovation output yields contribute on the higher income per capita. Furthermore, the stock of social capital has a positive effect on the accumulation of knowledge, output and investment in innovation (Grossman and Helpman, 1991; Aghion and Howitt, 1992; Akcomak and ter Weel, 2009).

3. Methodology

The entire planning process follows a model cycle as a way of learning to conduct a case study more effectively. This cycle begins with (a) European case studies, (b) translating these case studies into specific key success dimension, (c) assessing present and existing internal strengths and weaknesses, (d) assessing external opportunities and threats in relation to the goals and objectives, and (e) providing the result of the evaluations. To reinforce this cycle, the following diagram was frequently used.

Based on figure 3, the authors demonstrate the five European case studies: France, Spain, Netherlands, Luxemburg and Portugal; the countries were chosen because they are the successful innovation centers throughout Europe. Five criteria were used to evaluate the European case studies: (1) the key measures on the nature of legal status (2) Target market (3) Stakeholders (4) entrepreneurship and (5) jobs creation. All the criteria are dependent on the economic development of European countries. A S.W.O.T analysis will be used to analyze each case study depicting its strengths, weaknesses, opportunities, and threats. In conclusion, the S.W.O.T. analyses lead to best practices for successful implementation.

The data was collected through Intensive literature review, Published successful case studies and European reports. The first case study was conducted at CEEI Navarra in Spain, the second case study is based on PREMICE - Pôle de Resources et de Management de l'Innovation et de la création d'entreprises in France, the third case study concentrates on Business Development Friesland in Netherlands, the fourth case study in Luxemburg conducted at Technoport / Henri Tudor Research centre and the fifth case study based on the NET- BIC do Porto in Portugal**.** See Figure 4.

4. Case Studies

4.1 CEEI Navarra

In Spain, in 1988, the Government of Navarre founded CEEI Navarra with the mission to "diversify the industrial and economic fabric of Navarre and contribute to its development by motivating entrepreneurship, serving the creation and consolidation of new businesses, and promoting innovation in small and medium companies. CEEI Navarra has an incubation space of 4,186m^2 in 2008". CEEI Navarra also provides seed capital to entrepreneurs to help SMEs overcome financial constraints. CEEI Navarra's main objective is the technical and economical evaluation of SME and to encourage companies to innovate and participate in R&D projects. It networked with The European BIC Network (EBN), Spanish Association of Business and Innovation Centres (ANCES) and National Association of Development Agencies (ADR).

CEEI Navarra is an alternative to the difficulties that SME are finding in banks. It has stirred the creation of clusters in auto, ICT, food and renewable energies and linguistic competences and created over 1,877 companies and 4,083 jobs and helps entrepreneurs to turn their ideas into viable, consolidated and innovative businesses; trains entrepreneurs to be effectual, committed to novelty and ready to accept change, promotes entrepreneurship values among students of all ages and also in society. It received UNE-EN-ISO 9001/2000 Quality Certification and "Óptima" label as an entity that collaborates in equal opportunities.

4.2 Business Development Friesland

In the Netherlands, during 2002, in the northern part of the Netherlands, Business development Friesland was established to set up and carry out projects for start-ups and SMEs with the goal of stimulating investments, export, and innovative entrepreneurship to advance the economy of Friesland. Today, it has grown into an international project management

agency with an incubation space of 700 m^2 team of eight employees. Its proactive management style and one on one coaching strategy has successfully supported more than 100 start-ups and created more than 300 jobs. The BIC is concerned in the most important start-up programs (like the Fryslan Development Fund, FDF) and have carefully set up a network in the region, to become what BDF are now: a specialist on start-ups in the Province of Friesland. Furthermore BDF powerfully supports local SMEs with coaching, export development and financing. BDF has developed the Fryslan House concept: shared office facility in Amsterdam and Riga (Latvia) for the benefit of Frisian company. The FDF aims at financing 20 to 25 starting companies with an amount between 50.000 and 150.000 € within two years. BDF networked with The European BIC Network (EBN). BDF currently is lead partner in two European projects: Connessione and Pandora businesses to implement an active work-life balance policy (Connessione) and risk management policy (Pandora).

4.3 Technoport / Henri Tudor Research centre

In Luxemburg, Henri Tudor Research Centre was created in 1987 with the main mission of strengthening the economical and social innovation network of the Grand-duchy of Luxembourg with a European open-minded way of thinking. "From research to innovation" is the leitmotiv that the Centre has kept in mind at each stage of its development. The centre is carrying out a large scale of services and activities from applied and experimental research, doctoral research, development of tools, methods, labels, certifications and standards, technological assistance, consulting and watch services, knowledge and competences transfer, training and high-level qualification as well as incubation of high-tech companies. It holds 147 projects out of which 53 in European programs.

Technoport was one of the eight departments formed under Henri Tudor Research Centre. It has an incubation space of 1000m^2 and offers members the possibility of participating in R&D projects. In 2007, three companies that graduated from Technoport were acquired by the US-based company Patchlink, The German industrial company Weinig Group, and New Media Lux respectively. Technoport is a technology-oriented business incubator created in 1998 to support and promote the creation and development of technological and innovative companies in Luxembourg. Supported by the Ministry of Culture, Higher Education and Research, the Ministry of the Economy and the European Regional Development Fund. It networked with The European BIC Network (EBN), The European Space Incubator Network (ESINET), The International Association of Science Parks (IASP), Achieve More Network and Industrial and research related networks established by the Henri Tudor Research Centre at regional, national and European levels.

4.4 NET- BIC do Porto

In Portugal, the NET - BIC Porto was founded in October 1987 by a group of entrepreneurs and regional authorities. Its mission is to assist the creation of innovative business and technological enterprises, with great potential growth and low failure ratio, promoting the launch of small enterprises and supporting the modernization of existing SME, in the North Region of Portugal. NET – BIC Porto offers a transversal range of services to the new entrepreneurs that pretend built theirs news businesses or modernizing their companies. Currently, it is working on PROYECTO ER-INNOVA – "Programa Cooperación Transfronteiriza – España – Portugal" and BIOTECMAR – "BIOTEChnogical exploitation of MARine products and by-products" - Atlantic Area Programme". NET – BIC Porto maintains a network with The European BIC Network (EBN). It has an incubation space of 1025m^2 and offers 5 team members. NET – BIC Porto provides entrepreneurs with initial capital. NET offers a toolkit with Dictionary of Innovation, "Business Datasheets", Ideas Consulting Room (Clinic of Ideas) and Entrepreneurship and Entrepreneurs Club to promote the cooperation and experiences and best practices exchange.

4.5 PREMICE - Pôle de Ressources et de Management de l'Innovation et de la création d'entreprises

In France, in 1999, University of Bourgogne along with seven other key regional stakeholders formed PREMICE funded by French Research Ministry, Regional agencies and economic entities and the University of Bourgogne. This initiative reflects transformation of institutes of higher education all over the world from pure traditional teaching and research to include active participation in regional economic development. Founded on its mission to "promote, encourage and develop high innovative and technology firms based on university or R&D centres discoveries," PREMICE work intensively with universities and research centers to recognize and help to commercialize innovative ideas. It also offers services such as access to laboratories and equipments, sharing of scientific knowledge, validation of business model, and implementation of development business projects.

It has an incubation space of 200 m^2 and offers 5 team members. PREMICE set up every month a financial "tour de table", gathering all local, regional and national financial organizations to study and evaluate the projects. Since the creation of this financial "tour de table ", 43 projects have got money. It has contributed to the creation of the START EST Network made up of five regions of the East of France, is a forum where, every year, entrepreneurs can present their project to financial organizations and business angels. PREMICE provides to entrepreneurs a **"**Training-action**",** 6-7 entrepreneurs per session

to help and analyze every aspect related to their projects, from finance, to the marketing aspects or their internationalization possibilities.

5. S.W.O.T Analysis

From the analysis of the case studies, the results of SWOT analysis from European countries could lead the implementation of the innovation system worldwide as a powerful tool on the economic development.

The strengths can be concluded due to several points. First, industry networking between academia and industry to collaborate for mutual benefit and interaction between public and privet sectors. Second, Platform for Policy Decisions to provide a platform for cross-countries and share policy decisions. Third, high technology innovation could be accelerate the modernization and diversification of the region's economy. Fourth, government is an active player as stakeholders of innovation firms, which lead to legal status as a nonprofit organization and helping to create the best environment for businesses to start-up and growth. Finally, to support the growth of economic with smart growth, which lead high rate of employment.

The opportunities could be indicated in the three main points. First, focuses on the R&D and technological innovation are lead to knowledge transfer activities, starting from the idea from innovation firm to be converted it to innovated products and from innovated products to commercialization or technology transfer wither from countries to countries or from organization to organization. Second, long-term strategic economic development tool for the community helping to diversify the economy, and increase tax revenue. Finally, entrepreneurship climate to support the essential element in the innovation process the entrepreneurs and to create the best environment for the growth of the start-up.

The threats and weaknesses are the hardest to explore in some respects. This is due to the fact that the Innovation systems are a potential tool in the countries strategies form different perspective and combine all the elements effect on the development and use of innovations such as economic, social aspect, political aspect and organizational aspect.

6. Conclusion

Innovation systems have been discussed based on the European models. The innovation systems combine all the elements effect on the development of innovations such as economic, social aspect, political aspect, organizational aspect, institutional aspect and array of development and diffusion of new technologies complies with the government's implication policies to influence the innovation process. This study has demonstrated the five European case studies: France, Spain, Netherlands, Luxemburg and Portugal. These countries were chosen because they have successful innovation centers throughout Europe. Five criteria were used to evaluate the European case studies: (1) the key measures on the nature of legal status, (2) target market, (3) stakeholders, (4) entrepreneurship, and (5) jobs creation. All the criteria are dependent on the economic development of European countries. The S.W.O.T analysis of each case study reflects the strength with a great opportunity as the future plan and performance, weaknesses and threats.

In conclusion, figure 5 presents summary of the paper. Innovation systems are used as economic growth tools by almost of all countries. These evidences are from developed countries such United States and European countries. The adaptation leads to 1) industry networking, 2) platform for policy decisions, 3) high technology innovation, 4) government is an active player as stakeholders, and 5) to support the growth of economic.

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Table 1. The case studies key success dimension [Source: EBN, 2010]

		Key success dimension				
Country name	Case studies	Legal status	Target market	Stakeholders	Entrepre-neurship	Jobs creation
Spain	CEEI Navarra	Non-profit association depending on the Government of Navarre's Department of Innovation, Business and Labour	Regional entrepreneurs and small and medium companies	Stakeholders: Government of Navarre	13,459	1977
Netherlands	Business Development Friesland	Foundation (Non-for-profit, public equivalent body)	Starting entrepreneurs and internationally oriented SMEs	Regional Innovation Agency and private companies	100	300
Luxemburg	Technoport / Henri Tudor Research centre	Henri Tudor Research Centre's Department	Entrepreneurs involved in new innovative and technology based companies	N/A	55	56
Portugal	NET- BIC do Porto	Company	Entrepreneurs with an innovative idea or a new technology-based idea	Private (38, 96%) and public (61.04%) organizations	55	108
France	PREMICE - Pôle de Ressources et de Management de l'Innovation et de la création d'entreprises	Company	Private (38, 96%) and public (61.04%) organizations	Entrepreneurs with an innovative idea or a new technology-based idea	1153	108

Figure 1. Technological innovation in BICs [Source: EBN, 2012]

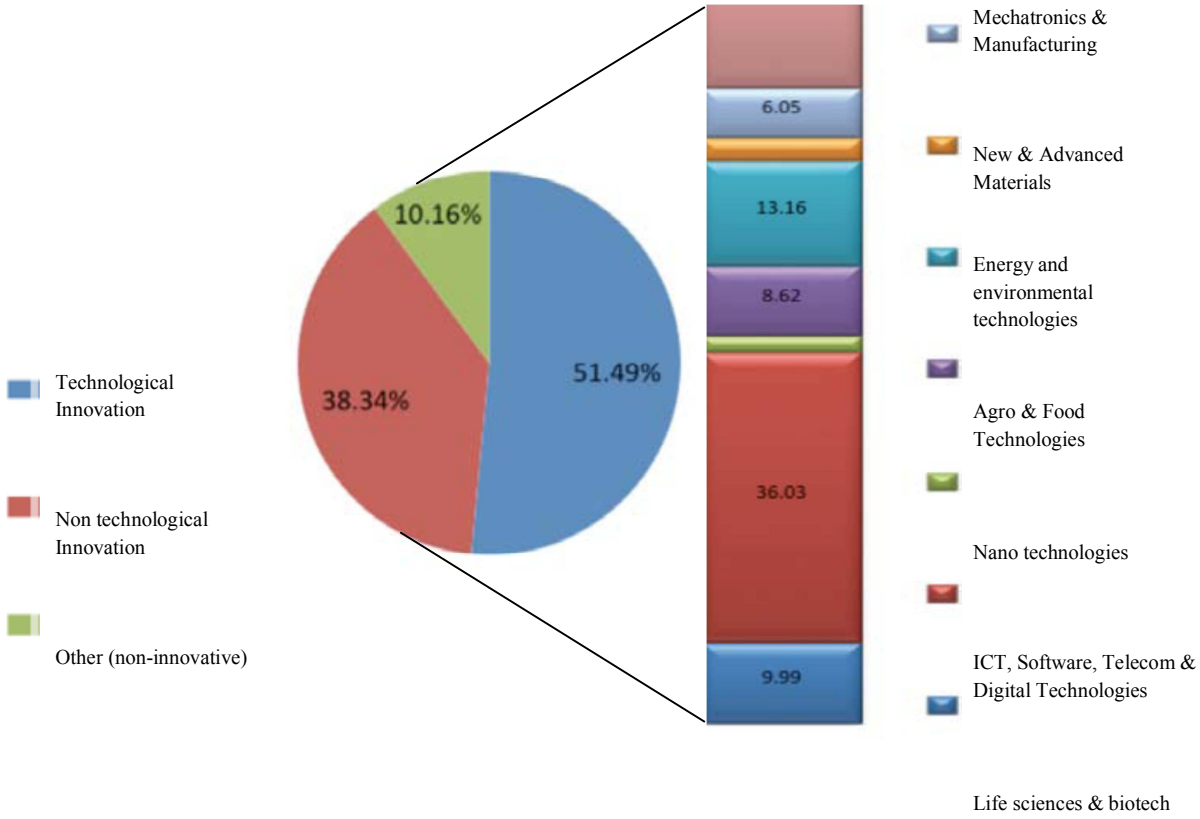

Figure 2. Intellectual property [Source: EBN, 2012]

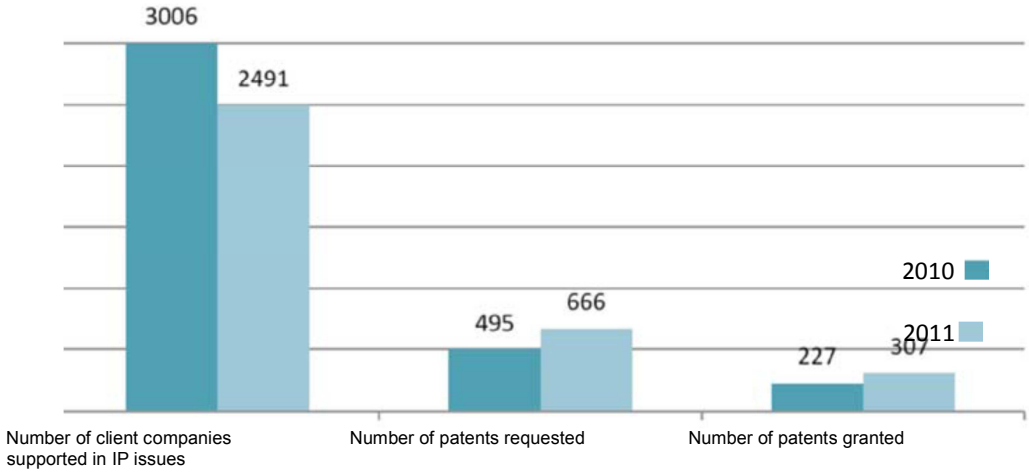

Figure 3. The SWOT analysis process of the case studies

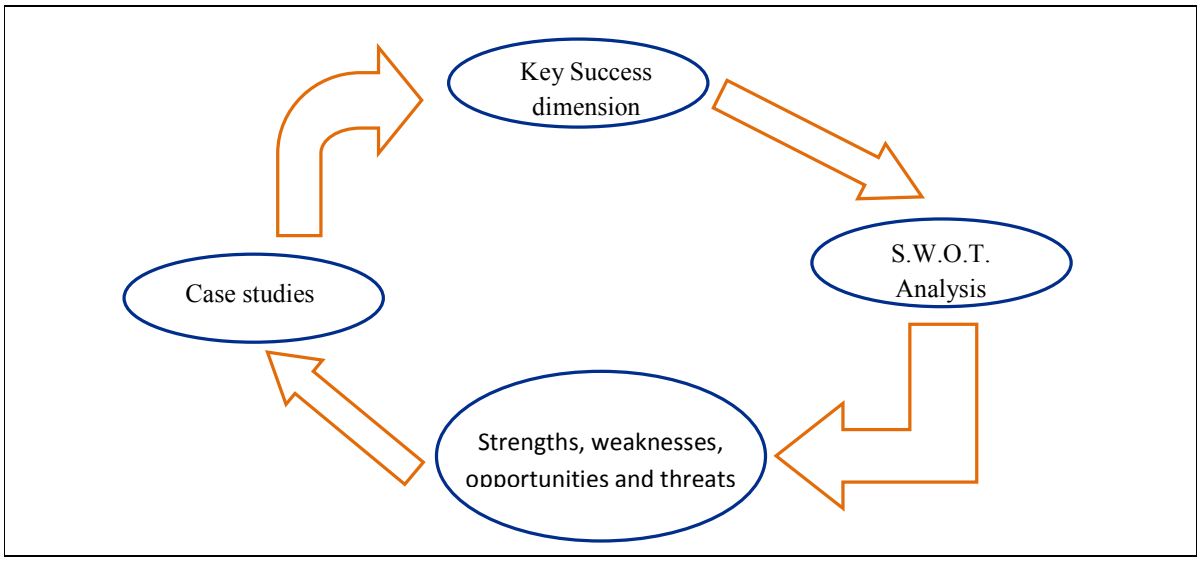

Figure 4. The process of developing a research methodology

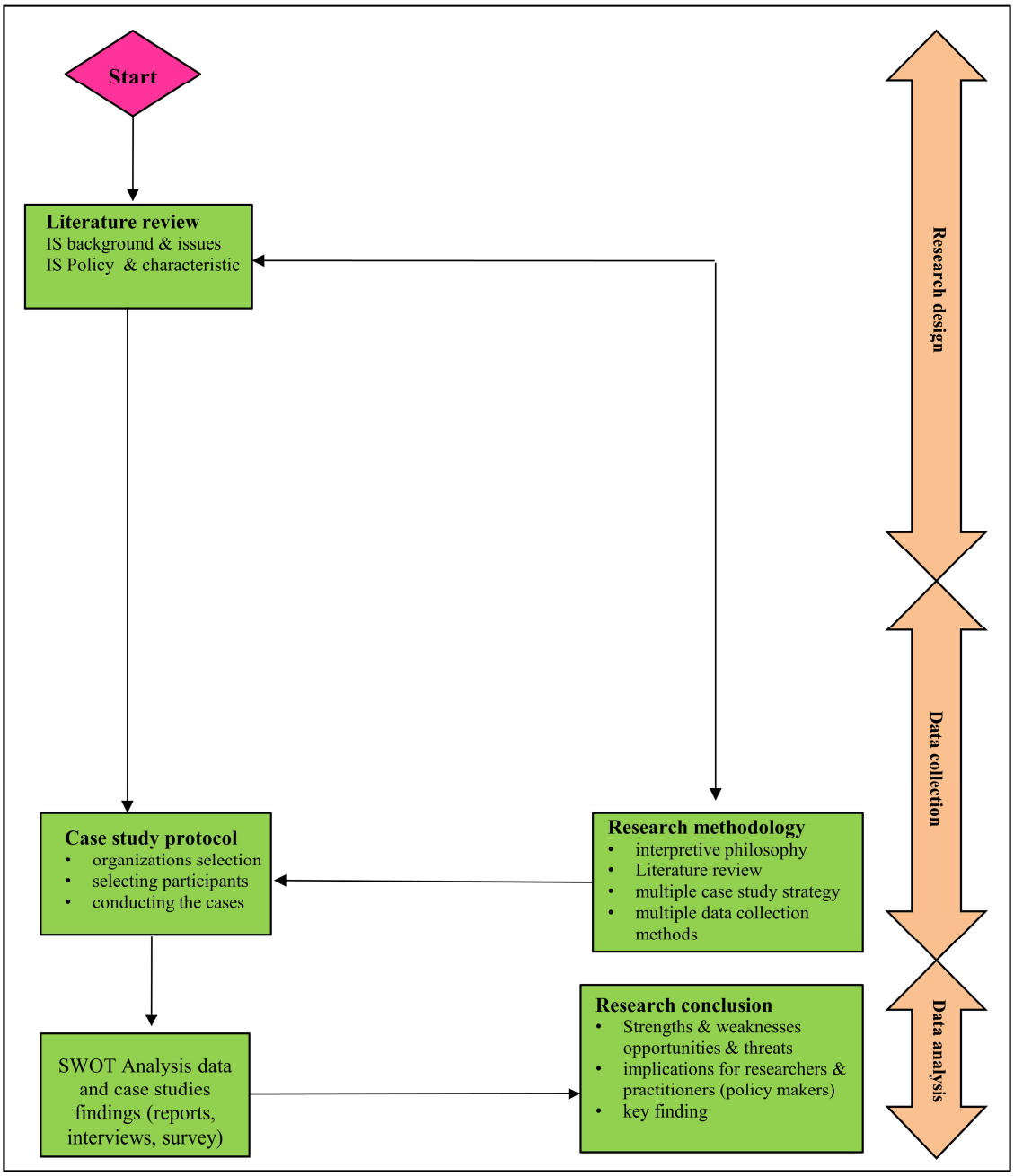

Figure 5. Research summary chart