

Design of a minimum viable innovation management system: university case

Diseño de un sistema mínimo viable de gestión de la innovación: caso universitario

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Received: 06/04/2018 • Approved: 25/05/2018

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ABSTRACT:

The purpose of this paper is to define the innovation portfolio of a Higher Education Institution (HEI) by means of an innovation system enabling its effective management. To this purpose we use a methodology based on four phases: theoretical foundations; data collection; case analysis in light of the theoretical foundations; and a synthesis of practical contributions. The conceptual perspective is based on the minimum viable innovation system model. The results show that the institution needs to fill the growth gap between the outcome of current activities and where it wants to be in five years' time. The prioritized idea within the innovation portfolio consists in designing and implementing a technological platform to support the offer of innovative social services.

Keywords: d

RESUMEN:

El propósito de este trabajo es definir el portafolio de innovación de una Institución de Educación Superior (IES) mediante un sistema de innovación que permita su gestión efectiva. Para ello se utiliza una metodología basada en cuatro fases: fundamentación teórica; recolección de datos; análisis del caso a la luz de la fundamentación teórica, y síntesis de contribuciones prácticas. La perspectiva conceptual se basa en el modelo de sistema de innovación mínimo viable. Los resultados muestran que la institución necesita llenar la brecha de crecimiento entre lo que producen las actividades actuales y dónde quiere estar en cinco años. La idea priorizada dentro del portafolio de innovación, consiste en diseñar e implementar una plataforma tecnológica que apoya la oferta de servicios sociales innovadores.

Palabras clave: Gestión de la innovación, innovación tecnológica, Universidades

1. Introduction

There is an extensive literature corpus on innovation processes that describes the process phases and its management, from idea to commercialized product (Rothwell, 1992; Tidd et al., 1998; Trott, 2005). One of the best-known linear or sequential innovation models is Cooper's Stage-Gate model (1990), which divides product innovation in stages with gates which serve as decision points between phases. A more recent model is that of Innovation System in Higher Education Institutions, which consists in a "combination of elements common to any innovation system that, implemented through designed and validated tools, facilitates the work's process" (Anthony, 2010). Such process is carried out under the learn-by-doing model: applying the methodology on a concrete innovation opportunity, the institution acquires and puts in place capabilities to replicate the process with innovation opportunities and increasingly complex and sophisticated businesses, supported with *Lean Startup* and *Design Thinking*.

Lean Startup is an entrepreneurial project management methodology that facilitates the launch of businesses, services and products and which has been highly successful since the publication in 2008 of the book thus entitled by Eric Ries. Although it stemmed from the technological startups in Silicon Valley, its potential as philosophy and management method is applicable to the launch of diverse projects and products of all kinds. The concept of minimum viable product is associated to lean startup: it is not necessary to achieve the perfect service or product initially; what is required is a prototype or basic product that evidences the essential

characteristics of what you want to do, which permits to measure the reactions of potential users and prove as soon as possible whether you are advancing in the right direction.

The term *Design Thinking* is used to refer to the study of designers' practices (for example, Cross, 2006; Dym et al., 2006; Lawson, 2006), and their application to problem-solving processes which are "open" and centered on the human aspect in other areas such as business, management and organizations (Rittel & Weber, 1973). As an approach to product innovation (Melles et al., 2012), *Design Thinking* improves decision-making practices in other fields such as health care services and systems (Duncan & Breslin, 2009), management and strategy (Lester, Priore & Malek, 1998; Dunne & Martin, 2006), organizational operations and studies (Romme, 2003), and more recently, projects of social innovation and impact (Brown & Wyatt, 2010).

The aim of this work is to define the innovation portfolio of a higher education institution (HEI) through an innovation system that allows its effective management. To achieve this, the paper is structured as follows: firstly, we develop a conceptual synthesis on innovation process models. Secondly, the central concept of innovation system is defined. Thirdly, the implementation of the case study is defined. Fourthly, the learned lessons are set out. Finally, the conclusions are presented.

2. Innovation process models

All innovation models have advantages and disadvantages, and no model can pretend to be exhaustive and cover all the different viewpoints for all the areas of application. The opposite is also true; there is no model that provides a "one size fits all solution", since there are too many variables influencing innovation processes (Du Preez & Louw, 2008). According to these authors, a synthesis of the innovation process models in the literature suggests the following:

1. Most innovation process models imply a pattern of the following steps or stages: (a) idea generation and identification, (b) concept development, (c) concept evaluation and selection, (d) development, and (e) implementation.
 2. Innovation can be market pulled, technology pushed, or a combination of both.
 3. Integration between the different functions within the innovation process is paramount, and can often be the discriminating factor.
 4. The latest (open) innovation process models favor a network approach where innovation is not only focused internally, but externally.
 5. Most of the models ignore the exploitation of the new innovation within the market. Exploitation is the only mechanism to competitiveness and financial survival and should therefore be included in the framework.
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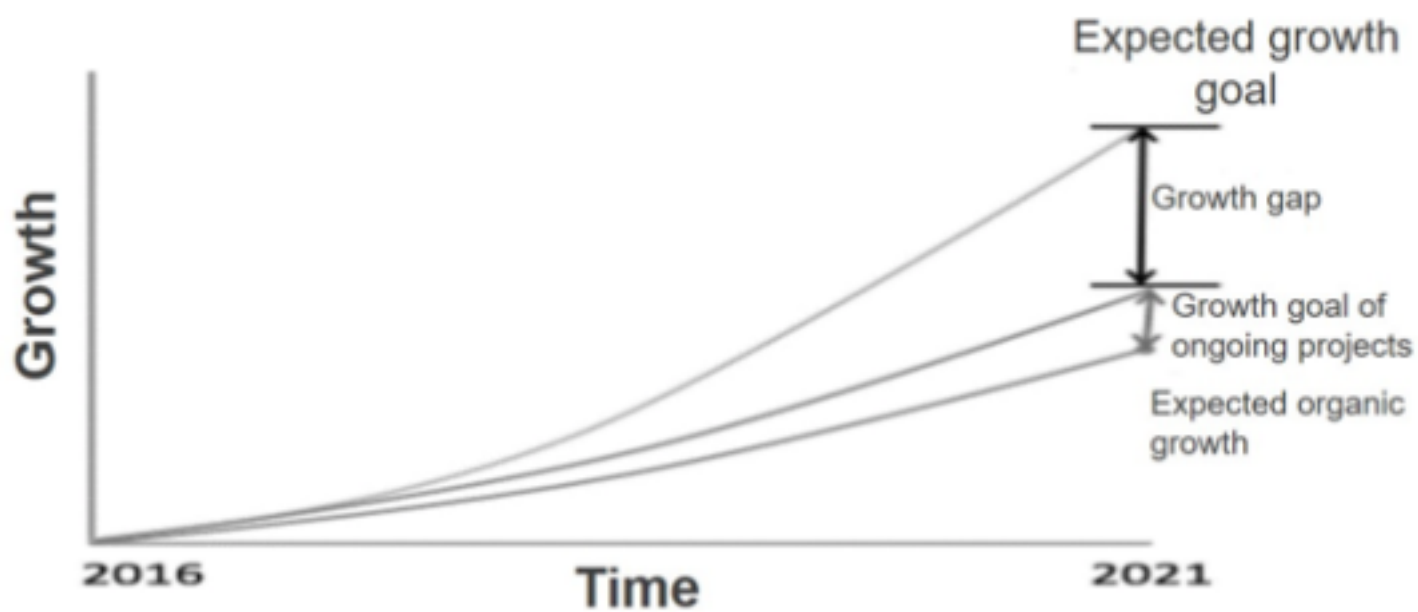
3. Elements of an innovation system

The innovation system comprises five stages for the achievement of the innovation goals, termed *minimum viable innovation model* (Anthony, Duncan, & Siren, 2014), which are developed in the following order: first, define the innovation points, *determining the gap between your current operations and your growth goals*, and the types of innovation that fill this gap. Second, focus on a few strategic areas, *identifying three strategic opportunities* that meet a specific *market demand* and which no one else is offering or doing well, with some *technology* that enables to do it more efficiently; *a competitive advantage* that helps us against competition. Third, transform ideas into projects, classifying the portfolio of ideas, evaluating the technological and market risk level of each one of the prioritized ideas, analyzing the opportunities each idea in the portfolio offers and managing the projects' life cycle through the stage-gate methodology. Fourth, *governance* and *controls* must be defined, that is, a governance systems centered on monitoring, resources allocation and the search for continuous improvement sources. Fifth, *leadership, talent* and *culture*: it must include leaders with vision and talent for innovation who reward talent and foster the culture of continuous development.

3.1. Growth gap definition

The purpose of institutional growth gap definition is finding the existing gap between growth aspirations and the likely growth the institution could achieve if nothing extraordinary is done, under stable external environment conditions. Extraordinary growth results from new efforts, acquisitions, expansion of core activity, adjacent markets, or from the creation of a value proposal totally new to the current market or a user segment not yet being served.

Graph 1
Depicts the growth gap



Source: own elaboration

To calculate the growth gap, it is necessary to have defined the criterion through which the institution is going to measure its growth, such as student registrations, total billing, budgets, among others. Once this criterion is defined, it is calculated through the methodology proposed by Anthony et al. (2010).

3.2. Innovation portfolio management

In order to develop the innovation system, the innovation bucket must be first defined, which is understood from the types of innovations the institution must develop to then manage the innovation portfolio. It is important to know that the innovation process can be distinguished into three types and these depend on the environment where they are implemented. According to the range of disruption they bring about, they are classified into three types: incremental, adjacent and transformational.

Incremental innovation

Incremental innovation projects consist mainly in "optimizing existing products or programs for existing users. They can take the form of small improvements to existing programs or incremental inroads into new markets" (Nagji & Tuff, 2012). Examples of these are improvements to the curriculum formulation in a program or in any of its already present associated services (enhanced program). These innovation projects only require resources and capabilities that the institution already possesses; therefore, they represent low risk. They are oriented towards the existing market and modify already existing programs or products.

Adjacent innovation

Adjacent innovation projects are those in which "the institution leverages something it already does well, to enter new markets or to satisfy new needs of existing clients. It basically means giving new uses to the institution's existing capabilities" (Nagji & Tuff, 2012). A good example of this is when the university institution decides to launch a tertiary education platform to promote the formation of technical specialists in specific areas. It is aimed to new markets or covers new needs of existing users.

Transformational innovation

Transformational innovation projects are those in which "institutions develop new programs, platforms or products to satisfy new markets and new clients' needs. They are also known as disruptive innovations. Examples of them are Starbucks in-store experience, and iTunes, among others. These projects represent the highest risk, since in many cases the firm has to build new capabilities and obtain new resources" (Nagji & Tuff, 2012).

3.3 Innovation Ambition Matrix

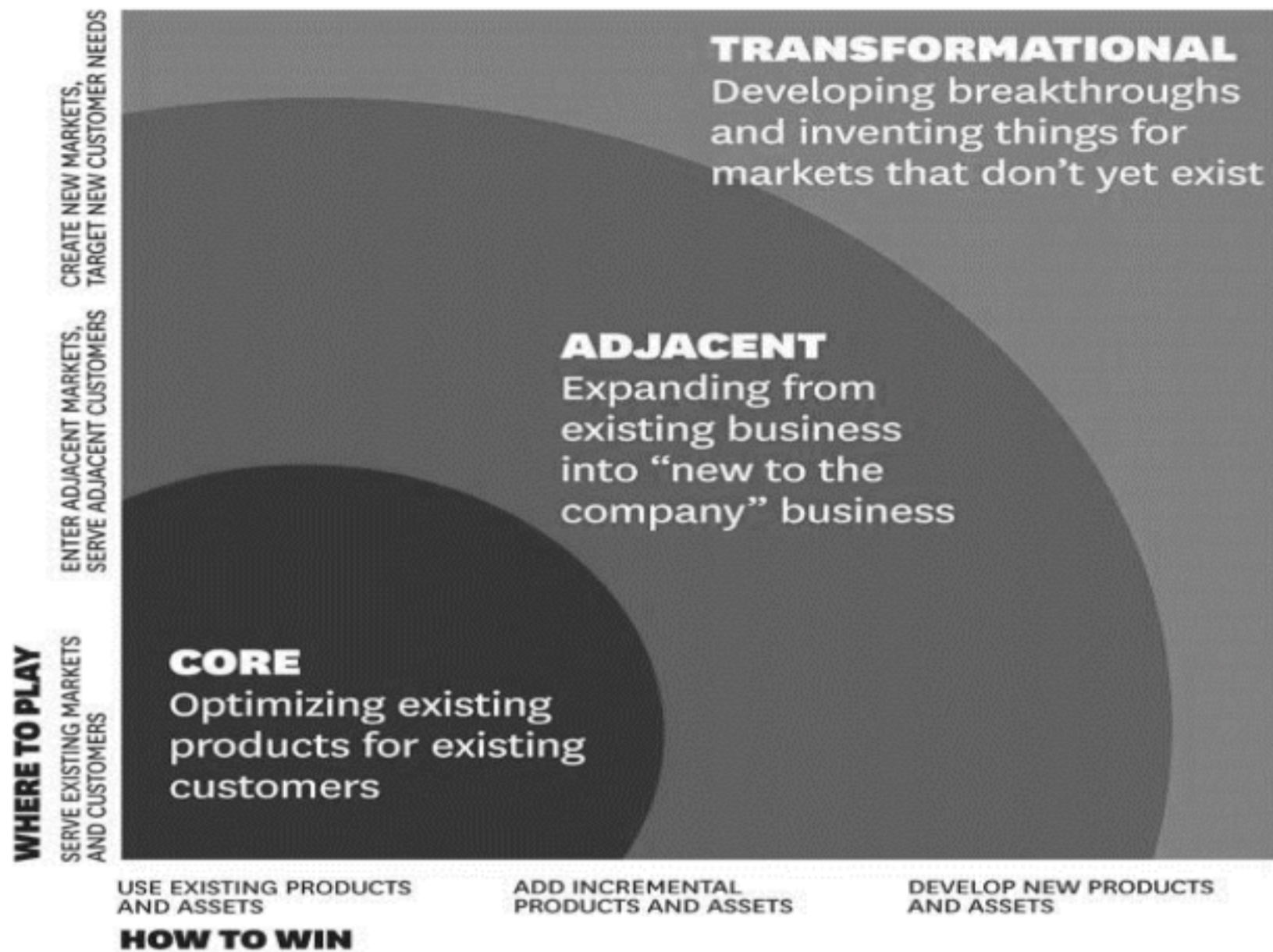
The tool developed to help organizations manage their innovation portfolio is what has been termed *Innovation Ambition Matrix* (see Graph 2). It is a refinement of a classical diagram devised by the mathematician Igor Ansoff to help enterprises allocate funds among growth initiatives. The Ansoff matrix clarifies the idea that tactics must vary whether a firm launches a new product, enter a new market, or both. The new version of the matrix substitutes Ansoff's binary choice of products and markets (old and new) with a range of values (Nagji & Tuff, 2012). It is thus recognized that the novelty of a company's offer (x axis) and the novelty of its customers' markets (y axis) are a matter of degree. For this, three distance levels are overlapped, which are described as follows (Nagji & Tuff, 2012):

On the lower left side of the matrix, the main innovation initiatives are found – the efforts to make *incremental changes* to existing products and the progressive advances in new markets.

On the opposite corner of the matrix are *transformational initiatives*, aimed at creating new offer to serve new markets and customer needs.

Adjacent innovations are in the middle, and they can share characteristics with the core and transformational innovations. They are innovations consisting in taking advantage of what the firm does well in a new space.

Graph 2
Ambition in innovation



Source: Nagji and Tuff (2012)

3.4. Innovation production system

Developing a sustainable value creation system requires that the university knows and masters all aspects of innovation from identifying the idea to its implementation. Most of the universities know that they should not focus only on service innovation, but also on processes, the strategy, the business model, the delivery of the service, among others. An innovation production system has four components:

1. Classification of the portfolio of ideas, 2. Evaluation of market and technological risks, 3. Opportunity analysis at the early stage of each project, and 4. The process of transforming ideas into products through stages and decisions (Stage- Gate).

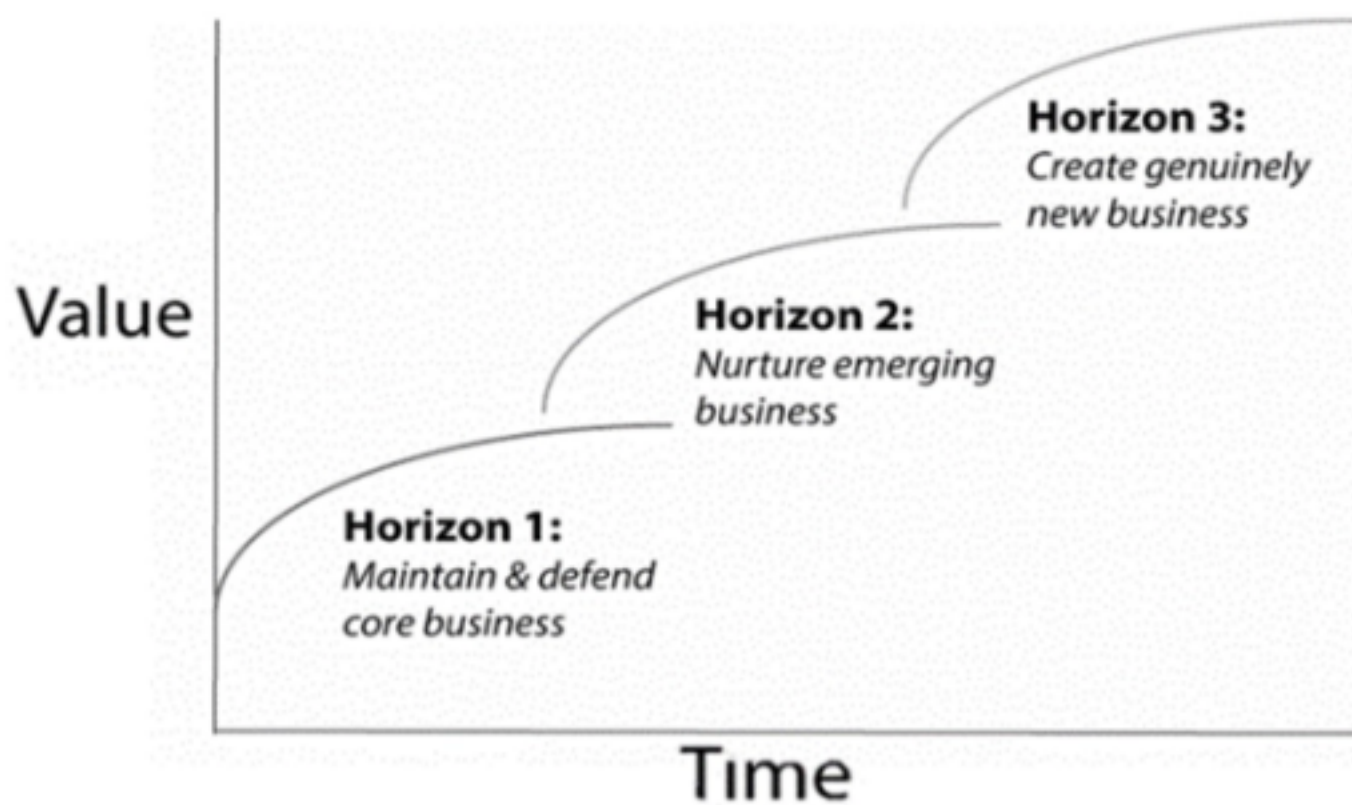
Classification of the portfolio of ideas from the theory of three innovation horizons.

In the same way as ideas and projects in an innovation system enter a process allowing to categorize them and establish their priority, this same classification should give the institution the possibility of establishing the time of executing them. "The theory of the three horizons of innovation" proposed by Baghai et al. (2000) is used for this classification. They highlight that a company distributes its innovations in three categories called "Horizons":

- Horizon 1, mature businesses.
- Horizon 2, fast growing businesses.
- Horizonte 3, starting businesses.

Each one of the horizons must be addressed in an independent manner since they deal with different approaches. Innovation horizons enable the organization's work team to plan, set goals and allocate complementary resources for the management of an innovation. Visually, it allows the company leaders to understand the north of their organization.

Graph 3
Horizons of innovation ideas



Source: Baghai et al (2000)

Table 2 exhibits the use of the horizon matrix for the first challenge in the innovation portfolio.

Risk matrix of prioritized ideas

The purpose of this matrix is to evaluate the level of market and technological risk of each one of the prioritized ideas (Day, 2007). Tables 3 and 4 show the use of the risk matrix for the idea of a social innovation technological platform, which, combined with graph 3, allows to rate the risk of said idea between 40-60%. This rating is also done for the rest of the ideas in the innovation portfolio.

Opportunity analysis for each idea in the portfolio

The R-W-W matrix (Real, Win, Worth it) of Dominick M. Schrello, cited by Day (2007), allows to conduct an opportunity analysis at an early stage in each project. It seeks to evaluate the reality of the opportunity, the value the institution can offer, and whether it is worth carrying out. If the score for one idea in the matrix is lower than 50, it does not qualify for the innovation portfolio; if it is between 50 and 80, it enters the portfolio but has to be validated in the market; if it is between 80 and 100, it continues in the process. The idea of the technological innovation platform scores 85 in the application of the RWW matrix, which allows it to continue in the innovation process (see Table 5).

Project life-cycle management. Stage-Gate Methodology

Once the proposal has passed the RWW matrix test, it will enter a funnel made up of stages, and it has to go through a series of gates to successfully complete it (technical viability and strategic relevance assessment) where various criteria will be validated by validation teams (different at each stage) that will ensure the proposal is meeting the defined goals and is directed towards achieving the growth expected by the institution (1990).

According to the type of project, and as the proposal passes each stage, decisions become binding in terms of allocating the technical and work team resources necessary to set it up. Therefore, validation teams are more specialized each time, and undoubtedly of a higher hierarchical level within the institution.

4. Implementation of the case study in Higher Education

4.1. Description of the case study

This case study implements the first three stages, that is, the growth gap and the generation of ideas and concepts, arriving with these concepts at an innovation project portfolio. The institution under study does not have a formal innovation management process. Based on the project *innovacampus*, coached by Purdue University, a more structured innovation management process based on the innovation system model was developed in order to improve the ecosystem of regional innovation and, particularly, the university subsystem.

4.2. Methodology

The methodology was divided in four stages, as described below:

Theoretical foundation and synthesis; data collection; case analysis in light of the theoretical foundation; and synthesis of practical contributions. In the first stage, the minimum viable innovation system model is assumed. In the second stage, the institutional growth gap is calculated, strategic challenges in four areas are defined as well as the type of innovation, and information from key respondents from the institution is gathered, based on input matrixes (RWW, Risk, Horizon) required by the innovation portfolio and the innovation funnel. In the third stage, the learned lessons are presented. Finally, the conclusions or practical contributions synthesis are drawn.

4.3 Findings

Calculation of the institutional growth gap

Nagji and Tuff (2012) found that firms that allocated an average of 70% of their innovation budget to the incremental innovation of their core initiatives ("safe bets"), 20% to adjacent initiatives, and 10% to high-risk radical/disruptive ones outperformed their peers, generally realising a premium of 10% to 20%. Adjacencies are defined by new student registrations, updates and course validations.

The agreed growth goal was set at 20% of the projected main revenues to year 2021, that is to say, COL\$68,086,797,783 * 0.2= COL\$13,469,969,455, instead of COL \$ 15.514.747.504 as shown in Table 1. These resources would be recorded as adjacent innovation.

Table 1
Calculation of the growth gap

Current operation of the HEI	Adjacency moves	New growth initiatives	Year 2017	Year 2018	Year 2019	Year 2020	Year 2021
Current revenues (Current students)	Desired adjacencies	Number of new initiatives launched	1	1	1	1	1
\$53,347,787,654	\$14,739,010,129	Estimate revenues per initiative for each one of the next five years	\$2,693,993,891	\$2,693,993,892	\$2,693,993,893	\$2,693,993,894	\$2,693,993,895
Growth index in 5 years							
5 %							
Projected main revenues in five years	Projected adjacency revenue in year 5	Projected success index per year	95 %	95 %	95 %	95 %	95 %
\$68,086,797,783	\$68,086,797,783						
Notes:	Notes:	Revenues from new growth projected to year five	\$3,102,949,501	\$3,102,949,501	\$3,102,949,501	\$3,102,949,501	\$3,102,949,501

Desired revenues to year 2021	\$83,601,545,287	Growth criterion is given in millions of Colombian pesos
Projected revenues to year 2021	\$68,086,797,783	
Growth gap:	\$15,514,747,504	

Variable	Item	Description	Value
A	Current revenues	Revenues for the current tax year	\$53,347,787,654
B	Expected growth index	Projected growth index for the next five years	

		excluding the impact of initiatives already in progress, such as new facilities or access to new markets. It may be the CPI index.	5 %
C	Main revenues projected to year 2021	$=A*(1+B)^5$	\$68,086,797,783
D	Desired adjacencies	New users, markets or channels which will expand the institution's business.	\$14.739.010.129
E	Projected adjacency revenues to year 2021	Estimated revenues from the adjacency moves	\$14,739,010,129
F	Number of new initiatives launched this year	Number of new growth initiatives that will be launched in each of the following five years. For example, 1 or 5, or 6.	1
G	Revenues / initiatives	Estimated average revenues to year 2021 generated by the initiatives launched each year.	\$14,739,010,129
H	Projected success index	Estimated success index of the initiatives launched in each one of the following years.	95 %
I	Revenues from new growth projected to year 2021	$=F*G/F*H$	\$15,514,747,504
J	Desired revenues to year 2021	Strategic objective for revenues in year 2021.	\$83,601,545,287

Source: Own elaboration

The second result consists in identifying at least four strategic opportunities:

The first challenge or opportunity is the design and implementation of a technological platform allowing the offering of the HEI's social services, which means the institution will have a technology enabling greater efficiency in its offer. Such challenge leads to the innovation of a more effective institutional process.

The second challenge relates to social knowledge transfer on the part of the HEI for the solution of local, regional, and national social problems. With this, the institution is able to meet a demand not covered by the current offer.

The third challenge consists in offering training services internationally certified by the HEI.

The fourth challenge is to implement an office for the transfer of research results that articulates the innovation processes in the HEI. This permits to benefit from the competitive advantage in the social services related to pharmaco-dependence, which most universities lack.

The third result consists in classifying the four previously mentioned opportunities or challenges through a matrix of innovation horizons, which exemplifies the first challenge (see Table 2). The same matrix allows to classify the other three challenges (see Table 6).

The fourth result consists in evaluating the level of market and technological risk of each one of the prioritized ideas through a risk matrix which exemplifies the first challenge (see Tables 3 and 4). The same matrix allows to evaluate the other three challenges (see Table 6).

Table 2
Matrix for innovation horizon

Criteria	Horizon 1	Horizon 2	Horizon 3	Score
Funding sources	A defined and approved funding source	A funding source which has been identified but not necessarily approved	Funding source yet to be identified	2
Strategic decision	Included within the annual budget for the attainment of objectives	Included within the institutional plan and the development plan in progress	It requires institutional vision and forward-thinking for its approval and execution	3
	Staff are available for immediate project	Staff must be found and hired for project execution, but they	Staff for the project are yet to be identified or if such	2

Human and technical resources	development. Equipment and technology are available for products and services development	must be approved	staff are at disposal, they do not have the time availability to work on the project	
Knowledge and intellectual property resources	Available for both internal and commercial use by the institution	The procedure has been identified and IP paperwork required for its commercial use is in progress	The knowledge required for project execution is not available presently, research is needed to build it up	1
Applicable rules	Both internal and external regulations are defined and in favour of the project	Internal and / or external clearance, which take time to be sorted, is required	The type of regulations that might apply is to be identified	1
Results	Between 1-5 Between 6-10 Between 11-15	Horizon 1 Horizon 2 Horizon 3		9

Source: Own elaboration

Table 3
Matrix for market risk

	Desired market					
	Serving existing market and customers	Breaking into new markets and targeting new customers		Creating new markets and targeting new customers' demands		
Consumer behaviour and purchasing decision are known	1	2	3	4	5	4
The way sales and distribution activities will be is known	1	2	3	4	5	4
The competitive environment is known (current and potential competitors)	1	2	3	4	5	3
Our brand promise is...	Highly relevant	Somewhat relevant		Not so relevant		
	1	2	3	4	5	1
The relationship with our clients is...	1	2	3	4	5	1
What is known about competitors' behaviour and intention is...	1	2	3	4	5	3
total:	16					X axis

Source: Own elaboration based on Day (2007)

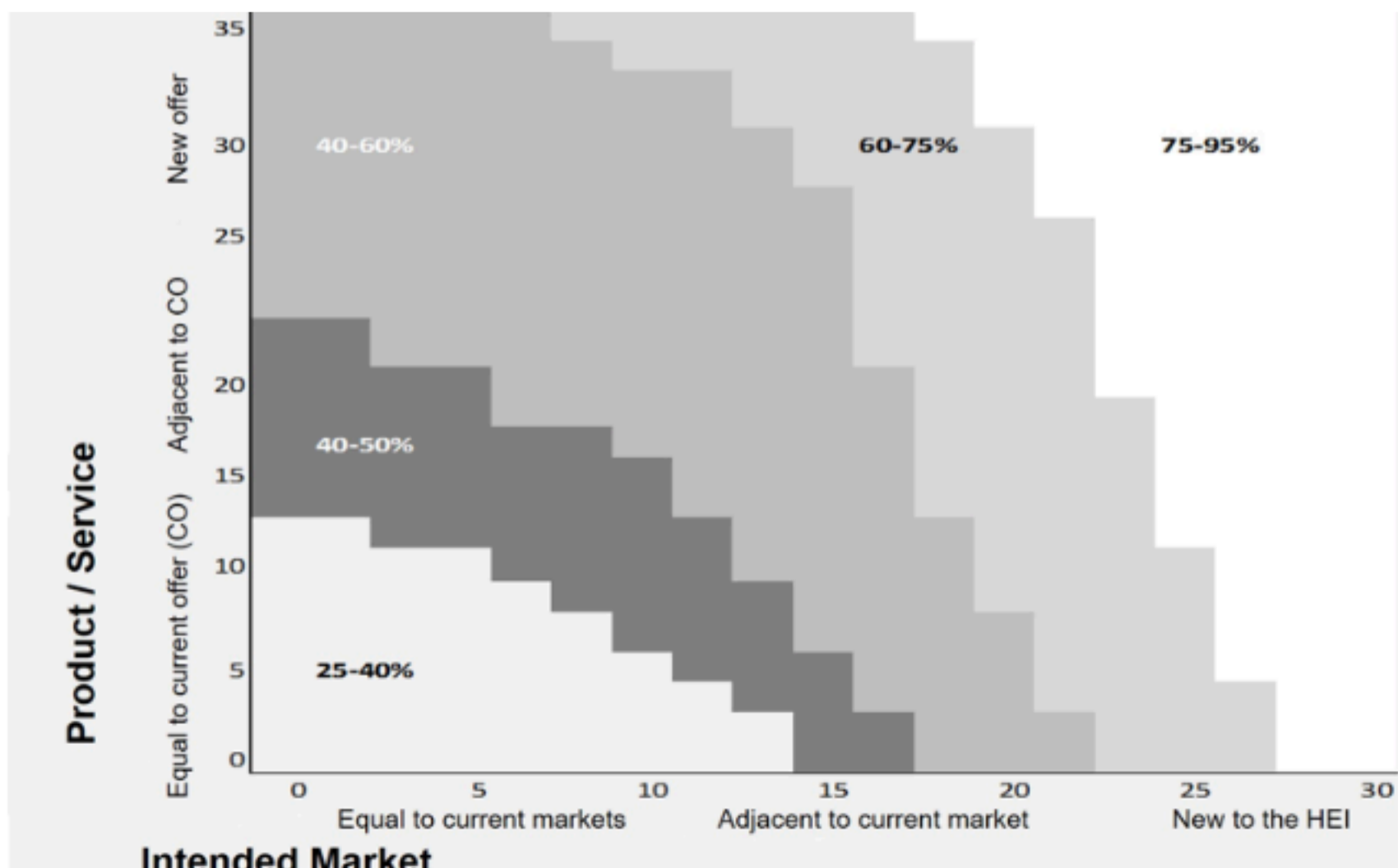
Table 4
Matrix for technological risk

	Product / Technology					
	Totally applicable	A significant adaptation is required		Not applicable		
Our current development capacity is...	1	2 3		4	5	3
Our technological competence is...	1	2	3	4	5	1
Our intellectual property protection is...	1	2	3	4	5	3
Our manufacturing and delivery service is...	1	2	3	4	5	3
	Identical to our current supply	Somewhat similar to our current supply		Completely different to our current supply		
The science and knowledge bases required are...	1	2	3	4	5	3
The necessary functionalities of products and services are...	1	3	2	4	5	3
The expected quality standard is...	1		2	4	5	4
		3				
20	Y axis total					

Source: Own elaboration based on Day (2007)

Graph 4

Risk derived from the market and service



Source: Day, 2007

Based on coordinate (16, 20) and Graph 4 (intended market vs service), where these two values graphically meet, a risk value between 40-60% is obtained. Likewise, the risks for the other three challenges are obtained (see Table 6).

The fifth result corresponds to the analysis of the opportunities of each challenge or idea in the portfolio through the use of the RWW matrix. As way of example, Table 5 shows the first challenge. This is done in a similar manner for the other three challenges.

Tabla 5
Matriz RWW

External analysis of the institution			Score
Is the opportunity for improvement real?	Is there an actual market?	Is it desired or needed?	5
		Can the user purchase the service / solution?	5
		Is the potential market size adequate?	5
		Can we reach the customer / user directly?	5
		Will the product / service / solution be purchased by the user?	5
	Is the product / solution real?	Is there a clear concept?	5
		Do we have any prototype to validate it?	1
		Can the product / service / solution be done?	5
		Will the service / solution be able to satisfy the market?	5
	Can we win or be the best option?	Can the product / solution be competitive?	Does the service / solution have a competitive advantage?
Can the advantage be maintained?			5
How will competitors react?			4
Can our HEI be competitive?		Do we have superior resources?	4
		Do we have the proper management?	3
		Can we understand the market and meet its needs?	3
Is it worth it?	Will the project / idea be profitable at an adequate risk level?	Are the forecast returns greater than the costs?	4
		Is there adequate funding available?	2
		Are the risks acceptable?	4
	Does launching the project / idea make strategic sense?	Does the service / solution fit into our global growth strategy?	5
		Will top-level management support it?	5
Total		85	

Source: Own elaboration

The innovation portfolio is built based on the five previous results. This is synthesized in Table 6.

Table 6
Innovation portfolio

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Idea / Name	Concept / Idea	Horizon	Risk Score	RWW Score	Type of innovation	Priority
Social innovation technological platform	Process innovation	2	40 - 60 %	85	Adjacent	
Social spin-off	Social innovation	3	40 - 50 %	65	Adjacent	
Supply of internationally certified training services	Service innovation	3	40 - 50 %	48	Adjacent	
Creation of the Office for the Transfer of Research Results (OTRR)	Process innovation	3	40 - 60 %	52	Adjacent	

Source: Own elaboration

Since the technological innovation platform idea is assessed as a viable opportunity as a result of its rating over 80%, then the next step is managing that idea by passing it through the innovation funnel (Table 7).

Table 7
Project management: State-Gate

	STAGE	GATE
		G1: Opportunity and challenge assessment
		Identifying the main sources for the selection of innovation ideas
Early recognition stage	Identifying ideas and strategies for the development of an innovation unit within the institution	G2: Assessment of ideas
S1: Idea generation stage	Identifying innovative ideas in teaching, research, internationalization, welfare, financial and administrative management	Assessing, evaluating and selecting the best ideas considering risks, benefit, impact and feasibility
S2: Assessing ideas	Prioritising innovation ideas (challenge 1)	G3: Financial and technical assessment of the idea
S3: Minimum viable product	Developing the project (challenge 1)	Assessing ideas considering pre-viability in: profitability and the cost-benefit relationship
S4: Implementation	Executing the project with the required resources	G4: Implementation decision
S5: Dissemination	Disseminating the project results	Supporting the idea of innovation based on the clear understanding of the contributions and benefits of the idea
		G5: Launching decision
		Reviewing the optimum results of the project

Source: Own elaboration

5. Learned lessons

The institution needs to fill the gap between what current operations produce and where it wants to be in five

years' time.

The greater the growth gap, the further innovations will have to be from the core, and the longer it will take to realise revenue from them.

If the growth gap is considerably large, the institution may want to divide its new-growth initiatives into two or three categories.

The quality of the innovation product, whether service or process, strongly depends on the quality of the process used to develop and put the innovation into practice.

The stage-gate model guarantees quality through the application of decisions at the review gates, which reduces risk and development time of the project, meeting with client requirements.

A critical success factor of innovation is the involvement of different people, interests and viewpoints in an innovation process, while at the same time focusing on the clients.

6. Conclusions

This paper proposes an innovation system using a mixed approach of *Lean Startup* and *Design Thinking*.

The selected idea within the innovation portfolio aims at designing and implementing a technological platform that supports the HEI's offer of innovative social services.

The selected idea of a social innovation technological platform is defined as a rapidly growing emerging business that will yield medium-term earnings, classified in horizon 2.

The HEI defined an innovation portfolio where all its innovation projects are *adjacent*, that is to say, the institution leverages on something it already does well in order to enter new markets or to satisfy new needs of existing clients.

The appropriation of this methodology on the part of diverse groups in the academic and administrative community will enable to improve the current innovation portfolio.

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