

POLITECNICO DI MILANO

Scuola di Ingegneria Industriale e dell'Informazione



Master of Science in  
Management, Economics and Industrial Engineering

**Business Models and Performance  
Measurement: a framework proposal  
and a case study**

Supervisor: Prof. Raffaello Balocco

Assistant Supervisor: Prof. Antonio Batocchio

Master Graduation Thesis by Martin M. Barrientos Baeza

Student ID 812956

Academic Year 2014/2015

## Table of contents

Chapter 1.....	0
1. Introduction.....	0
1.1 Objectives.....	3
1.2 Research Question.....	3
1.3 Research Hypothesis.....	4
1.4 Research Methodology.....	5
Chapter 2.....	9
2. Literature Review.....	9
2.1 Literature Review on Business Models.....	9
2.1.1 Manufacturing Industry.....	10
2.1.3 Business Model.....	11
2.2 Literature Review on Performance Management Systems.....	28
Chapter 3.....	42
3. Performance Managements Systems.....	42
3.1 Proposition of Models.....	42
3.2 Selection of Model.....	51
3.3 KPI's definition and measurementadjustments.....	52
Chapter 4.....	61
4. New PMS for Business Model.....	61
4.1 Detailed description of each component's evaluation sheet.....	64
4.2 Scales and Objectives.....	87
4.3 Recommendations to set minimum value.....	90
Chapter 5.....	93
5. Framework Application.....	93
Chapter 6.....	103

6. Final conclusion and future developments .....	103
References.....	109

# Chapter 1

## 1. Introduction

This study is part of a broader research which aims to create an Integrated Business Model considering also the topics of Strategic Governance and Performance Measurement Systems as integral part of its framework. It is therefore that the focus of this paper will be put majorly within the space of the academic literature and research related to Business Models.

The topic of Business Models (from now on to be called BMs) has been widely reviewed in the past decades by many illustrious academics from several different perspectives. However, it seems that it has been hard for them to agree upon a precise definition of what a BM actually is. On one hand, for example, it has been sometimes defined in a simplistic way just as “how you planned to make money” (Michael Lewis, 1999). On the other hand, some academics offer a more detailed and technical definition of what a BM is, such as “the chosen system of inputs, business activities, outputs and outcomes that aims to create value over short, medium and long term” (Integrated Reporting, 2013). In any case, the variety of definitions is explained by a simple intrinsic characteristic of BM itself, which is that it depends on how people are actually using it (Andrea Ovans, 2015).

This situation leads to a simple and unavoidable conclusion, BMs are perceived as an abstract concept which varies depending on the context in which it is being used, thus creating a void which makes the task of analyzing and defining its proper characteristics much more difficult. If there is something that is clear, is that a BM comprises choices and therefore consequences for the Company (Casadesus-Masanell, 2011), thus implying that every decision to be taken has to be carefully reviewed in order to understand the future behavior of the system as a whole.

The intangible essence of the BM, together with the need of deep analysis of the choices to be made, makes the design of a BM a very complicated and ambiguous task, as it is apparently impossible to determine exactly which outcomes a certain choice will provide. Nevertheless, it is of the outmost relevance to continue trying to create a system which could help Companies to somehow forecast the effectiveness in the short, medium and long term of the BM they will attempt to implement.

The objective of this study is, hence, to propose a framework, using modified existing methods, which would allow Companies to analyze and forecast their BMs success in order to determine the viability of the choice that was made. To accomplish this goal, the extensive literature on Performance Management Systems (from now on to be called PMS) available nowadays will be put to use to determine the equivalent to the “Key Performance Indicators” of a Business Model and a way to measure its level of effectiveness. This framework will be able to provide a quantitative and measurable system, thus enabling the development of a PMS for the BM itself which Companies could implement to forecast the success of their current or future Strategic Plans.

As the variety of different PMS available in academic literature depend to some extent on the correspondent Business Area, it has been decided that this study will be restricted to a BM applicable to manufacturing companies, thus leaving aside all the possible complications that could arise by mixing this industry with the service sector, amongst others.

This study will be built based on the available literature about BMs and Strategic PMS in order to build a theoretical framework, which will provide the necessary tools to develop a proposal of performance measurement system for a business model applied to a manufacturing company. This proposal will be afterwards confronted with the previously stated literature review, which will not only help to determine the effectiveness of the proposed PMS compared to its theoretical requirements, but also to highlight possible corrections to be made, which will help develop a system, which could be extensively used in real cases in the future.

This study will be organized as follows:

**Chapter 1 – Introduction:** In this specific section a general description of the study will be provided by describing the scope of the analysis and the research context, as well as a short description of general theory about business models and performance management systems. Furthermore, the specific objectives together with the relevant research parameters will be defined to provide a clear guideline of what will be developed in the following chapters. The research parameters that will be described are specifically the research question, the research hypothesis and the research methodology, which together will allow the reader to obtain a complete understanding of how the project will be built.

**Chapter 2 – Literature Review:** This chapter presents the extensive literature review on business models and performance measurement systems required to clarify the foundations of

the model to develop. The review on business models will be basically focused on the central work of this integrated research whereas the performance measurement review will provide a more general understanding of this topic, dedicating special attention to the main characteristics of a PMS, its design process and finally the roles it has within an organization.

**Chapter 3 – Performance Management Systems:** This chapter provides a deeper analysis on PMS and targets specific models that will be used to build the final framework this study aims for. It will start by describing the main PMS currently used and then compare them according to their suitability for this particular case. A model will be chosen as a guideline or template to develop the new PMS for BM and then the different key performance indicators of a BM for a manufacturing firm will be presented and described to determine which parameters this study will consider.

**Chapter 4 – New PMS for Business Model:** This chapter will provide a clear description of the new model by providing the different parameters it will measure, as well as the specific procedures and rules it will use to achieve this goal. Furthermore, a visual description of the model specifically designed for each one of the KPI's will be provided to allow the user to have a clear view of how the model should be implemented. Finally, the model will be put in contrast with the requirements defined within the literature review section to determine how accurately it suits the basic requirements of a PMS and to what extent, apart from defining if it is able to achieve its final objective.

**Chapter 5 – Framework Application:** In this section some data about a real company and a fictional new business model will be used to apply some modules of the framework in order to exemplify the methodology of the model. Some suggestions of procedures to determine the metrics and minimum acceptable values for the model will be presented by using Likert-type scales and a simple statistical analysis. It will also provide the opportunity to identify possibilities for corrections within the model when applied to a real case.

**Chapter 6 – Final conclusion and future developments:** In this section the model and procedure of the study will be summarized and analyzed in order to determine the final considerations it requires. The initial research questions and hypothesis will be reviewed to determine the effectiveness of the study and the suitability of the developed framework regarding the initial objectives. Possible suggestions for future developments will be presented as well as the general relevance of the research for practical application.

## **1.1 Objectives**

The main objective of this study is to create a suitable performance measurement system for the integrated business model which would allow the user to evaluate the model, in order to determine the sections where improvements have to be done, to which extent, and which levels of performance have to be achieved. This evaluation has the purpose of forecasting the completeness and effectiveness of the business model before the implementation.

## **1.2 Research Question**

A research problem or phenomenon is the topic that is addressed and analyzed within a specific research study. In order for the research to be successful, the research problem has to be properly understood and stated in a clear way that allows the researcher to define and identify the main aspects of the problem. Identifying a clear research problem enables or facilitates the process of addressing and measuring the phenomenon (Boudah, 2011).

Identifying the main problem is an essential part of the research, as it also enables the process of creating or defining the main research questions that the study should answer. According to Boudah (2011), a research question is the way in which a researcher shows interest in a problem or phenomenon. The statement should be clear and specific, refer to the problem or phenomenon, reflect and intervention in experimental work, and note the target population or participants.

A good research should be always based on a specific inquiry that provides a guideline to be followed throughout the study in order to determine if the final results indeed fulfil the initial requirements of the project. However, for this specific study about performance measurement system it is possible to identify more than one question that would be relevant to determine its success. In this section the main research question, as well as the complementary research questions will be clearly identified.

In order to achieve this goal, it is necessary to determine the outcome that is being expected from this research, which means to create a PMS for the integrated business model in order to forecast its success with a medium-high level of certainty. Therefore, the main research questions would be the following:

**Main question:**

- Which specific variables of the integrated business model should be measured and how should it be done in order to develop an effective performance measurement system with forecasting and evaluation purposes?

**Secondary questions:**

- How should a performance measurement system for a theoretical framework without any tangible assets be designed?
- Are there any successful examples of strategic PMS that would provide a suitable framework for the development of a PMS for business models?

By providing a suitable and reasonable answer to these three questions it would be possible to affirm that this study will have indeed fulfilled its purpose, as clearly most of the barriers to develop the model would be overcome and the different metrics of the PMS would be already defined.

### **1.3 Research Hypothesis**

A research hypothesis is a statement representing the initial expectations about the outcomes of the study or to put it in simpler terms, it is a possible answer to the previously stated research questions. A research hypothesis should be brief, remark the most important aspects of the study, and suggest variables that can be easily tested or investigated qualitatively (Boudah, 2011). In general, it is recommended to define research hypothesis before performing a study in order to set goals or guidelines for its development.

In this case, for each research question, at least one hypothesis should be provided in order to determine the possible outcomes of the study, with which they will be compared at the end of the paper. In this specific case the following hypothesis will be stated:

**Hypothesis 1:**

Every module of the business model will provide a KPI that will be measured in a scale depending on the relevance of the specific module for the particular business.



**Hypothesis 2:**

A PMS for a theoretical framework can be designed by using existing models that are found in strategic management related publications, which mainly focus on the related processes more than on the specific outcomes.

**Hypothesis 3:**

There are some examples of strategic performance management systems that once adapted will provide a suitable framework for the development of the PMS for the Integrated Business Model.

At the end of this study it will be possible to identify whether one or more of this hypothesis has been indeed correct from the beginning. However, it may be possible that none of them would actually have a relation with the real final outcome of the research.

## **1.4 Research Methodology**

Research in common parlance refers to a search for knowledge or a scientific and systematic search for information on a specific topic (Kumar, 2008). According to Clifford Woody, research “comprises defining and redefining problems, formulating hypothesis or suggested solutions, collecting, organizing and evaluating data, making deductions and reaching conclusions, and at last carefully listing the conclusions to determine whether they fit the formulating hypothesis” (Kothari, 1985). There is a substantial difference between research methods and research methodology, the first being the methods the researcher uses in performing research operations, whereas methodology is a way to systematically solve research problems (Kumar, 2008). Given these statements, it is possible to assume that research methods are indeed a part of the general research methodology, which is the responsible to identify if the chosen methods are relevant and suitable for the desired purpose.

There are basically five types of research that can be found according to the research problem and the methodology used. For instance, it is possible to divide them between descriptive and analytical, the first being the type of research that includes surveys and fact finding inquiries of different kinds, whereas analytical research is based on facts or information already available which is analyzed and evaluated. Another division comes from defining whether a research is applied or fundamental, the difference being that they focus on solving specific

immediate problems or generating and formulating theories about the topic respectively. A third type of research is a pair that can be either conceptual or empirical, the first being commonly used by thinkers and philosophers to develop abstract ideas, whereas the latter corresponds to the research based in facts capable of verification and experimental observation. The other divisions correspond to whether a research is qualitative or quantitative and experimental or non-experimental (Kumar, 2008).

When evaluating this particular study, it is possible to see that it fits the following types:

**Descriptive vs Analytical:** As no surveys will be used and the study will be based on theoretical findings and extensive literature research it is possible to state that this study is mostly analytical from a research point of view.

**Applied vs Fundamental:** It will be assumed that the aim of this study is to provide a functional performance measurement system for the integrated business model, which can be considered as solving an immediate problem; the need to forecast the results of the BM before its implementation. Therefore, this study will be considered an applied research.

**Conceptual vs Empirical:** Even if this study is based on available literature, it is possible to state that it is empirical, as the final result will be a model, which will be indeed able to be put under verification and experimental observation once applied in real life cases.

**Qualitative vs Quantitative:** The results of this study will be clearly qualitative as it will provide a general model which will be afterwards the one responsible for delivering specific quantitative data for the purpose of evaluation. However, the outcome of this study will not be a specific quantitative result for a particular case but a general framework applicable to a high variety of cases.

**Experimental vs non-Experimental:** No empirical experiments will be performed for this study, for which is possible to state that it is a non-experimental research.

Being the main characteristics of the research already defined, it is possible to define the steps required to perform the study, which will be the following:

- Define research problem
- Review of literature
- Formulate hypothesis
- Research design

- Determining sample design
- Collecting sample design
- Analysis of the data
- Interpret and report

Regarding this specific study, the aforementioned steps will be implemented as follows:

**Define research problem:** The problem has been already been defined, which is to develop a suitable performance measurement system for the integrated business model that allows the user to forecast the effectiveness of the BM before its implementation by measuring and evaluating its different KPIs.

**Review of literature:** The literature review will be mainly based on the available papers about business models and performance measurement system among others. These papers will be mostly found online through a different set of databases.

**Formulate hypothesis:** The different hypothesis regarding this specific research have already been stated in the previous section. Given the essence of this study the relevance of stating research hypothesis can be put into question, however it might be a useful tool depending on the final results of the study.

**Research design:** There are four main research design types, which are exploration, description, diagnosis and experimentation (Kumar, 2008). This study will have some characteristics concerning the first three types, as no empirical experimentation will be performed.

**Determining and collecting sample design:** Given the theoretical structure of the project no specific sampling method will be used, for which this step will not be taken into account.

**Analysis of data:** Data collected form the literature review will be interpreted and analyzed to determine the information that is relevant for the development of the model.

**Interpret and report:** After the relevant data has been chosen it will be used and transformed in order to crate the final framework for a new PMS for business models.

As stated in the previous paragraphs, this study is mostly if not entirely theoretical, for which no surveys or statistical analysis will be performed. On the contrary, it will be based on the available academic literature on the topics of business models and performance management/measurement system that can be found through several databases online. The

main filter for suitable journals and publications will be obtained from the AiIG classification by using as first option those publications published in a GOLD class journal. Publications from a SILVER class journal will be considered as well depending on the value of the information provided for this specific study.

Primary and secondary sources will be used to access the desired information and no distinction will be made between them, as both will be listed in the reference section of the study. However, it is important to state that information found in a secondary source will be quoted using the primary source throughout this paper.

Particularly, for the case study used within the framework application section, no surveys or interviews were performed, and all the information about the company used to illustrate the implementation of the method was obtained from secondary sources. Furthermore, the results obtained in this section regarding the new business model itself are all research-led and therefore do not contain any real information about the company. The main objective of this section is to exemplify the application of the proposed framework and not to validate its accuracy by implementing it within a real case study.

This research methodology aims to provide a large database of information regarding the related topics to help contrast the different perspectives available and determine which ones would be suitable for the study. Clearly, by obtaining a considerable database of suitable publications the comparison between theories, as well as obtaining new information becomes an easier task and provides the tools needed for an efficient and well informed research.

## **Chapter 2**

### **2. Literature Review**

The main topics to analyze within the literature review section are business models and performance management/measurement systems.

The literature review on BMs will describe their structure and more relevant characteristics in order to define their main key performance indicators (KPIs), thus enabling the process of measuring these variables.

Once the most relevant variables of the BM are clear, it is necessary to develop a system to quantify their levels according to a certain scale, hence the need of a literature review regarding PMS and their main characteristics. The provided theoretical framework will deliver the methods to design a PMS according to the specific characteristics of the BM by listing the essential needs of an effective measurement system and the basic structure it requires.

#### **2.1 Literature Review on Business Models**

Clearly, in order to develop a performance measurement system for a business model, the first step is to be able to recognize all the relevant characteristics of a BM itself. As this study takes part in the Integrated Business Model research, the literature review regarding this topic will be directly connected with the model used in the main module of the project. As it is possible to observe from the beginning of this study and the specific literature review developed in the main BM section of this work, this part will be focused on the BM's concerning the manufacturing industry, as it was previously explained.

Given this last statement, it is of the utmost importance to define what differentiates the manufacturing industry from others in order to determine which the main differences between the modules of a BM related to this sector and those of a BM related to any other are. To achieve this goal, the review will start with a short summary of the core characteristics of the manufacturing industry to be followed with a review on their respective BM framework.

## 2.1.1 Manufacturing Industry

There are several aspects that are common to many industries, such as the need to be sustainable and competitive in the long term run, the international aspect of their markets, the devotion towards customer service, amongst others. However, what differentiates the most the manufacturing industry from any other is their specific supply chain, which is a concept rather complex and difficult to explain. However, some definitions of the term have been elaborated and for the purpose of this study, a supply chain will be understood as a network of autonomous or semiautonomous business entities which are responsible for specific functions such as procurement, manufacturing and distribution of the company's products (Swaminathan et al., 1998) as described in Figure 1.

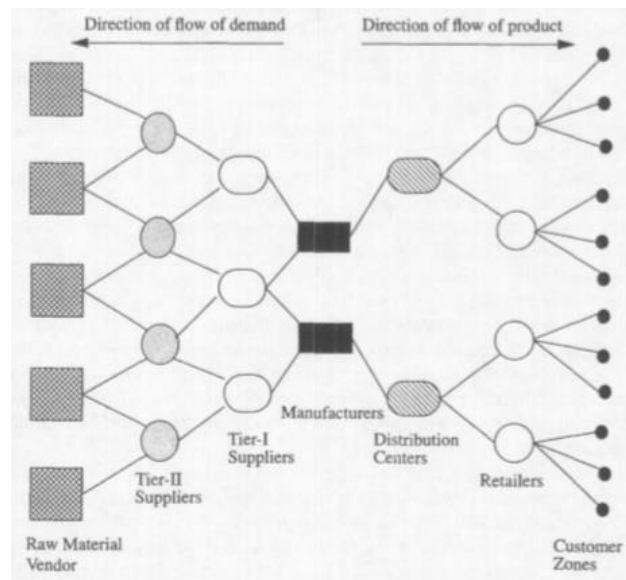


Figure 1. Supply Chain Network (Swaminathan, Smith and Sadeh, 1998)

One of the most interesting aspects of the modern supply chain is that the greater part of their modules tends to be outside the company. Not only suppliers and vendors are external entities but sometimes the manufacture of certain components and others, such as the departments in charge of distribution and logistics could be outsourced. This situation brings up one of the main challenges of the modern manufacturing industry, which is to optimize the functioning of the supply chain, in order to gain competitive advantage in the market, thus creating an important role for supply chain management within the business processes.

Ayers (2000) created a list of tasks that have changed in the past decades with the emergence of the supply chain as the main differentiator in competitiveness for manufacturing companies. These are developing supply chains for strategic advantage, implementing collaborative relationships, forging supply chain partnerships, managing supply chain information and removing cost from the supply chain.

Regardless of the specific network of the supply chain to be analyzed, a business model has to consider the development and implementation of a supply chain that contains these characteristics in order for the company to be successful in the future. It is therefore that the proposed business model will surely contain modules that consider this matter and allow the company to continuously improve their competitiveness as it grows by developing an effective supply chain.

### **2.1.3 Business Model**

As said before, the PMS will be developed to work with a specific framework of Business Model developed in the core of this integrated research. Therefore, this literature review will be based on describing the main features used and proposed by Batocchio et al. (2015), in their framework for an integrated business model in manufacturing industries.

The first obstacle to encounter in this section is firstly to give a consensual definition of what is a Business Model, as many different proposals have been created in the past decades. Most of them focusing more or less on the same aspects of the topic but approached from different perspectives, situation which explains their differences at the moment of providing a definition of business models. However, for the sake of simplicity and because of the similarities between the proposed definition and the proposed model, this study will use the work of Ghezzi (2013) which defines that a BM is a synthetic representation of the logic that the company adopts in order to execute its strategy.

Ghezzi states that a business model is mainly composed by three functional areas, which are the value model, value capturing and value creation and delivery. A more detailed description can be seen in Figure 2.



Figure 2. Business model, components, and related building elements (Bergna, 2010)

Based on this model and many others, a specific framework was proposed for the integrated business model. It has its core on the general value proposition of the company, which is covered by six main perspectives and their respective components as described in Figure 3 (Batochio et al., 2015):

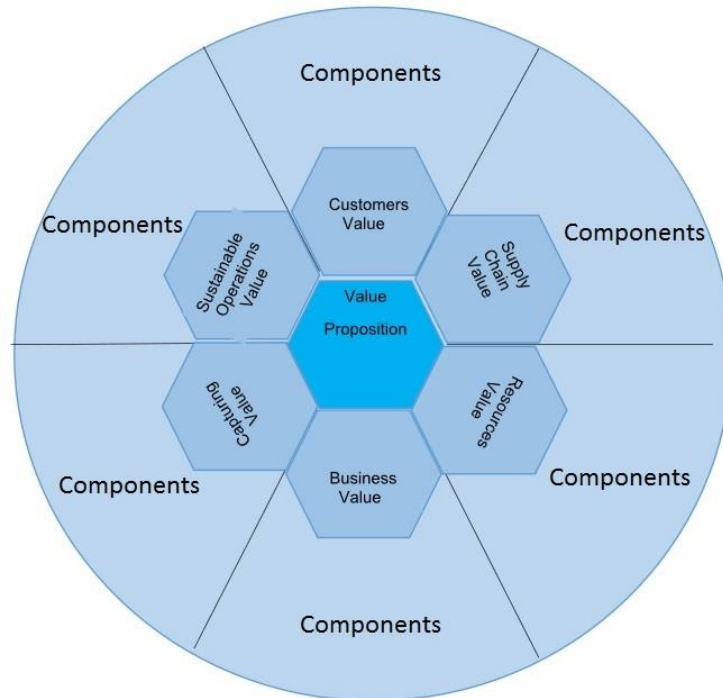


Figure 3. Integrated Business Model (Batochio et al., 2015)



- **Value Proposition:** The reason why customers turn to one company over another.
- **Customers Value:** Products (marketing), Services (technical assistance); Segments (market local, region or international) and, Relationship with Consumers (CRM);
- **Business Value:** Business; Strategy Choices; Investments and, Performance Systems;
- **Resources Value (key):** People (human resources); Partners and Network (core competencies); Technology; Innovation and, Process and Activities;
- **Capturing Value (financial):** Revenue; Cost; Support (infrastructure); Profit and, Pricing;
- **Supply Chain Value:** Channels; Partner Supply; Network Supply, Green Supply and, IT – Information Systems;
- **Sustainable Operations Value:** Competitors; Product Sustainable; Services Sustainable; Environmental Management; Cleaner Production and, Lean Green Production.

Within this particular framework, every perspective or section covers the core of the model which is the general value proposition. The definition of this concept used by Batocchio et al. (2015) to drive the proposed framework is the following:

It is the reason why customers turn to one company over another. It solves a customer problem or satisfies a customer need. Each value proposition consists of a selected bundle of products and/or services that caters to the requirements of a specific customer segment. In this sense, the value proposition is an aggregation, or bundle, of benefits that a company offers customers. Some value propositions may be innovative and represent a new or disruptive offer. Others may be similar to existing market offers, but with added features and attributes (Osterwalder and Pigneur, 2009).

This rationale provides an insightful idea of what makes a company successful in the long term run, as the main reason for success in manufacturing firms is the customers' preference. It also delivers a specific point towards which all perspectives of the business model must point, enabling synergy and synchronization between them. It provides a target to the system.

In the following section, each one of the perspectives and their respective components will be further developed:

## **Value proposition**

As said by Osterwalder and Pigneur (2009), the value proposition is “the reason why customers turn to one company over another. It solves a customer problem or satisfies a customer need. Each value proposition consists of a selected bundle of products and/or services that caters to the requirements of a specific customer segment. In this sense, the value proposition is an aggregation, or bundle, of benefits that a company offers customers. Some value propositions may be innovative and represent a new or disruptive offer. Others may be similar to existing market offers, but with added features and attributes”.

To determine the value proposition from a customer’s perspective, the following questions have to be answered:

- What are the consumers wants or aims when purchasing?
- What are the consumers’ needs when acquiring a product?
- What may be offered to consumers that exceeds their expectations?

## **Customers Value**

As previously stated customers are the most important actors regarding the success of a company and it is therefore that the value offered to them must be clearly stated as well as analyzed in order to ensure the delivery of suitable products, services and other variables which are critical to the end user. “The value of an offering is relative to an individual customer's subjective perceptions and experiences” (Eggert & Ulaga, 2002), for which the first step into delivering substantial value is to define specifically who the final customer is. According to Eggert & Ulaga (2002), the satisfaction of a customer will be defined by the difference between the product’s performance and their individual expectations of it before the purchase and in order to ensure the positive result of this process the expectations of the customers must be well defined considering different variables.

It is therefore that the customer value perspective has the following components (Batocchio et al., 2015):

- Products (marketing)
- Services (technical assistance)
- Segments (local, regional or international market)
- Relationship with the customers (CRM)

The first thing that comes to mind when discussing about customer value is the product itself, considering many aspects such as its performance, appearance, durability, amongst others. There is extensive theoretical background to accurately state that an improvement in product quality (with a quality perspective defined for each case according to the customer) could signify a substantial increase in profit and acquisition of new customers if well implemented. It is therefore that a business model must contain tools to enable the company to manufacture products in the future with a quality level which meets the desired standards.

Whenever purchasing a product, one of the things the customer is usually worried about is the range of services provided once acquiring the product itself. In the past, those services were mainly focused on technical assistance for installation or maintenance service and other similar offerings; however, nowadays it is possible to observe that a new phenomenon is arising. The importance of services is rapidly increasing to a point where in some cases the added services seem to be more important than the product itself, creating a new business model which offers services instead of products. “Instead of only innovating products, companies are investing in service differentiation. Consequently, instead of services being add-ons to the product, they become the center of the total offering, with products as add-ons to the services” (Gebauer et al., 2011). This situation clearly states that innovative and significant services are a fundamental part of what a manufacturing company requires to succeed in its respective market nowadays.

The importance of the market segmentation directly relates to what was stated in the description of customer value, where it was explained how this value is given by every customer according to their specific expectations and needs. As it is impossible to determine every single possible client’s expectations of the product, a market segmentation is needed. According to Mitchell et al., (1998) market segmentation is the process of analyzing and clustering potential and actual buyers who have similar needs into groups that can be approached with a homogenous marketing mix. This process of subgrouping customers helps to define the specific need and expectations a group of clients might have, thus allowing ensuring that the product or mix of products offered will have the quality level the customer requires.

All the previous components of this particular perspective have something in common, and it is that in order to define them within the company it is necessary to gather them from the customers themselves, in order to obtain feedback and thus improve the customer value. This

is where customer relationship management (CRM) comes into play, which according to Parvatiyar et al., (2001), consists in a strategy and process of acquiring, retaining, and partnering with selected customers to create value for the company and the customer. It considers areas such as marketing, sales, customers' service, amongst other functions to finally deliver real customer value.

## **Business Value**

Business Value is a concept that is hard to define as it includes many aspects not only from the financial standpoint but also from intangible assets, amongst other variables. For this particular study the business value will be understood based on its components, which are the following:

- Business
- Strategic Choices
- Investment
- Performance Systems

The development of a new vision depends on many variables, such as a vision and identification of an opportunity and risk level, favorable economic conditions, technological innovations, availability of resources and facilities, amongst many others. All of them simultaneously take part in the process of creating a new company; however none of them clearly identifies the purpose of an entrepreneurship, and even less the responsibilities that come along with it. A new business always has an impact on the society, whether it is social, environmental or economical, and every company has to be prepared to identify the influence of the entrepreneurial vision in the area where it occurs. To do this is getting every day harder, as the places where opportunities can be found are expanding with globalization and the vision of the new company as a whole get every day more complex.

Batocchio et al., (2015) state that there are two main parameters to consider before making strategic choices, and those are the context and the institutions of the place or places where the choice will be made or that will be affected by it. Afterwards two basic questions arise, which are basically related to what a strategic choice is, and how they should be made. For the first question a definition is proposed by examples such as choose whether to make or buy, or possibly develop or outsource. However for the second issues a more complex situation can be found, as decision can be made in many ways, such as considering judgment,

bargaining, or just choosing between alternatives (Nutt, 2002). Nutt, (2002) also provides a framework to decide which method to use, as analysis might not be the most suitable option for example when the result might not be favorable for relevant stakeholders. To solve this issue the following framework was developed:

		Means of producing results	
		Knowable	Unknown
Ends or objectives	Knowable	Analysis <sup>1</sup>	Judgement <sup>2</sup>
	Unknown	Bargaining <sup>3</sup>	Inspiration <sup>2</sup>

Figure 4. Decision approaches matched to decision tasks (Nutt, 2002)

- Analysis is recommended when both an end (objective) and means are known. In such a decision task, performance measures can be inferred from an objective to evaluate options.
- A judgmental approach is recommended when the objective can be identified but the means of producing results is ambiguous or unknown.
- Bargaining is recommended for decisions in which means are clear but objectives lack clarity. Such decisions can arise when prospective customers, suppliers, or oversight bodies have unknown or shifting expectations.
- When the objective and the means of producing results lack clarity, a volatile decision task is created in which there is no rational basis to make a strategic choice, calling for inspiration. (Bacotchio et al., 2015).

The investment component speaks for itself, as the BM has to clearly consider which investments the company will have to incur in to develop everything that is originally planned, not only for tangible assets such as facilities and machinery but also for intellectual capacity, for instance in the form of an R&D department. It is important that all areas of the BM are clearly revised and that a specific budget is developed at least for the initial phases of the creation of the company. The process of negotiation regarding the procurement of the investment fund also has to be considered by the model.

On the last component of this section the Performance Management Systems are found. As this topic is widely developed in the further sections there is no need for a deeper theoretical review. However it is important to say that the preliminary design of a PMS and its implementation process has to be an essential part of the agenda of any starting company.

### **Resources Value (Key)**

A company's resources might be the most fundamental element in the organization, as it enables every possible process as well as the implementation of all the strategic choices. The types of resources a company possesses are highly variable; however, this framework identifies knowledge as the most important asset of an organization. This does not only refer to individual knowledge, but also to the shared knowledge of all individual within the organization, as "it has been shown that the organization that shares knowledge among its management and staff grows stronger and becomes more competitive. This is the core of knowledge management – the sharing of knowledge" (Uriarte Jr., 2008). This particular perspective contains the following components

- People (human resources)
- Partners and network (Core competences)
- Technology
- Innovation
- Processes and activities

Knowledge itself lies in people and organizations, and given its high volume and the dynamics of production and consumption in services people play a critical role in companies' processes. Simultaneously, there is a huge need to formalize and codify this knowledge to transform it into routines and organizational culture (Abecassis-Moedas et al., 2012). This is the reason why academic sources indicate that an organizations knowledge sharing capabilities, considering communication, organization and spreading knowledge amongst other activities improves the general efficiency of a company (Artail, 2006).

Given the complexity of every industry in the modern world, a well-defined and efficient network of partners is essential to achieve success. It allows a group of organizations to share their core competences in order to increase each other's competitiveness in the market, and the ties and communication between them might as well define their future. The nature of the network is commonly defined by its size, density and strength of its ties (Wasserman et al.,

1994), as well by the frequency of communication between which defines the level of useful information each member gets from the other (Westphal, 1999). Figure 5 illustrates the main variables defining the characteristics of a typical network composed by partner companies:

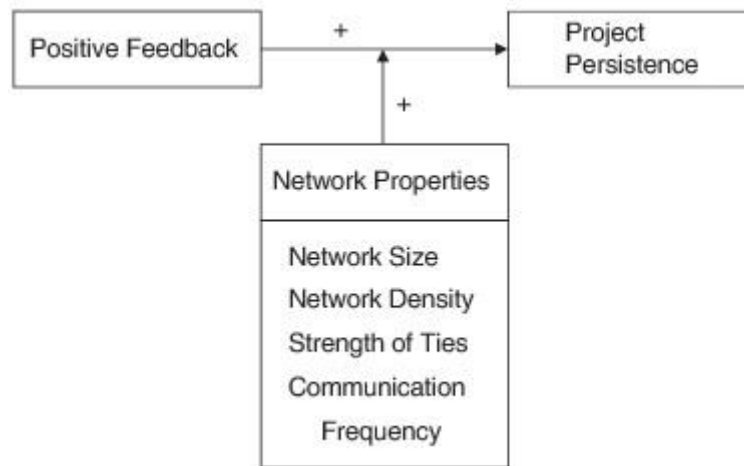


Figure 5. Conceptual Model (Patzelt, Lechner and Klaukien, 2011)

The topic of the application of new technologies within a company has been widely discussed, and it is clear that there is a correlation between the efforts towards implementing new technologies and its success. However, it is unclear if nowadays we reached a point in which technologies within a company provide a competitive advantage, as for most of them it became a basic necessity. This means that, the company with the proper technologies will be at the same level as its competitors, whereas the one without them will fall behind with high certainty. Assuming this situation only applies for first class companies, it is possible to state that technologies do provide a competitive advantage in case they are applied early, as they will be implemented as well by the competitors after its contribution becomes clear.

“Radical innovation is an important driver of the growth, success, and wealth of firms and nations” (Tellis et al., 2009). Looking at recent history it is clear that radical innovations have an important role in shaping markets, nowadays there are several clear examples of this such as the arrival of smartphones and online shopping. According to Tellis et al., (2009) there are four factors that explain why some nations are more innovative than others; these are Labor (skilled workforce), Capital (Availability of financial resources), Government (Policies) and Culture (See Figure 6).

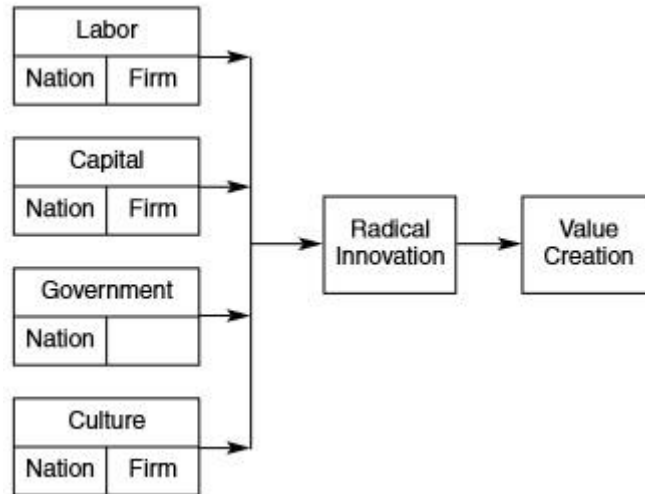


Figure 6. Framework radical innovation (Tellis, Prabhu and Chandy, 2009)

Processes and activities are basically everything a company has to do to deliver a product to the final customer. The main challenge lies in determining whether an activity indeed helps adding value for the customer to the final product. This process was highly simplified when in 1985 Porter published his book about Competitive Advantage in which he introduced his Value Chain (Figure 7). This model provides a framework to identify the primary (or core) activities of a company and its secondary activities. From this tool the Value Chain Analysis was developed in order to determine whether and activity adds value to the final product or not, and if it necessary to perform it or if it can be somehow avoided.

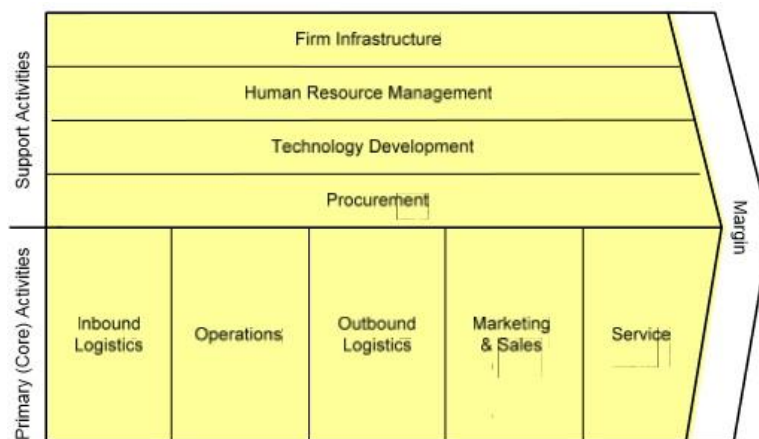


Figure 7. Porter's Value Chain (Porter, 1985)



## **Capturing Value (financial)**

According to Michel (2014), most companies focus mainly on the innovation concerning value creation, but lack the ability to innovate in value capturing. Both of them are highly important, “but when value capture goes unexamined, money is usually left on the table—and sometimes the only thing that can save a business is finding a way to capture value” (Michel, 2014). It is therefore that determining an innovative way (if necessary) to capture value is essential for the survival of a company, as many organizations fail because they are unable to financially liquidate their operations. Hence the need for a thoroughly revised financial system which allows the organization to produce positive flows of income to further proceed with any operations required. The main components of this perspective are the following:

- Revenue
- Cost
- Support (infrastructure)
- Profit
- Pricing

Revenue is by definition the income generated from the sale of goods or services, or any other use of capital or assets, associated with the main operations of an organization before any costs or expenses are deducted. As such, revenues are the main tool to provide profits for the company and the way they will be acquired is one of the first things a reliable business model should describe. The revenue streams (or way in which revenues will be obtained) have to be identified and tested before any real implementation can be put into action.

In its most simple definition, costs are the amount to be paid to get something, and they are usually divided into fixed and variables costs. There are many costs related to the manufacturing industry, which can be directly or indirectly related with the amount of units produced, variable or fixed, and are sometimes hard to precisely determine. This particular study considers basically two definitions of cost: the first one being The Boston Consulting Group’s definition where they analyze costs amongst four dimensions: manufacturing wages, labor productivity, energy costs, and exchange rates (BCG, 2015). The second analysis made by Anderson (2009), states that by initially determining the variable cost, fixed operating cost, and capital depreciation to the total product costs outputs, it is possible to give space to a more efficient cost reduction on the cost components that are most relevant. According to

Anderson no cost can be totally fixed or totally variable, but in the initial estimations at the beginning of the product development phase, it can be seen which costs are largely fixed and which are largely variable, making the cost estimation process more efficient.

With the opportunities brought by globalization, the manufacturing industry has changed in a significant manner, with an increased capacity, growth in the usage of digital information, new computerized technologies and new opportunities from the bilateral and multilateral trade agreements (WEFR, 2012). The most significant change was the introduction of digital manufacturing, which stands for “the use of advanced computing technologies to employ modeling and simulation techniques for engineering, testing, or design purposes.” This shift into the digital world lowered the entry barriers of the market and created a dynamic market with more competitors.

As Bare and Cox (2008) stated, the application of mass customization is both improving the efficiency and reducing the time and cost of product development, by enabling the engineers to predict the product performance in the early stages of product planning and design. The adoption of lean manufacturing approaches is the first step towards an increase of efficiency in the product development phase. In order for lean manufacturing to be implemented properly there must be:

- Organizational and technological interoperability, which can be obtained by having shared goals and management strategies in the enterprise
- Industrial interoperability, which can be obtained by developing industrial processes with a dynamic multi-layer organization
- Semantic interoperability, obtained by enabling different systems that understand exchanged information in similar ways.

It can be concluded so far that the workforce, with its skills and knowledge, holds a very important place in lean production. Therefore, companies should always invest in training, worker empowerment, encourage team work and provide quality leadership.

According to Porter (2008), companies’ strategists nowadays take into account a very narrow circle of competitors. However, when it comes to competition for profits it is much bigger, including also: customers, suppliers, potential entrants and substitute products (See Figure 8).

From these five forces that drive competition, the strongest one is determining the profitability by making companies follow it in the strategy formulation phase.

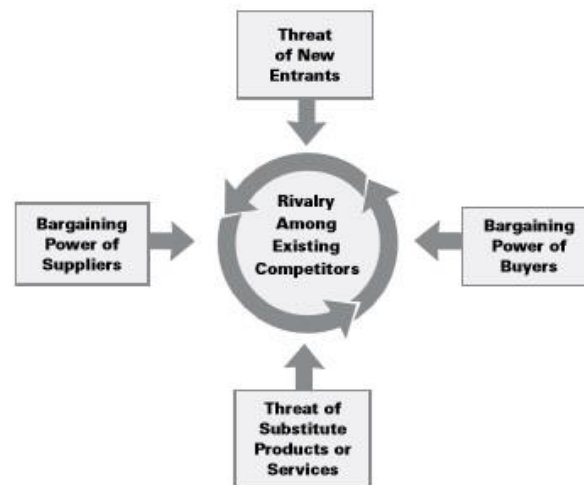


Figure 8. The five forces the shape industry competition (Porter, 2008)

For a business organization it is possible to measure its performance by following financial and non-financial indicators. Relying only on financial or non-financial measures has its limitations, which has been recognized by managers that have thus adopted a hybrid version of these measures (Chong, 2008). According to Bryan (2007), the focus of the companies is only on measuring the return on invested capital (ROIC) and not on the contributions that had an impact on it or produced it. Nowadays, the majority of wealth creation comes from knowledge, relationships, reputations and other intangible assets which are created by developing R&D, marketing and training sectors. Therefore, companies should restructure their financial performance measures to be able to track their performance better.

After the research done by Chong (2008) on the performance measures used in companies, the conclusion was that given the issues addressed above, they tend to use mostly a hybrid approach to meet financial and non-financial returns.

According to Talluri et al. (2008), when it comes to setting prices, companies have an even more complex decision making process. In Agdex (1999) some methods to facilitate this process are presented, including cost based pricing, which is including a profit percentage to the production cost and including it in the price. The second one is competition based pricing, which could be setting the price at the same level as the competition or setting the price to

increase the customer's customer base, seeking larger market share through price. The final method is customer based pricing, or using price to support product image. This method includes setting the price so that product sales increase, designing a price range to get more customer groups, setting the price in order to increase volume sales, and setting a price for a group of products to lower inventory levels or motivate customers.

## **Supply Chain Value**

As Lummus and Vokurka (1999) have stated, the modules of the supply chain are all the activities involved in delivering a product to the customer, including sourcing raw materials and parts, manufacturing and assembly, warehousing and inventory tracking, order entry and order management, distribution across all channels, delivery to the customer and the information systems necessary to monitor all of these activities. As for the place that leadership takes within the supply chain, Lummus and Vokurka (1999) state that it can be seen from different perspectives. Companies tend to be more detailed when choosing their suppliers; they are aware of the amplified national and global competition and as a result they know that customer's behavior has changed, and finally, the awareness of companies that by focusing on maximizing the performance of only one department may bring to lower performance of the overall organization. All these reasons, lead to the need of putting the focus of the organization on the supply chain.

In order to make a guideline for managers when it comes to supply chain management, Anderson, Britt and Favre (1997), made a revision of best practices made by successful manufacturers and came up with seven fundamental principles, including segmenting customers based on their service needs and adapting the supply chain to serve these segments, customization of the logistics network, alignment of the demand planning throughout the supply chain, differentiation of products and flow of information across the supply chain, strategic source management, development of a supply chain-wide technology strategy, and adoption of channel spanning performance measures.

Since supply chain integration brings to increased capability, it improves the flow of goods and information in the organization and as an outcome the companies have better performance (Janvier-James, 2012). This perspective is made from five different components: channels, partner supply, network supply, green supply and IT.

The first component, channels, is the one that becomes more complex as companies are becoming more spread around the world. According to Huang, Menezes and Kim (2012), the location of the distribution channel impacts the distribution costs the most. As the traditional approach in deciding where to place the DC takes into account only the inbound and outbound transportation costs and not the impact of supplier prices, it can be said that it is highly flawed. Since the supplier choice depends on the location of the DC and the supplier related costs have become more significant, managing the variation of material prices is the most important part in this phase.

The second step is partner selection, where the definition based on Lamert, Emmelhains and Gardner (1996) is presented. Partnership is a tailored business relationship, based on mutual trust, openness, shared risks and shared rewards that yield a competitive advantage, resulting in business performance greater than it would be achieved by the firms individually. Even if this definition captures the meaning of a partnership, still no benchmark for all potential situations exists.

The supply chain networks have become the biggest support of economic activities nowadays. According to the Deloitte Consulting's (Deloitte, 1999) report, companies will not compete among themselves, but supply chains will compete against other supply chains. This clearly shows the importance of their efficiency. Supply chain networks are composed of five main types: external suppliers, plants manufacturing intermediate and/or finished products, distribution and/or sales centers/ demand zones and transportation assets. Making a detailed analysis of the potential new network, with all possible supply, location, capacity, marketing and transportation options, is needed in order to start reengineering an existing network.

Green supply captures the management between suppliers, their products and environment and its goal is to put light upon environmental protection and to improve the competitive capacity of companies. Noci (1997) stated that the effective management of environmental issues has shown the need for customer-supplier relationships integration. In order to achieve this goal, there are four possible actions: reducing the quantity of components supplied with low environmental performance, controlling the cost of green products, reducing the company's response time and avoiding problems with the green image of the company.

Efficient information technology provides the company with smooth information flow and makes the supply chain flexible and resilient of changes (Tseng, Wu and Nguyen, 2001). By adopting an information system that is aligned with its supply chain, companies will reduce

their response time, have a better buyer-supplier relationship, and have a better coordination in their activities and decision making processes.

## **Sustainable Operations Value**

Sustainability is defined as “development that meets the need of the present without compromising the ability of future generations to meet their own needs” (WCED, 1987). On the basis of this concept, Klewitz and Hansen (2014) state: “the organizational-level concept of corporate sustainability can be understood as systematic management efforts by corporations to balance environmental and social with economic goals in order to minimize the harm to and increase benefits for natural environments and societies.” The focus of the companies should be on the minimization of the environmental impact and according to this perspective six components have to be followed: competitors, sustainable product, sustainable services, environmental management, cleaner production and lean green production.

All companies have competitors, some in the same business and others in different ones, but regarding of their sector a company has to identify several parameters that might lead to explain the impact of these competitors in the market. From here, companies try to develop market oriented attitudes and behaviors, which will help with their differentiation strategies. Porter (2008) stated that it is obligatory for an industry to have entry barriers. He stated also seven major sources:

- Supply site economies of scale, which grow when firms that produce larger quantities have lower costs per unit because they spread the fixed costs on more items
- Demand site benefits of scale, known also as network effects, which is when a buyer’s willingness to pay for a product increases as the number of other buyers increases
- Customer switching costs, when a buyer switches to another supplier and has to change product specifications, modify processes or information systems
- Capital requirements
- Incumbency advantages independent of size
- Unequal access to distribution channels, where the new entrants have difficulties in creating their own because they cannot overcome this barrier
- Restrictive government policies

According to Clark et al. (2009), Design for Sustainability (D4S) is a new methodology that captures all three pillars of sustainability (people, profit and planet) and is applicable for sustainable production capacity in developing countries. With this methodology, products and services have higher functionality, longer life spans, recyclability, lower environmental impact and improved material sourcing and production. D4S is used generally in small and medium companies in developing countries, with economies that have few incentives or support for innovation.

Hallstedt, Thompson and Lindahl (2003) state that if manufacturing companies want to include sustainability in their processes, firstly, they have to have a common view of what sustainability stands for. Secondly, they have to develop tools and methods for product development throughout the whole decision-making process. Thirdly, it is necessary to make a combination of widely used initiatives to support the process of incorporating sustainability. Fourthly, it is needed to really understand the importance of communication to achieve the desired sustainability goals.

Maxwell and Van der Vorst (2003) define the Sustainable Product and Service Development (SPSD) as the process of making products and/or services more sustainable in their entire lifecycle, from product design to the end of their life, by making them follow the Triple Bottom Line (TBL) context (Elkington, 1997) and by balancing economic, environmental and social factors.

The differentiation between technical product-service systems, according to Aurich, Fuchs and Weganknecht (2006) can be made by stating three distinctive characteristics. The technical services are mostly non-physical, and they can be made with minimum resources usage. Furthermore, services cannot be stocked or distributed like physical products. Secondly, the realization and consumption of a service occurs at the same time, unlike the longer process for physical products. And finally, the realization of the service needs customer involvement, for example by delivering the product for maintenance or providing staff for technical training.

Environmental management has become an important issue both in academia and companies. According to Huang and Kung (2011), corporate sustainability had significant changes as this “green” issue has become globally spread. The way that companies look upon environmental issues varies according to their knowledge and understanding of the importance of this topic. To this end, there are two general factors that influence companies in their environmental

performance. One group of obstacles is external to the plants and the other one is internal. The external obstacles are barriers which are outside of the companies' limits and they are not able to control them. On the other hand, companies have internal obstacles which have to be overcome so they reach a better environmental performance.

Cleaner production (CP) is one of the tools that are helping society with its sustainable development (Kubota and Rosa, 2013). According to Baas (2007) cleaner production was implemented in industries as a prevention-oriented paradigm to have cleaner industry and sustainable business communities. Cleaner production has the ability to decrease pollution, preserve natural resources and limit negative environmental impact of economic activities.

The introduction of lean thinking or continuous improvement was aimed for waste reduction and elimination of non-value adding activities. The difference between lean initiatives and green lean production is that the first one is focusing on maximizing productivity by increasing output per unit of input, conserving resources, reducing waste, and minimizing costs, and green initiatives are concerned additionally with protecting the environment. By incorporating the green part in the lean thinking it is possible to perceive a substantial reduction of waste generation, energy and raw material consumption and lower usage of dangerous materials (Verrier et al. 2014). The same authors through a research they conveyed about the proposed framework for Lean and Green management, including lean indicators, Green performance indicators and Green intentions indicators, concluded that manufacturers start to recognize the benefits of having Green initiatives. They state that although lean manufacturing improves operations from a customer's perspective, Green initiatives try to find ways to eliminate waste from an environmental perspective, bringing manufacturers and customers benefits as well.

## **2.2 Literature Review on Performance Management Systems**

Luckily for this study there is an extensive library of academic research on the topic of Performance Management or Performance Measurement Systems (for the sake of this study it will be assumed that both have the same role regarding the proposed model). The literature review on PMS will be based on three parts which will allow the reader to understand the structure and objective of the system.

The first part will describe the main roles of a PMS based on the studies of Pinheiro de Lima et al (2010) and other prominent academics in the field of Performance Measurement.



The second part of the literature review will provide information about the characteristics that define an effective PMS and the issues it necessarily has to address based on the studies published in many articles by scholars such as Pinheiro de Lima et al. (2010), Ferreira and Otley (2005, 2009) as well as, Folan and Browne (2005), Neely et al. (2000, 2005), amongst others. The objective of this section is to develop a checklist of the points to be taken into consideration when finally designing the PMS in order to ensure the complete coverage of all the relevant variables of a BM.

The last section of the PMS literature review will be focused on its design itself, with the target of developing a structured and concise methodology to create a functional PMS.

### **2.2.3 PMS Roles**

Understanding the role of a Performance Measurement System (PMS) is the first step in defining system capabilities and functions that will support such strategic management system (Pinheiro de Lima et al., 2008). Some authors such as Phusavat et al. (2009), Tan and Platts (2009), Folan et al. (2007), amongst others, provide insightful ideas regarding the importance of PMS roles:

They highlight the importance of establishing causal links between business strategy and PMS, and suggest there are theoretical constructions that mediate the relationship between strategy and performance measures and that these links should be studied in terms of their structural and dynamics characteristics. These mediating elements should be stated in terms of system roles (Pinheiro de Lima et al., 2010).

Following the same idea, the definition of the PMS role is crucial to identify the Company's business strategy, which helps determine the construction of the performance measurement system. According to Neely (2005), the concepts, processes and methods proposed in the 1980s and 1990s are challenged by actual application, which indicates there is a need of developing systems which are effectively applicable within the real world. Many scholars have understood the relevance of this topic, thereby creating a substantial database that has evolved in the past few decades.

Once the basic roles of a PMS have been properly defined it is necessary to determine its associated core functionalities (Pinheiro de Lima et al., 2008) in order to specify the real importance or reason of existing of the PMS within a Company. Globerson (1985) provided a performance criterion, which defines that the core functionalities have a strategic orientation,

and are therefore chosen from organizational objectives. These organizational objectives will thereby lead the search towards a consistent rationale behind the PMS roles, and must consequently be defined before obtaining a suitable answer to this inquiry.

Pinheiro de Lima et al. (2010) performed a study between the years 2007 and 2008 which included a panel 20 experts from the academic and industrial world in order to reach an idea regarding the actual roles of a PMS within a Company from a strategic point of view.

Simplifying the complexity of the research, it is possible to summarize it in the following steps:

1. Develop a set of plausible objectives based on the existing academic literature connected to PMS roles.
2. Interview the panel experts to get feedback regarding the validity of the established roles.
3. Create cognitive maps to improve and restate the PMS roles
4. Create a second list of roles
5. Perform a Delphi panel to rank the roles according to importance
6. Rank and redefine roles
7. Perform second Delphi panel
8. Develop the final list of the ranked roles according to the answers given in the previous interviews

The first set of possible roles was defined by using an extensive theoretical research. From the most relevant sources it is possible to quote Gomes et al. (2004), which defines that the main characteristics of a PMS should be the following:

- Involve relevant non-financial information based on key business success factors (Clark, 1995)
- Articulate strategy and monitor business results (Grady, 1991)
- Measures and related systems are based on organizational objectives, critical success factors, have a customer orientation and monitor both financial and non-financial results (Manoochehri, 1999)
- Dynamically follow strategy (Bhimani, 1993)
- Long-term oriented and simple to understand and implement (Santori and Anderson, 1987)
- Link to reward systems (Tsang et al., 1999)

- Cover financial and non-financial set of measures that are coherent and consistent with the strategic framework (Drucker, 1990; McNair and Mosconi, 1987).

Considering these amongst many other variables and the concept that “Measurement systems are part of a wider system, which includes goal setting, feedback loops and reward functions” (Neely et al., 2005), they obtained the following set of possible PMS roles:

<b>Role</b>	<b>Perspective</b>	<b>Author</b>
Produce a positive change in organizational culture, systems and processes in order to contribute to the strategic vision realization	Strategic PMS definition	Li and Tang (2009), Phusavat et al. (2009), Chiesa et al. (2008), Neely and Al Najjar (2006), Kwak and Anbari (2006), Jonker et al. (2006), Brown and Fai (2006), Bourne et al. (2005), Neely (2005), Amaratunga and Baldry (2002), Manoochehri (1999), Bhimani (1993), Blenkinsop and Davis (1991)
Performance measurement system should provide a closer understanding of customer needs, in order to create a perceived value for customers	Customer driven strategy	Molina-Castillo and Munuera-Alema'n (2009), Herzog et al. (2009), Neely et al. (2005), Bourne et al. (2005), Kennerley and Neely (2003), Neely et al. (2002), Kennerley and Neely (2002), Johnston et al. (2002), Kaplan and Norton (2001), Neely et al. (2000), Manoochehri (1999), Ghalayini and Noble (1996), Kaplan and Norton (1992), Globerson (1985)
Implement strategic management functionality in the strategic operations management system, providing the system with the jointly improvement of operational efficiency and overall business effectiveness	Strategic management function	Quezada et al. (2009), Taticchi and Balachandran (2008), Yusuf et al. (2006), Kling (2006), Henry (2006), Neely (2005), Bourne (2005), Gomes et al. (2004), Joshi et al. (2003), Kaplan and Norton (1992), Globerson (1985)
Develop a continuous improvement capability through implementation and management of an integrated operations strategic management	Continuous improvement capability development	Li and Tang (2009), Herzog et al. (2009), Wibe (2008), Nenadal (2008), Alegre and Chiva (2008), Wu and Chen (2006), Kling (2006), Neely (2005), Gomes et al. (2004), Kennerley and Neely (2003), Kennerley and Neely (2002), Johnston et al. (2002), Kaplan and Norton (2001), Neely et al. (2000), Medori and

system		Steeple (2000), Noci (1995), Ghalayini and Noble (1996), Lynch and Cross (1991), Maskell (1991), Johnson and Kaplan (1987)
Ensure that the performance management system covers long, medium and short term perspectives	Life cycle orientation for performance system design	Molina-Castillo and Munuera-Alema'n (2009), Kumar et al.(2008), Kathuria et al.(2007), Henry (2006), Neely et al.(2005), Chenhall (2005), Bourne et al.(2005), Flynn and Flynn(2004), Gomes et al. (2004), Slack et al.(2004), Acur and Bititci(2004), Maslen and Platts (2000), Flynn et al.(1999), Simons (1991); Blenkinsop and Davis (1991)
PMS results of measures definitions and performance framework recommendations	The systemic and hierarchical approach	Pinheiro de Lima et al. (2008), Folan et al. (2007), Binder and Clegg (2007), Gargeya (2005), Folan and Browne (2005), Gomes et al. (2004), Blenkinsop and Davis (1991), Maskell (1991), Globerson (1985)
Performance responsible for articulating strategy and monitoring business results	Strategy realization through the monitoring of the organization's results	Pinheiro de Lima et al. (2009), Colledani and Tolio (2009), Neely et al. (2005), Gomes et al. (2004), Nilsson and Olve (2001), Bhimani (1993), Kaplan and Norton (1992), Blenkinsop and Davis (1991), Grady (1991), Santori and Anderson (1987)
Measurement of business results implemented using financial and non-financial aspects of business performance	Financial and non-financial nature of the organization's performance	Verbeeten and Boons (2009), Gomes et al. (2004), Ketokivi and Schroeder (2004), Devaraj et al. (2004), Neely et al. (2002), Manoochehri (1999), Clarke (1995), Kaplan and Norton (1992), Blenkinsop and Davis (1991), Drucker (1990), Maskell (1991), McNair and Mosconi (1987)

Table 1. Strategic performance measurement system roles (Pinheiro de Lima et al., 2012)

The initial stages of the study showed that some of these roles seemed to be not accurate enough regarding its description, therefore after the first stages of the process a new set of refined business roles was presented to the experts in the second phase of the delphi panel. This new table was developed with a rank already introduced by using the results previously obtained from the first delphi panel and the first cognitive mapping. The results obtained are described in Table 2.

<b>Rank</b>	<b>Performance measurement systems could....</b>
<b>1</b>	Implement strategic management functionality in the strategic operations management system, providing the system with the jointly improvement of operational efficiency and overall business effectiveness
<b>2</b>	Be responsible for articulating strategy and monitoring business results
<b>3</b>	Produce positive change in organisational systems and processes
<b>4</b>	Develop a continuous improvement capability through implementation and management of an integrated operations strategic management system
<b>5</b>	Produce positive change in organizational culture
<b>6</b>	Provide a closer understanding of market needs to create a perceived value for customers
<b>7</b>	Show how the system design requirements lead to desirable results
<b>8</b>	Comply with external requirements, not directly managed by organization

Table 2. Ranked strategic PMS roles (Pinheiro de Lima et al., 2012)

To conclude, Pinheiro de Lima and his team together with the panel of experts consensually created a cognitive framework of PMS roles by granting each one of these roles a rank according to importance. The results indicated that the main roles of PMS are in the first place to “Implement strategic management functionality in the strategic operations management system, providing the system with the jointly improvement of operational efficiency and overall business effectiveness” and in the second place to “Be responsible for articulating strategy and monitoring business results”.

It is important to notice that roles ranked from position 3 to position 6 have a direct relation with the role of shaping the organizational culture, which is one of the main objectives of PMS within a Company. However, for the sake of the analysis of Business Models, which are systems without a predefined organizational culture, this roles will be somehow dismissed to keep the focus on the two firstly ranked definitions.

#### **2.2.4 PMS Characteristics**

In the field of business performance measurement, a diverse and multi-disciplinary research is appearing, which brings different attitudes towards performance measurement and causes complications (Striteska, 2012). This statement amongst other references from literature indicate that there is little consensus regarding how an effective PMS should be, and it is

therefore necessary to identify a Framework that would be suitable for the required analysis that might not necessarily fit the descriptions that are currently accepted for some specific business areas. For example, the United States Office of Personnel Management offers the following description regarding the characteristics that a PMS should include (Broadbent and Laughlin, 2009):

- Planning work and setting expectations
- Continually monitoring performance
- Developing the capacity to perform
- Periodically rating performance in a summary fashion and
- Rewarding good performance

As it is possible to appreciate, this description does indeed suit the needs of a PMS applied to an existent Company, however, the practical application of this features for a Business Model are clearly limited. Therefore, a deeper research is needed in order to identify a general framework for a Performance Measurement System that does not include an organizational re-structuring process as such. For example, Wagner (2009) defines PMS as a system which consists of components that are individual performance measures, through which we describe the elements, their characteristics and relationships within an examined model for performance measuring (Striteska, 2012). This statement, though limited, provides a suitable framework to build a PMS for the specifics needs of this study.

Revising the current literature it is hard to miss the contributions of the scholars Ferreira and Otley, which have developed a series of questions to provide a framework to managing performance. After a rework done to the initial research of Otley (1999), the research group defined what they called “the eight more functional issues/questions regarding PMS”, which are the following:

1. ‘What is the vision and mission of the organization and how is this brought to the attention of managers and employees?’
2. What are the key factors that are believed to be central to the organization’s overall future success?
3. What strategies and plans has the organization adopted and what are the processes and activities that it has decided will be required for it to ensure its success?

4. What is the organization structure and what impact does it have on the design and use of the performance management and control system? How does it influence and is influenced by the process of strategy implementation?
5. What are the organization's key performance measures deriving from its key objectives, key success factors, and strategies and plans? How does the organization go about assessing and measuring its success in achieving them?
6. What level of performance does the organization need to achieve in each of the areas defined in the above questions, and how does it go about setting appropriate performance targets for them?
7. What processes does the organization use for evaluating individual, group, and organizational performance? How important is formal and informal information on these processes? What are the consequences of the performance evaluation processes used?
8. What rewards (both financial and non-financial) will managers and other employees gain by achieving performance targets (or, conversely, what penalties will they suffer by failing to achieve them)? (Ferreira and Otley, 2005)

This particular set of questions does not offer a clear understanding of all the components a functional and effective PMS should have, nevertheless, it provides some important questions which once answered could help determine the most relevant characteristics that a Measurement System for a Business Model should have. Moreover, as most of the current PMS analysis is based on existing Companies with a predefined organizational culture and structure, it provides a convenient scenario to develop a new framework for this particular study. It is for this reason that from now on it is necessary to transform and indicate the characteristics the proposed model should have, by analyzing each question individually and determining if there is a way to find or shape an answer within the theoretical basis of Business Models.

Because of the aforementioned reasons, now a detailed analysis over each question will be made in order to define some of the characteristics the proposed PMS should have.

**Question 1:** What is the vision and mission of the organization and how is this brought to the attention of managers and employees?

This issue addresses the topic of communication within an organization and how it is transmitted (if it is). As a BM does not necessarily have a defined group of managers or employees it is necessary to approach towards it from a different perspective. Being the BM itself the organization to be measured by the PMS, the most relevant result to abstract from this question is whether the final objective of the BM is clear and concrete, hence the need to develop a model which provides a framework to transform a general strategic objective into a concrete and quantifiable goal. Naturally, it also should provide a pertinent scale to measure how clear and transmittable the target of the BM is.

**Question 2:** What are the key factors that are believed to be central to the organization's overall future success?

This is maybe the most fundamental question from all in this specific case, as the most complicated section of this study will be to the define the relevant KPI's of the different modules of the BM. In this case "Key Performance Indicator (KPI)" will be understood as the set of performance measures that lead to the achievement of current and future business success (Parmanter, 2007). According to this specification, the PMS should include a list of the most relevant KPI's of a general BM for a typical Manufacturing Company, which will be obtained from the most relevant sections of the Integrated Business Model that this study is part of. These sections should be interpreted and analyzed to develop a checklist of quantifiable variables and their correspondent scale which will determine the structure of the forecasting model of success of a BM

**Question 3:** What strategies and plans has the organization adopted and what are the processes and activities that it has decided will be required for it to ensure its success?

To answer the issues addressed by this question the proposed PMS model will have to identify if the predefined KPI's are being considered as part of the overall strategy of the company. Basically it will provide a measurement scale to determine how deeply the BM is taking the core factors into account. If the strategies and plans indeed exist, the model should deliver favorable values for them, if not, then it should suggest which core factors are the ones being missed and thus give the opportunity to redesign the model itself to ensure the success of the BM.

**Question 4:** What is the organization structure and what impact does it have on the design and use of the performance management and control system? How does it influence and is influenced by the process of strategy implementation?



This section should be divided in two parts accordingly to both parts of the question. In the first place, the organization's structure would be the definition of the BM itself and its key modules, whereas the impact on the design and use of the performance management and control system would consist in the links between these modules and the PMS. The second part relates to the connection between the structure of the BM and the final goal or vision it has set for the organization. To summarize, the PMS should consider its link to the BM modules and certain tools to identify the strength between the modules and the final target of the BM.

**Question 5:** What are the organization's key performance measures deriving from its key objectives, key success factors, and strategies and plans? How does the organization go about assessing and measuring its success in achieving them?

Even though this section might be similar regarding a PMS for BM to the one stated for question 3, there is a slight but relevant difference. This question has a higher focus in the way KPI's are supposed to be measured instead of the definition of the indicators themselves. It requires that the PMS presents a concrete scale to measure the levels of effectiveness of the critical success factors and the plans to assess the validity and general measure of the results. It is not only relevant to deliver a significant value but also an interpretation of what it means for the process.

**Question 6:** What level of performance does the organization need to achieve in each of the areas defined in the above questions, and how does it go about setting appropriate performance targets for them?

This characteristic of the proposed PMS is of the utmost importance, as obtaining a measurable value has no use until a threshold is defined. The PMS should suggest certain levels of minimum performance allowed to define a BM as successful. Probably, it should also count with a defined range to evaluate the level of performance of the BM giving its designer an idea of the goal to be achieved. Independently of the scale, for each KPI a minimum acceptable value should be defined as well as a recommended or optimal one. Not only the score of each individual KPI should be taken into account but also the score achieved by the complete BM or sections of it should be taken into consideration at the moment of evaluating the model.

**Question 7:** What processes does the organization use for evaluating individual, group, and organizational performance? How important is formal and informal information on these processes? What are the consequences of the performance evaluation processes used?

The advantages and disadvantages of the processes to be used to measure the different modules and KPI's of the BM should be clearly expressed within the specifications of the PMS for the Integrated Business Model. Some methods might have certain advantage for example regarding future financial results whereas others will have a higher focus on non-financial information to assess the variables. Both have some considerations to be made before taking a decision to define the method to be used, however, a mix between several methods will have the preference in this study as all of them will have to be slightly adjusted to fit the purposes of analyzing the Integrated Business Model.

**Question 8:** What rewards (both financial and non-financial) will managers and other employees gain by achieving performance targets (or, conversely, what penalties will they suffer by failing to achieve them)?

Given the nature of this study it is possible to state that this question does not provide relevant insights regarding BMs. Therefore it will not be considered thoroughly at the moment of defining the proposed PMS.

The aforementioned questions will provide a guideline to be used in the following sections, especially in Chapter 4 where the specific description of the proposed PMS will be made. While the model is being presented it will be shown how it complies with the requirements stated by the literature review regarding the characteristics of Performance Measurement Systems.

### **2.2.5 PMS Design**

There are several proposed methods or steps to take in order to design a PMS depending on the specific business area it will be used for, however generalized guidelines for the development of the systems are also available and it will be upon those where this study will have its focus. The design of a PMS for a BM does not differ much from the development of a similar system for other areas such as for example R&D. Chiesa et al. (2008) developed a study in which the research group managed to create a framework for a PMS applied to the R&D department of a pharmaceutical company (See Figure 9). It is quite intuitive that defining a PMS for R&D is a highly complex task, since “effort levels may not be observable

in quantitative, measurable terms, success is uncertain (and influenced by uncontrollable factors) and it can be assessed only after long delays” (Tipping et al., 1995; Brown and Svenson, 1988; Kerssens-van Drongelen and Bilderbeek, 1999; Loch and Tapper, 2002).

The framework they provided consists of two main parts, which consider not only the PMS factors but also the contextual factors. The following figure shows a graphical representation of their work:

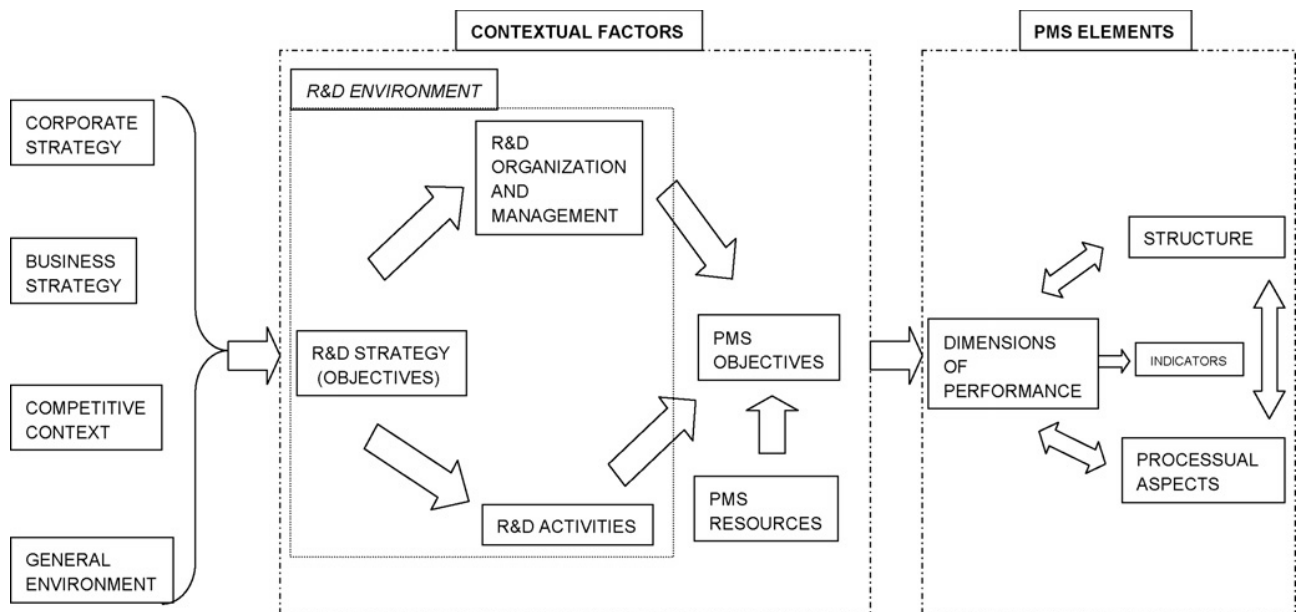


Figure 9. PMS for R&D (Chiesa et al., 2008)

The specifications of this framework will not be fully developed in this paper; however, a general description of the modules will be given:

- Within the context, those factors that constitute the R&D “environment” (i.e. R&D strategy, R&D organization and management, R&D activities) can be distinguished. The R&D strategy drives the choice of the R&D activities to be internally carried out and their organization in a certain structure.
- The PMS’s available resources can influence the PMS’s objectives, because they can represent a constraint that limits the informative completeness of the system and thus the achievable purposes (and the dimensions of performance to be monitored).
- The PMS’s objectives are driven also by the R&D management, e.g. because of a leadership style that stresses more or less the motivational aspects of the system; as far as, the objectives are driven by the type of activities (i.e. a high level of creativity

and complexity can require a particular attention to researchers' motivation and coordination).

- All the contextual factors influence the design of the PMS's elements.
- All the PMS's elements are interrelated and in close relationship, thus stressing their reciprocal dependence and the systematical nature of the PMS.

It is clear that the guideline provided in this study might be somehow rigid and not open to substantial changes, for which it will have to be complemented with general steps of PMS implementation to be redesigned for the Integrated Business Model. Nevertheless, this framework is presented here because it constitutes an example of a successful PMS framework for a department which counts with similar limitations to the ones of the BM, as are the intangible results and hardly measurable variables, and provides a viable model for the proposal this study is aiming for.

To determine the most basic steps for the design of a PMS in general, the groundwork performed by Neely et al., (2005) in their review on the paper published by Neely et al., (1995) seems suitable for the task. As part of the analysis for the implementation of a viable PMS they describe using the work of Wisner et al., (1991) a "nine-step" process which can be applied to design any performance measurement system:

1. Clearly define the firm's mission statement.
2. Identify the firm's strategic objectives using the mission statement as a guide (profitability, market share, quality, cost, flexibility, dependability, and innovation).
3. Develop an understanding of each functional area's role in achieving the various strategic objectives.
4. For each functional area, develop global performance measures capable of defining the firm's overall competitive position to top management.
5. Communicate strategic objectives and performance goal to lower levels in the organization. Establish more specific performance criteria at each level.
6. Assure consistency with strategic objectives among the performance criteria used at each level.
7. Assure the compatibility of performance measures used in all functional areas.
8. Use the performance measurement system to identify competitive position, locate problem areas, assist the firm in updating strategic objectives and making tactical

decisions to achieve these objectives, and supply feedback after the decisions are implemented.

9. Periodically re-evaluate the appropriateness of the established performance measurement system in view of the current competitive environment.

Analyzing this guideline it is possible to appreciate that some steps will be considered more deeply than others. For example, step number 5 does not entirely provide information as the BM naturally does not have such “lower levels of the organization” to communicate with. Nevertheless, following these steps in parallel with the use of the example provided by the framework of Chiesa et al., (2008) it is possible to assume that a fairly concrete design process has been defined.

## Chapter 3

### 3. Performance Managements Systems

In this section a deeper analysis on Performance Measurement Systems will be made focusing further into their application on Business Models more than on the literature review. To define a suitable model it is necessary to slightly jump out of the theoretical framework presented in the previous chapter and start analyzing the different available PMS to define which one would provide a better example to follow. As seen in the section of the PMS Design, this study already counts with a theoretical framework to follow, however it will only provide a general description of the modules the PMS has to contain but it will not directly define the links between the modules and the way the model will be implemented. For this reason, existing models will be put in contrast with the characteristics of the BM defined in Chapter 2 to determine which one would suit better the purposes of this integrated project.

Even if it seems a little counter intuitive, the KPI's will be defined after the example model has been chosen, in order to ensure that they will be managed by the system and chosen accordingly to the proposed frame. The main reason to follow this procedure is that it is easier to adjust the KPI's to the existing model than finding one method that would suit all the performance indicators at once. In addition to this situation, the chosen order of steps also facilitates to perform future corrections to the systems, which will be most surely done while trying to overlap the modules of the BM with the coverage of the PMS. It will also be necessary to modify the PMS itself by adding or withdrawing certain aspects of its structure, yet this is still an easier task than a complete adaptation of the measurement system and it is still viable as long as the essence of the framework stays relatively the same.

#### 3.1 Proposition of Models

Within the different Strategic Performance Management Models used in the current industries, the Balanced Scorecards and the EFQM Business Excellence Model are by far the most widely used (Striteska, 2012). Both of them were initially designed and improved in order to measure the intangible assets of a company to give sense and drive to its pertinent strategy; however it is possible to find some relevant differences that make each one of these models particular in the way they approach their objective. A small description of each one of these models will be developed in this section of the study, starting by the EFQM model and being followed by Norton and Kaplan's Balanced Scorecards.

## EFQM Excellence Model

This Model was created by the European Foundation for Quality Management in 1991 as a framework to evaluate applicants for the European Quality Award (Bou-Llusar et al., 2009), and has been since then expanding within different companies achieving over 700 members around the world. The main framework of this model is described in Figure 10.

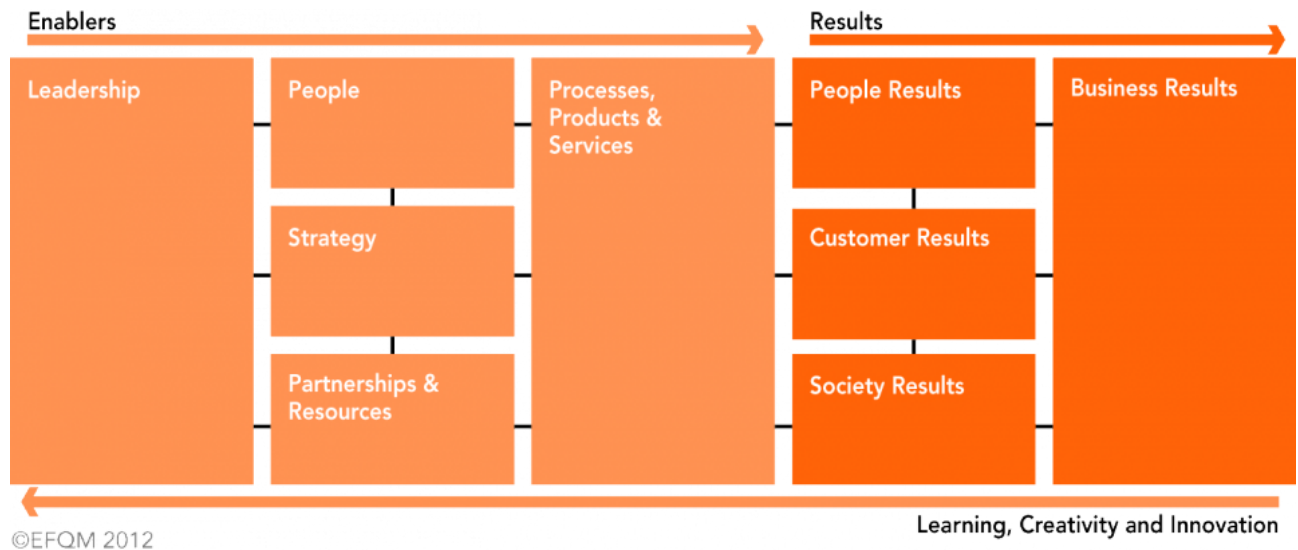


Figure 10. EFQM Excellence Model ([www.efqm.com](http://www.efqm.com))

This model is based on nine elements grouped into five enabler criteria and four result criteria, the first ones being the way the organization operates in different areas and the latter being the outcomes or achievements of the organization focused on its stakeholders. More specifically, the enablers and results can be defined as follows:

### Enablers:

**Leadership:** Excellent organizations have leaders who shape the future and make it happen, acting as role models for its values and ethics and inspiring trust at all times. They are flexible, enabling the organization to anticipate and reach in a timely manner to ensure the on-going success of the organization.

**Strategy:** Excellent organizations implement their Mission and Vision by developing a stakeholder focused strategy. Policies, plans, objectives and processes are developed and deployed to deliver the strategy.

**People:** Excellent organizations value their people and create a culture that allows the mutually beneficial achievement of organizational and personal goals. They develop the

capabilities of their people and promote fairness and equality. They care for, communicate, reward and recognize, in a way that motivates people, builds commitment and enables them to use their skills and knowledge for the benefit of the organization.

**Partnership & Resources:** Excellent organizations plan and manage external partnerships, suppliers and internal resources in order to support their strategy, policies and the effective operation of processes. They ensure that they effectively manage their environmental and societal impact.

**Processes, products & services:** Excellent organizations design, manage and improve processes, products and services to generate increasing value for customers and other stakeholders. (European Foundation for Quality Management, 2015)

### **Results:**

The results areas can be found on the right side of the diagram, and they are the outcomes of the organization's achievements related to their strategic goals. What the EFQM defines as excellent organizations:

- Develop a set of key performance indicators and related outcomes to determine the successful deployment of their strategy, based on the needs and expectations of the relevant stakeholder groups
- Set clear targets for key results, based on the needs and expectations of their business stakeholders, in line with their chosen strategy
- Segment results to understand the performance of specific areas of the organization and the experience, needs and expectations of their stakeholders
- Demonstrate positive or sustained good business results over at least 3 years
- Clearly understand the underlying reasons and drivers of observed trends and the impact these results will have on other performance indicators and related outcomes
- Have confidence in their future performance and results based on their understanding of the cause and effect relationships established
- Understand how their key results compare to similar organizations and use this data, where relevant, for target setting (European Foundation for Quality Management, 2015).
- The main result criteria are:



Customer results: Excellent organizations achieve and sustain outstanding results that meet or exceed the need and expectations of their customers.

People results: Excellent organizations achieve and sustain outstanding results that meet or exceed the need and expectations of their people.

Society results: Excellent organizations achieve and sustain outstanding results that meet or exceed the need and expectations of relevant stakeholders within society.

Business results: Excellent organizations achieve and sustain outstanding results that meet or exceed the need and expectations of their business stakeholders. (European Foundation for Quality Management, 2015).

As it is possible to appreciate, this model directly aligns with the parameters set by the Total Quality Management philosophy and provides a suitable framework to align a company's PMS to their strategic objectives by focusing in the organization and its components as a process.

In order to assess the performance of the different components of the organization this Model proposes a Radar Logic, which is summarized as described in Figure 11.

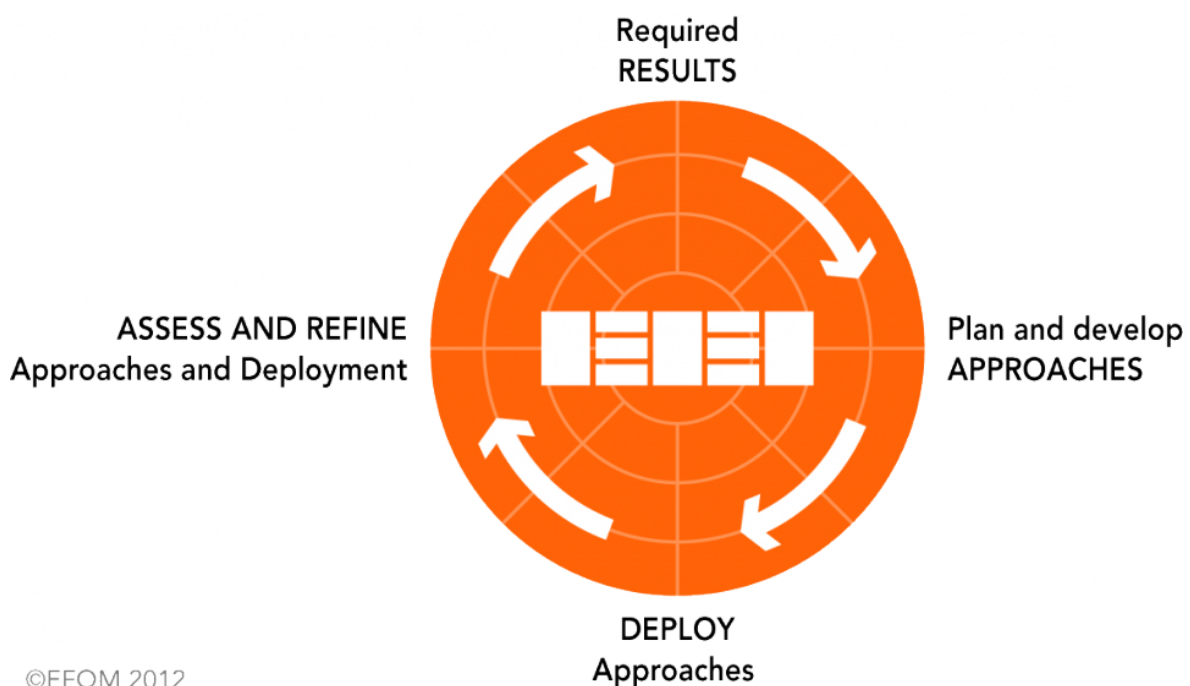


Figure 11. Radar logic to assess performance of EFQM Excellence Model (EFQM, 2015)

To assess enablers the Model focuses on the approaches adopted, their deployment and how the organization evaluates and improves their efficiency and effectiveness by looking at the following parameters:

- Sound and integrated approaches that support the achievement of the organization's strategy
- Structured deployment within all relevant areas of the organization that enables refinements to be implemented within appropriate timescales
- Measurement being carried out so the organization can understand how well the approach is working and how effectively it has been implemented
- Learning activities being undertaken to identify alternative or new ways of working
- Improvements being implemented as a result of measurement and learning (closing the loop). (EFQM, 2015)

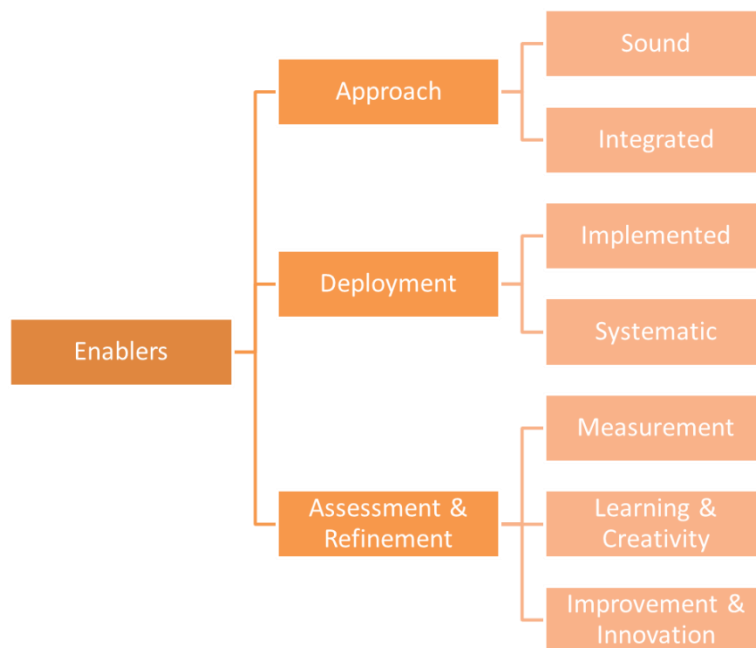


Figure 12. Enabler's assessment system (EFQM, 2015)

On the other hand, to evaluate results, the model looks at their relevance to the organization's strategy and the connection between them and the success of the different key objectives. In general, the evaluation considers the following elements to measure the assess results:

- Results which clearly show how the organization is progressing against its key strategies for the criterion

- Reliable data that can be segmented to give a clear understanding of what's happening in relation to different stakeholder groups, products or processes.
- Positive trends over a 3 year period
- Targets, which are appropriate for the strategic objectives, being achieved
- Appropriate comparisons and benchmarks to put the results in context within the organization's operating environment
- Evidence to show that the organization understands the underlying drivers of the results and effectively managing them to ensure that performance levels will be sustained into the future (EFQM, 2015).

### **Balanced Scorecard**

The Balanced Scorecard model was developed by Robert S. Kaplan and David P. Norton and revolutionized the way in which performance metrics were considered by including non-financial metrics into the organization's performance measurement system. This new model provided a suitable framework to identify the level of efficiency of a company's intangible assets allowing them to align their PMS with their strategic objectives. After performing a study which included twelve Companies "at the leading edge of performance measurement" (Kaplan et al., 1992), they created a "Balanced Scorecard" which includes financial measures together with operations measures on customer satisfaction, internal processes, and the organization's innovation and improvement activities. It allows managers to look at their business from four main perspectives which are (See Figure 13):

- How do costumers see us? (customer perspective)
- What must we excel at? (Internal business perspective)
- Can we continue to improve and create value? (innovation and learning perspective)
- How do we look to shareholders? (financial perspective)

## Translating Vision and Strategy: Four Perspectives

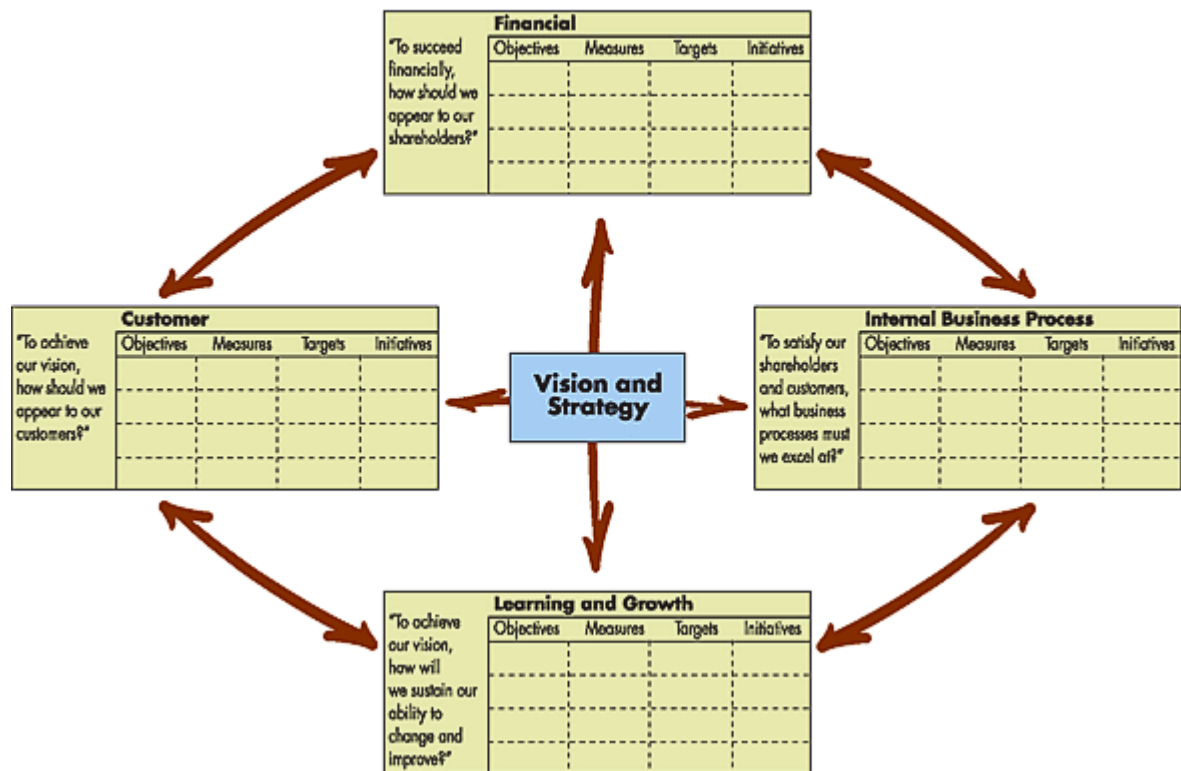


Figure 13. Four perspectives of the balanced scorecard (Norton et al., 1996, HBR.org)

The implementation of this model is basically based on four processes, “translating the vision, communicating and linking, business planning and feedback and learning” (See Figure 14).

The process of translating the vision consists in building a consensus on the organization’s vision and strategy, in which the statements must be expressed as an integrated set of objectives and measures that describe long-term targets for success. The second process of communicating and linking lets managers communicate the strategy through all the levels of the organization and linking department with individual objectives which are aligned with their long-term targets. Business planning allows companies to integrate their business and financial plans by synchronizing the company’s strategy with their financial performance. Finally, as in every modern PMS the feedback and learning step gives the companies the capacity to develop an internal strategic learning process to gather feedback and review their processes to determine whether the company, departments or individuals have met their goals (Norton et al., 1996).

## Managing Strategy: Four Processes

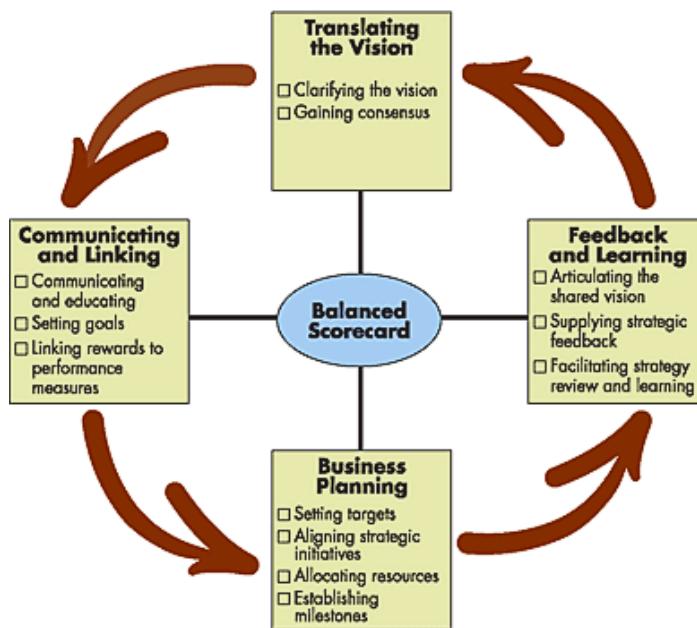


Figure 14. Four processes of the balanced scorecard (Norton et al., 1996, HBR.org)

Even if the model mainly considers four main perspectives, developing the vision and translating it into measurable objectives using not only the initial observations but the feedback provided from the PMS to improve the company's performance is a highly complex process. Norton and Kaplan (1996) provide a guideline which identifies the steps in which a company has to incur to develop a well-functioning balanced scorecard. This process is also cyclical, as the metrics gathered from the first rounds of measurement might have a direct impact into redefining the organization's overall vision of its strategic goals. Figure 15 provides an example of how a specific company might build a strategic management system based on the balance scorecard.

It is possible to appreciate that companies usually struggle with the first step, as stating a general strategic vision tends to be a hard task when it also has to provide the possibility to develop measurable metrics to be able to assess its performance. Nevertheless, Norton and Kaplan (1996) provide several examples of companies who were able to transform their previous visions into quantifiable objectives by following the framework given by the Balanced Scorecard (See Figure 15 and 16).

## How One Company Built a Strategic Management System...

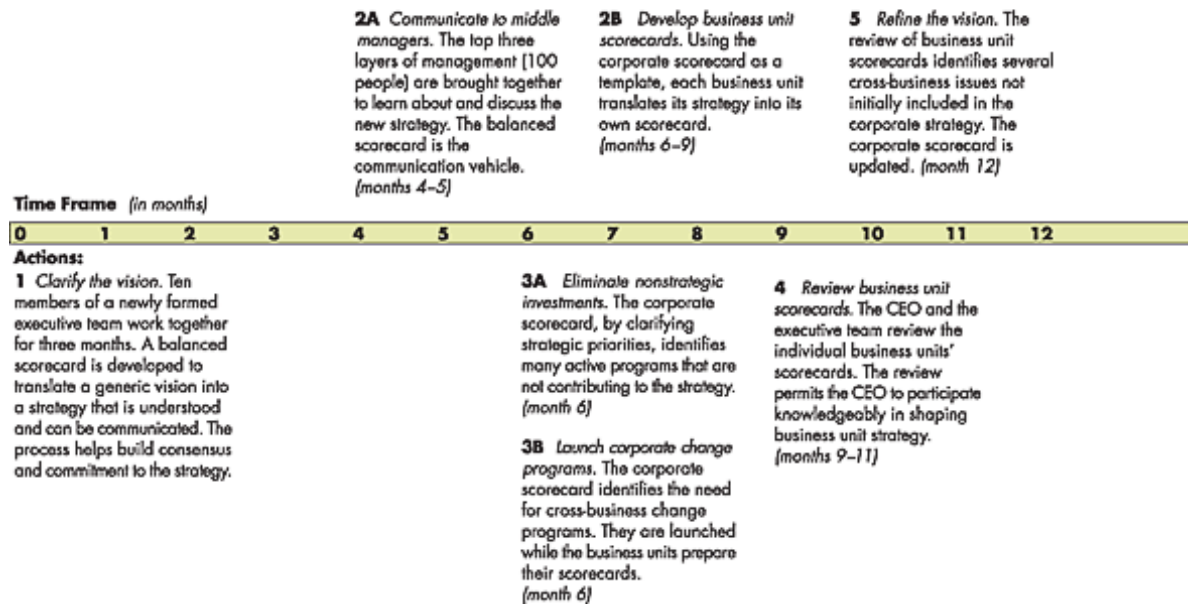


Figure 15. How to build a strategic management system (Norton et al., 1996, HBR.org)

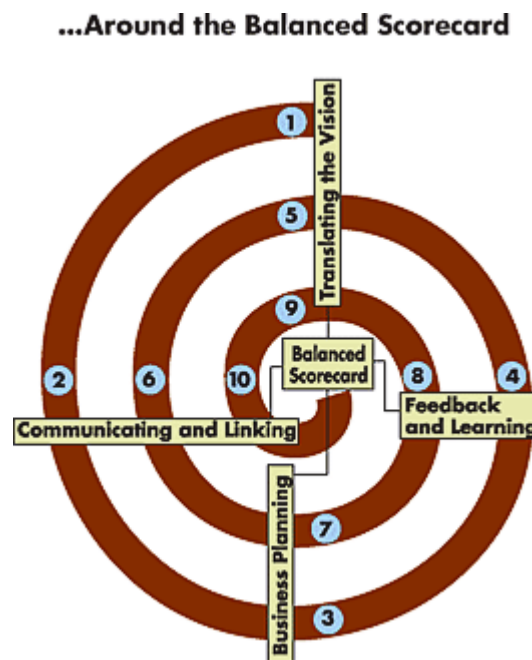


Figure 16. Balanced Scorecard process (Norton et al., 1996, HBR.org)

To conclude this section of the chapter it is important to state that other models were considered as suitable options. However, given that most of them have not been tested thoroughly in the real world and have stayed mostly in a theoretical level it does not seem appropriate to apply them in another theoretical study such as this. The value these two models add is highly focused in their proved effectiveness as Strategic PMS, thus increasing

the overall effectiveness of the theoretical framework being developed in this study. Furthermore, both of them also consider intensively the intangible aspects of a PMS which is a characteristic absolutely required in order to apply this model within the structure and essence of the proposed Integrated Business Model.

### 3.2 Selection of Model

After an extensive process of comparison between the two last chosen models based on their suitability to analyze the Integrated Business Model the Balanced Scorecard has been chosen. Table 3 summarizes the main characteristics of each model based on the requirements of the BM. As it is possible to appreciate, in most of the aspects to consider both models have an equal contribution to the development of the PMS for BMs, however, the visual tools and the high modular expandability of the Balanced Scorecards, amongst other factors, make it a more suitable option for this particular study. Another relevant variable corresponds to the adaptability or simplicity to adapt to other organizations or frameworks of the Balanced Scorecard which is apparently more complex when using the EFQM Excellence Model.

<b>Characteristic/Model</b>	<b>Balanced Scorecard</b>	<b>EFQM Excellence Model</b>	<b>Preferred</b>
<b>Visual tools for each one of the BM components</b>	High given the scorecard itself	Unclear	BSc
<b>Alignment of targets and measures</b>	Direct	Direct	Equal
<b>Modular expandability</b>	High	Low as it considers global instead of particular modules	BSc
<b>Coverage of modules</b>	Low as the BM has many modules to analyze and so far the BSc provides only four.	High as every module can be easily adapted within one criteria of the model	EFQM
<b>Consideration of intangible variables</b>	Considered	Considered	Equal
<b>Proved effectiveness</b>	High	High but lower than	BSc

		the BSc as it has been adopted less.	
<b>Strategic focus</b>	Yes	Yes	Equal
<b>Adaptability</b>	High	More constrained	BSc
<b>Available examples</b>	Several	Several	Equal
<b>Clear measurement scales</b>	Has to be defined	Has to be defined	Equal
<b>Clear design process</b>	Yes	Yes	Equal
<b>Clarity of structure</b>	High with many available examples of implementation.	Lower than BSc because of lack of clear examples.	BSc

Table 3: Comparison between Balanced Scorecard and EFQM Excellence Model

### 3.3 KPI's definition and measurement adjustments

This section might be the most critical and complex of this study as new relevant KPI's for each module of the Integrated Business Model have to be defined. The specific scale of the metrics used for measurement as well as the meaning of each value will be further developed in section 4.1 Description of the new model. In order to perform the task of defining relevant KPIs this study will use the information gathered in section 2.2.4 PMS Characteristics, more specifically Questions 2 and 3 of the list provided by Ferreira and Otley (2005), which will allow this study to identify if the defined KPI's fulfill the requirements of a valid PMS metric. Furthermore, the contribution of Wagner (2009) who stated that a PMS "consists of components that are individual performance measures through which we describe the elements, their characteristics and relationships within an examined model for performance measuring" (Striteska, 2012), provides the liberty of creating separate KPI's and measurement metrics and scales for each one of the modules, which will be afterwards joined into a coherent and cohesive concept in order to determine or structure the essence of the new PMS.

The results will be presented as a table which will be divided into the six main perspectives of the BM proposed by Batocchio et al. (2015) which will be separated according to their components. This study aimed to define at least one KPI for each one of the components, however, given the different nature of every component some flexibility had to be applied as



it is unclear if it is possible to assign a relevant and measurable KPI to each one of them. The obtained results are the following:

Perspective	Component	KPI
<b>Customers Value</b>	Products	<p>Technical performance: If existing, compare technical performance with main competitor or market leader.</p> <p>Lead time: Compare delivery time to market average.</p> <p>Customer satisfaction: Are surveys being performed with potential customers to estimate/forecast average customer's satisfaction levels, how many in compare with optimal value.</p> <p>User-driven: Determine if customer participation is considered in the design process.</p> <p>Customer focus: CRM to gather continuous information from customers is considered within the Business Model, at what extent.</p>
	Services	<p>Customization level: To what extent is the customization of a product enabled.</p> <p>Differentiation level: If considered, how many different types of services will be implemented that are not currently being offered by the competition.</p> <p>Quality level of technical assistance: Consider repair/replace, lead time, forecasted percentage of successful deliveries and compare with market average.</p>
	Segments	<p>Segmentation: Is segmentation performed or not.</p> <p>Segmentation level: Differentiation of products between each segment.</p> <p>Balanced Segmentation: Cost-benefits analysis.</p>

		Market size: Determine a potential market size and forecast market share. Compare potential customers with production capacity.
	Relationship with customers	CRM: If a well-defined CRM will be put into place. CRM Capability: Systems to measure CRM capabilities exist. Reactive-Proactive: If customer information has an impact in company's decision making process.
<b>Business Value</b>	Business	N/A
	Strategy Choices	Decision making process: Determine if the decision is made using a judgmental approach, analysis, inspiration or bargaining. To what extent systems are put in place to prioritize analysis as the first option and judgmental approach in any other case. CSF: All seven critical success factors completely defined - organization, process and technology.
	Investments	Investments rates: IRR, ROI and NPV positive and close to average values of the industry. Risks: How many contingency plans have already been created to successfully handle the main risk factors? Investment sources: Are financial institutions available to provide the required capital? To what extent.
	Performance Systems	PMS: Existent or not at an operational level. Strategic implication: Determine if strategic PMS systems are used and linked to the whole hierarchy of the company. KPI: key performance indicators defined with

		specific scales, targets and initiatives.
<b>Resource Value (key)</b>	People	<p>Shared knowledge: System to continuously share individuals and organization knowledge in place.</p> <p>Recruitment system: Profiles of required employees defined with pertinent hiring system.</p> <p>Employee satisfaction: A measurement system for employee's satisfaction in place.</p> <p>Organizational climate: A measurement system for organizational climate in place.</p>
	Partners & Network	<p>Network: Are all required partners defined</p> <p>System: If required, are partners incorporated in the internal system.</p> <p>Improvement: Is there any initiative to strengthen the links between company and partners.</p> <p>Assessment: Are there any systems in place to measure the suitability of the partners.</p>
	Technology	<p>Benchmarking: Develop scale to compare the use of most relevant technologies used by competitors with the ones used by the company.</p> <p>Evaluation: Will be there a system to evaluate if the technological level of the company reaches the required targets.</p> <p>Frequency: How frequently will the technological level of the company be evaluated?</p> <p>Decision-making: Will information from the systematic evaluation be used in the decision making process.</p> <p>Responsibility: Is there a technological department considered within the company's structure.</p>

	Innovation	<p>R&amp;D: Research and development department considered to foster innovation.</p> <p>PMS: Is there a systematic process to measure innovation.</p> <p>Reward system: Is there a reward system in place for innovation.</p>
	Process & Activities	<p>Definition: Porters Value Chain analysis performed.</p> <p>PMS: Measurement system considered</p>
<b>Capturing Value (financial)</b>	Revenue	<p>Sources: Are the sources of revenue defined.</p> <p>Ranking: Are the revenue sources addressed according to importance.</p> <p>Barriers: Have revenue sources barriers been defined.</p> <p>Measurement: Is there a system in place to measure revenue.</p> <p>Capturing: Is there a system to capture revenue in place.</p>
	Cost	<p>Cost types: Have fixed and variables costs been defined.</p> <p>Evaluation: Is there a system to systematically evaluate costs.</p> <p>Update: How often will the update of costs take place. Is there a real time system to determine current costs at any moment.</p>
	Support (infrastructure)	<p>Areas: Areas of the company defined.</p> <p>Capacity: Is the company production capacity defined.</p> <p>Physical resources: Does the business model consider all physical resources required.</p> <p>Manufacturing system: Have all manufacturing systems been analyzed to determine the best option.</p>

	Profit	<p>Capturing: Is the way in which profit will be captured clear.</p> <p>Level: Is the profit level above the minimum target.</p> <p>Indicators: Is there a financial PMS in place.</p>
	Pricing	<p>Systematic tools: Are the pricing systematic tools defined.</p> <p>Method: Determine which pricing method will be used by analyzing the three available methods.</p> <p>    Competition: Compare prices to market average for the specific segment.</p> <p>    Customers: Perform survey to determine willingness to pay of customers.</p> <p>    Cost: Determine if price covers costs</p>
<b>Supply Chain Value</b>	Channels	<p>Distribution Channel: Is there a clearly defined and available distribution channel.</p> <p>Communication: Are communication tools defined to control the different channels.</p> <p>Evaluation: Is there a systematic method to evaluate the distribution channels.</p>
	Partner Supply	<p>Suppliers: Partners defined and available.</p> <p>Strength of ties: Are there clear procedures to control and strengthen the relationship with suppliers.</p> <p>Options: Have more than one option of supplier been considered.</p>
	Network Supply	<p>Planning: Has the network been properly mapped and the position of the company well defined.</p> <p>Re-positioning: In case of a non-favorable positioning of the company within the network, have re-positioning plans been considered to</p>

		<p>move the company towards a more favorable one.</p> <p>Logistics: Have all alternatives of storage and logistics been considered.</p>
	Green Supply	<p>Optional</p> <p>Programs: Are there any green supply programs being considered.</p> <p>Impact: Has an environmental impact analysis been performed.</p> <p>Reverse supply chain: Is a reverse supply chain considered.</p>
	IT Information Systems	<p>Training: Will training sessions for employees to learn how to use the IT system take place.</p> <p>Update: Compare version or level of IT system with the one being used by main competitors.</p> <p>Coverage: Which percentage of the operational processes is automatized with the respective IT system.</p> <p>Integration: Which percentage of the company shares a common database.</p> <p>Access: Which percentage of the company has access to the information available in the IT system.</p>
<b>Sustainable Operations Value</b>	Competitors	<p>Definition: General competition well defined; direct and indirect competitors as well as replacement products.</p> <p>Barriers: Have entry barriers been clearly evaluated.</p> <p>Market share: Has a realistic future market share been properly forecasted. Compare with different competitors.</p> <p>Evaluation: Have all the proper tools been used to evaluate competitors. (Perceptual mapping,</p>

		competitors array, profiling, Porter's five forces, amongst others).
	Product Sustainable	Optional Law: Level of satisfaction of the technology according to the environmental legislation. Training: Are there any programs in place to inform employees about sustainable products?
	Services Sustainable	Optional Green services: From the adding value services the company offers, do any of them consider sustainability or environmental responsibility.
	Environmental Management	Optional Standards: Does the company comply with the current environmental management system standards like ISO14001.
	Cleaner Production	N/A
	Lean Green Production	Optional Production: Does the company consider the implementation of lean green production systems within their operations.

Table 4: Description of Integrated Business Model's main KPI's (Original contribution)

As it was stated at the beginning of this section, the validity of the KPI's will be evaluated using the theory provided in section 2.2.4 PMS Characteristics by answering questions 2 and 3 of the framework provided by Ferreira and Otley (2005). As a reminder, they are the following:

Question 2: What are the key factors that are believed to be central to the organization's overall future success?

Question 3: What strategies and plans has the organization adopted and what are the processes and activities that it has decided will be required for it to ensure its success?

The first inquiry is in this particular case easy to identify, as the key factors of the business model have been already directly defined by Batocchio et al., (2015) as creators of the model and they have not just been synthetized and thoroughly analyzed in the previous table but

also defined in such a way that every one of them can be whether measured in a specific scale or defined as a yes or no answer (which can be also translated as a Boolean variable 0 or 1 depending on the respective scale).

The second question might be somehow more complicated to answer as the processes and activities required to ensure their success are merely theoretical. However, it is possible to state a plausible plan of action for each one of them that will be effectively put into action considering the company's strategy once the business model has been implemented.



# Chapter 4

## 4. New PMS for Business Model

In this particular section of Chapter 4, the new PMS for the Integrated Business Model will be described in a summarized manner in such a way that the reader is able to visualize how it will look and which variables it will consider. First of all, as the Balanced Scorecard was chosen as the role model to imitate, the main visual conceptualization of Norton and Kaplan's framework will be used to define a Scorecard for each one of the components of the business model.

The first aspect of the PMS will be hence a general scorecard, or as it will be from now on called "evaluation sheet" (ES), with the proper theoretical variables to consider for each one of the components corresponding to each one of the main perspectives. This scorecard will consider, just as the balanced scorecard, the following sections:

**Main perspective:** At the top of the ES, the name of the main perspective will be defined. Even if this feature seems irrelevant it will be useful to group all the evaluations according to area of impact, providing this way the capability to evaluate not only every single component nor only the system as a whole but also to evaluate each particular sub-group or sub-section of the model in order to focalize the strategies and plans that will have to be implemented to improve any component of the model that does not meet the pre-required standards.

**Specific component:** The second part of the ES will be a description of the specific component that will be analyzed. The main reason to provide this information is merely organizational and also to provide the same flexibility to the model that is given by the definition of the main perspective, which allows to analyze different sections of the model separately and not only the framework as a whole.

**KPI:** On the left side of the ES, the specific KPI's of a component will be listed in a column. As it is possible to appreciate, the different components have often two or more KPI's, for which it seems relevant to put them all close together within one scorecard in order not to lose sight of which specific component the scorecard is evaluating.

**Target:** To the right side of the KPIs, a list of the correspondent targets of each KPI will be placed. This target will be similar to the one that can be obtained from description of each

KPI in the previous section. Even if sometimes it might seem logical, a clear explanation of the goals to be achieved is essential for the success and effectiveness of any PMS and it is therefore of the utmost importance to state each for every variable to consider.

**Metrics/Measurement:** The third column of the ES will contain a detailed description of the scale to be used to evaluate each KPI and the way points are supposed to be distributed. For the general evaluation sheet this column might contain more information than the others as it is sometimes difficult to summarize such a specific and singular procedure (evaluation of the different KPI's will be different for many cases). The respective number of points to value each KPI will be described in this section as well.

**Minimum value:** The fourth column of the evaluation sheet will contain the theoretical minimum value that should be obtained in the measurement of every KPI. It is important to state that even if sample lower limits can be indeed provided or suggested, the definitive limit will be set by the users and the expectations and goals they have regarding their own business model.

**Action plan:** The last column of the ES will contain a section to specify the desired changes in order to succeed in achieving the desired levels of performance for each KPI. Even if in general the Integrated Business Model focuses on manufacturing firms, it is possible to state that in every case there are several different ways to achieve the desired level of performance of KPIs and they all depend on specific situations and contexts. This section might be the less restricted of all in the sense that it is absolutely up to the user to define which strategic choices might lead the business model towards certain specific effectiveness. Luckily, the theoretical literature regarding different courses of action for many diverse situations has already been provided extensively in the academic literature, thus giving the user the possibility of finding help in the available sources.

To summarize, every evaluation sheet should be visualized similarly to the following example:

Perspective	Main perspective's name			
Component	Specific component's name			
KPI	Target	Metrics	Min. Value	Action plan
<b>KPI 1</b>	KPI 1 should accomplish this.	KPI 1 has a specific scale from 0 to n. If KPI1 meets this requirement it has 1 point....if KPI 1 meets these requirements it has n points. Otherwise 0.	KPI 1 should achieve a minimum of "x" points. Can be re-defined by user.	In order to improve the evaluation of KP 1 the following plans will be put into action: <ul style="list-style-type: none"> <li>• Plan 1</li> <li>• Plan 2</li> <li>• Plan X</li> </ul>
<b>KPI 2</b>	KPI 2 should accomplish this.	KPI 2 has a specific scale from 0 to n. If KPI 2 meets this requirement it has 1 point....if KPI 2 meets these requirements it has n points.	KPI 2 should achieve a minimum of "x" points. Can be re-defined by user.	In order to improve the evaluation of KP 3 the following plans will be put into action: <ul style="list-style-type: none"> <li>• Plan 1</li> <li>• Plan 2</li> <li>• Plan X</li> </ul>
<b>KPI3</b>	KPI 3 should accomplish this.	KPI 3 has a specific scale from 0 to n. If KPI 3 meets this requirement it has 1 point....if KPI 3 meets these requirements it has n points.	KPI 2 should achieve a minimum of "x" points. Can be re-defined by user.	In order to improve the evaluation of KP 3 the following plans will be put into action: <ul style="list-style-type: none"> <li>• Plan 1</li> <li>• Plan 2</li> <li>• Plan X</li> </ul>

## 4.1 Detailed description of each component's evaluation sheet

In this section the specific evaluation sheet for every single component will be thoroughly described by using the template of the ES provided in the last section and the theory provided in the literature review.

It is of the utmost importance to remember that not only the targets but the suggested metrics and minimum values can be (and should be) revised and redefined for each specific business model and that the values given are just an example of how the values inside should be presented once the evaluation is finished. Every value defined in this particular example is no more than a suggestion that should be improved using the specific knowledge of the market the company will have to face amongst other relevant factors that are particular of each industry and company.

Perspective	Customers' Value			
Component	Products			
KPI	Target	Metrics	Min. Value	Action plan
<b>Technical performance</b>	Technical performance higher than main competitors.	In general, this KPI will have a scale from 1 to 10, 1 being the lowest value obtained when the comparison determines that the product has a clear technical disadvantage over the competitors. An equal performance should be evaluated with 5, whereas a superior performance with 10. Every intermediate point should be valued according to the specific results of the benchmarking analysis.	This KPI should aim for a value of 6 or more.	Action plans should be clearly focused on improving the technical performance of the product from a production and components point of view.
<b>Lead time</b>	Lead time should be equal or lower than market average	In general, this KPI will have a scale from 1 to 10, 1 being the lowest value obtained when the lead times is clearly higher (around 20% more) than the competitors. An equal performance should be evaluated with 5, whereas a superior performance	This KPI should aim for a value of 6 or more.	Action plans usually related to improving the supply chain as a whole to reduce lead time.

		(around 20% less time) with 10. Every intermediate point should be valued according to the specific results of the benchmarking analysis.		
<b>Customers satisfaction</b>	Surveys should be performed to forecast future customers' satisfaction.	If surveys are performed often enough to provide an accurate result this KPI should have 5 points. If less or no surveys are performed the evaluation should go down until 0.	This KPI should have a value of 4 or more as it is of high relevance to determine the success of the product.	Organize several pre-arranged and pre-defined studies and surveys.
<b>User-driven</b>	Customers' participation should be considered in the design process.	This KPI should have a scale of 0 to 3; depending on the level the customer's participation will be considered.	This KPI should have a minimum value of 2. Depends on specific case.	User-driven processes are defined within the strategy of the company.
<b>Customer focus</b>	A CRM system should be implemented.	Scale from 0 to 5. It is a critical factor to consider a CRM within the company. % points if considered and 0 if not.	This KPI should always have a value of 5.	Implement CRM

<b>Perspective</b>	<b>Customers' Value</b>			
<b>Component</b>	<b>Services</b>			
<b>KPI</b>	<b>Target</b>	<b>Metrics</b>	<b>Min. Value</b>	<b>Action plan</b>
<b>Customization level</b>	Develop a system with a high customization level if applicable.	This scale depends on the extent on which customization is needed. The higher the need the higher the value of the scale. No general rule.	No general rule; depends on each case.	Implement customization tools and strategies.
<b>Differentiation level</b>	At least one new service which is not provided by the competition should be implemented.	In general, this KPI should have a scale from 1 to 10, 1 being the lowest value obtained when the competitors offer the same and more services than the company. If the other companies' services are offered as well as at least a new service then 10 points should be given.	This KPI should aim for a value of 6 or more.	Strategic choices should consider innovative services
<b>Quality level of technical assistance</b>	Technical assistance level should be equal or superior to market average.	In general, this KPI should have a scale from 1 to 5. 3 points will be obtained when the competitors offer the same quality of technical assistance than the company. 5 points when the expected quality level is considerably higher than competitors	This KPI should have a value of 3 or more.	Strategic choices regarding technical assistance should be made to ensure quality in every sense.

<b>Perspective</b>	<b>Customers' Value</b>			
<b>Component</b>	<b>Segments</b>			
<b>KPI</b>	<b>Target</b>	<b>Metrics</b>	<b>Min. Value</b>	<b>Action plan</b>
<b>Segmentation</b>	To perform segmentation procedures to determine potential customers.	This KPI should have a scale from around 0 to 5, achieving the lowest value when no segmentation is performed and 5 when the market is thoroughly segmented.	A value over 3 should be achieved to ensure proper segmentation of customers.	Implement segmentation procedures using the available technics.
<b>Segmentation level</b>	Have different offers for the different segments.	Flexible scale that depends on the range of products to offer and the segments defined in the previous phase.	Flexible according to specific case.	Depends of situation and strategy.
<b>Balanced segmentation</b>	Provide a segmentation cost-benefit analysis.	Scale from 1 to 3, as at last minimum cost-benefit analysis has to be performed in any case (1 point for this). A proper analysis should allow obtaining 3 points.	Minimum value of 2 as a suitable cost-benefit analysis is essential before any decision is taken.	Research different methodologies and perform a cost-benefit analysis.
<b>Market size</b>	Determine a market size and potential market share.	The scale should be between 1 and 10, considering not only the process of analyzing the potential market but also evaluating with a higher grade the results that provide a specific segmentation with a market share as close as possible to the forecasted production capacity.	5 or more should suffice. Depends on margins amongst other variables.	Techniques to forecast potential market size should be applied.

Perspective	Customers' Value			
Component	Relationship with customers			
KPI	Target	Metrics	Min. Value	Action plan
CRM	Put into place a proper CRM	0 in case there is no clear CRM system considered, 5 if it will be used in a complete capacity.	The minimum value should be over 3 as a CRM is essential for the success of manufacturing companies nowadays.	Research different CRM options, define the most suitable one for each case and implement it in the business model.
CRM capability	Implement a PMS for the CRM	Scale from 0 to 5 depending on the integration the CRM has with the desired PMS (0 if no PMS considered).	A value of 3 or more should be considered as CRMs tend to need constant feedback and revision to become effective.	Consider some of the available PMS for CRM that already exist.
Reactive-Proactive	Allow customers' information and feedback to have an impact in the decision making process.	Scale from 1 to 5 depending on the case. The higher grade should be given when customers' feedback is considered within the strategy of the company.	As manufacturing processes should deliver a product valued by customers this KPI should have a value of 4 or more.	Standardize the way customers' feedback will be used in the strategic decisions making process.



Perspective	Business Value			
Component	Strategy choices			
KPI	Target	Metrics	Min. Value	Action plan
<b>Decision makings process</b>	Prioritize analysis and judgmental approach in the decision making process.	Scale from 0 to 5, awarding the highest value to the processes than prefer judgmental approaches and analysis over other decision making techniques.	The minimum value should be over 4 especially for a company that is just starting.	Decision making processes should be standardize to avoid bargaining and other sometimes unfruitful procedures.
<b>Critical success factors</b>	All critical success factors should be defined from an organizational, technological and process point of view.	Scale from 0 to 5 depending on how deep the CSFs were analyzed.	A value of 3 or more should be considered as CSFs are crucial for the success of the company.	Access proper literature that provides guidelines to determine CSFs.

<b>Perspective</b>	<b>Business Value</b>			
<b>Component</b>	<b>Investments</b>			
<b>KPI</b>	<b>Target</b>	<b>Metrics</b>	<b>Min. Value</b>	<b>Action plan</b>
<b>Investment rates</b>	IRR, ROI and NPV should be positive and close to average values of the industry.	Scale from 0 to 5, awarding the highest value to those business models that consider all these rates and more.	Value of 4 or more.	Calculate the proper rates with all available information.
<b>Risks</b>	Provide contingency plans for all possible risks.	Scale from 0 to 5 depending on how deep the different types of risk and mitigation plans were analyzed.	A value of 3 or more should be considered to avoid unwanted circumstances to arise.	Consider risk management tools within the business model.
<b>Investment sources</b>	Determine financial institutions available and willing to invest	As a way to ensure available capital for the company this KPI should consider a scale of 1 to 10 according to the stage in which the investment phase is and the likelihood that funds will be obtained with a low interest rate.	A value of 6 or more.	Research on investment sources.

Perspective	Business Value			
Component	Performance systems			
KPI	Target	Metrics	Min. Value	Action plan
<b>Performance measurement system</b>	Consider a strategic performance management system within the business model.	Scale from 0 to 10, awarding the highest value to those business models that consider a strategic performance management system as a relevant aspect of the company's strategy.	Value of 8 or more given the criticality of an efficient PMS.	Implement within the business model a PMS such as the balanced scorecard to drive the company's business towards the desired goals.
<b>Strategic implication</b>	Create a direct link between the PMS and the company's strategy	Scale from 0 to 5 considering the strength of the real connection between management and the PMS.	A value of 4 or more should be considered as a PMS that is not directly linked to the company's management will not be effective.	Consider the research provided in this study amongst many others to link the PMS to the company's strategy.
<b>KPI</b>	Define the relevant KPI's of the business.	Scale from 1 to 10, evaluating according to the deepness of the KPI analysis provided.	6 or more assuming that the relevant KPIs will be revised to include arising KPIs and exclude irrelevant ones.	Research on KPI's definition and development of analysis regarding the topic within the business model.

Perspective	Resource Value (Key)			
Component	People			
KPI	Target	Metrics	Min. Value	Action plan
<b>Shared knowledge</b>	Develop a system in which knowledge is continuously shared within the organization.	Scale from 0 to 10, awarding the highest value to those business models that consider a database that allows individuals and departments in the organization to share the available knowledge.	Value of 6 or more.	Implement within the business model a system to share knowledge in the future organization.
<b>Recruitment system</b>	Create a consistent recruitment system to provide suitable candidates according to the organization's needs.	Scale from 0 to 10 considering size the pool of candidates and the effectiveness of the selection process.	A value of 6 or more should be considered given the relevance of counting with employees with the proper skills.	Consider outsourcing of recruitment or developing a recruiting office within the HR department.
<b>Employees' satisfaction</b>	Develop a system to measure employees' satisfaction in order to be able to improve it.	Scale from 1 to 5 depending on the system to be put in place as well as the priority given to employees' satisfaction.	3 or more as it is absolutely relevant to retain good employees as well as attract suitable candidates.	Research on human behavior and human resource to develop a system to evaluate the KPI.
<b>Organizational climate</b>				

<b>Perspective</b>	<b>Business Value</b>			
<b>Component</b>	<b>Partners &amp; Network</b>			
<b>KPI</b>	<b>Target</b>	<b>Metrics</b>	<b>Min. Value</b>	<b>Action plan</b>
<b>Network</b>	Define the network of partners.	Scale from 0 to 8, awarding the highest value to those business models that consider a complete description of the network required to function within the specific market.	Value of 6 or more given the high dependence companies have nowadays from their networks.	Define required partners and determine suitable candidates.
<b>System</b>	Incorporate partners in the internal system if required.	Scale depends on the importance of including partners in the company's processes.	Flexible	Depends on each situation
<b>Improvement</b>	Define strategies to strengthen relations with partners.	Scale from 1 to 5, evaluating according to the priority given to develop long lasting relationships with partners.	3 or more depending on the relevance of the ties with partners.	Depends on specific partners.
<b>Assessment</b>	Define systems to measure and evaluate suitability of partners.	Scale from 1 to 5 depending on the amount of variables and different possibilities of partners considered within the system.	3 or more depending on the relevance of the ties with partners.	Depends on specific case.

Perspective		Business Value		
Component	Technology			
KPI	Target	Metrics	Min. Value	Action plan
<b>Benchmarking</b>	Develop a scale to compare technologies used by competitors and the ones the company's plans to implement.	Scale from 0 to 10, awarding the highest value to those business models that consider implementing the most advance technologies available, suitable and affordable depending on the case.	This scale should aim for a value of 8 as the correspondent technologies are a must in competition nowadays.	Define and rank suitable technologies and select the best affordable option.
<b>Evaluation</b>	Implement a system to evaluate the effectiveness of the adopted technologies.	Scale of 1 to 5 depending on the deepness of the variables to analyze regarding the performance and suitability of the adopted technologies.	Over 2 as technologies cannot be modified too often given their price.	Depends on each situation
<b>Decision making</b>	Define if the information system will have a direct repercussion in the decision-making process.	Scale from 1 to 5 depending on the relevance of the IT system within the company's strategy.	3 or more depending on the case.	IT systems should usually be considered within the decision making process.
<b>Responsibility</b>	Create a department in charge of the IT system.	Scale from 1 to 3, awarding the highest grade in case a specific department is created and 1 if just some responsible person is appointed.	Depends on the size and technological complexity of the company.	Depends on each situation.

Perspective		Business Value		
Component	Innovation			
KPI	Target	Metrics	Min. Value	Action plan
<b>R&amp;D</b>	Consider an R&D department within BM to ensure sustainability and innovation.	Scale from 0 to 10, obtaining the highest value when a fully structured R&D department I considered in the Business Model.	Depends on the importance and urgency of new product development.	Create structure for an R&D department.
<b>PMS</b>	Implement a system to evaluate innovation levels.	Scale of 1 to 5 depending on the priority given to innovation within the BM.	Over 3 given the dynamic market in which manufacturing firms usually compete.	Access research on innovation measurement to implement a system.
<b>Reward system</b>	Define a reward system for innovation.	Scale from 1 to 5 depending on the relevance of the IT system within the company's strategy and the type of rewards to consider.	3 or more depending on the case.	Consider financial and non-financial reward systems.

Perspective		Business Value		
Component	Processes & Activities			
KPI	Target	Metrics	Min. Value	Action plan
<b>Definition</b>	Perform the correspondent Porter's value chain analysis.	Scale from 0 to 5, obtaining the highest value when a fully structured Porter's Value Chain analysis is performed.	It has to achieve a value of 5 as it is critical for the company.	Perform Porter's Value Chain analysis.
<b>PMS</b>	Consider an extensive performance measurement system.	Scale of 1 to 10 depending on how many processes are considered within the PMS and how deeply they are analyzed.	Over 7 given the relevance of the compliance with current standards and their implication in improvement processes.	Access research on PMS to implement it thoroughly in internal and external processes.



Perspective	Capturing Value (Financial)			
Component	Revenue			
KPI	Target	Metrics	Min. Value	Action plan
Sources	Define sources of revenue.	Scale from 0 to 5, obtaining the highest value when all sources of revenue have been clearly defined.	It has to achieve a value of 5 as it is critical for the company.	Perform Porter's Value Chain analysis.
Ranking	Rank sources of revenue according to importance.	Scale from 0 to 5, obtaining the highest value when all sources of revenue have been clearly ranked.	Value of 5 as it is imperative to rank sources of revenue.	Rank identified sources.
Barriers	Define revenue sources' barriers.	Scale from 0 to 3 according to how completely the barriers have been defined.	Minimum value of 2 given the need to be aware of the different obstacles towards capturing revenue.	Research about different barrier types.
Measurement	Define a systematic method to measure revenue.	Scale from 0 to 5 that depends on how specific is the result obtained from the system.	Minimum of 4 as tracking revenue is clearly an important factor in general accounting.	Define a clear and efficient accounting system.
Capturing	Define a system to capture revenue.	Scale from 1 to 10 according to the percentage of revenue that will be transformed into tangible profit.	Minimum value of 8 as a company that does not provide profit to the shareholders is not viable.	Explore different options to capture revenue.

<b>Perspective</b>	<b>Capturing Value (Financial)</b>			
<b>Component</b>	<b>Cost</b>			
<b>KPI</b>	<b>Target</b>	<b>Metrics</b>	<b>Min. Value</b>	<b>Action plan</b>
<b>Cost types</b>	Define fixed and variable costs.	Scale from 0 to 10, obtaining the highest value when all costs have been clearly defined and classified.	It has to achieve a value of 8 as it is critical to create profit.	Track every possible cost.
<b>Evaluation</b>	Consider a system to systematically evaluate costs.	Scale from 0 to 5, obtaining the highest value when all cost sources have been considered and included in the system.	Value of 5 as it is imperative to rank sources of revenue.	Define a way to measure costs further away than just the clearest ones.
<b>Update</b>	Update costs constantly.	Scale depends on how dynamic costs are.	Minimum value depends on cost dynamics.	Develop a system to easily update costs.

<b>Perspective</b>	<b>Capturing Value (Financial)</b>			
<b>Component</b>	<b>Support infrastructure</b>			
<b>KPI</b>	<b>Target</b>	<b>Metrics</b>	<b>Min. Value</b>	<b>Action plan</b>
<b>Areas</b>	Define company's areas and departments	Scale from 0 to 5, obtaining the highest value when all areas and departments have been clearly defined.	It has to achieve a value of 5 as it is critical for the company.	Structure the company using available models and customization.
<b>Capacity</b>	Define production capacity.	Scale from 0 to 5, obtaining the highest value when production capacity has been defined.	Value over 4 given the importance to determine limitations and goals.	Simulate full time production to define capacity.
<b>Physical resources</b>	Define physical resources required and consider them in business model.	Scale from 0 to 5 evaluated with the highest grade when location and other constraints have been solved.	Minimum value of 2 given the possibility to postpone this process.	Depends on context and needed infrastructure.
<b>Manufacturing system</b>	Determine best manufacturing system.	Scale from 0 to 10 when all manufacturing systems have been analyzed and best option has been taken.	Minimum of 8 as the definition of the manufacturing system is essential to start production and also determines several other components.	Define a clear and efficient manufacturing system.

Perspective	Capturing Value (Financial)			
Component	Profit			
KPI	Target	Metrics	Min. Value	Action plan
Capturing	Define the way to capture profit	Scale from 1 to 10 according to percentage of profit captured and lost.	Minimum value of 8 as a company that does not provide profit to the shareholders is not viable.	Explore different options to capture profit.
Level	Achieve the desired profit.	Scale from 0 to 10, obtaining the highest value when profit achieves or exceeds optimistic expectations.	Value over 6 as in an initial stage profit is hard to perceive.	Forecast profit levels.
Indicators	Implement a financial PMS.	Scale from 1 to 5, obtaining 5 when a viable and effective financial PMS is considered in the BM.	Value of 4 or more as tracking profits is essential for the company's financial state.	Develop a financial PMS within the business model.

Perspective	Capturing Value (Financial)			
Component	Pricing			
KPI	Target	Metrics	Min. Value	Action plan
Systematic tools	Define systematic pricing tools.	Scale from 1 to 5 according to how customized the pricing processes are.	Minimum value of 4 to ensure a price that would give the company competitive advantage.	Explore different pricing methods.
Method	Define pricing method.	This scale is flexible and depends absolutely on the chosen pricing method, which can be as described in the KPI section.	Flexible.	Depends on the chosen pricing method.

Perspective	Supply Chain Value			
Component	Channels			
KPI	Target	Metrics	Min. Value	Action plan
<b>Distribution Channels</b>	Clearly define distribution channels.	Scale from 1 to 5, rating with the highest grade when the distribution have been defined and analyzed.	Minimum value of 3 depending on the amount of products to produce and the variety of customers.	Define the channels accordingly to the production.
<b>Communication</b>	Define communication tools to control different channels.	Scale from 1 to 5 according to the efficiency of the communication tools.	Minimum value of 4 as an uncontrolled channel might be more harmful than useful.	Explore different options to implement communication and control over the channels.
<b>Evaluation</b>	Consider a system to evaluate distribution channels.	Scale from 1 to 5 awarding 5 points whenever channels will be fully supervised.	Minimum value of 3 or 4 as evaluation is a main requirement to improve the functioning of the channels.	Explore different PMS options.

Perspective	Supply Chain Value			
Component	Partner Supply			
KPI	Target	Metrics	Min. Value	Action plan
<b>Suppliers</b>	Clearly define suppliers.	Scale from 1 to 5, rating with the highest grade when the possible suppliers have been defined and analyzed.	Minimum value of 3 depending on availability of suppliers.	Define suppliers and cluster according to performance in different areas.
<b>Strength of ties</b>	Create strong ties with suppliers.	Scale from 1 to 5 according to the priority given to strengthen ties with suppliers.	Minimum value of 3, as in the current market the relationship with suppliers tends to be strategic.	Explore different options to strengthen ties with suppliers.

<b>Perspective</b>	<b>Supply Chain Value</b>			
<b>Component</b>	<b>Network Supply</b>			
<b>KPI</b>	<b>Target</b>	<b>Metrics</b>	<b>Min. Value</b>	<b>Action plan</b>
<b>Planning</b>	Provide a proper map of the network to understand company's position.	Scale from 1 to 3 depending on the detail of the map.	Minimum value of 1 as at least a general conception of the future position of the company is needed.	Gather information about the network and map it.
<b>Re-positioning</b>	Create re-positioning plans in case default position is not favorable.	Scale from 1 to 5 according to how many plans have been prepared and how detailed they are.	Minimum of 2 as repositioning strategies are relevant in the long-term run.	Explore different repositioning strategies from case studies and modify them according to possible future scenarios.
<b>Logistics</b>	Develop a list of options of different warehouses and logistics providers.	Scale from 1 to 10 with an evaluation highly depending on the company's needs.	Minimum value depending on the amount and range of products to move and store	Gather information regarding possible warehouse and logistics suppliers.

<b>Perspective</b>	<b>Supply Chain Value</b>			
<b>Component</b>	<b>IT Information Systems</b>			
<b>KPI</b>	<b>Target</b>	<b>Metrics</b>	<b>Min. Value</b>	<b>Action plan</b>
<b>Training</b>	Consider training sessions for employees to learn how to use the chosen IT system.	Scale from 1 to 3 evaluating with the highest grade those models where training is part of the desired organizational culture.	Minimum value of 2 depending on the need of training.	Consider continuous and constant training sessions for employees.
<b>Coverage &amp; Integration</b>	Connect every department of the company with the IT system.	Scale from 1 to 5 proportionally to the percentage of the company that will have access and therefore use the IT system and the shared database.	Minimum of 3 as more than 50% of the departments should have access to the IT system in order to provide some synergy within the organization.	Depending on the complexity of the IT system consider how to expand its coverage.

Perspective	Sustainable Operations Value			
Component	Competitors			
KPI	Target	Metrics	Min. Value	Action plan
<b>Definition</b>	Have a clear image of the competitors.	1 to 5 according to how deeply competitors have been analyzed.	Minimum value of 3 depending on number and position of competitors.	Gather information about competition.
<b>Barriers</b>	Determine entry barriers	Scale from 1 to 10 inversely proportional to the amount of entry barriers in the market and the possibility to overcome them. (The more barriers that cannot be passed, the lesser points will be awarded).	Minimum of 6 as entry barriers are the first blockade against starting a new business model and should be thoroughly analyzed.	Gather information about examples of companies succeeding in overpassing entry barriers and try to consider it in the business model.
<b>Evaluation</b>	Use all proper tools to not only identify but analyze competitors.	Scale from 1 to 5 directly proportional to the percentage of the available tools to analyze companies (Perceptual mapping, competitors array, etc.)	Minimum 4 as competitors should always be thoroughly analyzed. Benchmarking is part of success.	Apply the available tools.

So far the evaluation sheets for the main modules of the business model have been described in such a way that the reader can get an idea on how they should be used and which kind of variables they consider.

Apart from the previous evaluation sheets it is important to remember that nowadays sustainable and green development have become important trends within the modern markets and industries. However, as all the modules related to those topics are usually not critical to the success of the business itself but act more as a complement to the core modules, it has been decided to provide a set of evaluation sheets for them in a separate section.

The modules that have been considered as optional and their correspondent evaluation sheet will be shortly described here:



Perspective	Supply Chain Value			
Component	Green Supply (Optional)			
KPI	Target	Metrics	Min. Value	Action plan
Programs	Consider Green Supply programs.	1 to 5 depending on level of implication.	Flexible	Research and implementation.
Impact	Consider performing environmental impact analysis.	1 to 5 depending on how deep the analysis is and the level of implication.	Flexible	Research and implementation.
Reverse Supply Chain	Consider performing reverse supply chain.	Depends on each situation.	Flexible	Research and implementation.

Perspective	Sustainable Operations Value			
Component	Product sustainable (Optional)			
KPI	Target	Metrics	Min. Value	Action plan
Law	Develop products fitting the environmental legislation.	Scale of 1 to 5 depending on how far ahead does the company implement environmentally friendly products (1 for just satisfying the minimum requirements of the country's law).	Minimum 1 because the products have to meet the legislation's requirements.	Gather information about current regulations.
Training	Provide training sessions to employees to inform about sustainable products/production.	Scale of 1 to 5 according to the frequency in which the sessions are performed.	Depends on the strategy of the company.	Research about different sustainable products/production processes.

Perspective	Sustainable Operations Value			
Component	Sustainable services (Optional)			
KPI	Target	Metrics	Min. Value	Action plan
Green services	Consider environmentally friendly related value adding services.	Depends on specific context and importance of the service.	Flexible.	Flexible.

Perspective	Sustainable Operations Value			
Component	Environmental Management (Optional)			
KPI	Target	Metrics	Min. Value	Action plan
Standards	Comply with environmental management system standards.	Scale of 1 to 3 according to how far ahead the business model considers environmental standards (1 for just meeting the minimum requirements).	Minimum value 1 as it is necessary to comply with standards.	Gather information about environmental standards and apply to business model.

Perspective	Sustainable Operations Value			
Component	Lean green production (Optional)			
KPI	Target	Metrics	Min. Value	Action plan
Production	Consider lean green production within the business model	1 to 5 depending on the level of integration of green lean production.	Flexible depending on the company's strategy.	Gather information about green lean production and include in business model/plan.

As a reminder, it is important to state that all the provided examples from the different evaluation sheets are just a suggestion of the proportional importance every component should have within the business model. However, all scales and minimum values as well as the action plans should be revised and adapted from every single situation and in no case should the provided scales be considered as the general rule.

For example, a company producing bread in large scale might give a bigger importance to components such as partners, people or relationship with customer and a lower importance to technology, innovation and product sustainable, whereas a high tech company would give a stronger focus to products, technology, innovation and services and a lower focus to other areas. In each one of these cases, the correspondent scales and minimum values should be adjusted accordingly, giving a higher proportional scale and higher minimum value to those components that have a bigger relevance for the specific market and reduce the proportional scale and accepted value for the components that are not highly critical for that context.

Specific values of the adjustments of scales and minimum values will be provided in the objectives sections as part of the clarification on how to apply the framework to a specific business model.

## 4.2 Scales and Objectives

The first main concept to define while analyzing the objective of the PMS is the general evaluation itself. So far, every component has been analyzed and given a singular minimum value; however, there is no synergy amongst the modules as the connections between their ratings have not been clearly defined. In order to do this, the first step to take is rank the main perspectives and components that are the most relevant to the specific business model by adjusting the correspondent measurement scales proportionally to the importance of each evaluation sheet. Once this step is done the minimum values for each one of the components has to be defined using the same principle of relevance. Some recommendations for the definition of this value will be provided in the next section after the general process has been described.

Once all the scales have been defined, a minimum value for each main perspective has to be set by considering the relevance of the main perspective within the business model and in comparison with the other main perspectives. As this study is focused on manufacturing firms probably the Customers Value and Supply Chain Value perspectives should always be considered within the most important ones. Their criticality to the success of the company can be shown not only by increasing for example the proportional level of each component's scale but also by setting a minimum general value for the perspective that exceeds the sum of the minimum accepted values for each one of the components.

For example, assuming that in the Customers Value perspective the 15 different KPI's have a scale of 10 with a minimum value of 6 for each one, which would lead to assume that the minimum value for the whole perspective should be 90. However, given the criticality of the perspective and considering the maximum amount of points that could be awarded is 150 points, a minimum value of around 120 points could be considered as the minimum grade for the module as a whole in order to ensure its proper and effective functioning.

The same principle should be applied for each component by considering the core functions of the future company. High tech companies for example should have a high focus on the product's performance, and considering for instance that the 5 KPI's evaluated in the Products component from the Customers Value perspective have each one a scale of 10 with a minimum value of 7, it would be suitable to set a minimum general value of over 40 instead of 35. The objective of this adjusting procedure is to provide a general scale that indeed

reflects the criticality and importance of each KPI, component and perspective for the business model.

Once the scales are adjusted and the minimum values for components and perspectives are set, it is possible to award the general model with a general grade by just adding the grades of each perspective and comparing it with the sum of the total points of all the scales defined for each KPI. Even if this result might not give a clear view of the effectiveness of one business model in compare with another, as saying that a business model for a high tech company has a higher grade than a business model for a high scale bread producer provides no real information about the sustainability and profitability of any of those companies, it might provide a suitable scale to compare two versions of a similar business model applied to the same company. This allows users to prepare more than one business model for the same company (they should be similar but not equal) and then compare the values for each perspective and for the general model and get an idea of which one of them is more complete. Clearly, if the results are not too far away from each other the difference between them is not made absolutely clear by this PMS and therefore a further analysis should be taken into consideration. However, if for similar business models the general grades differ from 10% in scales than exceed the 100 points, the model provides the tools to compare both of them and identify the weak points of each one and identify the better option from a general perspective.

To evaluate the PMS as a whole and define if the general goals of a strategic PMS have been fulfilled, the theory provided in section 2.2.3 PMS Roles will be put to use. As stated by Pinheiro de Lima et al., (2012), the main roles of a PMS that were considered for the sake of this particular business model's study are the following:

- Implement strategic management functionality in the strategic operations management system, providing the system with the jointly improvement of operational efficiency and overall business effectiveness.
- Be responsible for articulating strategy and monitoring business results.
- Produce positive change in organisational systems and processes.

Analyzing the developed PMS and putting it in contrast with the objectives set it is possible to appreciate that there is a direct correlation and a positive response from the model towards the theory. Particularly, analyzing each PMS role, the information this specific model provides will be developed individually.

**Role 1:**

“Implement strategic management functionality in the strategic operations management system, providing the system with the jointly improvement of operational efficiency and overall business effectiveness.”

By using the PMS for the Integrated Business Model it is possible to see that the evaluation of each main perspective will lead to the redesign of its components in case the results obtained are not as high as desired. This implies that the strategic management and strategic decisions regarding the business model will be directly influenced by the results obtained in the business model. Furthermore, this process will allow the user to improve the quality of each one of the components continuously which can be compared with an improvement of operational efficiency and overall business effectiveness in an already established company, thereby fulfilling the requirements set for first and most important role a PMS should have according to the studies presented in the literature review section.

**Role 2**

“Be responsible for articulating strategy and monitoring business results.”

Regarding this particular role the designed PMS could have some flaws given the intangible essence of a business model. Even if indeed the model is responsible for articulating strategy as it provides a drive for users to redefine the way the future companies will work, it has some flaws regarding the monitoring of business results. This particular PMS model is not intended to be used long after the company is establish unless a modification of the business model is considered, and it is thereby of the outmost importance to implement a strategic performance management system once the organization is functional which will be indeed the responsible of monitoring business results within the newly established firm. Nevertheless, this particular PMS for Business Models has indeed the capacity of monitoring results from business model simulations by running them and modifying the different components and comparing the different results and correlations between the information provided by the simulation and the results provided by the PMS.

### **Role 3**

“Produce positive change in organisational systems and processes.”

This might be the clearer role that is covered by the new PMS for business models, as its main target is to evaluate the current models and provide information to determine where positive changes can be made and which parts of the structure of the model and the future organizational systems and processes can be improved. Even if it cannot directly impact the processes and structure once they have been created, it provides a suitable framework to define which ones might be the most suitable for the situation the company will find itself. To have a clear view of every detail and aspect of the model is essential as in many cases failures occur just because of the lack of consideration of some variables that maybe initially did not seem relevant.

### **4.3 Recommendations to set minimum value**

Clearly, one of the most complex tasks to perform when using this type of tool is not setting a specific grade for each component, but to determine the meaning this specific grade has. This is usually done by comparing it with the minimum accepted value of the component or perspective and calculating how far behind or ahead the evaluation is from this value. This result will be the final indicator to provide the user the required feedback and a general idea of which direction the component should take. It is therefore that defining a significant, relevant and suitable minimum value is maybe the most complex and critical task this framework complies and should thus be taken under special observation.

The first observation to be made is that the decision regarding the definition of the minimum acceptable value for any KPI, component, or perspective, should comprise the whole managerial plant or at least as many relevant actors as possible. To do this, a “Strategic Managerial Team” should be created considering the company’s CEO (or future CEO), the company’s directors as well as the first line managers, which will be the responsible to define limit values to apply in the model.

In order to do this, it is suggested to use an appropriate and systematic methodology. Several examples of suitable methodologies can be found within the available academic literature. However, this study will focus on describing how to proceed in this phase by using “Likert Scales”.

In year 1932 Dr. Rensis Likert, a sociologist of the University of Michigan, developed a technique to measure character and personality traits, which are nowadays known as “Likert scales”. “The original Likert scale used a series of questions with five response alternatives: strongly approve (1), approve (2), undecided (3), disapprove (4), and strongly disapprove (5). He combined the responses from the series of questions to create an attitudinal measurement scale” (Boone et al., 2008). This methodology has since then been applied in several different contexts and research procedures, proving its flexible applicability in almost any area. An example of how this scale can relate with this study as a way to define the minimum value of a specific KPI is shown in Figure 17.

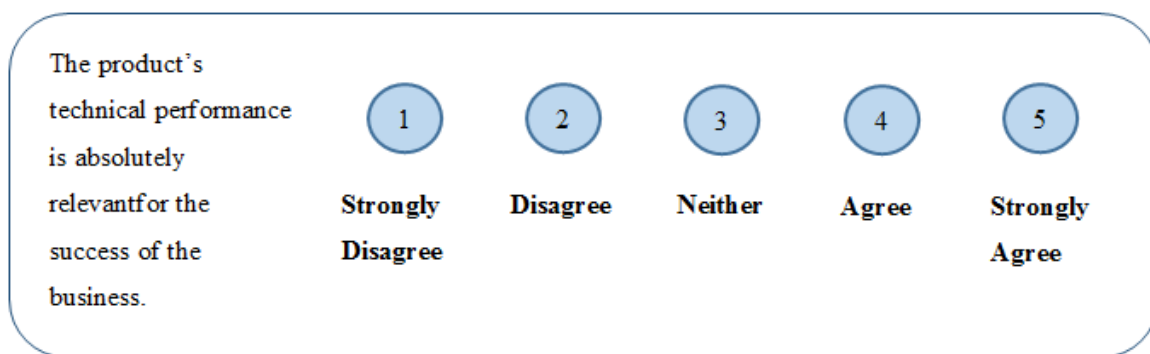


Figure 17. Example of Likert scale applied to technical performance KPI (Own elaboration).

An extensive document providing different Likert-type questions regarding every KPI, component and main perspective of the model should be delivered to the “Strategic Team” which will be the responsible to fill it as accurately as possible. In order for this methodology to be successful the group has to be ideally composed by at least five people in order to provide a significant statistical analysis. As expected, the higher the amount of people participating in this process, the more accurate the results will be.

After gathering all the information for the Likert questionnaires a statistical analysis has to be performed. Firstly, questions concerning the main perspectives have to be grouped and evaluated defining a mean and standard deviation to the values obtained by the different KPIs conforming the main perspective. If the results are significant enough from a statistical point of view it is possible to rank the different perspectives to finally determine the ranges of the minimum values that should be obtained for the perspective as a whole by defining a value proportional to the general scale and the result of the Likert scale. For example, if the mean of the Consumer’s Value main perspective’s KPIs is 4 with a standard deviation of 0.5, and the general scale is 100 points, then the minimum value for the whole perspective should be

set above 80. The same procedure can be afterwards applied to each component by grouping its related KPIs and also for each KPI by considering the mean of its own Likert scale results.

A specific example regarding the Likert scale and the general methodology of the framework will be provided in the next chapter as part of the general description of the application of the PMS for BM.



## Chapter 5

### 5. Framework Application

In order to exemplify the application of the developed framework, it will be partially applied to a specific business model from a manufacturing company. This procedure will allow the user to better understand how to apply the PMS in a real context, as well as to understand how to set the different values it requires and to interpret the results it provides. The first important remark to make is that only one main perspective will be directly analyzed, as performing a complete analysis would be excessively time consuming and would not necessarily provide a deeper insight of the procedure. Secondly, it is important to state that this section is not a case study as there is no clear and concrete information about any specific company that would enable this kind of research. Thirdly, the business model to be used should be considered fictional and not related to any real company in particular, but as a general description of a typical business model used by many manufacturing companies.

#### Company and Business Model Description

The company to be analyzed will be called “Pumps Ltd.”, and it is a company dedicated to create vacuum pumps for car engines. Naturally, Pumps Ltd.’s main customers are several multinational car-makers who seek for reliable suppliers of parts to build their engines, for which the company has developed several assembly lines and production areas each one fully dedicated to satisfy the needs and requirements of a specific customer. Pumps Ltd.’s success is mainly based on two different variables, the first one being the high technical performance and reliability of their products and the second one being its brand, which is worldwide known and highly appreciated. Given their success, the company has decided to open a new plant using the same business model and client’s database, but considering a more environmentally friendly approach. In order to do this they describe their business model’s sustainable operations value main perspective and their respective components as following:

**Competitors:** In the market of vacuum pumps for car makers in their region there are currently no companies giving a special focus to sustainable and environmentally friendly production. Therefore, if the focus is put on that area, it would be possible to say that no competitors will have the same business model and maybe the base of clients will not be shared. However, it is important to convince the car makers to switch from using normal pumps to the new “green pumps”. Pumps Ltd. defined that they have all the necessary

technologies and credentials to start producing right after finishing the construction of the new plant. For the sake of this case it will be assumed that competitors are perfectly known, as the number of companies in this specialized market is very small.

**Sustainable Product:** The Company has performed a research to develop more environmentally friendly pumps and has determined that they also comply with all the current national and international environmental regulations that would allow the company to assure the “green” features of the pumps. This does not only allow the company to manufacture the pumps from a legal point of view but also to use the environmentally friendly feature of the pumps as part of the marketing strategy.

**Sustainable Services:** Pumps Ltd. has not considered any special “green services” so far apart from those already offered to customers such as warranty.

**Environmental Management:** Pumps has developed a program that ensures them absolute compliance with the ISO14001 standards and they are quite confident to obtain the certification once the plant is fully functional.

**Lean Green Production:** After an extensive research, Pumps Ltd. has identified the most innovative production systems for the pumps as well as the most environmentally friendly materials that they could use for the specific applications they require. A reliable supplier that could build the assembly lines has been already identified and the negotiations are already in process.

After defining the general characteristics of every component of the business model, the next step is to evaluate each perspective and rank them according to their relevance for future success. In order to do this, as stated in the previous paragraph, a “Strategic Managerial Team” composed by Pumps Ltd.’s CEO, the board directors, and the first managerial line should be formed and presented with a Likert-type questionnaire. Some examples of Likert-type questions to evaluate the Sustainable Operations main perspective would be the following:

**Main perspective Likert-type question:**

1. The sustainable operations general perspective is of essential importance for the success of the project

**Components Likert-type questions:**

2. Competitors are relevant for the project as they are a main obstacle to struggle against.
3. The sustainability of the product will allow the company to acquire more customers
4. The sustainable services that the company could provide will help to attract more customers
5. To meet the international quality standards for green production is essential for success
6. Lean Green Production will allow Pumps Ltd. to reduce production costs and deliver a better offering to the customers

**KPIs Likert-type questions:**

7. To fully describe competitors will help Pumps Ltd. to better understand how to prevail in the market
8. There are several entry barriers for the new market that have to be considered
9. Pumps Ltd.'s market share is a relevant parameter within the new model
10. Compliance with environmental law is essential for the company from a production and marketing point of view
11. Training for employees to learn about green production would help them to better perform in the new model
12. Customers feel attracted to special services related with environmentally friendly processes
13. Compliance with standards is essential for the company to acquire and retain customers
14. Green Lean production will provide substantial cost reduction and marketing material.

An example of results for the Likert-type Questionnaire is shown Table 5.

Question	Mean	Standard Deviation
1	5	0.5
2	3	1
3	4	1.5
4	3.5	1
5	5	0
6	4	1
7	3	1.5
8	2	1
9	3.5	0.5
10	5	0
11	3	2
12	3	1
13	5	0
14	4	1

Table 5. Results of Likert-type Questionnaire (Original contribution)

After obtaining the results from the “Strategic Managerial Team”, the first step is to group them to identify the general scale of the main perspective and the components. It is important to state that this questionnaire will not provide in this case information about the general scale of the complete perspective as a comparison with the results of the other perspectives has to be performed to determine the proportional values of the scale. For the sake of this study, it will be assumed that the general sustainable operations value perspective has been awarded 100 points being one of the most relevant ones regarding the new green business model. Given this situation, the results of the Likert-type questionnaires will be used to determine the minimum value the perspective has to achieve.

Question one regards the perspective as a whole, and the team determined a mean of 5 and a standard deviation of 0.5. On the other hand, the components of the perspective (questions 2-6) have all together an average of 3.9 and a standard deviation of 0.9. Using only this value it is possible to award the general perspective a value of importance close to 4.5 with a standard deviation of 1 (approximate average between 5 for question 1 and 3.9 for questions 2 to 6),

which would mean that in a general scale of 100, the minimum value the perspective should achieve is 90 with a maximum deviation of 10, hence a final minimum value of at least 80.

An equivalent procedure should be performed for each component; in this case the competitors' component will be analyzed directly. Question 2 considers the component as a whole, whereas questions 7, 8 and 9 consider the competitors' KPIs. Question 2 has a mean of 3 and a standard deviation of 1, whereas questions 7, 8 and 9 have an average mean of 2.8 and an average standard deviation of 1. Therefore the average mean for the component is of 2.9 with a standard deviation of 1.

Performing the same procedure it is possible to determine the average mean and average standard deviation for every component, which are summarized in Table 6.

Component	Mean	Std. Deviation
Competitors	2.9	1
Sustainable Product	4	1.25
Sustainable Service	3.25	1
Environmental Management	5	0
Lean Green Production	4	1

Table 6. Mean and standard deviation per component of Sustainable Operations Value perspective (Original contribution)

A way to determine the general scale of each component is to choose a total value proportional to the general mean and the total scale of the perspective. In order to use this method, it is necessary to divide the general scale, in this case of 100, into segments proportional to the average mean of the component and its KPIs. The sum of all the means is 19.15, therefore competitors represents a 15%, sustainable product a 21%, Sustainable service a 17%, environmental management a 26% and lean green production a 21% as well. To obtain a balanced and more rational scale it would be recommended to define approximate values to enable an easier process of calculation, for which the following scales will be defined:

**Competitors:** Scale from 0 to 15

**Sustainable Product:** Scale from 0 to 20

**Sustainable Service:** Scale from 0 to 15

**Environmental Management:** Scale from 0 to 30

**Lean Green Production:** Scale from 0 to 20

It is important to remark that these scales can easily be adjusted if any errors are perceived from a logical point of view. In this case, for example, the “Strategic Managerial Team” could consider the scale for environmental management too high in comparison with the sustainable product perspective and change both of them to a scale from 0 to 25. However, this exercise has only the purpose of illustrating the application of the framework, for which exceptional situations will not be directly considered as they depend on every case.

From this point on, it is necessary to define the minimum value for each component, which can be again done using the mean and standard deviation available in table six and the logic applied before to determine the minimum value for the perspective as a whole. To exemplify, for the competitors’ component, with a scale of 0 to 15, a mean of 2.9 out of 5 and a standard deviation of 1, a suitable minimum value would be 10 points, and considering the standard deviation would result in a final minimum acceptable value of 7. This calculation is done by using simple proportional techniques, considering that 10 out of 15 is proportionally equivalent to 2.9 out of 5 (using the mean), and that 3 out of 15 is proportionally equivalent to 1 out of 5 (using the standard deviation). The results for the scale and minimum value of each component are registered in Table 7.

Component	Mean	Std. Deviation	Scale	Min. Value
Competitors	2.9	1	15	7
Sustainable Product	4	1.25	20	11
Sustainable Service	3.25	1	15	8
Environmental Management	5	0	30	30
Lean Green Production	4	1	20	12

Table 7. Scales and Min. Value of Sustainable Operations Value’s components (Original contribution)

So far a systematical example of how to obtain the scale has been provided, however the illustration is still missing the way to determine each KPI’s scale and minimum value. In order to perform this task an equivalent procedure will be used but considering just the mean for each one of the KPIs. To exemplify these sections, just the competitors’ component will be used.

Considering the results of the Likert-type questionnaire from Table 5, specifically questions 7, 8 and 9 regarding the KPIs of the competitors' component, it is possible to appreciate the following results illustrated in Table 8:

KPI	Mean	Std. Deviation
Definition	3	1.5
Barriers	2	1
Market Share	3.5	0.5
Evaluation	3	1.5

Table 8. Results for each KPI of the competitors' component (Original contribution)

As it is possible to appreciate, one Likert-type question has been linked with two different KPIs, thus providing the same mean and standard deviation for both. As both of them are directly connected to competitors' analysis, it is possible to state that they indeed have an equivalent importance. However, given the different nature of the issues they address, it is recommended to consider them separately at the moment of the final evaluation.

As stated before, the general scale for the competitors' component is of 0 to 15, for which the following scales for the KPIs can be considered:

- Definition has a mean of 3, which represents a 26% of the total scale.
- Barriers' KPI has a mean of 2, which represents a 17% of the total scale.
- Market Share has a mean of 3.5, which represents a 30% of the total scale.
- Evaluation has a mean of 3, which represents a 26% of the total scale.

Adjusting these values to a more concrete scale, it is possible to define the following scales for each KPI:

Definition: Scale from 0 to 4

Barriers: Scale from 0 to 2

Market Share: Scale from 0 to 5

Evaluation: Scale from 0 to 4

There are two main options to determine the minimum value for each KPI. The first one is for the "Strategic Managerial Team" to agree upon them by using a judgmental approach, which at this state of the process should be possible to do. The second option is to use the results of

the Likert-type questionnaire to determine a value obtained from the proportionality between the mean of the KPI and the recently determined scale. For example, question 8 refers to the barriers KPI, which has a mean of 2 out of 5, a standard deviation of 1 and a scale of 0 to 2. Therefore, the minimum value for this specific perspective should be 1. In the case of Market Share, with a mean of 3.5 out of 5, a standard deviation of 0.5 and a scale of 5, it is possible to determine a minimum value of 3. The same procedure can be applied to every KPI obtaining the results illustrated in Table 9.

KPI	Mean	Std. Deviation	Scale	Min. Value
Definition	3	1.5	4	2
Barriers	2	1	2	1
Market Share	3.5	0.5	5	3
Evaluation	3	1.5	4	2

Table 9. Scale and minimum value of competitors' component's KPIs (Original contribution)

Finally, using the results obtained in this section, it is possible to determine the main values to fill one evaluation sheet. However, the theoretical evaluation of each KPI has to be performed using the information available from the description of the business plan to determine the level of effectiveness of the project. An example of evaluation will be provided for each KPI of the competitors' component of the Sustainable Operations Value perspective. Once the KPIs are properly evaluated, a possible action plan will be recommended if needed.

**Definition:** This KPI has a scale from 0 to 4, and as stated previously the company has a clear view of their competitors given the low number of companies working in such a specialized market. Therefore this KPI will be awarded with a value of 4 with no action plan required.

**Barriers:** This KPI has a scale from 0 to 2, and as the company already has abundant experience and a stable position within the market all possible barriers are known and considered. Therefore it will be awarded a value of 2.

**Market Share:** There is no indication that a future market share has been forecasted, which should be a critical procedure whenever trying to create a new market. At least an approximation of the number of customers that would be initially interested in purchasing green pumps has to be determined. This KPI has a scale of 0 to 5, and given the previous



arguments it is possible to award a grade of 0. A possible action plan would be to develop a survey system to forecast the future initial customers.

**Evaluation:** This KPI has a value of 0 to 4, and so far there is no indication of a systematical analysis of the competitors. Given that some of their characteristics are known to the company a value of 2 will be awarded. The recommended action plan is to implement tools to systematically analyze competitors and determine their reaction once the company’s project is put into action.

With all the information gathered within this section it is possible to fill the correspondent evaluation sheet as shown in Table 10.

Perspective	Sustainable Operations Value (Scale 100, min. Value 80)			
Component	Competitors (Scale 15, min. Value 7)			
KPI	Target	Metrics	Min. Value	Action plan
<b>Definition</b>	Have a clear image of the competitors.	0 to 4. Current measure: 4	2	No action plan needed.
<b>Barriers</b>	Determine entry barriers	0 to 2. Current measure: 2	1	No action plan needed.
<b>Market Share</b>	Forecast a realistic future market share	0 to 5. Current measure: 0	3	Perform surveys to determine initial market size.
<b>Evaluation</b>	Use all proper tools to not only identify but analyze competitors.	0 to 4. Current measure: 2	2	Apply the available tools.

Table 10. Evaluation sheet for competitors’ component, Sustainable Operations Value.

(Original contribution)

The results for each KPI are in general good, as the component as a whole has a general score of 8 which is above of its minimum value of 7. However, the market share or market size KPI has a score above the minimum limit, for which it has to be improved. Once the action plans are put into action, it is possible to expect an improvement in the component as a whole, thus improving at the same time the general effectiveness of the perspective and therefore the business model.

At this point, a systematical procedure to determine the scales and minimum values of the main perspective, each one of its components, each one of the respective KPIs and their

current evaluation has been illustrated. Even if the results might not necessarily be realistic the procedure has been clearly explained and the user will be able to implement the provided framework by simply following the steps described in this section, which is the main goal of the framework application section.

## Chapter 6

### 6. Final conclusion and future developments

As repeatedly stated throughout this study, the main goal of this research is to provide a suitable performance measurement framework focused on business models with the purpose of evaluating its completion and thus to forecast the effectiveness of its implementation. However, the evaluation of intangible assets has always been complex task and there is little consensus amongst academics on how to proceed in these type of cases. By using extensive academic literature based on business models and strategic performance management systems, this study has followed a specific research methodology which has provided a more clear perspective of the different characteristics of the two different topics. Regarding business models, the framework developed by Batocchio et al. (2015) has been used as the main focus of analysis, which has led to develop a PMS specifically suitable for its components. Based on the academic review, the specific roles of a PMS, as well as its characteristics and design process have been clarified, thus providing insightful information to evaluate the effectiveness of the outcome of this research.

The result obtained from this work is a general framework or guideline to be applied in the evaluation of a general business model, which is not only repeatable and adaptable to many different cases but also easily expandable. The model consists in the development of several evaluation sheets, which divide the business model considering its main perspective, each perspective's components, and each component's different KPIs. After this process has been effectively performed, it is possible to develop the correspondent evaluation scales and recommended minimum scores for each KPI, component and perspective according to the results obtained from a Likert-type questionnaire filled by a "Strategic Managerial Team". As obtained in Table 10 from Chapter 5 Framework Application, the final evaluation sheet should present the following values:

**Main perspective:** The main perspective to which the different KPIs belong in order to cluster and organize the obtained results.

**Specific component:** The component of the main perspective to which the different KPIs belong which is also useful to cluster and organize the obtained results.

**KPI:** Different KPIs to be evaluated which will determine the general score of the component and main perspective.

**Target:** Objective of the specific KPI, a statement of the desired outcomes.

**Metrics/Measurement:** Scale in which each KPI will be evaluated. Just as the minimum value, each component and perspective's scale can be placed on their sections.

**Minimum value:** Minimum value that each KPI should reach in order to be accepted as sufficiently completed. The minimum value for the component and the perspective can be stated on their sections.

**Action plan:** Possible plan to be followed to improve the KPI evaluation if needed.

As it is possible to appreciate, this framework can be applied to several different models as long as the correspondent KPIs are measurable and clearly defined, and the application is systematical and repeatable for which the size of the model itself is not a restriction for the implementation of the PMS.

The main value of this model is that it might be one of the first attempts to measure the effectiveness of a business model, as it had only been done using a judgmental perspective and apparently no clear systematical procedures have been conducted so far to perform this task. As the need to measure intangible assets from companies is growing, the value of such models will increase in time until reaching a point where they become a critical tool in the corporate decision making process. This framework provides also the possibility to identify flaws in business models and thus the possibility to avoid future losses coming from unexpected or non-forecasted situations. A further development of this tool could be easily applied not only within companies but also within entrepreneurial groups which aim to create new companies, thus supporting the growth of the general market and creating value for society and entrepreneurs.

Regarding the evaluation of the outcome of this paper in comparison with the objectives stated in its initial phase, it is possible to state that it has completely achieved its main objective as described in the beginning of this section. However, it is also relevant to consider the initial research questions and research hypothesis developed in Chapter 1, which were the following:

**Question 1:**

- Which specific variables of the integrated business model should be measured and how should it be done in order to develop an effective performance measurement system with forecasting and evaluation purposes?

**Question 2:**

- How should a performance measurement system for a theoretical framework without any tangible assets be designed?

**Question 3:**

- Are there any successful examples of strategic PMS that would provide a suitable framework for the development of a PMS for business models?

**Hypothesis 1:**

- Every module of the business model will provide a KPI that will be measured in a scale depending on the relevance of the specific module for the particular business.

**Hypothesis 2:**

- A PMS for a theoretical framework can be designed by using existing models that are found in strategic management related publications which mainly focus on the related processes more than the specific outcomes.

**Hypothesis 3:**

- There are some examples of strategic performance management systems that once adapted will provide a suitable framework for the development of the PMS for the Integrated Business Model.

Question one can be easily answered by analyzing the developed model, as the variables to be measured correspond to the KPIs, components and main perspectives of the business model and the method of measurement are the scales and minimum values deeply analyzed in Chapter 5 Framework Application. Question 2 targets the design process of the PMS which is explained in section 2.2.5 PMS Design, where the PMS for R&D developed by Chiesa et al. (2008) together with the “9 steps” framework developed by Wisner et al. (1991) are described in order to exemplify the design process of the PMS used in this particular study.

Regarding the aforementioned “9 steps”, they can be described within the scope of this paper as following:

1. Clearly define the firm’s mission statement.

The equivalent to the firm in this case corresponds to the business model under analysis and its mission statement should be described prior to the development of the PMS.

2. Identify the firm’s strategic objectives using the mission statement as a guide (profitability, market share, quality, cost, flexibility, dependability, and innovation).

The strategic objective of the business model is to achieve the highest possible completion and synchronization between components in order to forecast all available foreseeable situations.

3. Develop an understanding of each functional area’s role in achieving the various strategic objectives.

Each area of the business model is represented by its main perspectives and components, which are developed in section 2.1 Literature Review on Business Models.

4. For each functional area, develop global performance measures capable of defining the firm’s overall competitive position to top management.

The global performance measures addressed in this step correspond to the KPI and component evaluation developed in the model. The obtained score in each metric will define the business model’s “competitive position”.

5. Communicate strategic objectives and performance goal to lower levels in the organization. Establish more specific performance criteria at each level.

As explained in the PMS design section this step depends on the situation in which the new business model is being developed. However, it is clear that all the members of the organization involved in the development on the business model should be absolutely informed regarding its state.

6. Assure consistency with strategic objectives among the performance criteria used at each level.

This step was performed in section 4.2 Scales and Objectives when the developed model was put in contrast with the roles of a performance measurement system previously stated in section 2.2.3 PMS Roles.

7. Assure the compatibility of performance measures used in all functional areas.

This step could only be fully performed with the application of the framework within a real situation in order to assure the requested compatibility. However, the framework application developed in Chapter 5 illustrates the procedure in which this step could be fulfilled.

8. Use the performance measurement system to identify competitive position, locate problem areas, assist the firm in updating strategic objectives and making tactical decisions to achieve these objectives, and supply feedback after the decisions are implemented.

This step has the same limitations stated in step 7, and it is therefore that it is impossible to perform it without systematically applying the framework within a real case.

9. Periodically re-evaluate the appropriateness of the established performance measurement system in view of the current competitive environment.

When the framework is applied to a real case and the proper evaluations are ready, it is possible to put the suggested plans into action. Once this step is fulfilled, a new evaluation can be done. This procedure should be periodically repeated until the business model is complete and should be re-evaluated once implementation takes place.

Finally, Question 3 is directly answered in Chapter 3 when the Balanced Scorecard from Norton and Kaplan is selected as a suitable example to be modified and applied for the new PMS for BM.

Regarding the initial hypothesis presented in Chapter 1, it is possible to see that hypothesis number 2 and 3 are directly answered by using Norton and Kaplan's Balanced Scorecard just as question 3. Furthermore, hypothesis 1 can also be proved by considering that the model indeed measures KPIs obtained from the business model itself and that the scales and minimum values are obtained from the Likert-type questionnaires, which indeed deliver metrics according to the relevance of each KPI. This situation indicates that all initial hypothesis have been proven correct, thus enabling to answer all the initial

questions and allowing to state that the initial objectives of the research have been fully satisfied.

Regarding the future steps to be taken in this area, the first and main procedure would be to apply the framework within real cases and compare the theoretical results with the actual results from the implementation of the business model. In case of discrepancy with both results the PMS could be adjusted accordingly and improved in a way that makes it accurate within actual applications. A secondary further improvement could be applied in the systematic process of defining the scales and minimum accepted values for KPIs, components and perspectives by creating a deeper statistical analysis which would deliver more accurate proportional relations between the modules.

Finally, it is possible to state that this paper finally achieved all the initially stated goals and that its outcome could be an initial step towards a systematical, concrete and accurate evaluation method for business models. The advantages and applications of this method would be countless and its value for modern companies could become critical if refined by using practical case studies in direct cooperation with real manufacturing companies.



## References

- Abecassis-Moedas et al., (2012). Key resources and internationalization modes of creative knowledge-intensive business services: The case of design consultancies, *Creativity and Innovation Management*, 21(3), 315-331.
- Acur, N., Bititci, U., (2004). A balanced approach to strategy process, *International Journal of Operations and Production Management*, 24(4), 388–408.
- Agdex (1999). Methods to Price Your Product. *Agriculture Business Strategy*, February, 1-6.
- Alegre, J., Chiva, R., (2008). Assessing the impact of organizational learning capability on product innovation performance: an empirical test, *Technovation*, 28(6), 315–326.
- Amaratunga, D., Baldry, D., (2002). Moving from performance measurement to performance management, *Facilities*, 20(5/6), 217–223.
- Anderson, J., (2009). Determining Manufacturing Costs, *Aiche-CEP*, January, 27-31.  
Available from: <people.clarkson.edu/~wwilcox/Design/CostEstn.pdf>. [24 March 2015].
- Artail, H.A., (2006). Application of KM measures to the impact of a specialized groupware system on corporate productivity and operations, *Journal of Information & Management*, 43, 551-64.
- Aurich, J.C., Fuchs, C., Wagenknecht, C., (2006). Life cycle oriented design of technical Product-Service Systems, *Journal of Cleaner Production*, 14(17), 1480–1494
- Ayers, J.B., (2000). A holistic approach to supply chain management: The impact on IT professionals, *Medical Industry Information Report*, 1-6.
- Bare, M., Cox, J. J., (2008). Applying principles of mass customization to improve the empirical product development process, *Journal of Intelligent Manufacturing*, 19(5), 565-576.
- Batocchio, A., Ghezzi, A., Rangone, A., (2015). *Framework of Business Model in Manufacturing Industries*, Research Report, DIG-Politecnico di Milano, Milano.
- BCG (2015). The Shifting Economics of Global Manufacturing: *How Cost Competitiveness Is Changing Worldwide (Cost Competitiveness: A Country View)*. Boston Consulting Group.  
Available at:

<[https://www.bcgperspectives.com/content/articles/lean\\_manufacturing\\_globalization\\_shiftin\\_g\\_economics\\_global\\_manufacturing/](https://www.bcgperspectives.com/content/articles/lean_manufacturing_globalization_shiftin_g_economics_global_manufacturing/)>. [27 March 2015].

Bergna, S., (2010). *Business models and strategic planning: a proposal for a unified framework and the application to the Mobile Telecommunications Industry*. MSc Thesis, DIG-Politecnico di Milano, Como.

Bhimani, A., (1993). Performance measures in UK manufacturing companies: the state of play, *Management Accounting*, 71(11), 20–22.

Binder, M., Clegg, B., (2007). Enterprise management: a new frontier for organizations, *International Journal of Production Economics*, 106(2), 409–430.

Blenkinsop, S., Davis, L., (1991). The road to continuous improvement, *Insight*, 4(3), 23–26.  
Bourne, M.C.

Boone, H.N., Boone D.A., (2012). Analyzing Likert data, *Journal of extension*, 50(2).

Boudah, D. J., (2011). *Conducting Educational Research: guide to completing a major project*, SAGE Publications Inc., California, 314.

Bou-Llusar, J.C., Escrig-Tena, A.B., Roca-Puig, V., Beltrán-Martín, I., (2009). An empirical assessment of the EFQM Excellence Model: Evaluation as a TQM framework relative to the MBNQA Model, *Journal of Operations Management*, 27(1), 1-22.

Bourne, M.C.S., (2005). Researching performance measurement system implementation: the dynamics of success and failure, *Production Planning and Control*, 16(2), 101–113.

Bourne, M.C.S., Kennerley, M., Franco-Santos, M., (2005). Managing through measures: a study of impact on performance, *Journal of Manufacturing Technology Management*, 16(4), 373–395.

Broadbent, J. & Laughlin, R., (2009). Performance management systems: A conceptual model, *Management Accounting Research*, 20(4), 283-295.

Brown, M.G., Svenson, R., (1988). Measuring R&D productivity, *Research-Technology Management*, 31(4), 11–15.

Brown, S., Fai, F., (2006). Strategic resonance between technological and organisational capabilities in the innovation process within firms, *Technovation*, 26(1), 60–75.

- Bryan, L.L., (2007). The New Metrics of Corporate Performance: profit per employee, *The McKinsey Quarterly*, 1, 57-65.
- Casadesus-Masanell, R. & Ricart, J.E. (2011). How to design a winning business model, *Harvard Business Review*, January - February, 100-107.
- Chenhall, R.H., (2005). Integrative strategic performance measurement systems, strategic alignment of manufacturing, learning and strategic outcomes: an exploratory study, *Accounting, Organisations and Society*, 30(5), 395–422.
- Chiesa, V., Frattini, F., Lazzarotti, V., Manzini, R., (2008). Designing a performance measurement system for the research activities: a reference framework and an empirical study, *Journal of Engineering and Technology Management*, 25(3), 213–226.
- Chong, H.G., (2008). Measuring performance of small-and-medium sized enterprises: the grounded theory approach, *Journal of Business and Public Affairs*, 2(1), 1-10.
- Clarke, P., (1995). Non-financial measures of performance in management, *Accountancy Ireland*, 27(2), 22–24.
- Colledani, M., Tolio, T., (2009). Performance evaluation of production systems monitored by statistical process control and off-line inspections, *International Journal of Production Economics*, 120(2), 348–367.
- Devaraj, S., Hollingworth, D.G., Schroeder, R.G., (2004). Generic manufacturing strategies and plant performance, *Journal of Operations Management*, 22(3), 313–333.
- Drucker, P.E., (1990). The emerging theory of manufacturing, *Harvard Business Review*, 68(3), 94–102.
- Eggert, A., Ulaga, W., (2002). Customer perceived value: A substitute for satisfaction in business markets?, *The Journal of Business and Industrial Marketing*, 17(2/3), 107–118.
- Elkington, J., (1997). *Cannibals with forks, the triple bottom line of 21st century business*, Calstone Publishing Limited, UK, ISBN 1-900961-27-X.
- European Foundation for Quality Management 2015. *EFQM Model*. Available from: <<http://www.efqm.org/the-efqm-excellence-model>>. [31 May 2015].

- Ferreira, A., Otley, D., (2005). The design and use of management control systems: An extended framework for analysis, AAA Management Accounting Section 2006 Meeting Paper. Available at SSRN: <http://ssrn.com/abstract=682984>. [25 March 2015].
- Ferreira, A., Otley, D., (2009). The design and use of performance management systems: An extended framework for analysis, *Management Accounting Research*, 20, 263–282.
- Flynn, B.B., Flynn, E.J., (2004). An exploratory study of the nature of cumulative capabilities, *Journal of Operations Management*, 22(5), 439–457.
- Flynn, B.B., Schroeder, R.G., Flynn, E.J., (1999). World class manufacturing: an investigation of Hayes and Wheelwright's foundation, *Journal of Operations Management*, 17(3), 249–269.
- Folan, P., Browne, J., (2005). A review of performance measurement: towards performance management, *Computers in Industry*, 56(7), 663–680.
- Folan, P., Browne, J., Jagdev, H., (2007). Performance: its meaning and content for today's business research, *Computers in Industry*, 58(7), 605–620.
- Gargeya, V.B., (2005). Plant level performance measurement: an exploratory case study of a pharmaceutical encapsulation company, *Technovation*, 25(12), 1457–1467.
- Gebauer, H., Gustafsson, A., Witell, L., (2011). Competitive advantage through service differentiation by manufacturing companies, *Journal of Business Research*, 64(12), 1270–1280.
- Ghalayini, A.M., Noble, J.S., (1996). The changing basis of performance measurement, *International Journal of Operations and Production Management*, 16(8), 63–80.
- Ghezzi A. (2013). Revisiting Business Strategy Under Discontinuity. *Management Decision*, 51(7), 1326-1358.
- Ghezzi A. (2014). The dark side of the Business Model. The risks of strategizing through business models alone, *Strategic Direction*, 30(6), 1-4.
- Ghezzi A., Balocco R., Rangone A., (2010), How to get Strategic Planning and Business Model Design wrong: the case of a Mobile Technology Provider, *Strategic Change*, 19 (5-6), 213–238.
- Ghezzi, A., Balocco, R., Rangone, A. (2015). A fuzzy framework assessing corporate resources management for the mobile content industry, *Technological Forecasting and Social Change*, 96, 153–172.

Ghezzi, A., Cortimiglia, M., Frank, A. (2015) (forthcoming). Business Model Innovation and strategy making nexus: evidences from a cross-industry mixed methods study, *R&D Management*, DOI: 10.1111/radm.12113.

Ghezzi, A., Cortimiglia, M., Frank, A. (2015). Strategy and business model design in dynamic Telecommunications industries: a study on Italian Mobile Network Operators, *Technological Forecasting and Social Change*, 90, Part A, 346-354.

Globerson, S., (1985). Issues in developing a performance criteria system for an organisation, *International Journal of Production Research*, 23(4), 639–646.

Gomes, C.F., Yasin, M.M., Lisboa, J.V., (2004). A literature review of manufacturing performance measures and measurement in an organizational context: a framework and direction for future research, *Journal of Manufacturing Technology Management*, 15(6), 511–530.

Gould, S. (2013). Business model background Paper for <IR>, *International Integrated Reporting Council*, 1-2.

Grady, M.W., (1991). Performance measurement: implementing strategy, *Management Accounting*, 72(12), 49–53.

Hallstedt, S., (2008). *A foundation for sustainable product development*, Doctoral Dissertation Thesis, Series No. 2008:6, Blekinge Institute of Technology, Karlskrona, Sweden.

Henry, J.F., (2006). Management control systems and strategy: a resource-based perspective. *Accounting, Organizations and Society*, 31(6), 529–558.

Herzog, N.V., Tonchia, S., Polajnar, A., (2009). Linkages between manufacturing strategy, benchmarking, performance measurement and business process reengineering, *Computers and Industrial Engineering*, 57(3), 963–975.

Huang, C.L., Kung, F.H. (2011). Environmental Consciousness and Intellectual Capital Management: Evidence from Taiwan's Manufacturing Industry, *Management Decision*, 49, 1405-25

Huang, R., Menezes, M., Kim, S., (2012). The impact of cost uncertainty on the location of a distribution center, *European Journal of Operational Research*, 218(2), 401–407.

- Janvier, J., Assey, M., (2012). A New Introduction to Supply Chains and Supply Chain Management: Definitions and Theories Perspective, *International Business Research*, 5(1), 194-207.
- Johnson, H.T., Kaplan, R.S., (1987). *Relevance Lost: The Rise and Fall of Management Accounting*, Harvard Business School Press, Boston.
- Johnston, R., Brignall, S., Fitzgerald, L., (2002). Good enough performance measurement: a trade-off between activity and action, *Journal of the Operational Research Society*, 53(3), 256–262.
- Jonker, M., Romijn, H., Szirmai, A., (2006). Technological effort, technological capabilities and economic performance: a case study of the paper manufacturing sector in West Java, *Technovation*, 26(1), 121–134.
- Joshi, M.P., Kathuria, R., Porth, S.J., (2003). Alignment of strategic priorities and performance: an integration of operations and strategic management perspectives, *Journal of Operations Management*, 21(3), 353–369.
- Kaplan, R.S., Norton, D.P., (1992). The balanced scorecard: measures that drive performance, *Harvard Business Review*, 70(1), 71–79.
- Kaplan, R.S., Norton, D.P., (1993). Putting the Balanced Scorecard to work, *Harvard Business Review*, September-October, 134-147.
- Kaplan, R.S., Norton, D.P., (1996). Using the Balanced Scorecard as a Strategic Management System, *Harvard Business Review*, 74(1), 75–85.
- Kaplan, R.S., Norton, D.P., (2001). *The strategy Focused Organization: How Balanced Scorecard Companies Thrive in the New Business Environment*, Harvard Business School Press, Boston.
- Kathuria, R., Joshi, M.P., Porth, S.J., (2007). Organizational alignment and performance: past, present and future, *Management Decision*, 45(3), 503–517.
- Kennerley, M.P., Neely, A.D., (2002). A framework of the factors affecting the evolution of performance measurement systems, *International Journal of Operations and Production Management*, 22(11), 1222–1245.

- Kennerley, M.P., Neely, A.D., (2003). Measuring performance in a changing business environment, *International Journal of Operations and Production Management*, 23(2), 213–229.
- Kerssens-van Drongelen, I.C., Bilderbeek, J., 1999. R&D performance measurement: more than choosing a set of metrics, *R&D Management*, 29(1), 35–46.
- Ketokivi, M., Schroeder, R.G., (2004). Manufacturing practices, strategic fit and performance: a routine-based view, *International Journal of Operations and Production Management*, 24 (2), 171–191.
- Klewitz, J., Hansen, E.G., (2014). Sustainability-oriented innovation of SMEs: a systematic review, *Journal of Cleaner Production*, 65, 57-75.
- Kling, R., (2006). In search of efficiency: concurrent concept elaboration and improvement, *Technovation*, 26(7), 753–760.
- Kothari, C.R., (1985). *Research methodology: Methods and techniques*, New Age International (P) Ltd., Publishers, Delhi.
- Kubota, F.I., Rosa, L.C., (2013). Identification and conception of cleaner production opportunities with the Theory of Inventive Problem Solving, *Journal of Cleaner Production*, 47, 199–210.
- Kumar, C.R., (2008). *Research Methodology*, S.B. Nangia and APH Publishing Corporation, New Delhi, 1-32.
- Kumar, V., De Grosbois, D., Choisine, F., Kuma, U., (2008). Performance measurement by TQM adopters, *The TQM Journal*, 20(3), 209–222.
- Kwak, Y.H., Anbari, F.T., (2006). Benefits, obstacles, and future of six sigma approach. *Technovation*, 26(5/6), 708–715.
- Lambert, D.M., Emmelhainz, M.A., Gardner, J.T., (1996). Developing and implementing supply chain partnerships, *The International Journal of Logistics Management*, 7(2), 1-17.
- Li, P., Tang, G., (2009). Performance measurement design within its organisational context: evidence from China, *Management Accounting Research*, 20(3), 193–207.

- Loch, C.H., Tapper, S., (2002). Implementing a strategy-driven performance measurement system for an applied research group, *The Journal of Product Innovation Management*, 19(3), 185–198.
- Lummus, R.R. and Vokurka, R.J., (1999). Defining supply chain management: a historical perspective and practical guidelines, *Industrial Management & Data Systems*, 99 (1), 11–17.
- Lynch, R.L., Cross, K.F., (1991). *Measure up: The Essential Guide to Measuring Business Performance*, Mandarin, London.
- Manoochehri, G., (1999). The road to manufacturing excellence: using performance measures to become world-class, *Industrial Management*, 41(2), 7–13.
- Maskell, B.H., (1991). *Performance Measurement for World Class Manufacturing: A Model for American companies*, Productivity Press, Cambridge.
- Maslen, R., Platts, K.W., (2000). Building manufacturing capabilities, *International Journal of Manufacturing Technology and Management*, 1(4/5), 349–365.
- Maxwell, D., Van der Vorst, R., (2003). Developing sustainable products and services, *Journal of Cleaner Production*, 11(8), 883–895.
- McNair, C.J., Mosconi, W., (1987). Measuring performance in an advanced manufacturing environment, *Management Accounting*, 69(1), 28–31.
- Medori, D., Steeple, D., (2000). A framework for auditing and enhancing performance measurement systems, *International Journal of Operations and Production Management*, 20(5), 520–533.
- Michael Lewis (2000). *The New New Thing*, New York: W.W. Norton.
- Michel, S., (2014), Capture more value, Harvard Business Review, October Issue.
- Mitchell, V., Wilson, D.F., (1998). Balancing theory and practice: A reappraisal of business-to-business segmentation, *Industrial Marketing Management*, 27(5), 429–445.
- Molina-Castillo, F.J., Munuera-Alema´n, J.L., (2009). New product performance indicators: time horizon and importance attributed by managers, *Technovation*, 29(10), 714–724.
- Neely, A.D., (2005). The evolution of performance measurement research: developments in the last decade and a research agenda for the next, *International Journal of Operations and Production Management*, 25(12), 1264–1277.



- Neely, A.D., Adams, C., Kennerley, M.P., (2002). Performance Prism: The Scorecard for Measuring and Managing Stakeholder Relationships, *Financial Times/ Prentice Hall*, London.
- Neely, A.D., Al Najjar, M., (2006). Management learning not management control: the true role of performance measurement, *California Management Review*, 48(3), 100–114.
- Neely, A.D., Gregory, M.J., Platts, K.W., (2005). Performance measurement system design: a literature review and research agenda, *International Journal of Operations and Production Management*, 25(12), 1228–1263.
- Neely, A.D., Mills, J.F., Platts, K.W., Richards, H., Gregory, M.J., Bourne, M.C.S., Kennerley, M.P., (2000). Performance measurement system design: developing and testing a process-based approach, *International Journal of Operations and Production Management*, 20(10), 1119–1145.
- Nenadal, J., (2008). Process performance measurement in manufacturing organizations, *International Journal of Productivity and Performance Management*, 57(6), 460–467.
- Nilsson, F., Olve, R.-G., (2001). Control systems in multibusiness companies: from performance management to strategic management, *European Management Journal*, 19(4), 344–358.
- Noci, G., (1995). Accounting and non-accounting measures of quality-based performances in small firms, *International Journal of Operations and Production Management*, 15(7), 78–105.
- Nutt, P., (2002). Making Strategic Choices, *Journal of Management Studies*, 39(1), 67-95.
- Osterwalder, A., Pigneur, Y., (2009). *Business model generation*. Alexander Osterwalder & Yves Pigneur Self Published, Amsterdam, Netherlands.
- Otley, D., (1999). Performance management: a framework for management control systems research, *Management Accounting Research*, 10(4), 363–382.
- Ovans, A. (2015). What is a business model, *Harvard Business Review*, January, 1-4.
- Parvatiyar, A., Sheth, J.N. (2001). Customer relationship management: emerging practice, process and discipline, *Journal of Economic & Social Research*, 3(2), 1-34.

- Patzelt, H., Lechner, C., Klaukien, A., (2011). Networks and the Decision to Persist with Underperforming R&D Projects, *Journal of Product Innovation Management*, 28(5), 801–815.
- Phusavat, K., Anussornnitisarn, P., Helo, P., Dwight, R., (2009). Performance measurement: roles and challenges, *Industrial Management & Data Systems*, 109(5), 646–664.
- Pinheiro de Lima, E., Gouvea da Costa, S.E., Angelis, J.J., (2008). The strategic management of operations system performance, *International Journal of Business Performance Management*, 10(1), 108–132.
- Pinheiro de Lima, E., Gouvea da Costa, S.E., Jan, J. & Munik, J. (2010). Performance measurement systems: A consensual analysis of their roles, *International Journal of Production Economics*, 146(2), 524-542.
- Pinheiro de Lima, E., Gouvea da Costa, S.E., Reis de Faria, A., (2009). Taking operations strategy into practice: developing a process for defining priorities and performance measures, *International Journal of Production Economics*, 122(1), 403–418.
- Porter, M. E., (1985). *The Competitive Advantage: Creating and Sustaining Superior Performance*, NY: Free Press.
- Porter, M.E., (2008). The Five Competitive Forces that Shape Strategy, *Harvard Business Review*, January, 1-18.
- Quezada, L.E., Cordova, F.M., Palominos, P., Godoy, K., Ross, J., (2009). Method for identifying strategic objectives in strategy maps, *International Journal of Production Economics* 122(1), 492–500.
- Rekha, S., Anjali, M., (2013). Treating questionnaire-based inputs for extraction of affect features, *International Journal of Advanced Research in Computer Science and Management Studies*, 1(7), 372-380.
- Santori, P.R., Anderson, A.D., (1987). Manufacturing performance in the 1990s: measuring for excellence, *Journal of Accountancy*, 164(5), 141–147.
- Simons, R., (1991). Strategic orientation and top management attention to control systems, *Strategic Management Journal*, 12(1), 49–62.

Slack, N., Lewis, M., Bates, H., (2004). The two worlds of operations management research and practice: can they meet, should they meet?, *International Journal of Operations and Production Management*, 24(4), 372–387.

Striteska, M. (2012). Key features of strategic performance management systems in manufacturing companies, *Social and Behavioral Sciences*, 58, 1103-1110.

Swaminathan, J.M., Smith, S.F., Sadeh, N.M., (1998). Modeling supply chain dynamics: a multiagent approach, *Decisions Sciences*, 29(3), 607-632.

Talluri, Kalyan et al., (2008). Revenue Management: Models and Methods, *Proceedings of the 2008 Winter Simulation Conference*, Eds.: S. J. Mason, R. R. Hill, L. Mönch, O. Rose, T. Jefferson, J. W. Fowler, 145-156.

Tan, K.H., Platts, K.W., (2009). Linking operations objectives to actions: a plug and play approach, *International Journal of Production Economics*, 121(2), 610–619.

Taticchi, P., Balachandran, K.R., (2008). Forward performance measurement and management integrated frameworks, *International Journal of Accounting and Information Management*, 16(2), 140–154.

Tellis, G., Prabhu, J., Charidy, R., (2009). Radical innovation across nations: The preeminence of corporate culture, *Journal of Marketing*, 73(1), 3-23.

Tipping, J.W., Zeffren, E., Fusfeld, A.R., (1995). Assessing the value of your technology, *Research-Technology Management*, 38(5), 22–39.

Tsang, A.H.C., Jardine, A.K.S., Kolodny, H., (1999). Measuring maintenance performance: a holistic approach, *International Journal of Operations and Production Management*, 19(7), 691–715.

Tseng, M.L., Wu, K.J., Nguyen, T.T., (2011). Information technology in supply chain management: a case study, *Procedia - Social and Behavioral Sciences*, 25, 257–272.

Uriarte Jr., (2008). *Introduction to Knowledge Management*. ASEAN Foundation, Jakarta, Indonesia, 167 p. ISBN No. 978 - 979 - 19684 - 0 – 9

Verbeeten, F.H.M., Boons, A.N.A.M., (2009). Strategic priorities, performance measures and performance: an empirical analysis in Dutch firms, *European Management Journal*, 27(2), 113–128.

Verrier, B., Rose, B., Caillaud, E., Remita, H., (2014). Combining organizational performance with sustainable development issues: the Lean and Green project benchmarking repository, *Journal of Cleaner Production*, 85, 83–93.

Wagner J. (2009). *Měření výkonnosti: Jak měřit, vyhodnocovat a využívat informace o podnikové výkonnosti*, Prague: Grada Publishing.

Wasserman, S., Faust, K., (1994). *Social network analysis: Methods and applications*, New York and Cambridge, ENG: Cambridge University Press.

WEFR - The Future of Manufacturing Opportunities to drive economic growth. A World Economic Forum Report in collaboration with Deloitte Touche Tohmatsu Limited, April 2012. 84p. Available from:

<[www3.weforum.org/.../WEF\\_MOB\\_FutureManufacturing\\_Report\\_2012](http://www3.weforum.org/.../WEF_MOB_FutureManufacturing_Report_2012)>. [26 March 2015].

Westphal J. (1999). Collaboration in the boardroom: Behavioral and performance consequences of CEO-Board social ties, *The Academy of Management Journal*, 42(1), 7-24

Wibe, S., (2008). Efficiency: a dynamic approach, *International Journal of Production Economics*, 115(1), 86–91.

Wisner, J.D. and Fawcett, S.E. (1991), Link firm strategy to operating decisions through performance measurement”, *Production and Inventory Management Journal*, 32(3), 5-11.

World Commission on Environment and Development (WCED), (1987). Report of the World Commission on Environment and Development: “Our Common Future”, General Assembly document A/42/427. Available from:< <http://www.wbcsd.org>>. [August 2011].

Wu, C.W., Chen, C.L., (2006). An integrated structural model toward successful continuous improvement activity, *Technovation*, 26(5/6), 697–707.

Yusuf, Y., Gunasekaran, A., Wu, C., (2006). Implementation of enterprise resource planning in China, *Technovation*, 26(12), 1324–1336.

