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Monitoring intellectual capital: a case study of a large company during the recent economic crisis

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To my wife Mayra and kids Daniel and Jose Miguel

Thank you.

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INTRODUCTION

The research problem this investigation addresses is: to identify, using descriptive methods such as case study (Creswell, 2011), how the decision makers of an organization are making their decision on intangibles in order to enable the intangibles to change their behavior to help the organization better respond to an economic crisis context. The research target is to gather significant elements from relevant literature reviewed and develop an understanding in a case study context about how the intangibles change their behavior to adapt to the new and critical situation. Moreover, for this research, the intangible behavior is within a process and intangibles are conceptualized as “living” assets that adapt to the circumstances depending on the context and on the decisions that impact them. However, the past literature did not reveal any explicit references to “living” or “animated” intangibles but, rather, were considered as fixed not animated assets.

It has been found in relevant literature that organizations such as businesses or enterprises during a crisis for example economic, security, health or other; people inside the organization sometimes behave and make decisions differently than in other context such as previously to the crisis and this affects the “process” intangible asset. Yet, it is pertinent to identify what a crisis is, in order to have a base line of this concept. According to Dayton's (2004) report, a crisis is a serious threat to the basic structures or fundamental values and norms of a social system which under time pressure and uncertain circumstances requires people to make critical decisions.

During a crisis situation, most of the people make decisions based primarily on their experience and intuition (Santella et al. 2009) often ignoring other forms of decision support. Mainly, they consider the information that arises from such a circumstance, meaning that they tend to improvise for making decisions and respond to the situation while influencing the behavior of intangibles, such as innovation and process, by doing crisis management. The result is that it becomes hard for the organizational decision makers to rely on the adaptive behaviors of their firm’s intangible assets due to the poor information quality (Dayton, 2004; Adrot and Robey, 2008). In Annex 1 there is an exemplification of the decision making process

and why people make decisions considering their experience and why they feel confident after following the process (Malakooti, 2010; Clark, 2010). Also and per Pressman (2011) one of the important aspects in decision making is to identify the habits and rules that drive individual decision maker's behavior.

Since 2007-2008, the World has been experiencing the worst economic crisis and this is considered as the "perfect storm" after the "Great Depression" that started in the USA in1929 (Krugman et al, 2009). In addition, the businesses and organizations are trying to be safe under this crisis context. That situation impacted not only to the macroeconomic elements of the nations and regions but also to the microeconomic elements of industries; this includes the organizations belonging to those impacted industrial sectors, as well. In line with this, the current research case study considers an example of a large international organization that has been affected with the 2007-2008 international economic crisis (financial crisis) and it is still doing several efforts to respond and survive. This case study will reveal how the decision makers decisions influenced the firm's intangibles performance. For example, intangibles processes were affected by the cost-cutting process as well as relationships outside the organization's boundaries (Adrot and Robey, 2008; Foss, 2010). In this dissertation are included how intangibles are adapting to the economic crisis context and how they have been influenced by executive decision making. The organization continues to enable its intangibles to respond to the situation in order to start a new growth period.

Hitherto, the crisis concept has been reflected on the macro and micro economy, but it is relevant to clarify how those concepts apply to any organization economy. At this point and while comparing the business economy to the macro and micro economic concepts, for definition they are different and should not be considered as similar. So, for the enterprise case study purpose, there are not insights around macroeconomic concepts. However, there have been some cases like during the 1990's Bank crisis in Asia, that the macroeconomic policies impacted the microeconomic decisions and the Banks themselves (Suetorsak, 2006).

Alike the macro economy, the microeconomic concept should not be considered directly to the organization or enterprise economy. Mostly because the microeconomic theory involves industries such as electrical, automotive, and agricultural, among others; while the firms and enterprises are inside those industries. So, the microeconomic concepts are originally from the industrial organizations theory (Ilmakunnas and Topi, 1999) and the organizations belonging are influenced by the industrial sector they belong and are considered for the firm theory. As Kawai and Urata (2002) mention on their report, that small and medium enterprises are close to the economic growth. Meaning that, to apply microeconomic concepts to a specific organization, the industry where the enterprise belongs should be considered in the middle between the both microeconomic and the firm theory.

For this research, the microeconomic concepts such as economic or business cycle from Akerman theory are considered to a specific industrial sector that the enterprise of the case study belongs. Moreover, those concepts are addressed in a proper dimension from microeconomic business cycle of Akerman to the organization case study, while passing by the economic cycle of the industry. This approach is appropriated accordingly to Erixon (2011) report where it is mentioned that the Akerman's concepts and terms regarding business cycles from the microeconomic perspective are the same to those used at the enterprise or firm level.

Previous to the economic cycle theory of Akerman, which is considered during this research, there was another business cycle theorist that provided former microeconomic concepts that were followed later by Akerman. Schumpeter considered as a pioneer on the theory of economic development and new value creation throughout the process of technological change and innovation. Schumpeter focused on the individual entrepreneur contribution to innovation by new novel combinations of resources (Andersen and Striukova, 2010).

For Erixon (2007) Schumpeter's theory of business cycle considers that a former cycle ends not only due to errors on the micro economy but also due to the fact that industries created innovations that make the others fall in a critical situation. Moreover, the recession part of the economic crisis is explained by the interruption of the current non-innovative status and the insertion of an ambiguous, unsound and not considered aspects created by the new innovative industry to start a new cycle (Erixon, 2007).

The Schumpeter's business cycle is compatible to Akerman's economic cycle, mostly because both theoretical models consider innovation as the start of new cycles (Erixon, 2007). Also, the first model considers clusters and the second blocks to explain economic growth, but both concentrates in the industry that would be affected by multiplier accelerators mechanisms for recovery from recessions (Erixon, 2007).

The Akerman's economic cycle was elected for this research because this has a model that identifies the different phases of the business cycle such as the growth, crisis and recession, among others. Moreover, if the industry business cycle is compared to the organization economy behavior (Francois and Lloyd-Ellis, 2008), as market vs. enterprise sales then the both of them seem to be alike, from the shape viewpoint; consequently the Akerman's model might apply, especially while identifying the economic crisis part and the subsequent recession and the following start of a new cycle with a new growth part.

Thus far, it has been considered the elements around economy and its reflections to the enterprise level, but there is another element that needed to be included in this case study and it is related to the intangible assets during an economic crisis management. For example, the concept of R&D is an intangible that could help organizations to respond to an economic crisis because and per Frescati Manual (Edquist, 2011), R&D is defined as a creative work performed under a systematic basis in order to increase the stock of knowledge and use this

new knowledge in new applications. Here is shown that there is no tangible element for the R&D definition.

Next are insights neighboring the intangible assets and how they are part of the intellectual capital of an organization; especially while people are making decisions that change the behave of the intangibles to influence on the organization to respond to the economic crisis, as described before and further covered during the following chapters of this research report. For example and accordingly to Schumpeter concepts, the innovation is crucial for economic growth (Edquist, 2011) and this element is considered as intangible.

At any organization, there are elements that participate or contribute on its value generation. They are not seen, but their contributions are relatively important to the wealth of the organization. If they operate different from the business goal, it is probably that that organization will have problems, but if they are aligned to the business goals and also they are performed to achieve those objectives, then the organization would be successful. So far, this is the importance of the intangible assets of any organization (Lev, 2001; Edvisson and Malone, 1997; Bounfour, 2003; Andriessen, 2004). Moreover, other researchers and knowledge management practitioners have found relevant to identify and measure the intangible assets contributions in different ways, but at the end the primary method to measure them is grouping in the intellectual capital such as human, structural and relational capital (Lev, 2001; Edvisson and Malone, 1997; Bounfour, 2003; Andriessen, 2004). But, it is out of the scope of this research the formal measurement of the intangible assets of the enterprise case study.

Before going forward, it is important to remark the definitions of an asset and intangible asset provided by the International Accounting Standard (IAS) and included in Petkov (2011a) report: An asset is "*a resource that is controlled by the company as a result of a past transaction that is expected to contribute towards future benefits with reasonable probability*" (Petkov, 2011a). Likewise the

definition of an asset, the intangible asset goes further and it requires that the item does not have physical substance and must be identifiable and distinguishable from goodwill (Petkov, 2011b). Next it is textual from Petkov (2011a, 2011b) reports, more detail about identifiable part of the definition that comes from the paragraphs of the IAS:

"*An asset is identifiable if it either:*

a) *It is separable, i. e. is capable of being separated or divided from the entity and sold, transferred, licensed, rented or exchanged, either individually or together with a related contract, identifiable asset or liability, regardless of whether the entity intends to do so; or*

b) *Arises from contractual or other legal right, regardless of whether those rights are transferable of separable from the entity or from other right and obligations."*

Moreover and considering Petkov (2011a, 2011b) reports, next are the IAS classifications of intangible assets. In Annex 2 there is more information about samples and origin of intangibles:

a) Marketing-related intangible assets.

b) Customer- relates intangible assets.

c) Artistic-related intangible assets.

d) Contract-based intangible assets.

e) Technology-based intangible assets.

This research is focused on the identification of those intangible assets that are relevant to an organization and then monitor the way they behave as the intellectual capital of the business, but to let the organization respond to the economic crisis situation. Also, this research has a basic contextual environment that is the economic crisis produced from the international crisis of 2007-2008. In the literature reviewed, there was not found any researches about intangible assets and intellectual capital applied to an organization but under the mentioned context; there were found only a number of relevant papers and reports for industrial sectors or for macroeconomic and microeconomic cases.

Furthermore, the research goal is to identify which intangibles are relevant during the economic crisis of the organization and also to identify how the organization is using them to keep it competitive and respond to the economic crisis, to later start growing again. There is more detail regarding the main research question in Chapter 1.

To contextualize the research, it is important to highlight that the World has changed the way the businesses are performed, especially during the international crisis of 2007-2008 that has changed the face of the economic context (Krugman et al, 2009). This research focus on an organization case study that has been affected by the international context and also includes how it has handled intangible assets that are trying to help the organization to keep it safe and operational during the economic crisis. So, it becomes relevant to monitor the intangible assets and its influence in the shaping of the new face of doing business. Also, and during the research approach, the organization is trying to implement an innovation process that not only would help to expedite the growth but also would help the firm to respond to the crisis. At this point, it is relevant to mention that innovation is part of the intangibles of the organization.

The present research report has eight chapters that include the identification of the taxonomy of intangible assets that applies to the organization case study.

Then, it considers the economic crisis and recession as part of the economic cycle from Akerman business cycle theory. It also considers the monitor of intangible assets that are relevant during the current economic crisis and recession context. So, next are the introductions of the different chapters.

CHAPER 1 is about the goal and scope of this research. It also includes the epistemological perspective of the research around intellectual capital and correspondent intangible assets. This chapter also includes the underline concepts of the intellectual capital taxonomy beginning from the human, structural and relational capital that might apply during the contextualization of those elements during the economic crisis. Moreover, there is more information about the approach of research and the main questions of the investigation as well. Those questions are the guidelines of the research. Thus, the research approach is using a case study of an organization that is experiencing an economic crisis and how it is using its own intangible assets to respond to that situation.

On Chapter 1 are included a number of perspectives on regards of intangible assets and intellectual capital in order to clarify them. This part addressed that the intangible assets are those elements of the organization that are not seen and touch but contribute in somehow to part of the value generation of the organization, while the intellectual capital provides a method to measure and report in an orderly way those intangible assets.

Herein is reported the approach followed that includes field interactions with decision-making people in order to identify those intangible assets that are becoming relevant during the economic crisis and how they are helping to respond to that situation and prepare the organization to start a new cycle later.

CHAPTER 2 considers and talks about the intellectual capital identification for any organization, regardless the growth or contraction of its economy. Later on

this chapter of the research report, it is a direct classification of those intangible assets appropriated to the economic crisis context. However, in this chapter there is a journey from the employees' knowledge and up to the intangible assets that are part of the intellectual capital, but being part of a theoretical framework, that would help to build later the taxonomy.

Hereinto, there are definitions regarding the three categories of the intellectual capital as follows: human, structural and relational capital; and how the intangible assets that constitute that intellectual capital begin at people minds and their ideas. After considering altogether, there is built an intellectual capital general taxonomy that considers the relevant intangible assets of the organizations and how they are grouped in the three categories mentioned on this paragraph.

CHAPTER 3 includes the economic cycle and the correspondence to the economic crisis and recession part of the set. The identification of these parts is relevant due to the scope of the research and also to identify this context for the enterprise case study. This chapter includes the economic cycle for the microeconomic variables. This was significant, because the majority of the relevant literature found was more related to the macroeconomic variables than to the microeconomic. So, after reviewing different authors and refining the search of microeconomic variables, this chapter concentrates only on Schumpeter and Akerman's concepts. It is relevant to mention that those microeconomic concepts are reflected to the industry and consequently are mirrored to the enterprise level, as mentioned previously in this introduction.

Regarding economic cycle, authors such as De Langen (2002) considers that it is relevant to recall the former economic concepts defined by primary theorist, whereas the cycle concept was more aligned to the agricultural cycles and moon phases. In the early 1900's, the economists of that time considered that the economy and crisis were more related to agricultural production cycles than other activities. This is because at the beginning of the cycle, there was certain amount

of agricultural production (based on year station and moon phase) but after that cycle passed there was an insufficiency of production and then it created an economic crisis, for the reason that there was no more food available, such as meat or different grains like corn to buy or to sell (De Langen, 2002). That is the reason why several economists considered an economic cycle in terms of years. Later on, other economists such as Schumpeter considered the economic cycle more related to industrial cycles. After him, there were more economists from the same region of Stockholm School, such as Akerman that continued the research, but this last author focused his theories from the macroeconomic perspective like Schumpeter to the microeconomic level and to end up to the firm level. Furthermore, more authors such as Keynes are not considered in this research because their theories are at the macroeconomic level only; and it is not possible to use those concepts up to the enterprise level.

On Chapter 3, there are included Schumpeter’s and Akerman's business cycle theoretical models, respectively; and also are considered their own perspective and concepts as well as other authors contribution to these economists from Stockholm. For this research purpose, it is considered Akerman's business cycle and all of its phases that depicts the economic crisis and recession. Also, it is considered a validation to use those microeconomic concepts and terms from the industry level up to the firm level, according to Erixon (2009) report.

CHAPTER 4 includes the taxonomy of intangible assets but focusing them on those that are relevant during an economic crisis and might apply to the research case, in order to accomplish the main goal of the research. In this part there are also included the accounting concepts of the organization case study and are only considered those related to expenditures on intangibles. Moreover, the expenditures considered should be related to intangibles, but they might include tangibles as well.

Also, in this Chapter 4 there are identified intangible assets from any organization but in a context different to an economic growth. The approach used to filter the main inventory of intangible assets that are included on the general taxonomy described on previous chapters. It was to focus on those that appropriated to the crisis and recession context considered on relevant literature reviewed for industry and firms in a similar situation. For example, there were considered organizations with international operations, government entities and policy makers' contribution while creating new laws and institutional adjustments to let enterprises respond to the crisis. Also considering the own organization approach and actions. At the end of this chapter, there is a theoretical inventory of intangibles assets that are relevant under and economic crisis or recession. This last list is compared to the decisions made of the enterprise and then compared to confirm or adjust an appropriate inventory for the organization.

CHAPTER 5 is regarding the research methodology, herein are described the steps followed during the research and also the ways used to gather and analyze the relevant data acquired. This chapter describes the quantitative and qualitative approaches that were used to identify the relevance of the intangible assets. The quantitative approach was implemented to handle hard data available, such as sales (billing) and expenditures. Meanwhile the qualitative approach was more related to the answers and soft data provided by the decision makers of the organization. Also all the interactions and data gather considered time span of 5 years accordingly to the economic cycle of the enterprise case study, and also includes the a growth phase and the later recession. The end of the recession is not complete jet, but there is an optimistic feeling of the decision makers that make them think that the growth or new cycle would arrive there in a couple of years more.

For the quantitative approach, known statistical tools such as standard deviations, means, T-test, F-test and Pearson correlation were implemented in order to identify relevant data of the different expenditures enlisted on previous

chapters and compared to the sales (billing) of the organization. However, after several designs of experiments executed with the amount of data gathered and its respective and intrinsic quality, the results reached were not conclusive and the information achieved did not provided an appropriate answer to the research question. So, an alternate method was elected. This method is the calculus of the area (surface) under a curve by calculating the integer of a polynomial equation. This method required to identify the equation of the data series of the sales (billing) and expenditures; then to calculate the surface under such equations between the time span identified. After comparing the surface during the growth vs. recession, the expenditure on intangibles is defined as relevant for this research.

Regarding the method used to provide a qualitative answer to the research question, it is important to mention that the main reason because the polynomial approach was elected vs. any other was due to the fact that the mentioned approach reduced the uncertainty of the result while doing the surface integral with the actual amount of data of the series and it was not required to gather more data. Also, this approach provides the answer not only with the surface calculation but also graphically. Meaning that in an x-f(x) axis graph it is shown the trend and relevance of the calculation done.

This Chapter 5 also includes the qualitative approach that considers interviews to the different decision makers of the organization case study. The idea with this information is to identify how intangible assets are behaving and are adjusted to respond to the critical situation, based on the relevance or importance that relevant actors are making around them. The information gathered then is in graphs in order to identify those intangibles that are relevant for the decision makers of the organization.

Also and to perform this chapter, it was relevant to review applicable references around ground theory and qualitative research. Primarily, due to the fact that the

information gathered from the interviewed people was obtained from direct conversations on a regular basis and also, they were well-informed about basic rules to communicate for those concepts used in the research (Berge, 1998). It meant that previously was documented a ground theory on Chapter 4 and the information collected was then grounded and analyzed as quantitative data to make it comparable to the qualitative analysis performed previously on this chapter.

In CHAPTER 6 are included the findings of the research and the answer to the main questions as well. Thus are included the different analysis qualitative and quantitative that were mentioned on the methodology in order to find those intangible assets that are more relevant during the economic crisis and recession. The information gathered was analyzed and then it was built a new taxonomy of the intellectual capital but appropriated to the organization and to the current economic crisis and consequent recession. This chapter identifies those intangibles that are relevant from the decision made and also those expenditures on intangibles that are helping to keep the organization competitive.

Also, in this Chapter 6 is included a special part of the analysis related to one relevant intangible asset, that is part of the intangible asset of process and procedure belonging to the structural capital. That intangible asset elected was focus to the quotation and pricing process of the final goods to be sold. This asset was chosen because this organization is experiencing problems with the income and part of this symptom is related to the way the organization makes its quotations and pricing. The idea is to drill-down in more detail within the mentioned asset and try to map the decisions made to it and its correspondent answer or impact that has on the organization. The result is an increase on the quotation hit-rate and win-rate, meaning that without decisions around it, the quotes would be diminished and consequently would affect the income; but after the process was updated to the current context, the situation started to change and revert in order to be more successful after a quotation was submitted for a

bid or sale of the final product. In the future, this would be echoed in the sales (billing) graph.

CHAPTER 7 includes the research results conclusion. This chapter includes the relevant findings during the monitor of intangibles during an economic crisis of the organization case study, such as the identification of those intangible assets that are relevant during the economic crisis as well as the pertinent expenditures on intangibles. Thus, there are enlisted two sets of intangible assets: one based on the expenditures of the organization, result of the polynomial approach and the second is the list of intangibles based on the qualitative analysis of the interviewed people.

Also, there is a part that provides the answer to the research questions based on the findings, which is related to the adequate taxonomy for this case study and economic crisis context. Moreover, this chapter includes a list of other lines of research that could be followed in order to enrich the exploration around intellectual capital. This part includes a number of ideas to expand the research to other intangibles during a similar context, or move and expand the scope to the measuring and considering the contribution of the intangible assets in a financial report.

The CHAPTER 8 includes a general conclusion for this research. This chapter describes the principal conclusion and also puts the results in perspective respect to other efforts done by international authorities regarding intellectual capital and knowledge management such as several entities that are doing their activities to help nations and organizations to overcome the economic crisis and how the intangible assets are considered to help. For example, there are efforts from the World Bank to measure the national intangibles while implementing the Knowledge Assessment Methodology; or the activities around intangibles done by the OECD and identify how they help to growth nation or regions, such as

considering innovation as the main driver of economic progress and also to build an Innovation Strategy to help nations and regions (OECD, 2007).

At the end of this research and considering relevant literature around the current economic crisis, there are at least two concepts to reflect on: First, the microeconomic and industrial business cycle concepts influence on the economic behavior of the enterprise. This was shown while comparing the Akerman's microeconomic model, the industry market and the enterprise sales. The three of them were alike and the different cycle's phases could be identified. And second, the intangible assets of the organization are helping to provide an appropriate response to the economic crisis. Moreover, the intangible asset of innovation is considered for authorities such as the OECD (2009) as the activity that any organization such as regions, nations, cities and enterprises should foster to overcome a crisis situation and also to provide a long-term growth.

Before closing this introduction, it is also relevant to mention that not only the interest on intellectual capital is for nations or regions; it also includes the enterprise level. In this last sector there is more interest about intangible assets and its impact on business performances. There are evidences on Annual Financial reports, such as the Australian companies (Jones, 2011) that include intangible assets as part of the value generation or cost expended during the previous year of the report.

Typically the intangible assets that are included on annual financial reports are similar to those mentioned by Jones (2011) as follows: patents, trademarks, brands, licenses; and other less commonly reported such as: copyright, intellectual property, royalties, franchises, media master-heads, proprietary technology and technology rights, among other. However, the list of intangibles included in this paragraph could be grouped in the three categories of the taxonomy of intellectual capital of the organization.

CHAPTER I: RESEARCH OBJECTIVE

Previously to the current decade of 2010s, an important number of organizations have been interested on identifying or measuring the value contributions or impact of the intangible assets on their performance (Marr et al, 2003; Bounfour, 2003; Spender, 2006; Allee, 2008). Also, several academics and knowledge management practitioners have contributed to the formal literature regarding how to identify intangible assets and also how to measure them into the intellectual capital context. For example, Spender (2006) considers that intellectual capital includes people capabilities.

Since 2008, the World has been experiencing an international economic crisis; it is quite similar and relevant as the 1929's downturn in the USA. The goal of this research is to identify and monitor the intangibles assets of an organization but under an economic crisis situation. The main idea is to contextualize the intellectual capital of the organization but in an adverse economic environment such as an economic downturn and then identify how those intangibles are helping the organization to respond to the crisis.

Thus, there are two situations that need to be attended. The first is related to the identification of the underlying aspects of the intangible assets that are part of the intellectual capital of an organization. And the second is about the economic crisis and the relevant intangibles that help the organization to respond to that challenge and then to start a new economic cycle, staring with growth.

Ordoñez (2003) and others mention that it is often found on the intellectual capital literature that the intangible assets are grouped in three. For example on the IC-Rating or on the Sveiby's Intangible Asset Monitor (Tichá, 2008; Andriessen, 2006) they identify the intellectual capital in the following groups: human capital, relational capital and structural capital; but in other cases, they exchange the last one by the organizational capital. Moreover, other authors

such as Allee (2008) group the intangibles in human competence, brand and relationships, as well as internal structure. However as Moeller (2009) mentions and accordingly to the Working Group on Intangible Assets of the Schmalenbach Society Working Group Accounting and Reporting of Intangible Assets – WGARIA- the intangibles could be grouped in seven independent categories of capital: innovation, human, customer, supplier, investor, process and location. Thus, the value contribution of the intangible assets could overlap two or more categories and are part of the intellectual capital of the organization (Lev, 2001).

So the epistemological difference between authors such as Sveiby and Moller are reflected in their way they make a taxonomy and grouping of the intangible assets of the intellectual capital of an organization. For this research and considering the underlying concepts of how to make taxonomy and grouping of the intangible assets, the appropriate way to manage and monitor them appropriately are by grouping in the three groups of the intellectual capital taxonomy: human capital, relational capital and structural capital.

At this point, it has been clarified the intellectual capital taxonomy and how the intangible assets are part of the three categories; but it has not been expressed the linkage between the intangible assets and the intellectual capital, so far. For authors like Lev (2001), the intangibles are elements of the organization that claim for future benefits but do not have physical or financial embodiments. Also they are normally referred as a concept for the accounting literature. For this case, the intellectual capital concept is related to the management and legal literature, but it is an interchangeable term with intangible assets.

Other authors like Bounfour (2003) expresses that the intellectual capital is a perspective that provides a method that measures the intangible assets contribution to the organization but in four categories according to Skandia Navigator and in terms of accounting. Meanwhile, for Andriessen (2004) the intellectual capital is a method for measuring intangible assets. Although there

are several methods to do the measurement, the intangible assets could be set on three groups: the first group uses the intellectual capital to solve internal management problems and use the intangibles in an improved way for decision-making. The second group uses the intellectual capital to report in financial way the investment on intangibles. And the third group is related to give a price to mobilize intangibles while selling them or to calculate goodwill. Despite of the grouping, the intellectual capital is used as a method for the valuation of intangible resources.

Furthermore, authors like Edvisson and Malone (1997) consider that the intellectual capital is a taxonomy and perspective to measure the economic contribution of intangible assets of the organization in an orderly way and grouping them in different groups. Additionally, for Bontis (2002) the intellectual capital is a strategic tool to measure the performance of intangible assets in an organization. Meanwhile for Roos et al (1997) consider the intellectual capital as a language to think, talk and act around the conductors of the future drivers of the organization.

Thus and considering the underlying concepts of the three groups of the taxonomy the intellectual capital for the intangible assets and the linkage between them; for this research the intellectual capital is considered as a perspective to classify and monitor the intangible assets on three groups while the intangible assets are those elements of the organization that do not have physical embodiment, but an important economic contribution and are part of the accounting terminology. The three groups of the intellectual capital taxonomy considered are as follows: human, relational and structural capital.

Returning back to the beginning of this chapter, the second relevant consideration of this research, besides the intellectual capital, it is the economic crisis as a context for the research analysis. But before mentioning the economic crisis, it is relevant to identify and clarify what the economic cycle is and its

different parts such as: the prosperity, the crisis, the downturn or recession, and then the back to prosperity (Akerman, 1960; Calandro, 2004; Francois and Lloyd-Ellis, 2008). Now that the economic crisis has been identified as a part of the economic cycle, it is relevant to clarify and identify the intangible assets that are relevant. This relevance is due to the fact that the decision makers make their own decision to adequate intangible assets that help the organization to respond the downturn phase and consequently to accelerate the beginning of a new cycle starting at the prosperity part. This research focuses on how intangible assets of any organization that undergoes through an economic crisis and downturn, are helping to respond to the critical situation. The goal is to monitor them as the intellectual capital in order to identify which are having more relevance while comparing among them.

1.1 Research Context and Case Study

As mentioned previously and under the context of the international economic crisis of 2008, this research set the basis of a theory about how intangible assets help organizations to respond to economic crisis and recession. To confirm such statement, this research also considers a case study of a large enterprise located in Mexico that it is not exempt of this situation due to its natural market relationship in North America; and it is experiencing a slope-down of its own business economy. Despite of this current situation, the enterprise was experiencing an impressive growth that allowed to expand its operations to another country and also to expand its portfolio of products and services; including the design, manufacturing and sales of new line of products and services.

Also, it is considered for this case study that the international economic turbulence started on the USA in 2007 but affected the enterprise in 2009 as shown on Figure 1.1. On this Figure 1.1, there are identified two cycles: the first

ended in 2004 and the second started in 2005. This research is focused on critical situations and considers the case study of the large enterprise economic cycles as follows: From 2005 to 2008 the business experienced a positive slope of operation profits, but in 2009 its economy started to diminish due to low sales and market contraction as a consequence of the international economic crisis, and it is estimated to continue with this trend in 2010 and even the following years. On the Figure 1.1 is shown the end of a previous cycle (or cycle 1) and then an almost complete one in terms of operation profit, which was used for the case study of this research (or cycle 2). Moreover, this Figure 1.1 is used as reference of an enterprise economic cycle, but it is relevant to clarify the usage of microeconomic concepts and terms of the microeconomic business cycle on an enterprise economic cycle because those models can be mirrored to the industry of market whereas the enterprise belongs and then reflected to the enterprise economic performance.

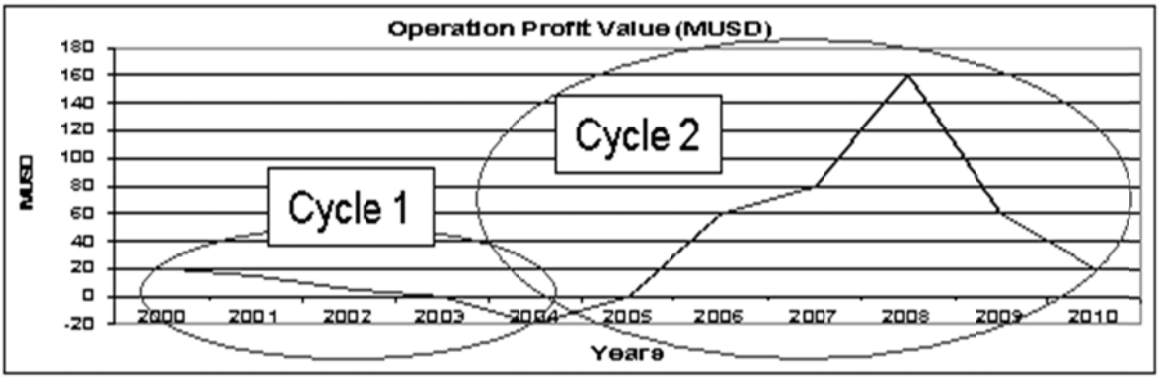

Figure 1.1. Research case study and its 10 years' operating profit

1.2 Research Question

Considering the previous information mentioned and the research goal of corroborate the theory around intangible assets contribution to respond during economic crisis, the case study used to confirm the theory mentioned is focused

only on the economic crisis and recession of the almost complete cycle 2 identified on Figure 1.1. Only on year 2009 starts the crisis and continue as recession during the following years. Thus, the research goal is to identify the intangible assets that are contributing to an organization in order to respond to the crisis and also be ready to start a new cycle as soon as it arrives.

So, to monitor the intangible assets during the crisis, the research question is stated as follows:

> **What is the performance of the intangible assets from the enterprise intellectual capital during an economic crisis context?**

To clarify the intangibles trends and organization priority on them and also to have a broad perspective and answer to the research question, there are three additional complementary questions as follow:

> Q1. Which intangible assets are relevant during economic crisis?
>
> Q2. How is the organization spending on intangibles during a downturn?
>
> Q3. How are managers making decisions during the economic crisis and recession to influence on intangible assets?

1.2.1 Theoretical Assumptions for the Complementary Research Question

After considering relevant elements and also considering assumptions found during the literature review regarding intangible assets, the complementary question sated above could be completed as follows:

Q1. Which intangible assets are relevant during economic crisis?

Assumption: Intangibles related to human capital should remain secure inside the organization. This means that the individuals of the organization provide tacit-to-explicit knowledge that turns into intangible asset to resolve problem during though times (Harvey and Lusch, 1997; Schenker-Wicki at al., 2009; Eliasson, 2005; Heylen and Pozzi, 2007).

Moreover, intangibles associated to relational capital have relevance due to the need of the organization to access public economic resources and promote laws and economic rules to facilitate the commerce and reactive local economy (Chin et al., 1999; Ernst, 1998).

Finally, intangible from structural capital should focus on activities that create differentiators and innovations to the current portfolio of products and services, while coming from R&D activities and cost-out projects (Tan and Mathews, 2009; Pate and Narain, 2008; Moore, 2009).

Q2. How is the organization spending on intangibles during a downturn?

Assumption: Considering particular cases under a downturn such as the Asian airlines that experienced and economic crisis during the 1990's. They decided to stop spending on expenditures related to flights that did not create relevant value or were costly, so they decided to remove those travels (Chin et all, 1999). Another example is Daewoo, the Korean *chaebot* that de-incorporated the motor business and focused their operation to other activities, this during the same Asian economic crisis (Alvarado, et al., 2007). Also, those organizations that experienced a downturn, they tend to cut the majority of costs that are not directly related to the value generation such as organization imaging or other non-

productive activities. Additionally, organizations spend only on activities that reinforce competitive advantages. The business focuses on high profit product and services while eliminating those that the revenue was low or took much time to see the profits back (Lafrenz, 2006).

Moreover, organization would use more resources on R&D activities to create new products and services that satisfy current demand and customer needs. For example those devices based on high technology but at lower prices. Thus implies from the investment to let the business be ready while the growth shows up (Blausten, 2009).

Q3. How are managers making decisions during the economic crisis and recession to influence on intangible assets?

Assumption: The relevant literature around decision-making during economic crisis mentions that organizations decision-makers put together conclusion faster than ordinary times and the decisions are based majority on their instinct and experience. This means that during expansion or growth time, decision-makers have more time to analyze the situation and choose considering the majority of information and data available (Bonn and Rundle-Thiele, 2007; Sayegh et al., 2004; Lee et al., 2008; Santella et al., 2009).

The decision-making behavior expressed in the last paragraph has a direct impact to on the intangible assets adaptability. This means that since decisions are done fast and other would take more time; the intangibles would change the way they ordinary behave. For example, the cut-cost process is not considered so often during growth period, meaning that this asset is not having too much mobility in that period of time, but after the crisis arises and the decision makers consider it as a priority, then this asset would have more relevance and also it would be monitored every so often. The consequence is that the perception and

relevance would move from a low profile situation to a high one and its performance would be considered during the downturn.

1.3 Research Approach

To answer the primary question and its complementariness, the research was conducted base on the following Figure 1.2.

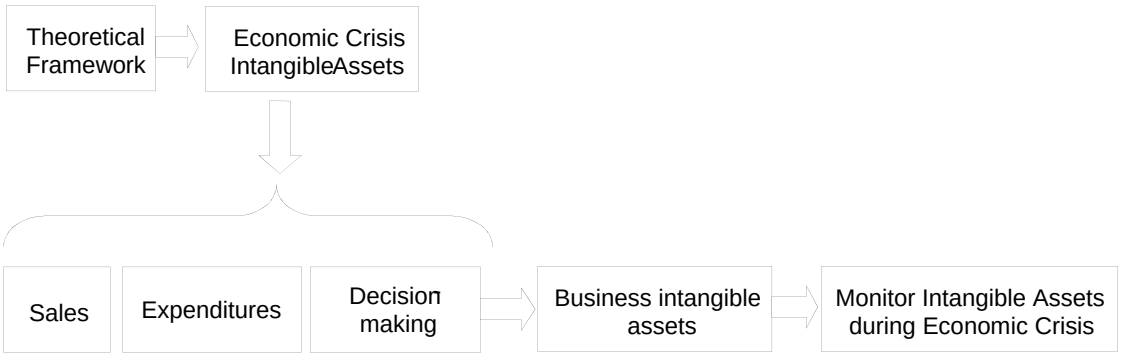

Figure 1.2. Research diagram

On the Figure 1.2 is shown that this research starts with the identification of the theoretical framework around intellectual capital, intangible assets and economic crisis. With the information gathered, the theory of this research is built around those intangibles that contribute on the organizations to respond to an economic crisis. Also, the group of intangibles is part of the intellectual capital taxonomy. After this point is addressed, a case study is elected to confirm the assumptions stated in the research theory. The case study focuses on a large enterprise that is experiencing an economic crisis and recession. Then and from this organization is collected relevant information that includes monthly sales, monthly expenditures on intangibles and relevant-important decisions made by

the decision-makers. The complete information gathered is used to identify those intangible assets that are relevant for the enterprise but under the critical condition and confirm the theoretical concept of this research about those intangibles relevant vs. real case. After that next starts the monitoring of behave of those intangibles during the crisis and recession of the organization.

Identifying intangible assets that are relevant during economic crisis has different aspects to consider. The first is to clarify where and when the economic crisis is in the business cycle. To confirm the theory of this research it is considered in the case study the last ten years, whereas a complete economic cycle has been identified. For the economic crisis and clarity/quality of the information and data available, the research focuses on the last 5 years (2005-2010).

Although the economic cycle has been associated to the business operational profit, this research considers on the case study the sales (billing) trend because it has a similar trend and shape like the economic cycle of the industry it belongs to.

After identifying the phases of the cycle using the sales (billing) trend as base line, the next step is to compare that trend to the expenditures of the business. To perform this activity, the information regarding expenditures is classified in two mayor categories: the first is related to tangible and material assets and the second is for intangibles. The first category is not considered in this research and the second is grouped in 3 types: those account terms related to human capital, related to structural capital and related to relational capital. However, some of these expenditures might have tangible parts that cannot be separated.

The last activity of this method consists on identifying more intangible assets but while reviewing the decision made during the related period of time. To gather this information, periodical interviews with decision makers were conducted as follows: 15 minutes interviews once a month during one year with 4 managers

and 1 director. The answer was compared to the intellectual capital taxonomy and intangible assets adjusted to and economic crisis context, then the relevance of intangible assets was identified. This information is compared to the result of sales trend and intangible expenditures during the same period of time.

With the previous information, a monitor of intangible comes after comparing the behavior of the intangible expenditures and the intangible assets while compared to the business cycle of this research. To perform this activity, the data gathered was compared using statistical tools that included standard deviation, F-test, T-Test and Pearson correlation, as well as mathematical ones such as the polynomial equations of the data trends to calculate the surface under the curve using the Integral function. This means that the data polled is ordered using polynomial equations and compare them graphically.

Moreover, a final considerations was done that implies to focus to one intangible asset and monitor its behave during the down turn. This approach is due to the fact that the theory stated in this research ask for the monitor of the intangibles and its result on the business performance; the case study help to confirm this concept. To answer this new matter and because of the nature of the organization of this case study, the asset considered is the one that was more mentioned by the decision makers and it is related to the quotation process. A special focus had been done to monitor this asset that includes not only the decision made around it, but also to identify extra expenditures that were done to foster the goal and purpose of this asset.

The information gathered in this research and principally after the analysis of the data obtained would be shown to the director of the area. This is due to the fact was an “un-written” agreement but the relevant information would provide the analysis of the area.

CHAPTER 2: INTELLECTUAL CAPITAL THEORETICAL FRAMEWORK

As described previously, the intellectual capital of any organization could be considered as a method to group and measure the contribution of the intangible assets and they could be grouped in 3 (Bounfour, 2003; Ordoñez, 2003; Andriessen, 2004): human, relational and structural capital. Next in this chapter is described the origin and flow of the intangible assets of the organization. Thus for this research, as Polanyi mentioned in his research, the beginning of an intangible asset starts at the tacit knowledge of the people. That knowledge is then turned into assets (Nonaka and Takeuchi, 1995; Ordoñez, 2003).

2.1 Knowledge Assets and Intellectual Capital

The Figure 2.1 illustrates the origin and possible consequence of knowledge assets in an organization, considering it as a part of the intellectual capital. The knowledge assets begin at people minds after they enhance their tacit knowledge due to three incomes or sources (Ordoñez, 2003; Nonaka and Takeuchi, 1995; Pfeffer and Sutton, 1999; Spender, 2006):

1) The previous experience and knowledge.

2) The knowledge gotten due to R&D projects.

3) The knowledge gain during on-the-job projects.

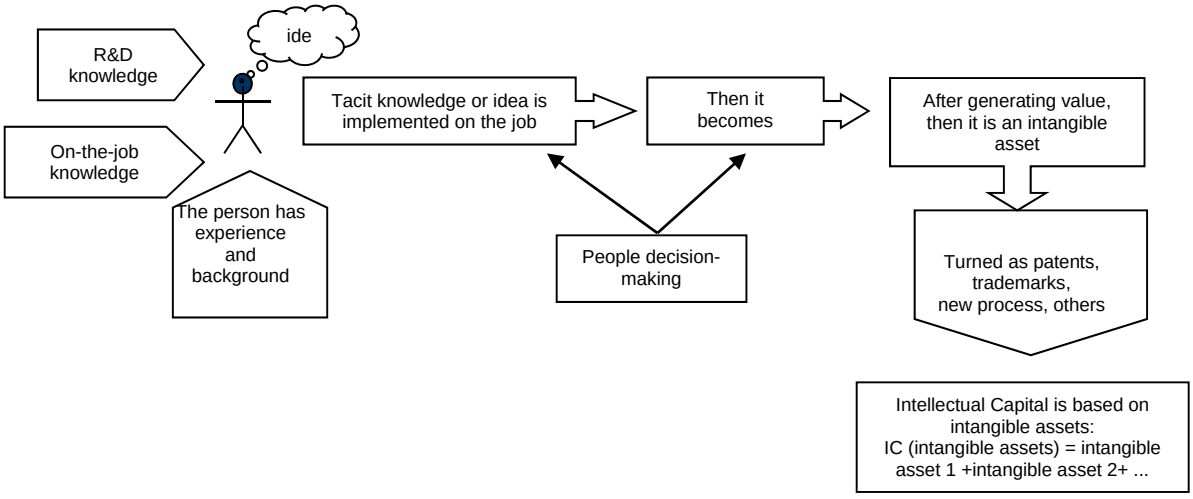

Figure 2.1. Intellectual capital flow coming from knowledge assets

(Schenker-Wicki at al., 2009; Eliasson, 2005; Yang et a., 2007; Rudez, 2006; Castro and Lopez, 2008; Bornemann, 2007; Stahle and Bounfour, 2008; Marr and Adams, 2004; Mourtisen et al., 2001, Jennewein, 2004, Lee et al., 2003)

With these elements, the person can generate knowledge maps (Andriessen, 2004) coming from ideas to solve work problems or to execute a research project. When those ideas are exteriorized coming from their mind into a solution to the normal job, then that knowledge can be classified as knowledge asset (Nonaka and Takeuchi, 1995). Herein, the person makes decisions based on the current context of the organization as well as on the job basis.

Thus far and for example, the knowledge are part of the human capital, because it is from the people head and then people rent this capital to the organization; but depending on its final destination, it is turned into structural or relational capital (Yang et a., 2007; Rudez, 2006; Castro and Lopez, 2008; Bornemann, 2007; Stahle and Bounfour, 2008; Marr and Adams, 2004; Mourtisen et al., 2001, Jennewein, 2004, Lee et al., 2003). Furthermore, if the intangible asset turns into a selling product such as a patent, trademark or best practice, subsequently it

means that the intangible asset could be measured while giving an economy value and then it could be grouped into the intellectual capital of the organization, as mentioned previously during the relationship between intangible assets and intellectual capital.

2.2 Intangible Assets Concepts

Due to the fact that the intangible assets are part of the organization, it is relevant to describe what an intangible asset is. Accordingly to Lev (2001) an intangible asset is any asset that has a future economic benefit or income for the organization, such as goodwill. Although, it cannot be managed using traditional accounting, but nowadays it is widely used in literature done by academics, accountants and economics specialist or practitioners. Furthermore, Andriessen (2004) considers that intangibles assets are more likely as intangible resource because the asset term implies control and ownership, while resource is more appropriate to the intangible nature. This means that intangible assets should be considered as resources that have a future economic benefit and are accounted under new accounting rules. Finally, Bounfour (2003) considers that the intangibles of the organization are the main source of value creation and competitive advantage of the organization that holds it. So, the intangible assets are important element of future economic benefit of the organizations and it holds the organization goodwill.

2.3 Intangible Assets as part of Intellectual Capital

Considering that persons are the most relevant asset in any business and a source of the core competences (Harvey & Lusch, 1997), they have a significant role in the organization. This is because the stakeholders & stockholders, directors, managers, staff personnel and all labor should demonstrate decision-

making, loyalty attitudes, work commitment, right values, work group (including external entities), innovative attitude and efficient to help business being successful and make it competitive (Gonzalez et al., 1995; Blausten, 2009; Wu et al, 2007). The specialized literature has identified numerous cognitive mechanisms that appear to guide successful managers toward effective decisions that include: the processing of the information, the gathering data intuitively and the emotional reactions that interact instantaneously during the decisions process (Sayegh, et al., 2004). Theoretical models incorporate the roles of emotions and tacit knowledge in instinctive decision-making of managers, particularly when they are experiencing an economic crisis conditions. Those models consider emotions and experience as key components in instinctive decision-making (Sayegh, et al., 2004). More detail is in the following chapters.

As mentioned previously and as found in general literature, the intangible assets could grouped in three as part of the intellectual capital taxonomy: human, structural and relational capital.

2.3.1 Human Capital Concept

The intellectual capital of the organizations is hidden inside the walls and is part responsible of the value generation of the organization. In addition, part of the importance of intellectual capital is the complete group of intangible assets that create it such as the human capital. This group is made of different knowledge assets of the person, such as people knowledge backlog coming from training, skill, innovation and other (Ordoñez, 2003). Also, this capital is part of the core competence underpinnings of the organization (Harvey & Lusch, 1997; Jennewein, 2004, Lee et al., 2003).

2.3.2 Structural Capital Concept

As mentioned previously, the core competences of organizations are made of intangible assets; also the majority of them come from people ideas. However, after those assets are implemented in the organization and contribute in the value creation, such as intangible assets like process, method, systems, information technology software, among others (Ordoñez, 2003); the second group of the intellectual capital arises that is the structural capital.

The structural capital includes all of those assets that stay at the organization, as some say that they reside inside the walls right after people goes home (Rudez, 2006; Castro and Lopez, 2008; Bornemann, 2007; Stahle and Bounfour, 2008; Marr and Adams,2004; Mourtisen et al., 2001).

2.3.3 Relational Capital Concept

After taking into account the intangible assets of the organization, at this moment there are considered only those that has a direct implication to the inside operation of the organization or endogenous perspective. However, there is another group of intangibles that have a direct relation to the activities outside the organization that involves customer, government authority relationship and international operations, among others. This group is named as the relational capital (Ordoñez, 2003).

After the three groups of intangibles have been identified, next is described the taxonomy of the intellectual capital of an organization. This approach would help later to identify those intangibles that are relevant during an economic crisis, as described in following chapters.

2.4. Intellectual Capital General Taxonomy

The identification of the intellectual capital taxonomy of an organization is not an easy task. This is because there are several situations that might be considered by the time the intangible assets inventory are enlisted, i. e. the attitude and willingness of the upper level management of the organization to consider them (Marr et al, 2003). But after reviewing relevant literature around this concept and also considering the pervious parts of this chapter where the intellectual groups the intangible assets in three, there is a way to build out the intellectual capital taxonomy of an organization. Next are identified the most relevant elements found in this review. This information would be used to identify the appropriate taxonomy but for an organization experiencing an economic crisis.

Furthermore and as mentioned previously, author such as Rudez (2006) mentions in the report that there are intangible assets that constitute the intellectual capital of an organization and also create additional value because they generate competitive advantages. Those intangibles consider the possession of knowledge, experience, technical development, customer relationship and other intangible assets that are used in the strategic maps of the business. Also, other authors such as Castro and Lopez (2008) among others found in the relevant literature reviewed are concurrent on an intellectual capital taxonomy model of any organization that considers the elements enlisted on Table 2.1. Additional, they consider the term of Capital due to its economical nature of value generation. On the Annex 5, there are specific definitions of each element of the intangible assets enlisted on Table 2.1.

Intellectual Capital	Intangible Assets
1. Human Capital	1.1 Backlog Knowledge 1.2 Skills 1.3 Innovation 1.4 Values 1.5 Experience 1.6 Know-how 1.7 Loyalty 1.8 Performance 1.9 Development 1.10 Attitude 1.11 Other
2. Structural Capital	2.1 Investment in R&D 2.2 Investment in technology 2.3 Process and procedures 2.4 Innovation process 2.5 Intellectual property 2.6 Cut cost process 2.7 Culture 2.8 Administration and management 2.9 Information technology 2.10 Routines and practices 2.11 Publications 2.12 Business strategy 2.13 Other

Intellectual Capital	Intangible Assets
3. Relational Capital	3.1 International and local providers 3.2 Customer 3.3 Government participation 3.4 Partners 3.5 Stakeholders 3.6 Stockholders 3.7 International policies 3.8 International operations 3.9 Consultants and assessors 3.10 Other

Table 2.1. General intellectual capital taxonomy

(Rudez, 2006; Castro and Lopez, 2008; Bornemann, 2007; Stahle and Bounfour, 2008; Marr et al, 2004)

However for Castro & Lopez (2008) and Mourtisen et al (2001), there are more elements apparently aside to those enlisted on Table 2.1, but after reviewing their definitions and comparing them to the three groups of intangible assets, the supposition is that they are included but under different names or representation, i. e. Technology and Organizational capital belongs to structural capital, or the Business and Social capitals belong to relational capital, because of their natural capacity of the business to relate with other and facilitate the performance of several basic business processes. But, compared to Mourtisen et al (2001), the innovation is part of the human capital and not to the structural capital; also the Customer capital is considered, but due to its behavior and description is more related to the relational capital than standing alone.

In the following chapters, the taxonomy described on Table 2.1 is used for the identification of those intangible assets that become relevant during an economic crisis and also this table is an important referential element during the analysis of the qualitative and quantitative data of the research case study.

CHAPTER III: ECONOMIC CYCLE AND ECONOMIC CRISIS THEORETICAL FRAMEWORK

The economic crisis is part of the economic cycle. For the aim of this research, in this chapter are considered two relevant theories related to economic cycles that can be considered as business cycle as well. After reviewing different authors such as Leontief, Keynes, and Foster among others related to economic theories, the majority of them focus their theories on macroeconomic models, but the two theories that were relevant for this research are Schumpeter's and Akerman's. These two authors developed two different theories, one each; and they have included the microeconomic perspective. Moreover, Akerman included on his model of the business cycle the firm economic performance (Erixon, 2011) as part of the microeconomic theory; making possible to use his business cycle model as a referral up to the enterprise level that allows to use his theory of business cycle as the economic cycle of the enterprise that is used on the case study of this research. Schumpeter and Ackerman were members of the 1920's-1930's Stockholm School.

Moreover in this chapter not only are considered the relevant concepts of the economic cycles of Schumpeter and Akerman, but also are included other authors contributions to Schumpeter's and Akerman's theoretical frameworks. With the consideration of this part of additional contributions to former theories, there is an update and also helps to adequate Akerman's model to this research.

3.1 Schumpeter Business Cycle and Microeconomic Theoretical Concepts

Schumpeter business cycle model considers three fundamental elements as follows and are described on his book "Business Cycle: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process" (1939):

1) Regardless the macro or micro economic perspective, the economy of an organization is influenced by external elements and they make it change and adapt. This concept was demonstrated while the *railroadization* of the US, the changes on agriculture and lately on the automobile industry in the early 1920's. The three industries were affected due to the economic environment by that time (Schumpeter, 1939, 39).

2) The innovation and its respective entrepreneurs are both factors that have the most important elements that drive the beginning of any business cycle. For Schumpeter, the people knowledge on specific activities of their industry is the basic ingredient that fosters innovation. Not only on the offering products, but also on their services. This innovation motivates other competitors in the same industrial sector to enter into a crisis and encourage them to innovate; other way, they would enter into a recession cycle because their market would be diminished and consequently their current customers would be attracted by the innovator entrepreneur (Schumpeter, 1939, 84).

3) The third element on Schumpeter theory of business cycle is related to the three cycles that he used to base his theories (Schumpeter, 1939, 169). The cycles have the name of their contributors that Schumpeter used to identify them as follows. Their length depend on a time basis:

    a. Kondratieff Cycle: Based on the cyclic concepts provided by Nikolai D. Kondratieff. For Schumpeter, this is the largest cycle and could be associated to the biggest world revolutions such as the industrial revolution in Europe or the *railroadization* of the USA economy in the early 1900's.

b. Juglar Cycle: This cycle considers Clement Juglar theories of cycles that contemplate a medium duration respect to the Kondratieff and Kitchin cycles.

c. Kitchin Cycle: Based on theoretical concepts of Joseph Kitchin, that includes the shortest cycle and also is the less strict than the other two.

There are two major considerations for Schumpeter's business cycles: One is related to the time duration of the cycle and how they interact, meaning for example that the economic cycle does not run independently but they could be happening together or at the same time. For instance, one Kondratieff cycle could have Juglar cycles inside, and inside them other Kitchin cycles could be. The second consideration is the innovation as a driver of a new cycle; meaning that after one organization has innovated, it fosters the crisis of the other organizations inside that industry, because if they do not innovate they would disappear. However, and accordingly to Erixon (2009), the Schumpeter's theory does not consider neither the innovation nor the structural changes of the industry to respond any crisis of the business cycle, both concepts should be during the expansion or growth period, previously to the crisis.

3.1.1 Other Contributions to Schumpeter Business Cycle Concepts

In the economic and business theory field, the Schumpeter book "Business Cycle: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process", edited in two volumes and published in 1939, it is considered one of the most important book of the economic history and is used as a referral by others. Also, this book contributes the most in the business economic cycle definitions (McCraw, 2006). However, this book has been heavily criticized by other authors, primarily due to the fact that this is considered as an economic

model based on empirical data and research; while for other authors Schumpeter did not document in a scientific and rigorous way. Despite of this situation, his research has been considered by more authors as a good referral of the real economy of organizations, primarily because he integers the innovation and entrepreneurship as the beginning of new business cycles. These concepts were not considered by other theorist on business cycle (Kingston, 2006).

As McCraw (2006) mentions on his document, for Schumpeter the cycle concept is neither documented nor analyzed apart of the economy of the business. It is fundamental for the organizations were it resides and was exemplified in different industries such as textile, railroad, finance and electricity, despite the size of the corporation or organization. Additional, the business cycles described by Schumpeter are based on different interpretations of the three relevant economists previous to his time (Andersen, 2006; Kaza, 2006; Kingston, 2006):

1. Kondratieff cycle or “long wave” is 50 years long.
2. Juglar cycle is 7 to 11 years long.
3. Kitchin or “short wave” is 3 to 5 years long.

But, the three of them could be grouped in two major cycles or waves as follows (Schumpeter, 1931):

1. Long cycles or Juglar that is equivalent to 6 Juglar per Kondratieff
2. Short cycles or kitchin that is equivalent to 3 Kitchins per Juglar.

As mentioned previously and additional to the time duration of the cycles, another relevant concept is the innovation (McCraw, 2006). For Schumpeter, the innovation fosters the economy of the organization because it involves the people that innovate that are known as Entrepreneurs. This type of innovative people not only contribute to the production value chain, but also in the consumers buying behavior; meaning that after innovating in a product or service (different from

inventing), the organization must convince the customers to buy the innovation regardless they know it or not. This last activity enriches the business cycle and also makes grow the organization. Furthermore, the innovator organization starts after the organization pass throughout a technological breakthrough in a particular industry. For example as cited by McCraw (2006), Schumpeter enlists the automotive industry based on Ford's T model. In this particular case and back to 1909, the Henry Ford entrepreneurship innovates in the production way to manufacture a vehicle accessible to everybody. The consequence of this innovation in the process and on the product motivates other manufacturers such as the entrepreneurship of Alfred Sloan from GM to innovate not only on the product, but also in the way customer bought their vehicles; creating the credit loan to buy a new car, and making it accessible to everybody as well. This example illustrates the innovation of Ford initiated a crisis at GM that made them innovate, other way this last organization might disappeared.

In summary, the Schumpeter Business Cycle theoretical concept consists in fostering innovation held by entrepreneurships. After having entrepreneurs innovating, the organization could capitalize it and consequently grow. But the innovation is not only applied to the final good, it is also considered in the internal business process or at customer relationships (McCraw, 2006). Thus, during the growth period of the organization external activities such as legislations of new laws do not influence on their decisions (Andersen, 2006; Kingston, 2006). Also, it is relevant to recall Erixon (2009) research whereas it is mentioned that innovation of the firm should not take place during the economic crisis or recession, because it would not help; but if a new cycle would happen or it is needed to start, the innovation should be during the growth of the industry. This means that accordingly to Erixon (2009), external factors would help the industry to respond to the crisis.

3.2 Akerman Business Cycle and Microeconomic Theoretical Concepts

For Akerman, the organizations live in business cycles that are influenced primarily by external agents (Akerman, 1960, 186). But in general, his economic model is similar to Schumpeter's concepts in order that considers empirical data coming from historical activities (Akerman, 1949). This is due to the fact that Akerman studied and was part of the Stockholm school, like Schumpeter (Erixon, 2005).

Akerman's business cycle model considers that the cycle is made of a wave with a specific length and amplitude similar to sinusoidal equations, like the Fourier research (Akerman, 1960, 189-190; Akerman, 1949). But also it is related to the internal facts of the organization than those externals happening at the same time; this is why the cycles have different length but in the understanding that despite the circumstances, the cycles would also be present and are not unique. Those concepts and characteristics are part of Akerman's economic cycle, which is described in a six phases model as shown on the next Figure 3.1 (Akerman, 1960, 194). This model also applies to the organizations at the microeconomic level (Akerman, 1960).

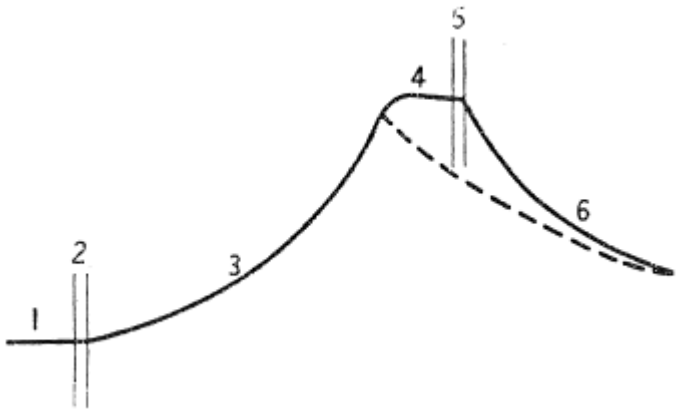

Figure 3.1. The 6 phases of an economic cycle (Akerman, 1960)

- Phase 1: This is the lowest part of the cycle, and could be considered as the beginning of the economic cycle. This is not necessary due to an innovation or technology breakthrough.

- Phase 2: It is the small time period where there is a transition between phase 1 and 3 where the growth starts.

- Phase 3: This is an accumulative and growth period of the micro economic model. Akerman compares this phase to Schumpeter's model but includes the organization growth and consequently the capitalization and liquidity of the business.

- Phase 4: This is the time period previous to the economic crisis and it is right after the growth ends. At this phase, the organization ends its expansion.

- Phase 5: Similar to phase 2, this small period of time identifies the crisis and the recession or economic contraction starts next.

- Phase 6: It is the slope down of the economy of the organization and fosters the specialization of the organization and business to survive.

For Akerman (1960, 200), the beginning of phase 5 or economic crisis is primarily due to external factors such as monetary crisis or credit problems coming from the financial sectors or others. This was shown during the USA economic crisis of 1815 and 1940, which created industry recessions.

3.2.1 Other Contributions on Akerman's Business Cycle

There are different authors like Polanyi, Brenner, Harvey, Arrighi, Keynes, Böhm-Bawerk, Clapham, Schumpeter and Marx (Arnold, 2009; Akerman, 1960) that have done research on the fundamental concepts of economic cycles, and they had included the economic, financial and industrial crisis definitions as well. On Figure 3.1, Akerman (1960) describes the 6 phases of an economic cycle, where it can be identified the crisis beginning and ending as mentioned previously.

Phase 5 is characterized by the economic crisis itself. It normally starts in futures market (credits, hedging, money capital, stock market), then it is expanded and affects industrial sectors immediately (Wang et al, 2005; Santoro and Gaffeo, 2009), causing monetary and financial crisis too. Moreover at phase 6, the slope down of the economy, also known as recession, firms happen to be specialized, collapsed or disappeared. R&D smart investments and cut costs are part of the business activities and intangible assets take relevant precedence but its control is sometimes difficult (Eliasson, 2005).

For Akerman, and others such as Schumpeter, the complete cycle depends on the majority of seasonal curves such as a physical oscillation like a sine curve (Boianovsky and Trautwein, 2007), but every cycle has its own story from the phase 1 through 6. Also the complete cycle starts in a depression, but it is being *contaminated* like a virus by others factors, for example the financial crisis could create an exchange crisis that would affect the organization and making it to start a phase 4 of crisis and then the consequently recession (Carlson, 1999).

The phase 6 ends when the economy reaches it thought and the recession is completed. Right after that, the phase 1 starts all-over again. The concepts described on the phases 5 and 6 could be easily related to any type of crisis such as economical -for regions or business-, industrial -for industrial sectors-, financial -for banks and stock markets-, or exchange –for monetary markets-

(Wang et al, 2005). Usually and due to the contagious characteristic of economic crisis, for example it affects business when at the national level there is a financial crisis (Wang et al, 2005; Santoro and Gaffeo, 2009). Another example is the way Nations response to economic crisis, this starts when in the nation change monetary rules, fiscal law, exchange and stock market regulations, and other that were affecting financial sector blocking the global growth (Arnold, 2009).

Also considered on Erixon (2009) report, for Akerman's business cycle there is also a similarity regarding innovation and new business cycle, like with Schumpeter model. For Akerman, the innovation helps the industry and the firm to start a new cycle, but it does not contribute to react to the crisis or recession phases, it only affects the firm performance during the growth phase. Also and for the same author Erixon but on a different report (Erixon, 2011), Akerman contributed and put more emphasis than Schumpeter on the concepts of business cycle theory that also involved the firm level; while Schumpeter's considered the industry level only.

3.3 Business Cycle and Economic Crisis Model for the Research

After reviewing other economic models additional to those described above, the Akerman's business is more applicable to this research for the following reasons:

1. The model is coherent to Schumpeter model and considers its applicability to the microeconomic level, for example to an enterprise or organization.

2. The crisis and recession phases are clearly identified on Akerman's model, as phases 4, 5 and 6.

3. The model includes a clear definition (start and end) of the crisis and consequent recession.

4. This model fosters the employees to change the internal economic situation to a new one, regardless the innovation entrepreneurship of the employees.

5. The terms and concepts used by Akerman's business cycle are used not only for the microeconomic theory, but also for the industry and the firm, meaning that those concepts of phases of the business cycle applies also at the industry level and at the firm level as well (Erixon, 2011)

So this model is more oriented to the economy of the organization (Erixon, 2007). In the following chapters of this research, the identification of the crisis and following recession parts of the case study considers Akerman's 6 phases model. This theoretical concept is used to identify and monitor the intangible assets of the organization but under an economic crisis and recession situation of an organization. It is important to recall that the Akerman's model is based on microeconomic concepts and can be applied to the industry economy and the firm as well. Moreover and for this case study, the similarity on shapes between the industry and the enterprise, the Akerman's model can be reflected, meaning that the theoretical business cycle applies to the industry trends but it could be mirrored or reflected to the enterprise or firm (Erixon, 2011; Kawai and Urata, 2002; Ilmakunnas and Topi, 1999) in order to identify the 6 phases of Akerman's business cycle in the firm economic performance and more specific the crisis and recession phases.

If Akerman's economic cycle model is compared to the industry business cycle and it is reflected to the case study, the three of them have some similarities as depicted on next Figure 3.2. For comparison purposes the Figure 3.1 is brought back and placed together to the economic cycle of the organization.

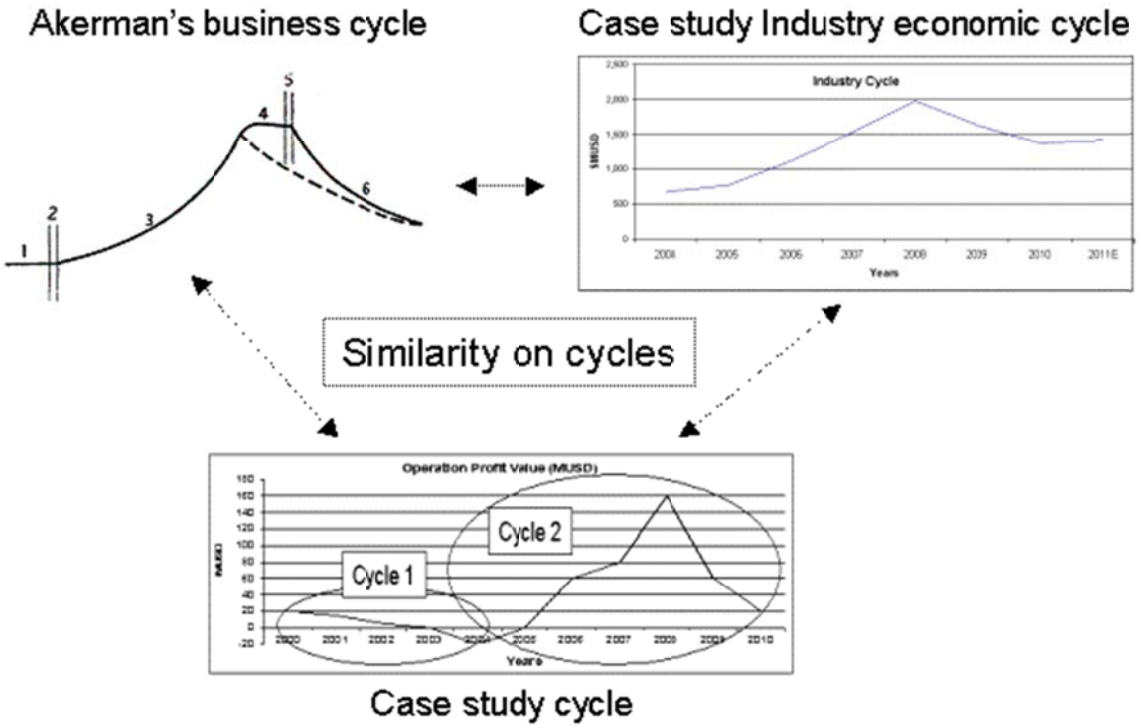

Figure 3.2. Comparison of business cycle, industry cycle and firm case study economic cycle

As mentioned previously for the economics models such as Schumpeter and Akerman, the economic cycle has a beginning and end, starting all over again after certain time has passed and the organization returns back from the recession to a period of expansion or growth. On Figure 3.2, there is identified an Industry cycle that is influencing the enterprise economy are identified two cycles whereas the organization passed from a crisis and recession to a new period of

expansion. In the next chapters, there is identified decisions made at the organization that are trying to reduce the time of the recession period and start as soon as possible a new expansion.

Moreover and due to the similarity found on Figure 3.2, it confirms the usability of Akerman's business cycle theoretical model to the enterprise economy, but after considering the economic cycle of the Industry sector of the firm. As mentioned previously, the theoretical business cycle is reflected to the industry cycle and then the economic phases are mirrored to the enterprise level (Erixon, 2011). So the Akerman's 6 phases could be implemented as a representation and identification of the crisis phase in the firm of the case study.

Moreover, as mentioned previously in the research goal, the objective is to identify and monitor the intangibles assets that are having more relevance at the organization and are helping to start a new cycle again; and also group them as the intellectual capital. For the research case study, the information and analysis of the data is the one gathered during the phases 4, 5 and 6 of the theoretical model, because they are related to the crisis and recession parts.

CHAPTER IV: THE INTELLECTUAL CAPITAL TAXONOMY UNDER ECONOMIC CRISIS CONTEXT

From the intellectual capital perspective, that is a perspective to group intangible assets of the organization as mentioned previously, this chapter reviews a manner of how to identify intangible assets and how they have preference and relevance during economic downturn, regardless the industrial sector or business purpose (Pate and Narain, 2008). Also, it considers why those intangible assets need to be secure inside the business to make it successful and competitive under that context (Barro, 1989; Harvey and Lusch, 1997; Johanson et al., 2001).

Also at this chapter are considered the organization relevant factors that influence on their decisions made during economic crisis, but taking into account different perspectives, such as inside pronouncements, international operations and government interactions, among others. The idea is to identify the most articulated intangible assets framework model for different scenarios and then use this to build the appropriated theoretical intangible assets taxonomy for this research.

4.1 Intangible Assets in an Economic Crisis Context

As mentioned in previous chapter, hereinafter the Akerman's economic cycle is used as referral to identify the economic crisis and recession of the case study.

4.1.1 Business Cycle and Economic Crisis

Although this research focus on the business cycles and especially to its respective part of economic crisis for an organization or firm level, it is significant to review its macroeconomic perspective. This is because the majority of the

specialized literature reviewed has the better definitions and could be applied to the microeconomic context. Also, authors such as Erixon (2009) mentions that Akerman's and Schumpeter's theoretical concepts regarding the crisis and recession of the industry are responded and consequently started a new growth phase of a new cycle due to external factors, but the innovation and structural changes from inside.

Authors such as Arnold (2009) and Akerman (1960) considered that the economic crisis of a business cycle at the organization level includes other elements that influence it, but from the macro level such as financial or industrial crisis that could be going on at the region of the organization.

4.1.2 Economic Crisis in Business with International Operation

Organizations with international operations have a particular behavior during economic crisis that depends on the national or regional policies (Kalyuzhnova and Vagliasindi, 2006; Buck et al., 1999). Based on the geographical location of the economic crisis, it would affect only the part of the multinational firm that is on that region but the rest of the organization that is out of the geographical influenced region would be safe (Wang et al, 2005). During this circumstance in a nation, the supply chain inside the region is affected due to the variation of local prices of provisions. Consequently and to remain competitive, multinational firms must search for regions stable and not affected by the crisis, also to find places with cheap suppliers and qualified competitive work force (Chung and Beamish, 2005).

Additional to the physical place where providers are located, the organizations have to consider another implications as new variables, such as the global cost of operations; for example costs and charges formerly not included such as transportation and logistics, local export/import policy and laws, local custom

taxes, local money depreciation and exchange rates between the firm headquarters and the subsidiary or foreign business operation (Lee and Makhija, 2009; Chung and Beamish, 2005; Mudd et al, 2002).

Another characteristic of international or multinational organizations to remain competitive during an economic crisis is the R&D investment they do and its relationship with their exportations (Lee et al, 2008). For example and during 1990's Korean crisis, authors like Ernst (1998) reported that those firms which invested in R&D to diversify their technology in areas such as design, market, production and knowledge intensive services; they had more possibilities to explore and research on new logistics processes and access to new markets not explored; this kept them safe and out of the downturn in any region. However and just as comparison, those firms that invested in image during the economic crisis failed and in some cases disappeared (Lee et al, 2008; Ernst, 1998; McSweeney, 2009). The reason was due to the image campaigns are normally local and made organizations not so flexible to adapt to the change. For the cases described on this paragraph, the public sector did not contribute to their activities (Lee et al, 2008; Ernst, 1998; McSweeney, 2009).

So far, particular intangible assets that are relevant during economic crisis for organizations with international or multinational strategies are identified as: outsourcing business process, invest in R&D or reduction of cost related to image campaign expenditures.

4.1.3 Intervention of Government into Business during Economic Crisis

In the relevant literature reviewed, national policy makers took relevant actions to help and remain operational representative business of the region during economic crisis. Some examples include new monetary exchange rates, banking interest rates or the usage of public funds to save business, also known as bail-

out (Ernst, 1998). Going back to the example of the 1990's Asian economic crisis, another industry affected was the air travel and transportation. This industrial sector was collapsed in 1998 because the customer did not travel at a similar rate than they used to. So, the income from tickets sales was diminishing. The consequence was that airline companies cut-off important cost such as the laid off of 5,000 employees in that year. However and at the same time, local government changed the law and granted airline companies to cluster their routes and share flights codes among different Airlines firms. Also during this law reform, the air was open to international companies an allowed them to fly and share codes with the local ones. Those initiatives helped to keep the industry competitive (Chin et al., 1999).

Another example of government intervention in companies is the Daewoo case during Asian crisis of the 1990's (Alvarado, et al., 2007). This case has the relevance that during the stable years this *chaebot* (Asian concept for big familiar-holding organizations) grew so impressively that any decisions they made influenced to the regional policies. But due its size and the economic situation of the region, it took much time to react and response. The effect was that the government took an intervention policy to save the organization while they sold parts of its operations such as Daewoo Motors to GM (Alvarado, et al., 2007). This activity helped to the organization being competitive and also to keep the nation safe during that time.

In this section, there is another intangible asset that is relevant during economic crisis, and it is tight to the relationship of the organization to the local policy makers. In other words, this means that during downturn the intangible asset of relationship to the government is a relevant element to keep the organization safe and competitive to let them respond to the economic crisis.

4.1.4 Business Behavior during Economic Crisis

Platt and Platt, cited in Santoro and Gaffeo (2009) agreed that young firms have more probabilities of and economic failure than experienced ones during an economic crisis. This is due to the fact that immature firms have weak financial structures and experience for this type of context than the others and consequently tend to failure easily than bigger or established corporations. On the other hand, certain organizations dedicate efforts to reduce cost while cutting personnel among other financial statements, but use the minimum resource and make investments on R&D. A representative example of this behavior was the Asian semiconductors firms that took a similar approach during 1990's economic crisis and made them the biggest companies in the area (Tan and Mathews, 2009). Moreover and during a downturn, organizations might be beneficed while restructuring and efficiently improve cost reduction in procurement, production and human resources, refocusing new business segments and make them grow or resizing while reducing non-core activities (Lafrenz, 2006). The main idea of taking actions is to let organizations being in good health, up to date and with good competitive advantages respect to competitors and be ready to deliver products/services right after the economic crisis is over and the new demand is in place back again (Blausten, 2009).

Sanpaolo and Turinetti (2009) mention that it has been reviewed by a number of authors that during an economic crisis, a variety of organizations have stress inside because of the sales fall, then and as a result they have a delay payments to providers and in some cases the cancellation of new ventures (Sanpaolo and Turinetti, 2009). That means that the cash flow is diminished and affects operations of the firm. Even though other organizations, such as the airline companies in Argentina or Asia, changed their marketing and created more aggressive promotional prices or share code flight with other airlines. The idea of these companies was to remain competitive regardless the economic environment they were experiencing (Chin et al., 1999).

Other business contemplate that more than taking specific actions to respond to the economic crisis, they think of that there are other elements that should be reviewed and then would help them to remain competitive. Those organizations are thinking on intangible asset, because they consider them relevant during an economic crisis. This is because of those assets generate future values that would help the organization growth just after the economic crisis is over. The intangible assets more relevant for the greater part of the business are those related to human capital and R&D expenditure (Pate and Narain, 2008). Other examples of intangible assets with significant preference are some cases that have been seen in the Information Technology industry (Wang and Liu, 2009): Some activities to keep the industry and organization competitive are those tight to the human capital, because they use the employees experience and knowledge to make and implement a rational choice to accomplish the organization goals as follows (Schenker-Wicki at al., 2009):

1. Reduction of long term projects and applying only to the short term.

2. Reduce new project and focus only on optimizing ones. This include less human resources and less cost of software and hardware.

3. Choose best software platform but not the most expensive

4. Adequate budget to economic crisis.

The previous list might give the impression that are steps to consider during a downturn, but the relevance is that together came from the experience, knowledge maps and knowledge assets of the organization team members, as part of the human capital.

4.2 Intangible Assets During Economic Crisis

As mentioned previously, intellectual capital of an organization is hidden inside the walls and it is partially responsible of the value generation of the organization. In addition, one of the important factors of intellectual capital is the complete group of intangible assets that considers in its taxonomy, such as the human capital that is craft by different intangible and knowledge assets of the person. Also, this capital is the underpinning of the core competence of the organization (Harvey and Lusch, 1997; Jennewein, 2004, Lee et al., 2003).

The other intangibles considered are for example: databases, brand, product and corporate reputation, networks. All of them are part of the core competence (Harvey and Lusch, 1997). But, not everything is soft and easy in real organizations. Normally businesses do not consider intangible assets with its intellectual capital and do not keep them secure inside the firm premises. The reason is due to the fact that intangibles have the following elements, among others (Harvey and Lusch, 1997):

1. Lack of accounting value
2. Difficult in establishing monetary value
3. Lack of formal monitoring/control system
4. Monitoring or controlling intangible is not part of management compensation
5. Due to its nature of intangibility, if not seen then why to secure

6. And also, if the intangible is lost, there is not an economic impact immediately.

Despite the reluctance to monitor, measure or control intellectual capital from organizations, the modern economic theory recognizes that intangible assets have an important role in firm's competitiveness and help them to prevail over economic crisis, particularly while those intangibles are related to technology development and innovation, for the reason that they are a stream of future benefits (Barro, 1989; Pate and Narain, 2008; Johanson et al., 2001, Power, 2001).

During 1990's Asian economic crisis, the policy makers and the firms pushed people to update their skills, competences and knowledge to be ready for the next massive laid offs. But that training or skill improvement is not only due to an approach of only going to school, but also to learn on the job. This new approach changed the organizations culture of loyalty, meaning that in the past firms used to put more attention to loyalty than performance. With this paradigm shift, organizations request people to take their own employability during any economic crisis, letting them to be responsible of their own income and value generation to the organizations. At the same time, other organizations still hire skilled and flexible people even during downturns (Lee et al., 2003). The result of this new paradigm was that countries like Singapore changed their industries from manufacture economy to value added multi-skilled services. (Lee et al., 2003, Eliasson, 2005).

Moving forward to other intangible assets of the organization, there are others that are relevant to the organization as well such as (Eckstein, 2004):

1. R&D to improve productivity, earnings and shareholders value

2. Technology change

3. Economic growth

4. Computer technology

5. Patents, among others

As mentioned previously, the core competences of organizations are made partially of intangible assets, and also the majority of them come from people ideas. The group listed above could be group in another capital, which is structural capital. This includes all of those assets that stay at the office when the person goes home. (Rudez, 2006; Castro and Lopez, 2008; Bornemann, 2007; Stahle and Bounfour, 2008; Marr and Adams,2004; Mourtisen et al., 2001).

The other intangibles considered are for example: customer, govern relationship, and international operations, among all others. But those that are relevant during an economic crisis, as mentioned above are the intangible assets that deal with international operations, customers, providers and government relationship as follows:

- For international: it is relevant the relation of the firm with local markets and local providers they have operations. To get the better prices possible

- For providers: as mentioned in the past bullet, this relationship is critical while negotiating better process of provisions. This would help the organization remain competitive.

- For customers: it is relevant to keep selling and avoid diminish of cash flow.

- For government: it is significant to keep this relationship since the policy makers could change the law and market conditions to be in favor of business goals.

4.3 From Intellectual Capital General Taxonomy to an Economic Crisis Context

For this research, the path followed to identifying those intangibles that are relevant during an economic crisis context considers some steps. The first step is to compare the taxonomy built for a general context as shown on the next Table 4.1 to the relevant activities and decisions made during a crisis situation. The type of activities and decisions found in relevant literature were described previously. The result of this activity is shown on Table 4.2; whereas the second step includes the matching or coincidences form different authors to each intangible. Herein, those assets with more concurrences would be part of the new taxonomy as described next. Moreover and on the Table 4.3, there is the result of the analysis and consequently is shown the taxonomy that might applies during economic crisis.

However, it is important to clarify that the Table 4.1 is the same that was described previously and to be homogeneous with the research, it is brought back again at this part.

Intellectual Capital	Intangible Assets
1. Human Capital	1.1 Backlog Knowledge 1.2 Skills 1.3 Innovation 1.4 Values 1.5 Experience 1.6 Know-how 1.7 Loyalty 1.8 Performance 1.9 Development 1.10 Attitude 1.11 Other
2. Structural Capital	2.1 Investment in R&D 2.2 Investment in technology 2.3 Process and procedures 2.4 Innovation process 2.5 Intellectual property 2.6 Cut cost process 2.7 Culture 2.8 Administration and management 2.9 Information technology 2.10 Routines and practices 2.11 Publications 2.12 Business strategy 2.13 Other

Intellectual Capital	Intangible Assets
3. Relational Capital	3.1 International and local providers 3.2 Customer 3.3 Government participation 3.4 Partners 3.5 Stakeholders 3.6 Stockholders 3.7 International policies 3.8 International operations 3.9 Consultants and assessors 3.10 Other

Table 4.1. General intellectual capital taxonomy

(Rudez, 2006; Castro and Lopez, 2008; Bornemann, 2007; Stahle and Bounfour, 2008; Marr et al, 2004)

Intellectual Capital	Intangible Assets	Relevant Contributions for Economic Crisis
1. Human Capital	1.1 Backlog Knowledge 1.2 Skills 1.3 Innovation 1.4 Values 1.5 Experience 1.6 Know-how 1.7 Loyalty 1.8 Performance 1.9 Development 1.10 Attitude 1.11 Other	1.1 Santoro and Gaffeo, 2009 ; Schenker-Wicki et al, 2009 1.2 Pate and Narain, 2008 1.3 Harvey and Lusch, 1997 ; Jennewein, 2004 ; Lee et al, 2003 1.4 Harvey and Lusch, 1997 ; Jennewein, 2004 ; Lee et al, 2003 1.5 Schenker-Wicki et al, 2009
2. Structural Capital	2.1 Investment in R&D 2.2 Investment in technology 2.3 Process and procedures 2.4 Innovation process 2.5 Intellectual property 2.6 Cut cost process 2.7 Culture 2.8 Administration and management 2.9 Information technology 2.10 Routines and practices 2.11 Publications 2.12 Business strategy 2.13 Other	2.1 Lee et al, 2008 ; Pate and Narain, 2008 ; Eckstein, 2004 2.2 Ernst, 1998 ; Eckstein, 2004 2.3Tan and Mathews, 2009 ; Akerman, 1960 2.4Chin et al, 1999 ; Lee et al, 2003 ; Eliasson, 2005 2.5 Harvey and Lushc, 1997 ; Eckstein, 2004 2.6 Chin et al, 1999 ; Lafrenz, 2006

Intellectual Capital	Intangible Assets	Relevant Contributions for Economic Crisis
3. Relational Capital	3.1 International and local providers 3.2 Customer 3.3 Government participation 3.4 Partners 3.5 Stakeholders 3.6 Stockholders 3.7 International policies 3.8 International operations 3.9 Consultants and assessors 3.10 Other	3.1 Lee and Makhija, 2009; Chung and Beamish, 2005; Mudd et al, 2002 3.2 Eckstein, 2004 3.3 Kalyuzhnova and Vagliasindi, 2006

Table 4.2. Comparison to an economic crisis context

So, from previous Table 4.2, there are intangibles that are considered for the authors cited meanwhile the rest of intangibles are not considered. As a result, those intangibles that were not mentioned by the authors found are not considered on the taxonomy for the economic crisis and the final inventory as shown on the next Table 4.3. This new table is considered in the following chapters during the identification of those intangible assets of an organization that become relevant during an economic crisis context.

Intellectual Capital	Intangible Assets for Economic Crisis
1. Human Capital	1.1 Knowledge 1.2 Skills 1.3 Innovation 1.4 Values 1.5 Experience
2. Structural Capital	2.1 Investment in R&D 2.2 Investment in technology 2.3 Process and procedures 2.4 Innovation process 2.5 Intellectual property 2.6 Cut cost
3. Relational Capital	3.1 International and local providers 3.2 Customer 3.3 Government participation

Table 4.3. Intangible assets for economic crisis context

(Santoro and Gaffeo, 2009; Schenker-Wicki et al, 2009; Pate and Narain, 2008; Harvey and Lusch, 1997; Jennewein, 2004; Lee et al, 2003; Eckstein, 2004; Ernst, 1998 ; Eckstein, 2004; Tan and Mathews, 2009 ; Akerman, 1960; Chin et al, 1999 ; Eliasson, 2005; Lafrenz, 2006; Lee and Makhija, 2009; Chung and Beamish, 2005; Mudd et al, 2002; Kalyuzhnova and Vagliasindi, 2006)

4.4 Intangible Assets from Accounting Perspective

For this research and considering the research methodology described in the following chapter, it is relevant to find those intangibles but from the accounting principles. The idea here is to use this information to find the relevant expenditures on intangibles during the economic cycle of this research.

In the next Table 4.4 are enlisted those accounting concepts for the organizations as expenditure categories that are used in this research. But, they are grouped under the taxonomy of intellectual capital groups such as human, structural and relational capital. In spite of the concepts that are principally considered as intangible, in some cases they involved expenditures on tangible assets as well. However, the human capital is not considered on this Table 4.4 because the information was not accessible for this research. In the Annex 5 there are samples to clarify more the description of the different expenditure categories.

Intellectual Capital	Expenditure Category	Description
1. Relational capital	1. Meetings	Internal and external working sessions
	2. Expos and Conferences	Marketing activities
	3. Travel Expenditures	Travel expenditures
	4. Marketing and Promotion	Marketing activities
	5. Assessors and Consultants	Interaction with external experts to the organization
	6. Inscription to Public Bids	Interaction with external entities to increase sales
	7. Clubs and Associations Fees	Fees for external organizations
	8. Technical Assistance for Imports	Interactions with external experts to the organization but related to import matters
2. Structural capital	1. Non-Deductive Expenditures	Other taxable expenditures that are not directly related to the business
	2. Variable Expenditures	Other non-classified expenditures
	3. Services and Taxes Related to the Product	Intangibles related to the selling product
	4. Telephone and Computer	Expenditures related to It infrastructure
	5. Rent of Special Equipment	Rent of special equipment

Table 4.4. Accounting expenditures concepts for intangible assets

CHAPTER V: METHODOLOGY

As described on relevant literature, the case study is considered as a research strategy to the research aim (Yin, 1981). Also and per Yin (1981) report, the case study could provide the required answers while using qualitative and quantitative evidence. This research report uses the method of case study as a research strategy, and also the research question considers both evidences to handle relevant data. Moreover, the achieve of relevant data for the research method is complimented with the application of questionnaires and also while getting narrative answers to be analyzed with the qualitative approach and ground theory (Yin, 1981; Yin, 1997), as described later in this chapter.

In order to achieve the goal of this research, on Figure 5.1 is shown the methodology that was implemented to gather relevant data, analyze the information, consequently visualize legible answers and then finally provide a conclusion to the main question of the research. Due to the characteristic and nature of the data and information to be handled during this research, the records were collected and analyzed considering two approaches: quantitative and qualitative (Long et al., 2000). The first approach of quantifiable data considers records such as amount of sales, expenses in US Dollars or the total people working and laid-off at the business area of the case study, depending on the usage of such information. Meanwhile, the second group of qualitative information is softer and is majority related to decisions made by relevant actors; the source of this type of information comes from interviews and conversations on a regular basis.

The answer to the research question and theoretical assumptions for this research were confirmed by the analysis of relevant data of a case study. This case study is a large enterprise that is facing an economic crisis and it is trying to respond to this situation.

Thus, the information analyzed using both approaches provide two conclusions and answers to the main question. But at the end, there is only one conclusion for this research that includes the complete results of this research.

Additionally, once the analysis of the intangibles related to economic crisis and recession is accomplished, the next step is to perform a similar quantitative and qualitative analysis but for one intangible. With this, more insights could be provided to have a more complete understanding of the relevance and trend of intangibles during a particular situation of economic crisis.

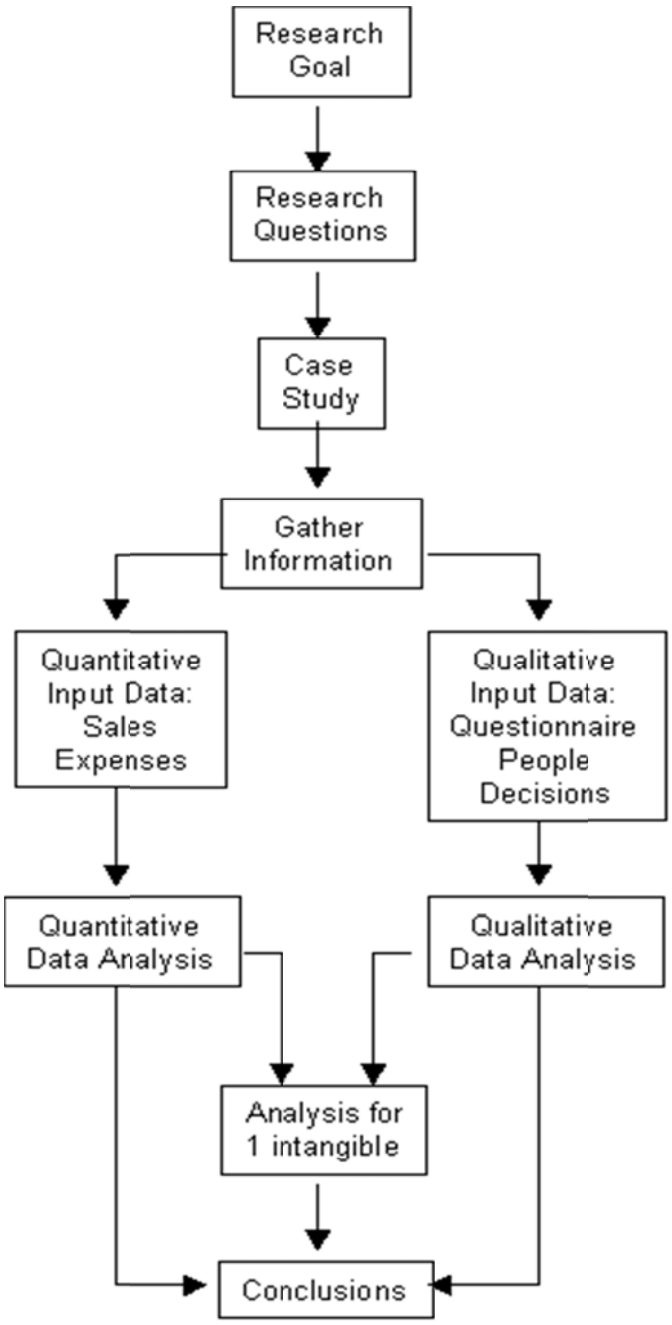

Figure 5.1. Research methodology diagram

5.1 Quantitative Input Information

There were a number steps followed in order to achieve the goal and research objective. One of it was to identify quantitative data and information that would be input source to analyze (Long et al., 2000). For the research case study, this information was total sales and total expenditures. This is because the first represent a most realistic trend of the economic situation of the business case, wherein the economic cycle is located and its correspondent crisis and recession parts; and the second data related to expenditures, they represent the way as the organization is investing more or less on activities related to intangibles in terms of economic value, as follows:

Sales: The total sales of the product manufactured in the organization case study are reported in thousands of US Dollars, and it was gathered in a monthly basis. This information came from the marketing databases and started as of January 2005 until May 2010. This information was chartered in a graph and then the economic cycle could be mapped, including the identification of its different parts, such as the crisis and recession parts.

Expenditures: The first activity was to identify those expenditures that are more related to intangibles; they are from accounting perspective (some expenses could involve tangibles as well). Then and like the sales data series, the information was collected in thousands of US Dollars on a monthly basis during the same time frame as of January 2005 until May 2010. Then, the data was classified in the three major groups of the intellectual capital as human, structural and relational capital. This information was chartered as well, like the sales and the plot was compared to the cycle of sales. The idea is to identify which expenditure is having more or less funds and also try to identify which intangible activities is the organization giving more resources and to which are cutting-off during hard times.

The information related to expenditures described previously was used primarily during the analysis of the relational and structural capital. But due to a particular situation of confidentiality and inconsistent output from internal processes, the expenses related to human capital were not accessible. So, the analysis of the quantitative data for this last group of intangibles is handled in a different way, but considering this information as quantifiable.

The data gathered from the relational and structural capital were analyzed considering three approaches as follows: standard deviation, Pearson correlation and polynomial approach. Next in this chapter there is more detail related to these types of analysis.

5.2 Quantitative Analysis for Human Capital

The information considered and gathered for this part of the analysis included the following described elements. Their source was the Human Resources department, which is aside of the case study organization. This is because the organization does not have such data.

1. Headcount of the area: this concept means total amount of people working in the area and to consider the complete human capital of the organization. With this, any laid-off could be seen.

2. Personnel certified on core competences: to identify the additional value contribution of employees to their functions.

3. Years of experience at the organization: to consider the knowledge, experience and people backlog.

4. Scholar level from the people, considering bachelor as baseline.

The first package of information related to the headcount was chartered in the same time span considered for this research as of January 2005 until May 2010. This chartered information provides the trend of people hired and laid-off during the crisis and recession phases of the economic cycle.

Since 2002, in the organization case study there has been a program of people training and certification only on core competencies. So and for this case study, if there were people certified on the core competence, they were considered as a 1.25 person. This 0.25 fraction comes from an organization definition of a core competency that is composed by: knowledge, skills, attitudes and performance. So, if one employee achieves the certifications then increases 1 out of the 4 elements mentioned, specifically the knowledge part. Also, the person contributions and job performances are different than someone else without this type of certification. Thus, if that person is separated from the organization, then the trend of the graph would have more impact than other under such circumstance.

The third and fourth package of data related to the years of experience would help to identify how relevant is for the organization the experience and moreover to confirm the mixture of experienced and academic level of people after any organizational adjustment. The result of this exercise is a pie chart representing the people distribution depending on their years of experience at the organization (Pfeffer and Sutton, 1999), and also if they have a bachelor degree or higher.

5.3 Quantitative Analysis for Structural and Relational Capital

As described in previous paragraphs, to analyze the quantitative information related to intangible activities belonging to the structural and relational capital groups, three approaches were used. The idea of using such approaches is

because after getting the result of using one of it, there is a need to confirm and confirm that new information; so the implementation of the other two would help to provide that. Wherein, the methods implemented are described as follows:

5.3.1 Standard Deviation Approach

With the data gathered and related to sales and to the expenditures for each intangible, the first step was to normalize all the data to one and make them comparable among them and then calculate the median, average, minimum, maximum and standard deviation (MathIsFun, 2005) per series. Also and before doing the previous calculus, the data was grouped in three but considering: one is related to the period of time when the sales are growing, other is related to the time frame of the economic crisis, and the last group is related to the recession period or slope down.

The tools used to identify which data series become relevant during the economic crisis and recession were the t-Test or Student's test (GraphPad, 1999; Trochim, 2006; Diaz and Fernandez, 2001), the F-Test and the ANOVA (La Brake, 1992). These tools were used to compare the different standard deviations calculated previously and after the crisis while comparing them and after finding which expenditures would show as relevant, such as those with a similar standard deviation to sales standard deviation.

5.3.2 Pearson Correlation Approach

This approach is considered due to the fact that it provides representations between both data series of sales and expenditures. This means that if the two data series have a similar trend then the calculation provides a number close to +1, but if the calculation gives a number of –1 then it implies that both data series

are running in opposite ways. However, if the result is close to 0 means that both data series are completely different. Considering this criteria, next are other considerations for the analysis:

1. The expenditure is considered relevant when its Pearson correlation is close to +1 respect to sales during the economic growth. This means that the sales are increasing and the expenditure is doing the same.

2. The expenditure is considered relevant when its Pearson correlation is close to –1 during recession part. Due to the fact that during this phase the sales are going down while the expenditure is expected to increase. This means that both are running opposite trends.

3. But if the Pearson correlation has a result close to 0, it is considered as a-non-relevant data because the expenditure and the sales trend are both running differently.

5.3.3 Polynomial Approach

For this approach, first converts the data series into a multi-degree equation: there would be one equation for sales, and one equation per expenditure. But for comparison purposes, a similar period of time is considered first for the time corresponding to the recession and secondly with the same period of time but during the growth period. For clarity purpose, the sale function is only used to confirm the assumption that a data series is more relevant if the surface under the function f(x) is greater than the other. In Annex 3 is a more detail procedure around these concepts.

Regarding the this approach, it is important to mention that the main reason because this was elected was due to the fact that this has the peculiarity that has less uncertainty of the result while doing the surface integral with the actual amount of data and was not needed to gather more data. Also, this approach provides the answer numerically and graphically while obtaining the surface under the f(x) expression.

The polynomial equations calculated are expressed as f(x) functions with a maximum of a 6^{th} degree power of the variable x. The degree is due to the fact that with this, the equations have a close trend and similarity to the data points gathered. For every equation a surface under the curve is calculated after using the integral of f(x) respect to x. With an x value corresponding to the months considered during the identification of the polynomials, and f(x) is the amount of US dollars in terms of sales or expenditures. Next are enlisted the steps to follow in order to conclude the relevant intangible asset during the economic crisis. In Annex 3 there is more detail about the identification of the equations and the integer calculation.

1. The polynomial equation per intangible expenditure and for the sales (billing) is obtained after considering the 16 data samples of the phase 6, this refers to the 16 months between January 2009 and April 2010. To make a consistent comparison, the phase 3 of the economic cycle and it respectively polynomial equations also considers the same amount of samples as the last 16 months of the growth from February 2007 to May 2008.

2. For the identification of the polynomial equations, all the data series are normalized to the maximum value of the data range per expenditure. The idea is to obtain comparable equations and make sure that only trends are evaluated. The polynomial equations calculated are expressed as f(x)

functions with a maximum of a 6^{th} degree power of the variable x, as mentioned previously.

3. After calculating the polynomial equation of expenditure, they are compared to themselves. This means that expenditure 1 at phase 3 is compared only to expenditure 1 at phase 6 and so on.

4. For every equation, it is chartered in a two axis chart whereas one is the x value in months and the other axis is the f(x) value of US dollars related to sales or expenditure. This plot is also known as curve. So per every curve it is calculated the surface under after using the integral of f(x) function respect to x. With an x value coming from 1 to 16, corresponding to the months of the phase.

5. The relevance per expenditures is obtained after making the subtraction of the Integral calculus corresponding to the phase 3 less to the phase 6.

If the subtraction has a positive result (+), it means that the surface of the phase 3 or growth is greater than the surface of phase 6 or recession, so there is no relevance of this expenditure because the expenditures at the recession are diminished respect to the expansion. However, if the subtraction has a negative result (-), it means that the surface of the phase 3 is lower than the surface of phase 6, then the expenditure has relevance during the recession because its trend is to grow.

5.4 Qualitative Information for the Intellectual Capital

The other part of the information gather for this research required a qualitative method, so it was relevant to consider appropriated literature reviewed about

ground theory and qualitative research (Glaser and Strauss, 2009). These considerations were due to the nature of this research that required interactions with others and also to interpreter their experience and comments that were verbally expressed. So, this could be considered as social research (Glaser and Strauss, 2009; Burck, 2005).

The qualitative analysis includes information that is mostly based on people perceptions and interpretations. This is because this type of information is useful to identify which were the decisions made during the economic crisis and recession and how those decisions influenced and provided more relevance to the intangible assets of the intellectual capital of the organization. The qualitative information achieved was the type of storytelling, personal experience, observations, interviews, historical activities among others (Carlson et al., 1995).

The way used to gather the relevant information described above was by the design and implementation of a series of questions that were answered by relevant actors or decision makers. The method used is similar to the method used to assess and audit knowledge in any organization (Burnett et al., 2004; Levantakis et al, 2008; Baxter, H. and Prevou, M, 2010). This means that first was identified the area of the research and then a verbal agreement was done with the decision makers to have the interviews on a regular basis. Once the agreement was accomplished, the next was to design and apply the questionnaires, review the answer and then make the analysis of the information. Following are enlisted the people involved as well as the question applied.

In Annex 6 is included the qualitative research method used to the gathering and analyze of the information collected as qualitative data. This approach was used during the interviews and building of intellectual capital taxonomy for the organization case study.

5.4.1 Questions Applied

Before applying the questions, the incumbents were introduced with the research goal and the previous month analysis. Also, they were informed about the partial results regarding the quantitative analysis. In Annex 4 are enlisted the questions applied to the interviewed. The idea to apply such questions is to gather from first instance how are changing intangible assets of the organization in order to response to the crisis situation.

A relevant challenge of this part of the research was the identification of the different relationships found on the answer provided after questions were applied during the different sessions. So accordingly to Glaser and Strauss cited in Carlson et al. (1995), the ground theory and qualitative research articulates more formally the different patterns found in text and wording information.

5.4.2 People Interviewed

The interviews were performed on a monthly basis from September 2008 to April 2010, individually and in a period of time of 30 to 60 minutes, depending on people availability and amount of information to be shared. The conversation was performed on a relaxed environment and under colloquial language. The people interviewed were primarily those key respondents and also it was necessary to build a trusted environment in order to allow them to share as much information as possible (Carlson et al., 1995)

Moreover, the personnel of the key respondents were interviewed as well and asked with similar questions. The idea was to confirm the application of decisions made. In spite of this, the people interviewed as key respondents were as follows: Area Director and 4 Marketing & Commercial Managers, plus 2 area employees.

During the interviews, it was relevant to consider the next that Berge (1998) mentions as important during consultation as the following commandments, it also includes implications for the research:

1. Never begin an interview cold. Try to start talking about other things and try to “break the ice”.

2. Keep in mind the interview purpose.

3. Present as natural as possible. It is an interaction between humans.

4. Demonstrate aware hearing. This creates a confident environment and willingness to share.

5. Think about appearance. For this research, all incumbents were dressed business casual as usual.

6. Interview in comfortable place. For this research, all interviews were at interviewed office, during business hours but with door closed and sited in comfortable chairs.

7. Monosyllabic is not enough. The interviewed were encouraged to express themselves as much as possible and in certain cases to enter in detail of particular topics that were not so clear.

8. Be respectful at all time. Interviews were conducted during business hours and in a professional way.

9. Practice before interacting with people. For this research, the questions were formulated before going to the field and also the interviewer practiced in order to gather as much information as possible.

10. Be cordial and appreciative. As mentioned previously, the interviews were in a professional environment in a business context.

5.5 Qualitative Analysis for Intellectual Capital

The answers provided to the questions made to the interviewed gave information that was classified accordingly to the taxonomy group of the intellectual capital; later on the answers were filtered as decisions made to intangible asset and counted as matching or occurrence to the intangible asset. The amount of matching to the intangible versus time was chartered in order to represent the trend of the decisions of the complete group of intangibles. This trend was compared to the sales graph of the quantitative input information, in order to identify the increasing/decreasing of decisions around the group of intangible assets during the period of time of the research subject. Also, those matchings' found were chartered in a different graph where there were identified those intangible assets, the period of time when they occurred and the number of matchings'. With this new representation were presented those intangibles that were becoming more relevant based on the amount of matchings' reported.

Herein and additionally, all the decisions marked as matching of the intangibles were chartered but using a bar chart per asset involved. This new graph shows which intangible assets are more relevant while having more matchings', but during the period of time related to the economic crisis and recession.

After all the analysis was done for the three groups of intangible assets that included the human, structural and relational capital; there was an special attention and focus to one intangible asset, in order to monitor its performance. This approach and finding was included in the research report because makes available more information and more elements to be included in the conclusion when it disclosure about behave of intangible assets during an economic crisis, which the theoretical assumption of this research. After the asset was picked, the interviewed people were asked about it. The answers in form of matching were charted as decisions made around the asset. Additional a second plot is included and it is about the indicators this intangible has. With this second graph, it would be easily to see how is changing the intangible performance after decisions are made.

After completing the analyses for the quantitative and qualitative data input, a final conclusion is provided in order to give an answer to the research questions stated at the beginning, but in two aspects: first is the conclusion for the analysis done to the intangible asset elected and, the second is related to the complete research. Also and considering this information, new lines of investigation could be proposed for future research. As described on the previous Figure 5.1.

CHAPTER VI: MONITOR OF INTELLECTUAL CAPITAL: RESEARCH CASE STUDY RESULTS AND ANALYSIS

In this chapter are shown the results found after applying the methodology described previously. Also, there is included the analysis done to the data and information gathered during the acquisition of the data for the qualitative analysis, as well as for the information provided by the interviewed to complete the qualitative part.

6.1 Research Case Study Background

According to the methodology described previously and based on the research goal to confirm the theory stated around the monitor of intangible assets during economic crisis context, in this chapter is reviewed the case study considered to answer the research questions. To confirm the theory for this research the case study considered is about a company located in Mexico. The business focus is the manufacturing of electrical machines; it is also a Joint Venture between a Mexican group that holds the 50% of shares and the rest belongs to a global enterprise. The company started operations in 1969 and during the 1990's completed the Joint Venture. Moreover, during the year of 2008 the organization reported on its financial annual report that had more than 5,700 workers and annual sales around $1,150 million of US Dollars. Also, the business started its global operations after acquiring an enterprise outside Mexico, this during 2008.

The case study is narrowed to a business unit of the organization that is related to commercial activities of the manufactured good, and it is organized as follows: one business director, 5 managers and more than 20 employees distributed among the management areas. This area was elected because has a direct relationship to the sales of the business and to other internal process of the

complete organization. Also, the interviews were conducted only with the managers and 2 of the area employees.

6.2 Economic Cycle of the Case Study

Since 2008, part of the global economic environment has been polarized due to international economic crisis and recession. The organization of the case study was not exempt of this situation and is experiencing a slope-down of its economy. However and previous to this situation, the business was experiencing an impressive growth that allowed to expand its operation in other countries and also to increase its portfolio of manufactured products; including the design, manufacturing and sales of new line of products and services.

For this case study, the international economic turbulence started in 2008 and affected the business in 2009 as shown on Figure 6.1. Here, there are two cycles identified; the first ended in 2004 and the second started in 2005 until the present days. From 2005 to 2008 the business experienced a positive slope of operation profits, but in 2009 its economy started to diminish and it is estimated to continue with this trend in 2010 and expected to continue with this trend for the following couple of years or 2012 and even more.

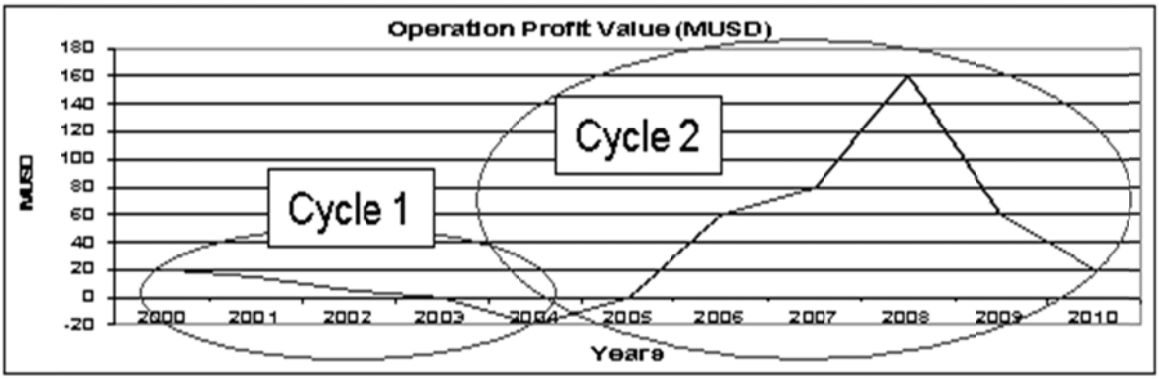

Figure 6.1. Research case study and its 10 years' operating profit

At this point, it is important to recall as mentioned previously that the usefulness and applicability of Akerman's business cycle in the enterprise economic trend to provide the answer to the research question and also to confirm the research theoretical assumptions. Because based on the business cycle theory that includes the economic cycles of the micro economy applies to the industrial cycles, it also could be reflected or mirrored to the enterprise economic trend. Primarily because it was found that the microeconomic trends, in particular cases influence on the firm economy performance, meaning that terms and concepts of microeconomic theory are similar at the firm level (Ilmakunnas and Topi, 1999; Erixon, 2009). On the next Figure 6.2 it is recalled the previous concept.

The Figure 6.2 identifies the similarity on the 3 type of economic cycles used in the research. This means that the theoretical Akerman's business cycle has a similar shape as the microeconomic shape, for this case study the micro economy means the economy trend of the industrial sector of the case study enterprise. Moreover and in this same figure, there is shown the economic cycle of the enterprise that happens to have the same shape as the other two. So and according to Erixon (2009) the Akerman business cycle can be used to identify the six phases of the enterprise economy and also, use this model to provide an answer to the research question.

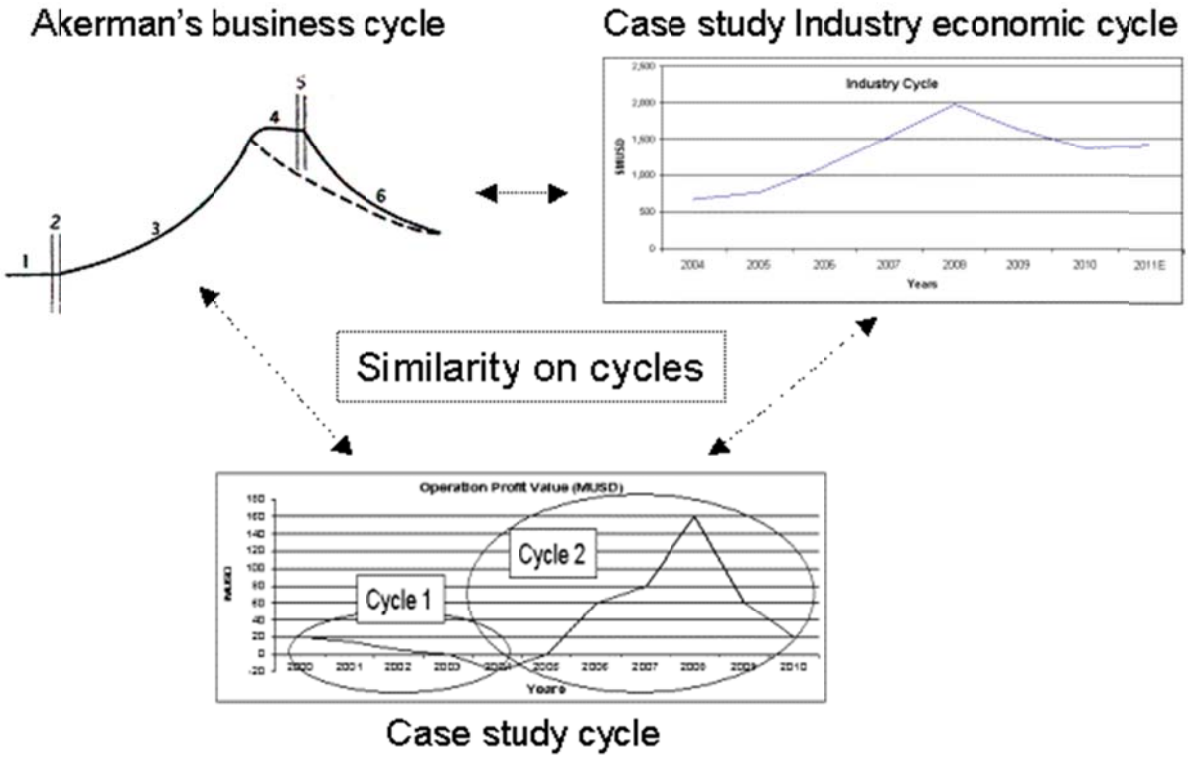

Figure 6.2. Enterprise economic cycle

In order to contextualize the economic downturn of the case study, next are relevant elements that influenced during the year 2009 and contributed in the economic crisis and recession of the enterprise:

- International economy downturn: for the business implied a 50% reduction on sales to overseas and market participation reduced to 30%.

- Overseas Enterprise acquisition: represented more than $ 4 million of US Dollars.

- Quality crisis in complex export product manufactured at the Mexican facility.

Moreover and to provide an answer to the research aim, the next considerations were in place to monitoring the intangible assets during the current crisis and recession:

- Monthly interviews with decision-makers to clarify more intangibles trend. From December 2009 until May 2010. This time includes the crisis part and the beginning and slope down of the recession. Also the interviews were with the 5 commercial and marketing managers, 2 employees and not so often with the business unit director (for this case was every quarter).

- Monthly sales report to identify the recession trend and compare to intangible trends. This information was gather from the business unit databases and confirmed with the commercial manager

- Monthly expenditures per human, structural and relational capital to confirm intangible relevance. This information was gathered from the corporate human resources databases, and also confirmed with the 5 managers involved.

The next Figure 6.3 indicates the annual sales of the enterprise case study from years 2006 to 2010, while the year 2010 is estimated. Also and to compare the information in the same dimension, the next Figure 6.4 shows the monthly sales (billing) trend of the business but as of May 2010. Hereinafter and for confidentiality reason, there are not amount shown neither for sales nor for

expenditures, only a polynomial trend line is shown, but the amounts are in millions of US Dollars, but for confidentiality of the information, they are expressed only in US Dollars. This information is useful to confirm the theory stated in this research and that is related to the relevance of intangible assets during and economic crisis context.

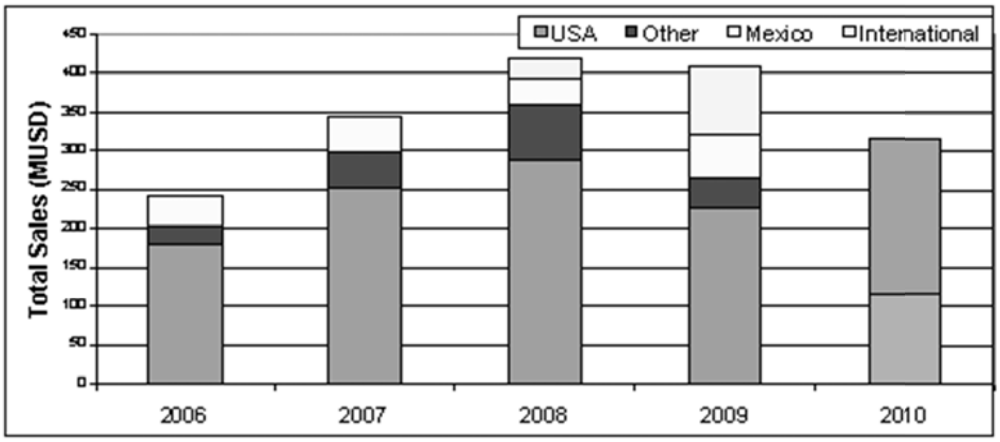

Figure 6.3. Annual sales from years 2006 to 2010 (note: 2010 is estimated)

Furthermore, if Figure 6.4 of the monthly sales of the research cases study enterprise is compared to the Akerman's economic cycle and its respective 6 phases, then the phases from 3 to 6 are identified as follows on Figure 6.5 (phase 1 and 2 are previous to year 2006 as described in previous paragraphs): Phase 3 for growth starts in year 2005 through year 2008, phase 4 for economic crisis beginning is from May 2008 to October 2008. The economic crisis phase 5 is from November 2008 to December 2008, and the last phase 6 or recession starts on January 2009 and would be present during year 2010 (after May is estimated).

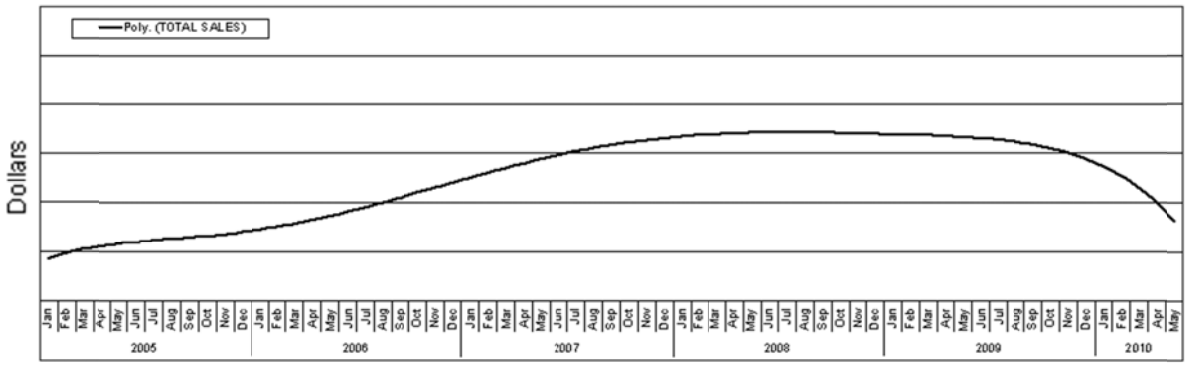

Figure 6.4. Monthly sales from years 2005 to 2010

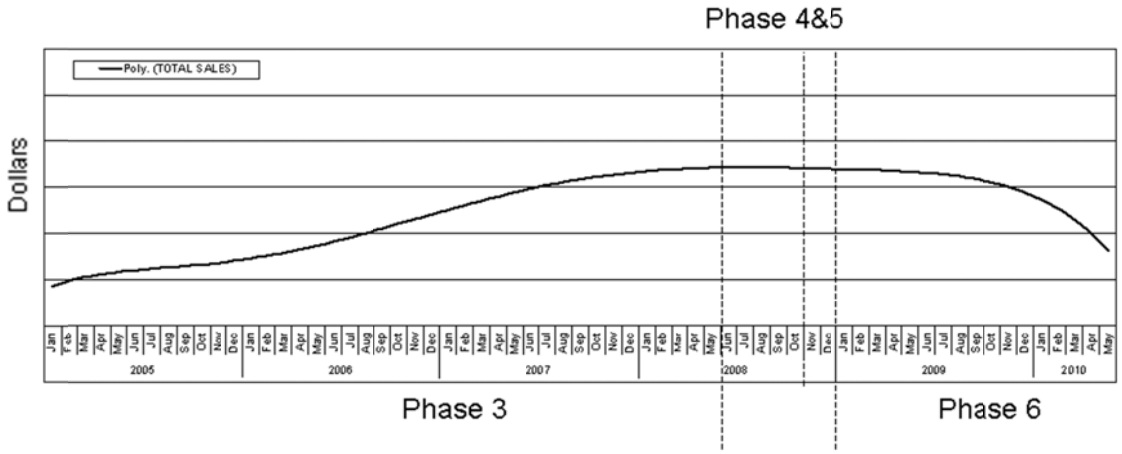

Figure 6.5. Economic cycle phases for the case study

So far, the economic crisis has been recognized for this case study but the question regarding the relevance of intangible assets is still open. To address this answer of the research aim to confirm the theory formulated, it is important to identify in which intangibles is the organization spending on and then clarify to which is giving importance. Also, it is required to identify which decisions are done in order to identify the relevance of intangible assets.

As an element to identify the relevance of the intangible assets is to consider the expenditures the organization are doing in this matter. Thus and with the expenditures on a monthly basis, they are compared to the economic cycle of the Figure 6.5 in order to contrast the relevance based on trends and confirm where the organization is cutting cost during the economic crisis and also to identify in which areas are investing more. The theory documented for this research says that cut cost are related to those activities that do not generate immediate value, and the investments are primarily in R&D and human capital development (Blausten, 2009; Lafrenz, 2006; Tan and Mathews, 2009; Pate and Narain, 2008).

6.3 Research Finding: Intangible Expenditures and Decision Made to Identify Relevant Intangible Assets

Note: For confidentiality of the information, the following figures and tables are represented only as polynomial trends and not real amounts are expressed, just as US Dollars.

Because this research focus on the identification and monitoring of intangibles based on their tendencies and relevance during an economic crisis and recession of the organizations, on the next Figure 6.6 is shown the expenditures on all intangibles relevant to the organization case study. Herein the tendency is to reduce the expenditures in a time previous to the phase 4, but at this point that tendency stops. However, on phase 5 there is an increase of expenditures until the 2nd half of year 2009, where a new contraction in expenditures starts. Thus the expenditures had major amplitude than previous years. At the next figures there are detailed information per capital such as structural and relational in order to understand better the tendency and moreover to identify to which intangibles the organization is expending more during the economic crisis of year 2009 and following years.

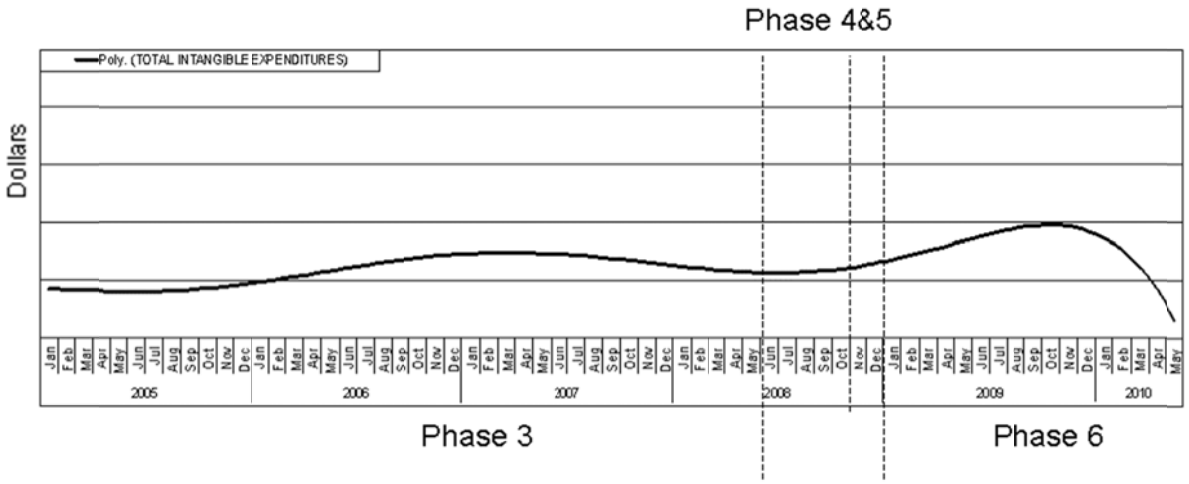

Figure 6.6. All expenditures related to intangible assets

So far, there have been shown tendencies from the quantitative perspective. Next, there are comments related to the qualitative information gathered that is related to the decisions made by relevant actors or decision makers.

To understand better and have more clarity on which intangibles the organization case study is making their decision and making them more relevant during the economic crisis to confirm the theory stated for this research; on Figure 6.7 are the most relevant decisions made that influenced in the intangible assets. On this Figure 6.7, there are identified the months when the organization made the majority of the decisions, which happened at the very beginning of the phase 6 of recession; this situation implied that the organization made many things to counter-cycle the recession and tried to help the business to be safe while trying to increase the sales amounts. Also, and after the decisions were made, on the Figure 6.7 there is a tendency to diminish the decisions made that meant the organization was waiting until those actions had effects on the slope-down. Moreover and due to the fact that the sales still are going down, the organization made more decision by the end of the year 2009 and it is expecting to see more result by year 2010. Despite the decisions made, the business is living an

outside-in effect that is pulling down the sales and internal activities are not being very effective, but they have diminished the impact of the recession to the business. This last sentence means that the biggest challenge the enterprise of this case study is experiencing is the industrial recession and the market contraction.

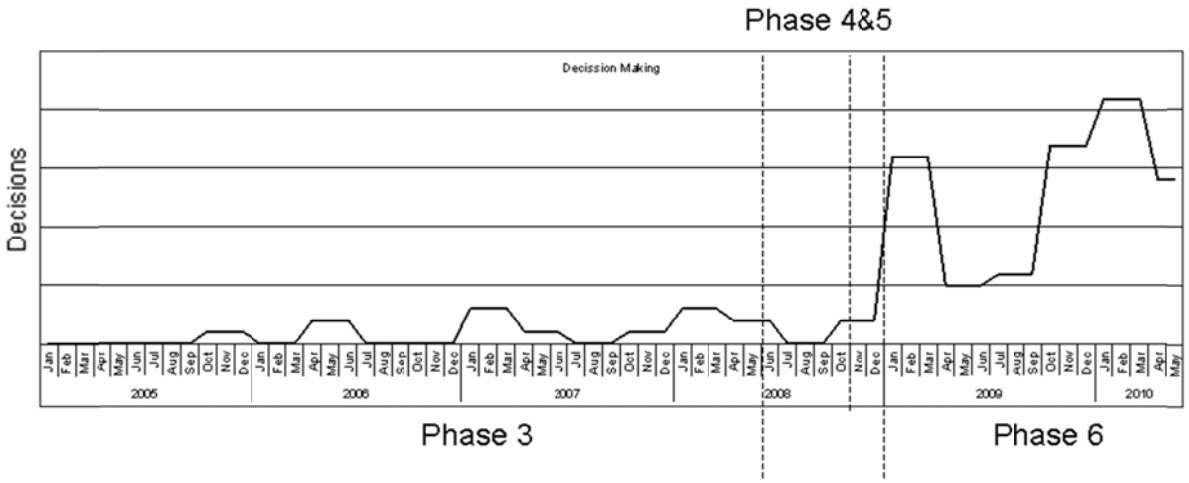

Figure 6.7. All decisions made related to intangible assets

As mentioned on previous paragraphs, next are detailed figures with the decisions made per intangibles.

6.3.1 Human Capital Findings and Report

For the analysis related to human capital, on the Figure 6.8 is shown the headcount (total of employees) of this business unit, also on Figure 6.9 are shown all the decisions made related to human capital. Herein it is displayed that during the month of December 2009 there is a relevant diminish or laid-off of the

headcount. This is because in November 2009 the organization decided to eliminate the Service Business that was implemented in year 2007, but under the current context the organization is focusing only on products sales. Actually, on November 2009 the organization decided to incorporate a new manager that is focused on the process of product quotation. Part of the functions of this new position is to redefine the processes involved and make them more efficient during the downturn. This is due to the fact that the current environment is more aggressive and more focused on final price than other times.

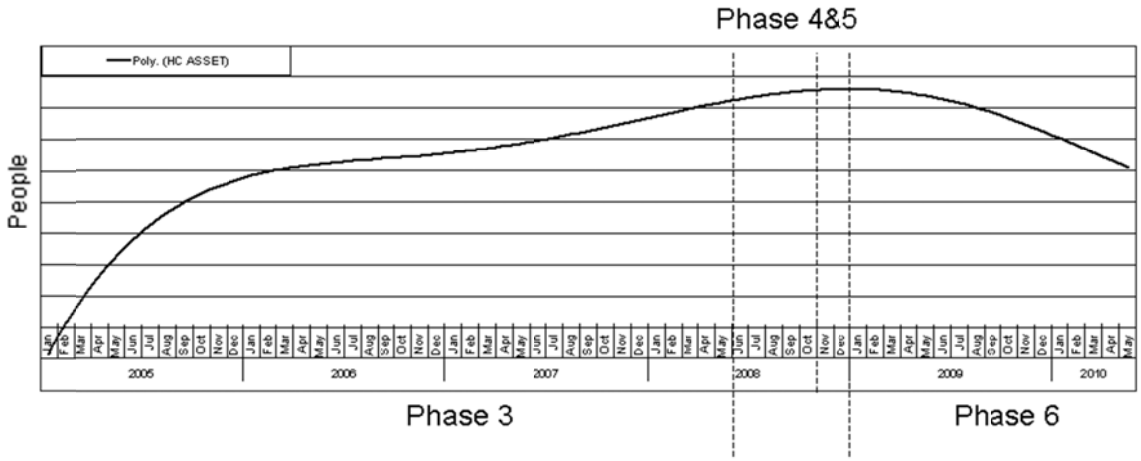

Figure 6.8. Headcount of the organization

As mentioned on the methodology, during the interviews with the decision makers and after the question related to this group of intangibles was questioned, the managers provided in a narrative way, information related to human capital and from this information the matching to human capital intangibles were marked and then charted on Figure 6.9. For example during the months of April 2009 the managers made decisions that had a direct implication to the human capital. Moreover, during the months of July and August of the same year, they did not

make new decisions that impacted human capital but they kept those that were implemented previously. For example, from the previous quarter they did not change activities related to training and kept that training at least for one more quarter.

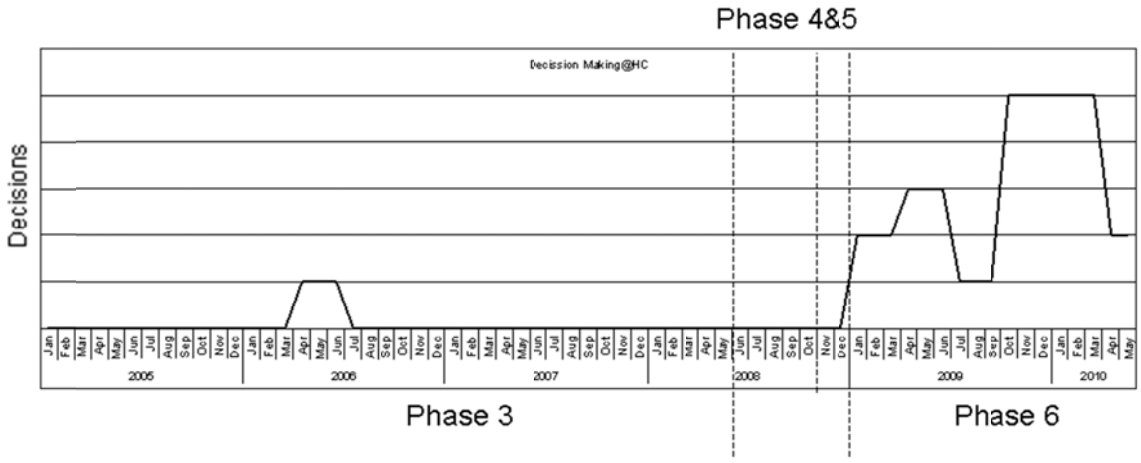

Figure 6.9. Decisions made related to human capital

- **Quantitative Analysis of Human Capital:**

In Figure 6.10, there is a comparison of intangible assets of the human capital in two scenarios. The first scenario is previous to the decision made of laid-off personnel by removing the Service Business and subsequent laid-offs, while the second scenario is after the change and also shows the part that was removed. The intangibles are about the distribution of the people related to the years of experience and their scholar degree.

It is relevant to identify that on Figure 6.10 and after comparing part a) human capital experience distribution previous to the organization change and c) human capital experience after the organization change; there is not a relevant change on the distribution of people experience and scholar degree, but decreased from

95.45% to 92.86% the people with a bachelor or higher degree. Also and after comparing the amount of people more experienced, it changed from 11% to 14%. So far, it could be considered that there is not change on the level of the personnel as well as the experience, however there is downsize of the organization. Moreover, if years of experience from the people are considered, it is relevant to mention that the organization after all has more people with more than 16 years at the organization and the less people with less than 5 years. For the analysis purpose, this implies that the experience of the people is having a relevant role during the crisis and recession.

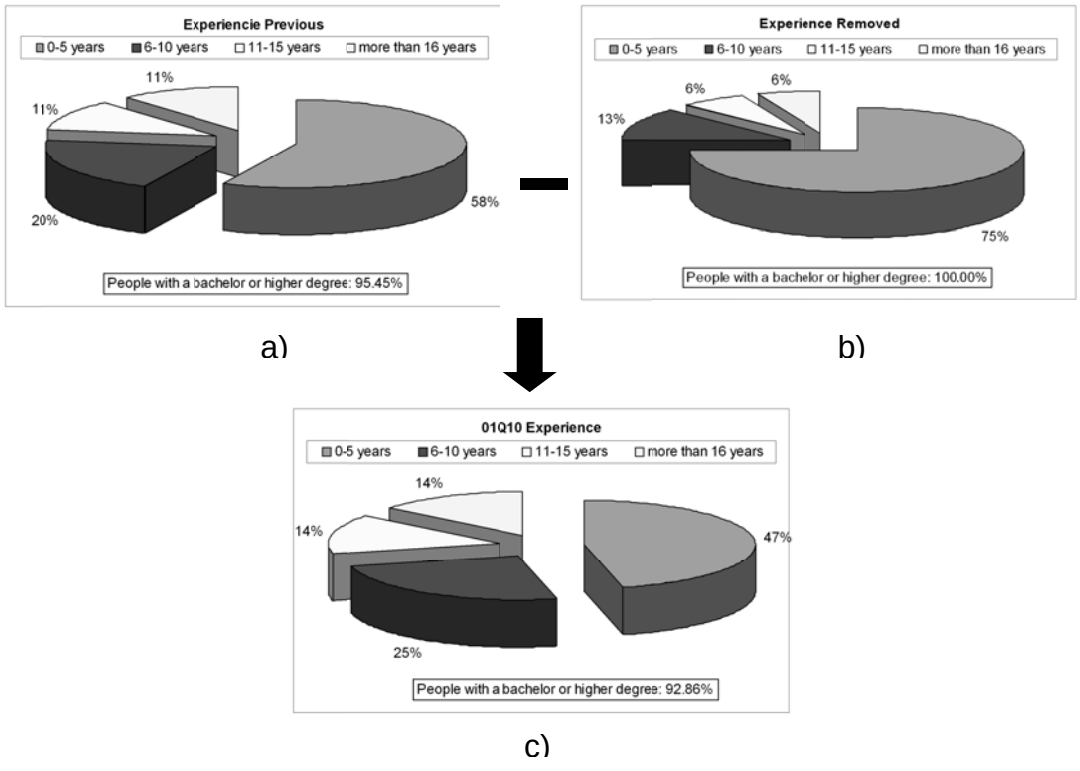

Figure 6.10. a) Experience distribution previous to the organization change. b) Experience removed, and c) Experience after the organization change

- **Qualitative Analysis of Human Capital:**

In the next Figure 6.11 are identified the tendencies of the intangibles based on the answers provided by the interviewed, as described on the methodology. This Figure 6.11 includes those intangible assets belonging to the taxonomy for economic crisis context, as well as the rest of them from the general taxonomy as follows:

- Up to the upper right side of the figure are listed the intangible assets but those underlined belong to the economic crisis context.

- The vertical axis represents the amount of matchings related to the intangible element but at the phase of the economic cycle.

- The horizontal axis of the Figure 6.11 represents the intangibles enlisted previously and are identified in two groups: the first group is for those that are part of the intellectual capital taxonomy for organizations under an economic crisis context, and the second includes those other intangibles from the general taxonomy.

- The second horizontal axis in perspective includes the time frame when the information was submitted; this means that the dates are grouped in the phase 3 and phases 4&5 timeframes and for the phase 6 of the economic cycle is separated in quarters for the 2009 and 2010 years. This is because there is more granularity of the information provided and gives more information for the monitoring of the intangibles during the context of this research. This group is from first quarter of 2009 until first quarter of 2010.

The description mentioned above is used and has the same interpretation for the rest of the intellectual capital taxonomy, in terms of relational and structural capital.

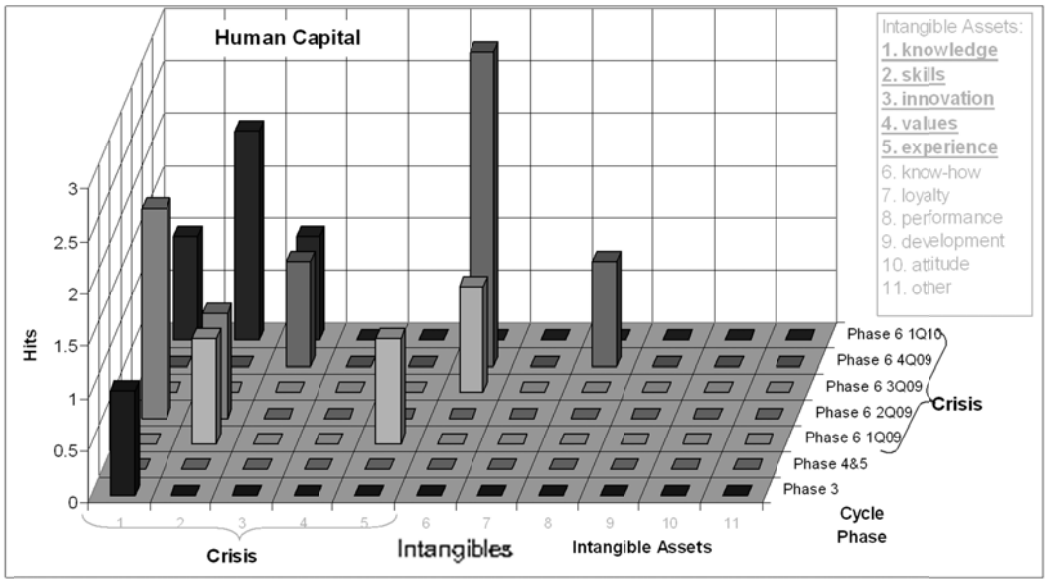

Figure 6.11. Decisions related to human capital

The Figure 6.11 shows those intangibles that are relevant during the crisis and recession phase 4 to phase 6 of the economic cycle. Based on the highest amount of matchings provided by the decision makers during the interviews hold, the organization is concentrating their efforts on those assets related to employees' knowledge, skills, innovation and experience; all of them from the economic crisis taxonomy, but the organization is also concentrating on other intangibles from the general taxonomy such as know-how and people performance. However, those intangibles related to employee values are not becoming relevant during the recession phase, while the theory of this research include them as relevant for any organization under an economic crisis context.

6.3.2 Structural Capital Findings and Report

Regarding the analysis of the structural capital and the way it performs during economic crisis of the organization case study, the Figure 6.12 shows the expenditures related to this group of intangibles. This also includes the identification of the relevant phases of the economic cycle.

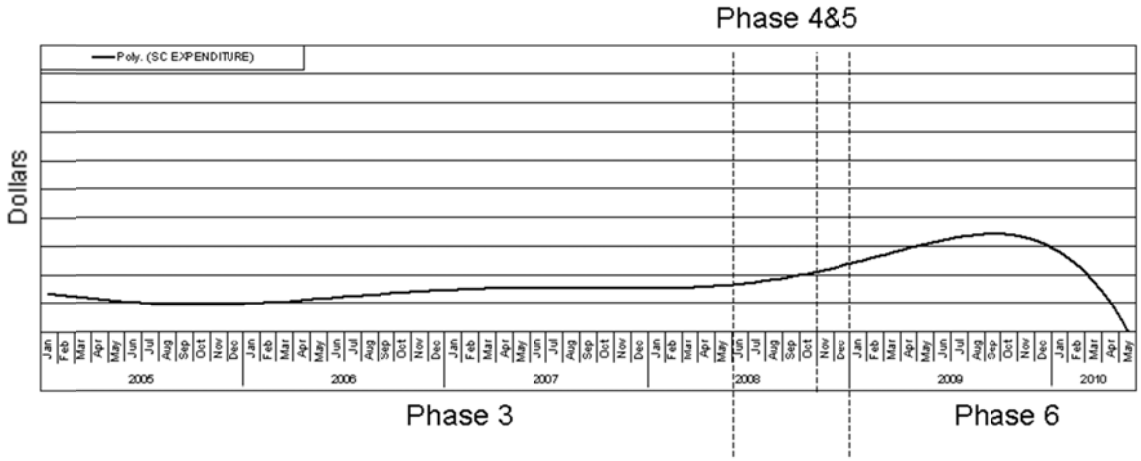

Figure 6.12. Expenditures related to structural capital

- **Quantitative Analysis of Structural Capital: Standard Deviation**

The result of this part of the research did not provide a clear trend of preference related to the expenditures. The results obtained are shown on Annex 7. This is due to the fact that the information gathered was not enough to provide conclusive answer to this method and also, the quality of the data was low for the design of experiments. If the enterprise case study would have more data available and with more certainty, then this method of standard deviation would provide more significant information to conclude the theory of the research.

- **Quantitative Analysis of Structural Capital: Pearson Correlation**

In next Table 6.1 are shown the results of the Pearson correlation for the structural capital. This analysis includes the sales as part of the correlation and the gray numeric cell indicates that the element compared to sales has a Pearson correlation close to one; meaning that both elements have a similar trend after charting them.

Structural Capital: Phase 3 (Jan05-May08)

Pearson correlation	1. Non-Deductive Expenditures	2. Variable Expenditures	3. Services and Taxes Related to the Product	4. Telephone and Computer	5. Rent Of Special Equipment
0.- Sales	0.42383	-0.07369	0.39127	-0.37114	0.21714
1. Non-Deductive Expenditures	1.00000	0.06211	0.26283	-0.24157	-0.07376
2. Variable Expenditures		1.00000	0.01360	-0.20825	-0.31049
3. Services and Taxes Related to the Product			1.00000	-0.17122	0.05964
4. Telephone and Computer				1.00000	-0.08974

Structural Capital: Phase 4&5 (Jun08-Dec08)

Pearson correlation	1. Non-Deductive Expenditures	2. Variable Expenditures	3. Services and Taxes Related to the Product	4. Telephone and Computer	5. Rent Of Special Equipment
0.- Sales	0.39815	0.36943	-0.04015	-0.24819	-0.47633
1. Non-Deductive Expenditures	1.00000	0.00638	0.64954	-0.74668	-0.03452
2. Variable Expenditures		1.00000	-0.09637	-0.01665	-0.13469
3. Services and Taxes Related to the Product			1.00000	-0.38546	0.12162
4. Telephone and Computer				1.00000	0.41185

Structural Capital: Phase 6 (Jan09-Apr10)

Pearson correlation	1. Non-Deductive Expenditures	2. Variable Expenditures	3. Services and Taxes Related to the Product	4. Telephone and Computer	5. Rent Of Special Equipment
0.- Sales	0.18632	0.20980	0.10689	-0.14817	0.11400
1. Non-Deductive Expenditures	1.00000	0.63101	0.51682	0.00628	0.47779
2. Variable Expenditures		1.00000	0.45279	0.01580	0.52051
3. Services and Taxes Related to the Product			1.00000	0.01632	0.12011
4. Telephone and Computer				1.00000	-0.02147

Table 6.1. Pearson correlation analysis

From Table 6.1, it is shown that during phase 3 the expenditure related to Non-Deductive Expenditures, Services and Taxes Related to the Product have a close relationship to sales trend. So, next is the comparison to phases 4&5 related to the crisis and phase 6 related to recession as follows: For phases 4&5, the relevant expenditures are Non-Deductive Expenditure, Variable Expenditures, because these accounts are closer to 1 respect to the others.

For phase 6, the relevant expenditure is Telephony and Computer, because the Pearson correlation analysis result is closer to –1 respect to the others. Also, and after interviewing relevant actor about this finding, it made sense due to the fact that during the recession they are spending more time at telephone conference calls looking for more deals and also to counter-cycle the decision to minimize travels. This means that instead of sending people to have face-to-face meetings with customers, they decided to place a conference call and use this tool to clear questions of submit relevant information to customers.

The previous analysis represent that for this case study, during the economic crisis the expenditures around Telecommunications and Information Technology are more relevant than the others; but when the crisis started the expenditures related to activities that are non-deductive such as any activity that is not directly associated to the business or to the operation diminished; also the variable expenditures such as activities that are not in the expenditure catalog and are not fixed to the business operation became relevant.

- **Quantitative Analysis of Structural Capital: Polynomial Approach**

The quantitative analysis for the gathered data regarding the structural capital expenditures using the polynomial method, considers the transformation of all the data series as of the Accounting expenditures list into polynomial equations, as described in the methodology part. All the equations used for this analysis are

included in Annex 4, and next on the Table 6.2 are the results of applying the difference of surface under the curve concept between each expenditure respect to phase 3 less phase 6 of the economic crisis corresponding to the 16 months period described. On this table are identified as significant those expenditures which subtraction of phase 3 surface result less phase 6 surface result has a negative number. This means that for the same expenditure the amount of US dollar expended during the recession part is greater than the amount expended during the growth phase. However, those with a positive result after the subtraction are not significant for this analysis, not for the organization.

Structural Capital				
Intangible Expenditures	**Phase 3 Surface**	**Phase 6 Surface**	**Surface between**	**Result**
1. Non-Deductive Expenditures	3.6536	6.8708	-3.2172	**Significant**
2. Variable Expenditures	5.0922	1.3002	3.792	Not significant
3. Services and Taxes Related to the Product	3.8273	3.5162	0.3111	Not significant
4. Telephony and Computer	9.1265	4.1897	4.9368	Not significant
5. Rent Of Special Equipment	6.9872	4.6218	2.3654	Not significant

Table 6.2. Surface results

Notes: 1) the units of surfaces expressed on this table are in $ by month.

2) The data shown herein equals the total of US Dollars expended (normalized) by the 16 months.

So, it is found that the Non-Deductive Expenditures is the data series significant during the recession. Next is the graphical result of the previous conclusion, meaning that the Non-Deductive Expenditure for phase 3 and phase 6 are chartered considering the 16 months per phase. On the next Figure 6.13 is marked in gray the surface between both polynomial equations, denotation that this is the difference of using the Integer surface under the curve.

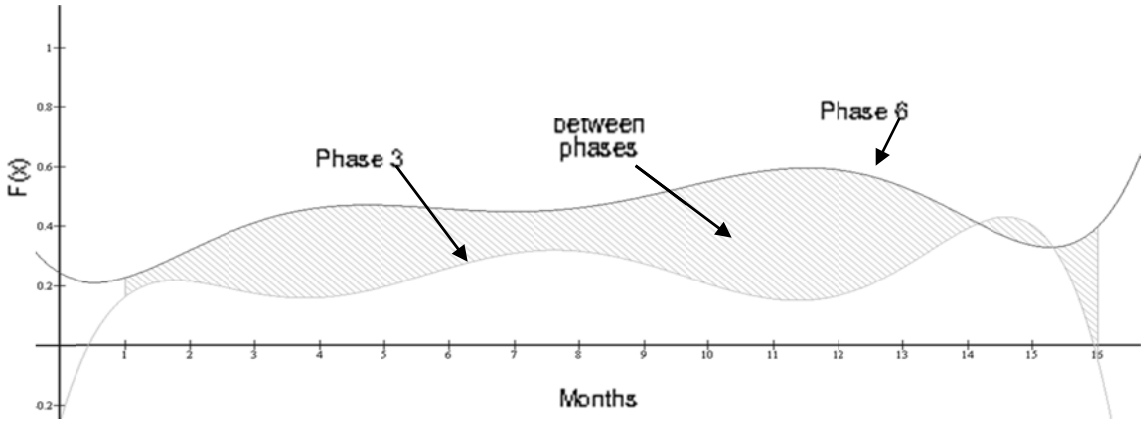

Figure 6.13. Non-Deductive Expenditure during phase 3 and phase 6

For this case study, this expenditure of Non-Deductive is related to activities that are not directly related to the business and they do not have a formal receipt to demonstrate it, for example taxi service during a trip or any gratifications for services acquired, such as tips to waiters.

- **Qualitative Analysis of Structural Capital**

After the crisis phase is ending and the recession is taking place, the expenditures are increasing, but in a certain time of the year 2009 they increased to get contracted later. But, if this trend is compared to the decision made on Figure 6.14, there are shown that the decision makers are making the majority of its decisions considering intangibles related to process, procedures or cost reductions, among others.

Similar to the human capital part, this analysis consider the narrative provided by decision makers and those words related to the intangibles of this group were considered as matchings and then chartered on the Figure 6.14. For example,

the interviewed manager made decision related to this group during the month of January and February 2009 but after those months they did not make too many decisions in order to see the impact of the decisions on the enterprise performance. However and due to the fact that the organization case study is not answering properly to the recession, during the following months of September 2009 to April 2011, they made more decisions. All of the answers provided were chartered on this figure.

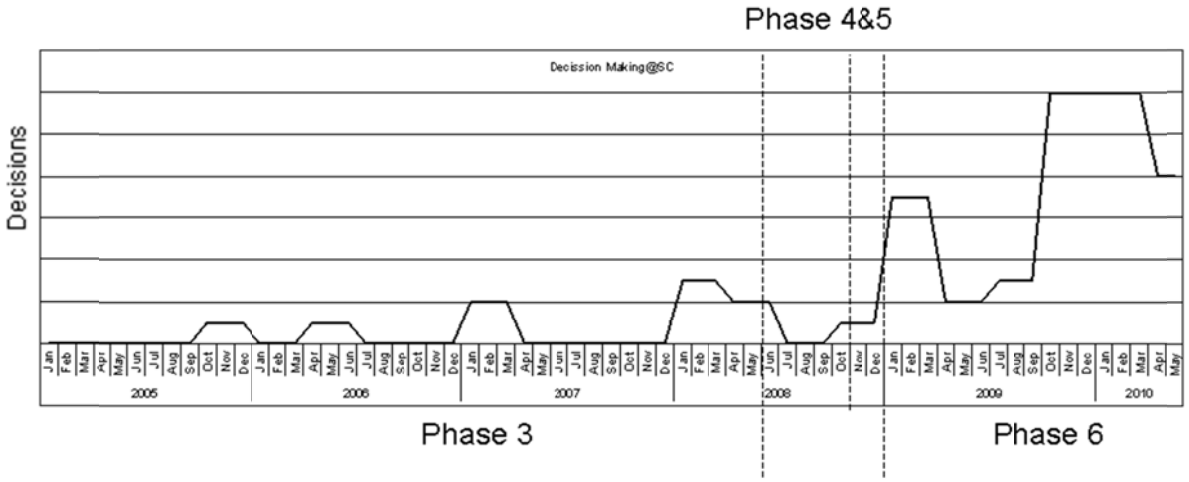

Figure 6.14. Decisions made related to structural capital

Here is relevant to mention that previous to the crisis, the organization made particular decisions related to this group of intangibles, but the majorities were made right after the recession started in year 2009. During this period, the organization made decisions and expected to see the consequences on the economic situation then. However and after the critical part is not getting better, the business made more decisions that were under evaluation and progress during this first quarter of year 2010. At the Figure 6.14 is more detail regarding the decisions made during the crisis period and also, there are identified those intangibles more relevant under the mentioned context.

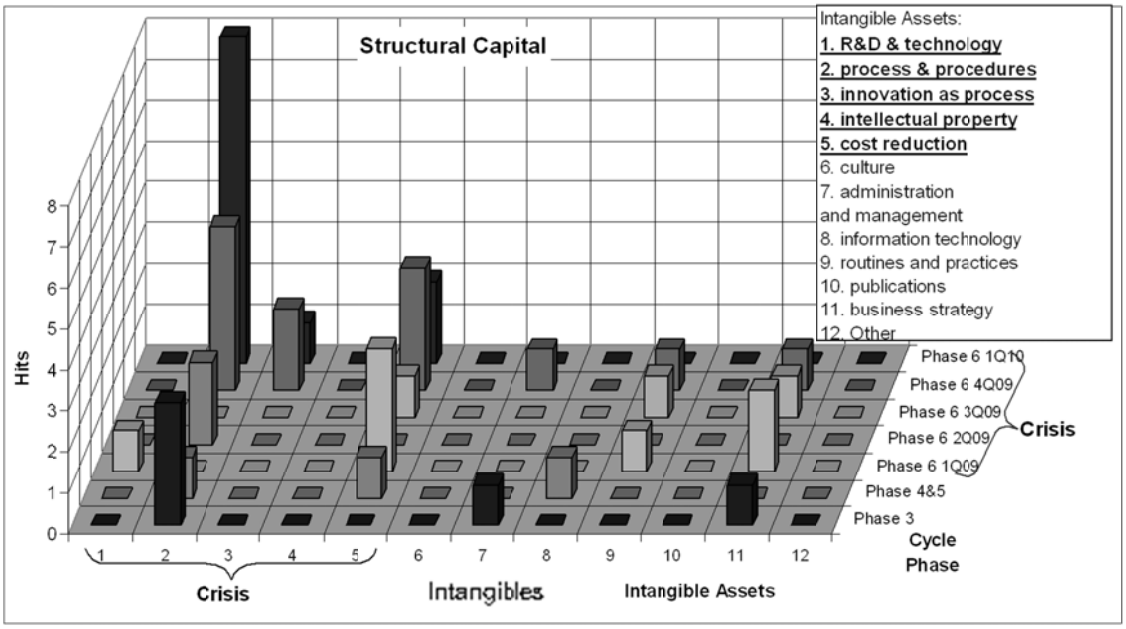

Figure 6.15. Decisions related to structural capital

Like in the human capital qualitative analysis, next is the interpretation of the Figure 6.15:

- Up to the upper right side of the figure are listed the intangible assets but those underlined belong to the economic crisis context.

- The vertical axis represents the amount of matchings related to the intangible element but at the phase of the economic cycle.

- The horizontal axis represents the intangibles enlisted previously and are identified in two groups: the first group is under an economic crisis context, and the second includes those from the general taxonomy.

- The second horizontal axis in perspective includes the time frame when the information was submitted.

On Figure 6.15 is identified that the decision were more concentrated on Process and Procedures. This is due to the fact that the organization is a manufacturer and its operation is normally based on process track. Especially the types of processes that the organization is trying to fix are those related to quoting and pricing. On the following chapters of this report there are more information regarding the process of quotation and the decisions made around this to help the organization to respond to the critical situation.

Another intangible relevant for the enterprise case study is the Cost Reduction. This finding is aligned to the literature reviewed and the theory stated for this research and for this case study, the organization is trying to create lower cost products in order to keep selling enough to survive and to have sufficient cash flow. Finally, the Innovation process is becoming relevant at the end of the phase 6. This means that the organization is trying to have more innovative ideas to help the business.

However and based on the previous analysis of intangibles under critical situation, it is a relevant finding that the rest of intangibles such as R&D & Technology or the Intellectual Property are not becoming relevant under the current critical situation. This similar situation applies proportionally to the rest of intangible assets listed in the structural capital group of the intellectual capital.

6.3.3 Relational Capital Findings and Report

Regarding the relation capital group of intangibles of the intellectual capital of the research and reviewed at the enterprise case study, on the next Figure 6.16 are identified the expenditures related to this group of the intellectual capital taxonomy. Thus, the graph trend is to diminish this type of expenditures right after the phase 3 or the expansion was coming to an end. Meaning that the crisis was almost to start on its phase 4 and the organization decided to cut costs.

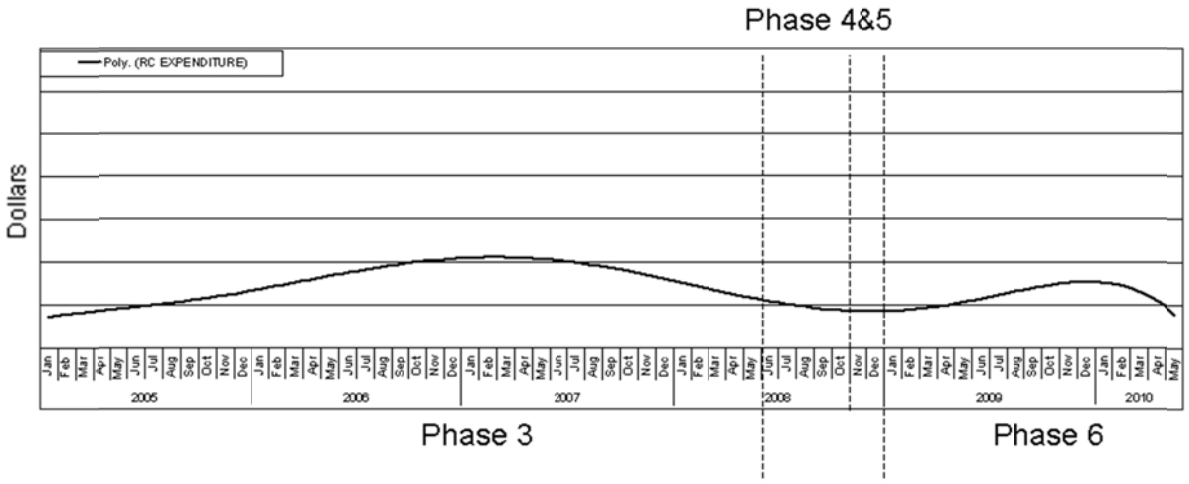

Figure 6.16. Expenditures related to relational capital

- **Quantitative Analysis of Relational Capital: Standard Deviation**

Similar to the structural capital analysis, the result of this part of the research did not provide a clear trend of preference related to the expenditures. The results obtained are shown on Annex 7. This is due to the fact that the information gathered was not enough to provide conclusive answer to this method and also, the quality of the data was low for the design of experiments. If the enterprise

case study would have more data available and with more certainty, then this method of standard deviation would provide more significant information to conclude the theory of the research.

- **Quantitative Analysis of Relational Capital: Pearson Correlation**

In the next Table 6.3 are the results of applying the Pearson correlation method to confirm the research theory about those intangibles that are relevant during economic crisis in an organization. Here and similar to the previous section of structural capital, the same criteria are used in order to identify which intangible expenditures are relevant during the economic crisis and recession.

From the Table 6.3, the next expenditures are relevant during the different phases: For phases 4&5 the Meetings, Expos and Conferences, and Assessors and Consultants are the relevant expenditures on intangibles. Moreover, during phase 6 the Marketing and Promotion, as well as Assessors and Consultants expenditure are the relevant items. Also and after interviewing relevant decision makers, they confirmed that these variables made sense because during the difficult times, they tried to promote the brand on international markets and also asked for professional advisor to help the organization to overcome the current situation.

Relational Capital: Phase 3 (Jan05-May08)

Pearson correlation	1. Meetings	2. Expos and Conferences	3. Travel Expenditures	4. Marketing and Promotion	5. Assessors and Consultants	6. Inscription to Public Bids	7. Clubs and Associations Fees	8. Technical Assistance for Imports
0.- Sales	-0.09616	0.16888	0.19705	0.29646	0.17055	0.12798	-0.29694	0.14083
1. Meetings	1.00000	0.02612	0.38339	-0.00820	-0.12823	-0.01962	0.18036	-0.30802
2. Expos And Conferences		1.00000	0.20494	-0.04376	-0.00039	0.22280	-0.06346	-0.06003
3. Travel Expenditures			1.00000	0.21080	-0.03028	0.13397	0.06495	-0.22571
4. Marketing and Promotion				1.00000	0.51603	-0.08263	-0.18411	-0.05570
5. Assessors And Consultants					1.00000	-0.00772	0.04437	0.13046
6. Inscription To Public Bids						1.00000	0.17798	-0.11673
7. Clubs And Associations Fees							1.00000	-0.06692

Relational Capital: Phase 4&5 (Jun08-Dec08)

Pearson correlation	1. Meetings	2. Expos and Conferences	3. Travel Expenditures	4. Marketing and Promotion	5. Assessors and Consultants	6. Inscription to Public Bids	7. Clubs and Associations Fees	8. Technical Assistance for Imports
0.- Sales	0.29863	0.31114	0.05912	-0.34913	0.31941	0.25830	0.13880	ND
1. Meetings	1.00000	-0.36821	-0.45630	-0.29784	-0.19559	-0.17681	-0.39845	ND
2. Expos And Conferences		1.00000	0.69640	-0.28962	0.67934	0.95131	0.81417	ND
3. Travel Expenditures			1.00000	0.26529	0.52255	0.74721	0.93004	ND
4. Marketing and Promotion				1.00000	-0.17804	-0.31492	-0.07342	ND
5. Assessors And Consultants					1.00000	0.68103	0.64486	ND
6. Inscription To Public Bids						1.00000	0.87855	ND
7. Clubs And Associations Fees							1.00000	ND

Relational Capital: Phase 6 (Jan09-Apr10)

Pearson correlation	1. Meetings	2. Expos and Conferences	3. Travel Expenditures	4. Marketing and Promotion	5. Assessors and Consultants	6. Inscription to Public Bids	7. Clubs and Associations Fees	8. Technical Assistance for Imports
0.- Sales	0.07661	0.60605	0.60836	-0.46618	-0.23236	-0.01527	0.26030	0.16892
1. Meetings	1.00000	0.30083	0.63379	0.01498	-0.17821	0.58561	-0.13986	0.22314
2. Expos And Conferences		1.00000	0.28512	-0.06579	-0.03875	-0.12408	0.10145	0.59062
3. Travel Expenditures			1.00000	-0.31673	-0.10853	0.39152	-0.12973	0.06567
4. Marketing and Promotion				1.00000	0.03057	-0.27367	-0.10311	-0.18563
5. Assessors And Consultants					1.00000	-0.25285	-0.08693	-0.12356
6. Inscription To Public Bids						1.00000	-0.17672	0.33442
7. Clubs And Associations Fees							1.00000	-0.07012

Table 6.3. Pearson correlation analysis

- **Quantitative Analysis of Relational Capital: Polynomial Approach**

Similar to the structural capital analysis, all the calculated equations are described on the Annex 3 and they have the same time span of 16 months for the phase 3 and phase 6. Also, they are compared among them to identify which expenditures have relevance during the economic crisis. On the next Table 6.4 are the results for this analysis. Again, on this table are identified as significant those expenditures which subtraction of phase 3 surface result less phase 6 surface result has a negative number. This means that for the same expenditure the amount of US dollar expended during the recession part is greater than the amount expended during the growth phase. However, those with a positive result after the subtraction are not significant for this analysis, not for the organization.

From this particular analysis it is found significant that the expenditures that are significant during the phase 6 are those related to Expos and Conferences, Inscription to Public Bids and Technical Assistance for Imports. On the following Figures 6.17, 6.18 and 6.19 are represented the graph of the mentioned expenditures and also is shown in gray color the surface remaining after subtracting the surface of both phases.

Although on the Figure 6.17 is not evident at first sight why this expenditure is relevant; basically because in certain months of the sample the phase 3 is higher that the phase 6. But if the complete 16 months sample is considered the mentioned result is obtained. Here is shown one of the reasons because this method of Integer surface is used to identify relevant expenditures.

Relational Capital				
Intangible Expenditures	Phase 3 Surface	Phase 6 Surface	Surface between	Result
1. Meetings	5.2958	4.5334	0.7624	Not significant
2. Expos And Conferences	5.1	6.1766	-1.0766	**Significant**
3. Travel Expenditures	5.1698	1.4062	3.7636	Not significant
4. Marketing and Promotion	4.4535	1.4057	3.0478	Not significant
5. Assessors And Consultants	2.2894	1.5606	0.7288	Not significant
6. Inscription To Public Bids	3.6474	4.0251	-0.3777	**Significant**
7. Clubs And Associations Fees	2.7416	1.6727	1.0689	Not significant
8. Technical Assistance For Imports	0.3848	1.3756	-0.9908	**Significant**

Table 6.4. Surface results

Notes: 1) the units of surfaces expressed on this table are in $ by month.

2) The data shown herein equals the total of US Dollars expended (normalized) by the 16 months.

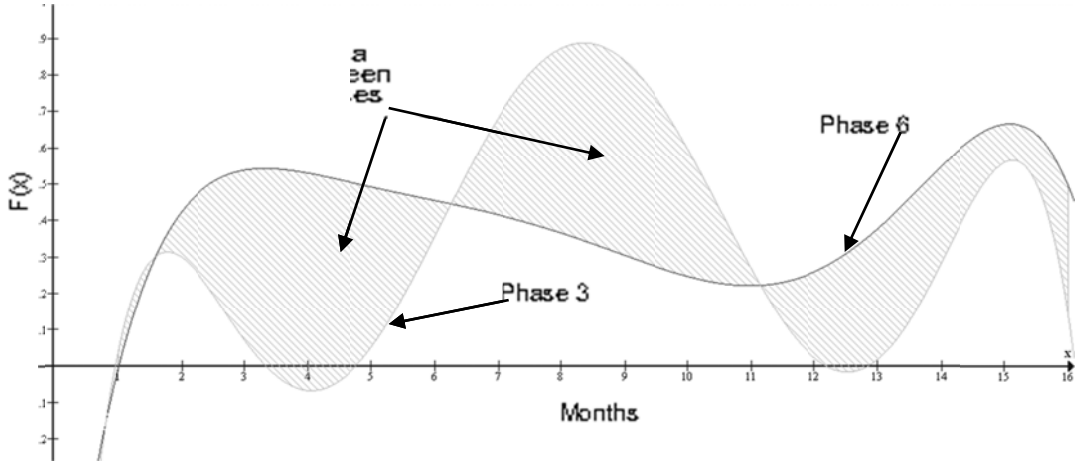

Figure 6.17. Expos and Conferences Expenditures during phase 3 and phase 6

Similar to the previous Figure 6.17, on this Figure 6.18 there are many intersections between both equations, making hard to identify which is more relevant respect to the other; but if the surfaces between both are considered within the 16 months the difference between both functions provides the result that this expenditure is relevant.

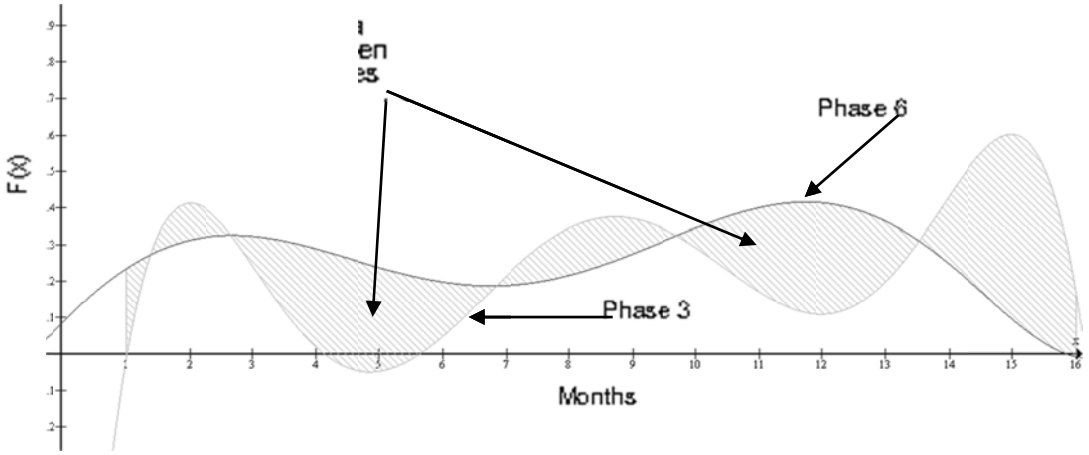

Figure 6.18. Inscription to Public Bids Expenditure during phase 3 and phase 6

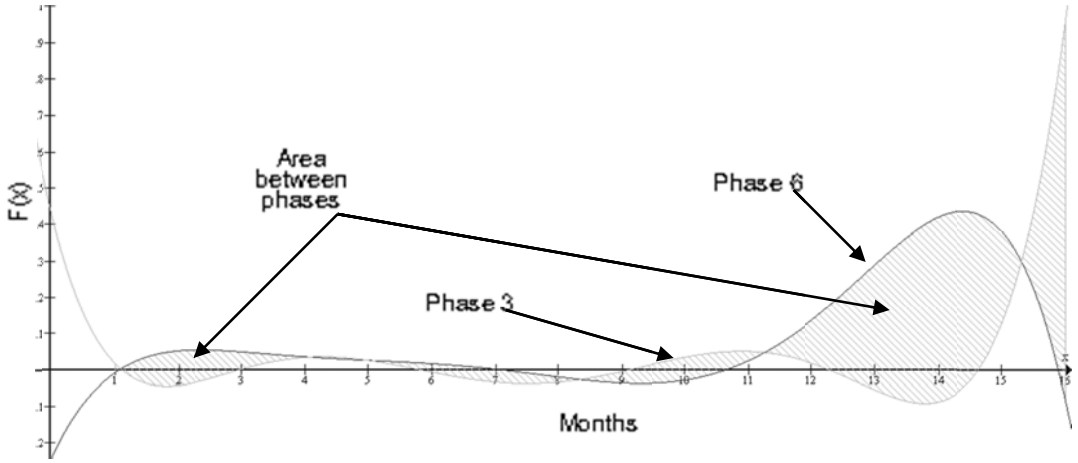

Figure 6.19. Technical assistance for Imports Expenditures during phase 3 and phase 6

Technical Assistance for Imports expenditure has a particular behave. As shown on the Figure 6.19 both equations have a similar trend at the beginning of the sample, but at the end and close to the month 16, they are disperse making it more clear to recognize why this expenditure is relevant during the economic crisis. Also, the result of the Integer calculation provides a relevant data to make this conclusion.

- **Qualitative Analysis of Relational Capital**

The decision makers made their decision around this group of intangibles, as shown on the next Figure 6.20. As described previously, the decisions are mostly related to cutting travel expenditures and also reducing the frequency of trips to visit customer or other. This situation considered that travels that used to include many employees to visit customers, conventions and forums as many as possible; now, they only send one employee to the minimum travels. Moreover, this situation of cost reduction included expenditures related to consults and assessors as described next.

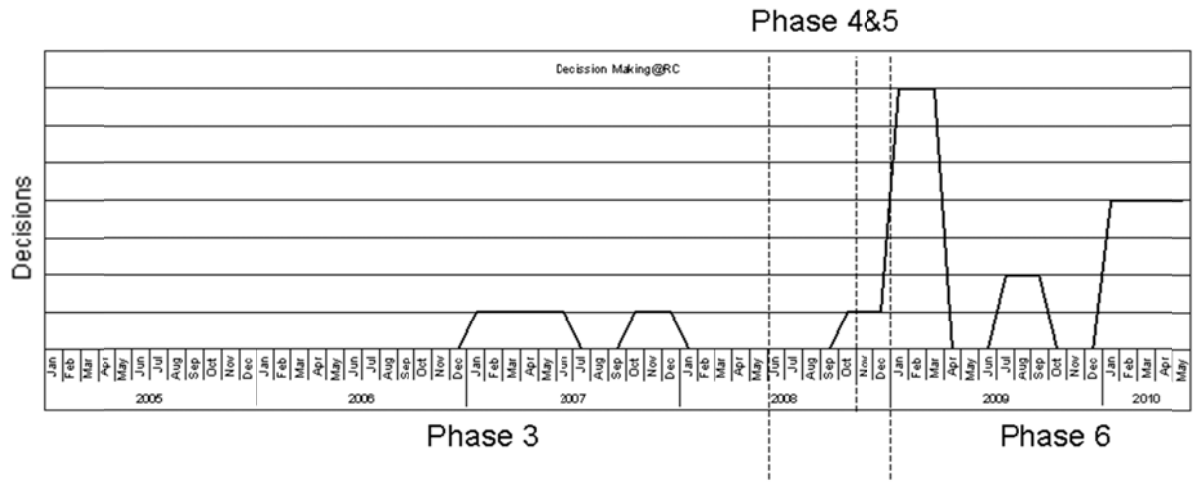

Figure 6.20. Decision made related to relational capital

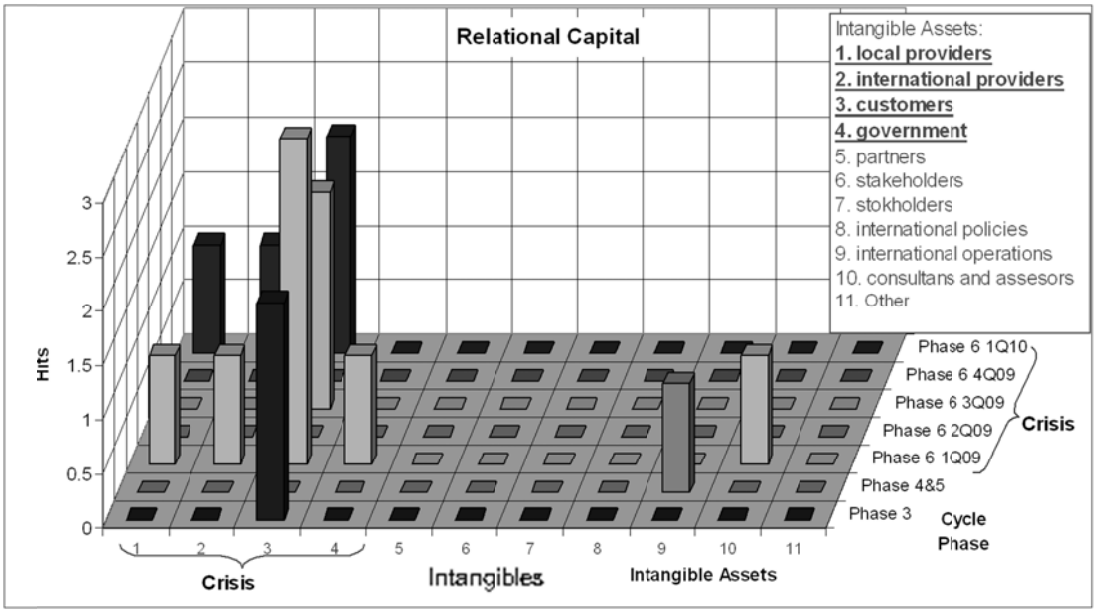

Figure 6.21. All intangibles related to relational capital

For this group and on Figure 6.21 are shown the intangibles that are becoming relevant at the downturn context, but based on the decisions made on the same period of time. Similar to the human and structural capital qualitative analysis, next is the interpretation of Figure 6.21.

- Up to the upper right side of the figure are listed the intangible assets but those underlined belong to the economic crisis context.

- The vertical axis represents the amount of matchings related to the intangible element but at the phase of the economic cycle.

- The horizontal axis represents the intangibles enlisted previously and are identified in two groups: the first group is under an economic crisis context, and the second includes those from the general taxonomy.

- The second horizontal axis in perspective includes the time frame when the information was submitted.

From this Figure 6.21, the relationship with local and international providers, government related activities and the relationship to customers are the decision to intangibles more relevant during the year 2009 and beginning of year 2010. In spite of those intangibles, the relationship to customer is the most relevant of all of them during the phases previous to the economic crisis, and even during these phases. This makes sense because at the end, this organization is trying to keep selling to current and new customers, in order to have cash flow to succeed the downturn.

However, decisions related to intangibles such as consultants, assessors and international operations became relevant but at the beginning of the economic crisis context; and no more decisions of them have been done during the following recession phase.

6.4 Relevant Comments Regarding Intangible Asset

With the information found and analyzed previously, and to put together the relevant findings for the research aim, it becomes relevant to mention the following ideas that contribute to confirm the theory of this research.

1. - At the beginning of the economic crisis and recession, the decision makers of the enterprise case study made more decisions related to intangibles belonging to the group of structural and relational capital, but while the recession and downturn became more deep, the organization prioritized their decision around structural and human capital. Because of this deepness, the decision makers confirmed that the organization decided to diminish expenditures to consultants and activities out of the business such as customer visits (reduce the amount of delegates per trip), expos on summits and others.

2. - The intangible assets that are being more relevant are those related to internal process, procedures, systems, cut-cost and other that are part of the business structural capital. This is also confirmed with the expenditures related to this type whereas the organization is spending more on internal process and procedures than other. But their expenditures are more inverse- correlated to the sales (billing) on the matters of telecommunications and telephony services.

3. - At the beginning of the recession, the organization made many decisions related to the relational capital group of intangibles, but after the time passed the organization decided to stop expenditures on this part (as described on previous paragraphs). However, the decision makers considered relevant actions around local and international providers, as well as customers. Moreover and regarding their expenditures, the organization is considering more relevant all expenditures related to the re-positioning of the brand during the recession phase.

After these qualitative and quantitative analyses that provided relevant information for the organization, the taxonomy of intangible assets during economic crisis is found for this case study and shown on Table 6.5. This is similar to the taxonomy for economic crisis described before, but this has more aligned elements to the organization decision made and expenditures on intangibles. Next, on Table 6.5 are enlisted the intangible assets that are relevant during the economic crisis and recession for the research case study.

Intellectual Capital for Case Study Economic Crisis		
Intellectual Capital	**Quantitative**	**Qualitative**
	Intangible assets investment	**Relevant intangible assets**
1.- Human Capita	1.1. Headcount	1.1. Knowledge 1.2. Skills 1.3. Innovation 1.4. Know-how 1.5. Performance
2. Structural Capital	2.1. Non-deductive expenditures	2.1. R&D & Technology 2.2. Process & Procedures 2.3. Innovation as a Process 2.4. Cost Reduction 2.5. Information Technology 2.6. Administration and Management 2.7. Routines & Practices 2.8. Business Strategy
3. Relational Capital	3.1. Expos and Conferences 3.2. Inscription to Public Bids 3.3. Technical Assistance for Imports	3.1. Local Providers 3.2. International Providers 3.3. Customers

Table 6.5. Case study intangible assets during economic crisis

6.5 Highlights Related to Decision Making

Herein, there are enlisted relevant comments provided by the decision makers, and are considered as complementary elements of the context for the research analysis.

- During the interviews conducted, the decision makers concluded that the decisions made were mostly based on data and information coming from different sources inside and outside the organization. Due to the culture of the organization, the decisions were less based on intuition and more on hard data. This goes in opposite way to the relevant literature found whereas the decision makers hurry their decision and based them more on the intuition and previous experience.

- The decision makers commented that the amount of working interviews and working meetings have not changed neither of the frequency, duration nor participants. They only adjust the focus of the meetings making them more intense and focused on sales, new customer opportunities to sell and on new orders entry. This happened on all daily meetings. Like on the previous bullet, the theory found mentions that organization tends to hurry up things while speeding-up meeting or diminish them to let people focus on their own activities.

6.6 Monitor Relevant Intangible

After identifying and monitoring the intangible assets that were relevant during the economic crisis and recession for the research; it is appropriate to monitor the performance of one of them in order to clarify its behave. The asset picked for this activity is the related to process and procedures of the structural capital group. The main reason why this asset was picked among the rest is due to this

type of asset is very intensive in the manufacturing industry and also this was the asset with the highest matchings during the interviews with the decision makers.

To clarify more on this asset, a drill-down analysis was conducted with the decision makers and then it was found a relevant process belonging to this intangible (Huxley, 2003; Brynjolfsson et al., 1997). The process that is monitored in detail is the related to quotation and pricing of the product. This intangible asset has different inputs such as market information, competitive sources and manufacturing cost and it is influenced by other elements that take account of it. In addition, the output of this process has a direct impact to the sales (billing) of the organization. Also to monitor this intangible provides more insights on customers buying trends.

Furthermore, the decisions made around the process of quoting and pricing the product has a direct consequence on the hit-rate and win-rate indicators of the organization. Whereas the hit-rate means a relationship between the quotations accepted by customers respect to all quotations done. And the win-rate is the relationship between the won quotations respect to accepted ones on all the bids. Both parameters are reported in %.

Regarding the hit-rate and the win-rate and for clarity purpose, on the next figure 6.22 is shown the normal flow of a product sale, whereas it is included the hit-rate and the win-rate. Herein the process starts when the sales team or similar team founds a sales opportunity; then, they prepare an answer or an appropriate quotation to the Request for Quotation (RFQ) for the potential customer. Once the RFQ is submitted, the costumer accepts or rejects it for the biding. If it passes this filter, then it is count as hit-rate, so the quotation enters in a new filter at costumer premises for the bidding. If it is also accepted on this stage, then it is count as win-rate, and the costumer provides a Purchase Order or PO.

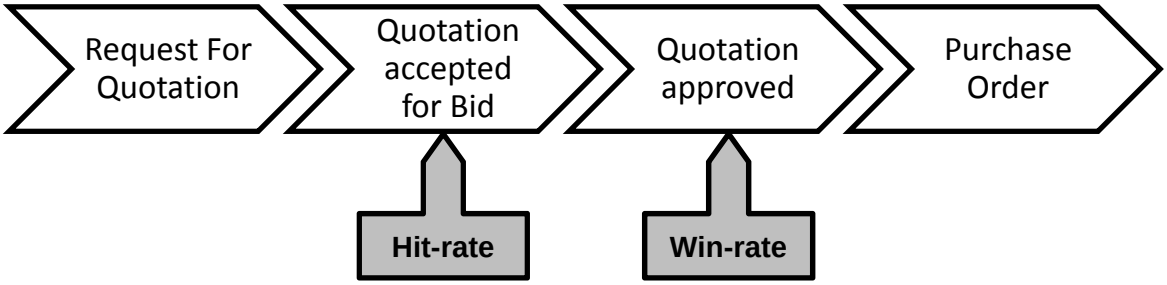

Figure 6.22 Hit-rate and Win-rate on the RFQ process

Also and on the following Figure 6.23 there are shown the decisions made of the structural capital and it is compared to the hit-rate and win-rate of quotations. However, both parameters are not relevant on a monthly basis; they are measure on a bi-quarterly basis (half year). With this consideration, the information gathered provides a better scenario of the context of the market quotation.

It is relevant to consider that the enterprise case study made a decision to create a new management team related to quoting and pricing goods. So, after the new manager was inserted as of October 2009, many decisions were done around the review and re-define of the quoting and pricing processes as described on Figure 6.23. Also and at the end of phase 3, the win-rate was diminishing because the price of the product was not accordingly to the new market context. Then and after making decision around this matter, the win-rate was getting better performance as shown at the phase 6, but it still needed to grow to the levels showed during year 2007. The main reason of this new trend is because the updated quotation and pricing process has being more tuned and removed parameters that used to make the selling product more expensive than competitors. Current biding prices are more aligned to the current context and the customers are accepting better the quotations.

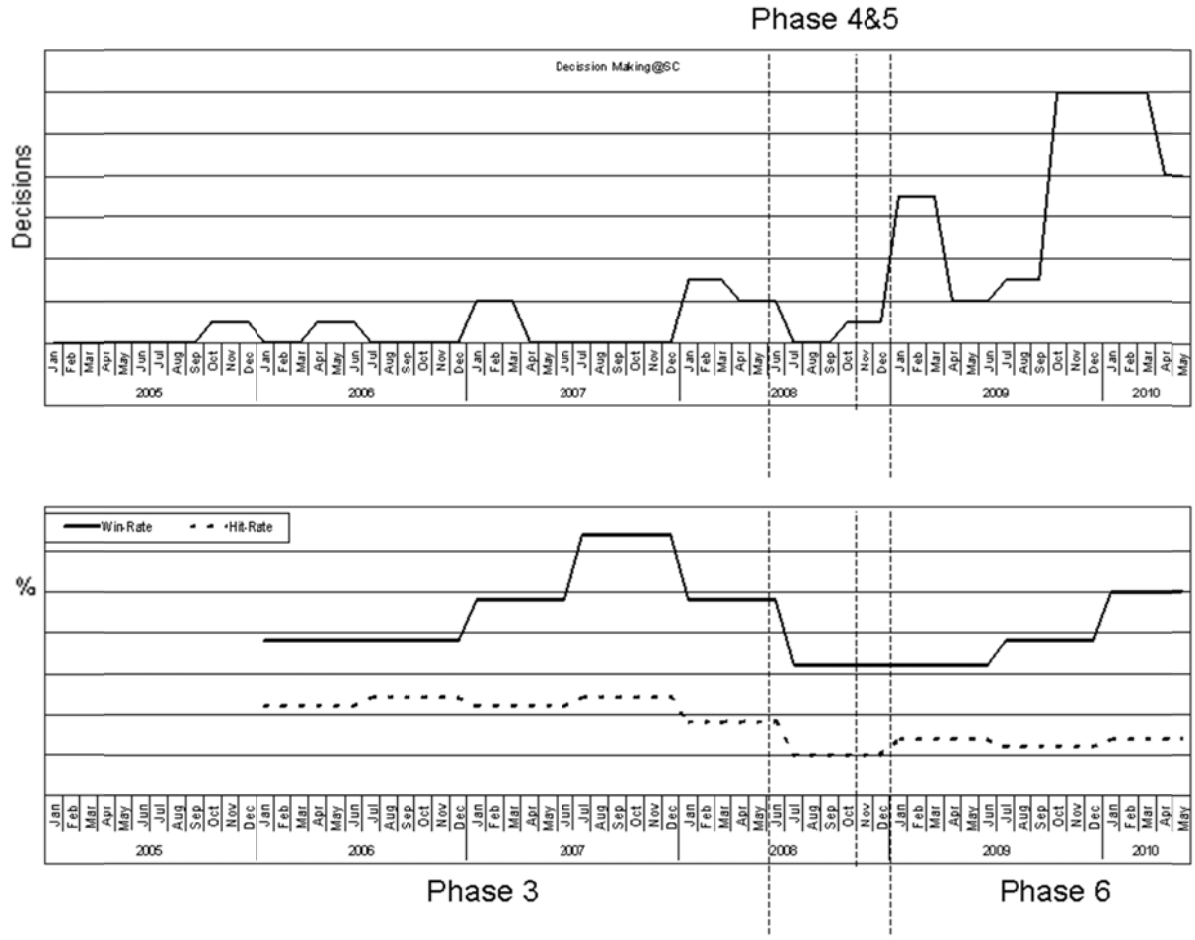

Figure 6.23 Hit-rate and Win-rate compared to structural capital decisions made

So, this new quotation approach includes decisions made around on human capital, because they included a new manager and reorganized the team. Additionally they considered intangibles belonging to the structural capital while reviewing and adjusting the quotation process. Finally other decisions were made around the relational capital, because they are adjusting the interaction with customers while trying to sell more products during the recession phase of the economic cycle.

For the aim of this research, a relevant outcome was found and it was about the intangible asset of process and procedure, and more specific to the process of

quotation and pricing. The finding from the case study helps to confirm part of the research theory as follows: after the decision makers made decision around the intangible of process and procedure, the asset behave in a different way during economic crisis, and also this new performance of the asset contributes to the value generation of the organization. For this case study, the improved process of quotation and pricing is helping to the value generation, but the value generation understood as the increase of the hit-rate and win-rate that ends in more sales. Also, the decision of include a new manager to take care of this process, is directly related to the human capital, and also this situation is helping to the value generation as described in this paragraph.

CHAPTER VII: CASE STUDY CONCLUSIONS

The present research had many accomplished activities, including the identification of an appropriate economic cycle that applies to the micro economy dimension and consequently applies to the enterprise case study. This is significant due to the fact that in the relevant literature reviewed there is more information related to macroeconomic perspective and seldom to the micro. Also and after documenting the theoretical framework for the research, the Akerman's business cycle theoretical concepts were the most appropriate due to its roots on Schumpeter theory and also to its clearly identification of the different phases that includes the crisis and recession phases. Therefore, having an appropriated business economic model, as framework of the research is essential to identify what a crisis and recession are and also use as baseline for the intangible assets identification and monitor required in this research to confirm the built theory.

Furthermore, another relevant activity accomplished was the identification of the intellectual capital taxonomy for an organization and also focus it to the context of economic crisis and recession. Likewise the previous paragraph, it was significant to have for organizations an adequate framework of the intellectual capital and its correspondent intangible assets that apply to the regular operation contexts; also it was important to build an appropriate taxonomy adequate to the microeconomic crisis context. Both circumstances, one for the regular operations and the other for economic crisis were considered while monitoring those intangible assets belonging to the intellectual capital taxonomy. Moreover while doing this monitor was remarkable to find that the intangible assets found in literature that might apply under an economic crisis were not enough for the enterprise elected as case study. Meaning that for this particular case, the decision makers consider intangibles that were not considered by others and also intangibles considered by others were not considered for this case study analysis. There for, it was needed to monitor intangible assets of the organization regardless the context and isolate those that applies in the research case. If not

considered, then there was a risk that the result of the research would be incomplete or might need more data to incorporate to the theoretical framework; but either case, the analysis would be incomplete.

Then and after considering the business cycle model, its respective crisis and recession phases, also the appropriated intellectual capital taxonomy for the economic crisis context; it was relevant to interact with the decision makers and involve them in the process of identifying intangible assets and monitor them during the specified period of time. This activity was accomplished to confirm the theory of this research. But a challenge was to share those concepts and ideas on regular interactions in real life. Therefore and for the decision makers, the usage of a common language, explain in detail the scope of the research and involve them during the process of identification and share to them the result made it easier to keep gathering information and relevant data for the research; especially after identifying intangible assets not considered in the theoretical taxonomy for economic crisis.

Finally, the focus to one intangible asset of quoting and pricing process was relevant to identify behave during the economic crisis and recession. It was relevant to recognize that the decisions made had an impact on the hit-rate and win-rate of the organization. This means that when the decision maker move the intangible asset related to this process, the slop down trend of the win-rate and hi-rate was stopped and changed its direction to a situation previous to the crisis. In fact, the influence on intangible assets was helping the organization to respond to the current crisis and recession situation. But the rest of intangibles are doing their part to contribute and help the organization to start a new growth cycle sooner as phase 1 of Akerman's business cycle.

So, changing the way an intangible asset behaves from the growth period to a recession affects in some way part of the value generation of the organization. There is a group of assets in the organization that are becoming more relevant or

significant during the recession, but during the growth period they were in a certain way that needed to adapt while the context changes.

For this research, it was found that the organization case study has an adequate set of intangible assets that are trying to help it to be operational and competitive during the phase 6 of the economic cycle. This set of intangibles might change from organization to organization because they are conformed from the decisions that people inside made. For this case study, the decision makers are focusing their meetings and decisions mostly to those interactions to customers and also they are trying to be more accurate while interacting with people outside. For example, they did not attend all the congress, symposiums or summits as they used to do on the phase 3. But now they are picking those that would provide more markets to attend, more customers to sell and also to increase the relationship with current customers.

Another relevant conclusion of this research is related to the quantitative method elected to identify those intangible assets that are relevant during the economic crisis. At the beginning of this research there were mentioned three ways to analyze data coming from sales (billing) and expenditures, but only one was used to make pertinent conclusion, and is the polynomial equations. Next are the main reason and conclusion about this:

- Standard deviation, ANNOVA, T-Test and F-Test: For this case, the enterprise case study did not provide enough data to identify and confirm clear trends. This approach required enough data and high quality information to make experiment designs and then conclude. However, there were only a few amounts of numbers with low quality that did not help the analysis.

- Pearson correlation: This method helped to identify those intangible assets that were relevant during the economic crisis and then to

confirm the theory of this research about the expenditures. However, this tool required to compare the sales to the expenditures during the phases 3, 4, 5 and 6, but the data series had a problem with the variation form one period to another (in months) and also the US dollar for sales was bigger than the US dollar for expenditures. This was in a ratio of millions to thousands relationship. This big gap did not help to get reliable results.

- Polynomial surface calculation: this approach was elected to provide the answer to the research question because it compares the sales (billing) to itself but in time spans different, and also is the same for the different expenditures to themselves. This means that the surface under the polynomial equation was calculated with the integral function from a period of time belonging to the phase 3 and it was compared to the same data series but in phase 6, with the same amount of month. Also, by doing this way the answer was charted in graphs per every data series. For this case, the amount of months considered and the quality of data streams were not a problem because it compared data series with itself.

7.1 Answers to the Research Questions

At the beginning of this research there were stated one research question and three more as complement. Hereinafter there are the answers to them in based of the research results described and analyzed before. For clarity purpose, first are the answers to the complementary questions and then to the main research question.

- **Q1. Which intangible assets are relevant during economic crisis?**

There are intangible assets that are becoming more relevant during the economic crisis and other that were more intense during the growth period; however they are not so relevant under the recession context. This means that the organization is focusing on those intangibles that help the organization to be safe during the downturn and respond to the crisis. So, the pattern shown is more related on the amount of interactions they have on their respective group, as follows:

1. Those intangibles related to human capital such as knowledge, skills, innovation, know-how and employees performance are more intense on activity and interactions respect to others in the general taxonomy of the intellectual capital.

2. Also, those related to the structural capital like R&D & technology activities, process & procedures (including quotation and pricing process), the innovation as a process, cost reduction, Information Technology, business administration & management, routines & practices or business strategy have a particular pattern of more activities if compared to the rest of this group.

3. And those belonging to the relational capital as of interactions with local providers, international providers and customers are the most active intangibles during this situation. As described previously, the interaction with current and new customers are becoming more intense because the organization is looking for more sales and consequently more income.

- **Q2. How is the organization spending on intangibles during a downturn?**

Similar to the answer provided above, the expenditures of the organization on intangible assets are different if compared to a growth period; in some cases those expenditures included tangible assets, as well. Mostly, the organization case study has been more careful while making expenditures and they are trying to be more sharpness and focused before making those expenses. Next are those expenditures that are being more intense during the economic crisis and recession period. However, the rest of expenditures are less or had being stopped.

1. For the human capital expenditures, the organization has been active in the headcount or amount of people hired. They are trying to have lean teams to provide the same response and time to market, while trying to keep safe the most experienced personnel.

2. For the structural capital, the organization case study was more active on those expenditures related to non-deductive expenditures. Meaning that expenditures without a formal and fiscal format are more intense. This might imply that those expenditures are many transactions but using small amounts of US Dollars; for example payments to taxis or bus for employees traveling, or any other transaction that did not provide a formal receipt that would help the organization make more tax deductions.

3. Also and for relational capital, the organization case study was more concentrated on expenditures related to expos and conferences, inscription to public bids to be ready to capture more selling opportunities, and expenses technical assistance for imports because the attended markets outside the country.

- **Q3. How are managers making decisions during the economic crisis and recession to influence on intangible assets?**

As indicated previously, the decision makers are making their decision mostly based on relevant and hard data gathered from the environment. Also, their decisions have a principal objective: to sale more and to keep competitive at the current downturn. Also, they are looking for succeed as fast as possible and start a new cycle at phase 1 and be ready to grow again. Therefore, their decisions are oriented to move or activate more those intangible assets that help the organization achieve the goals mentioned here.

Next is the answer to the main question of this research as follows:

What is the performance of the intangible assets from the business Intellectual Capital during an economic crisis context?

Apart to the answers and information provided previously, the intangible assets related to the competitiveness and sales of the organization are being more intense on activity and in some cases they are providing satisfactory results, such as the quotation and sales process shown here in this research. Also, the other set of intangibles included in the taxonomy build for this research and related to economic crisis context are active but not with the intensity of those mentioned above; but at the end, the main idea is to help the organization to complete the current economic cycle as soon as possible and then start a new one. The challenge is relevant, because the organization's sales performance and consequently business operation depends on the outside variables such as the international crisis and other exogenous factors and the organization need to adjust to the current context.

On the next Figure C.1 is a graphical summary of the answers of this research. Whereas is identifiable the taxonomy defined for the enterprise case study. On this figure are shown no only the intangible assets that are relevant during the economic crisis context, but also the respective answer to the research question stated in this report. For example, the first question related to the intangible assets relevant is found all across the table; the question two related to the expenditures of the organization, the answer is described in the second column of the table. Similar is for the third question, were the answer involves the assets found in the third column.

In summary, the representation of Figure C.1 is the taxonomy of the enterprise case study and it is aligned to the intellectual capital taxonomy built at the research theory that applies to the economic crisis context. This means that after identifying in theory those intangible assets that are relevant for normal operations and conditions, and then classify those that are relevant during the economic crisis and recession, all of them should be included in the group of intangible assets of the enterprise case study elected to validate the theory. As described above and for this case study some intangibles not considered in theory appeared in the case study as relevant during an economic crisis.

Q2: How is the organization spending on intangibles during a downturn?

Q1. Which intangible assets are relevant during economic crisis?

Intellectual Capital for Case Study Economic Crisis		
Intellectual Capital	Quantitative	Qualitative
	Intangible assets investment	Relevant intangible assets
1.- Human Capita	1.1. Headcount	1.1. Knowledge 1.2. Skills 1.3. Innovation 1.4. Know-how 1.5. Performance
2. Structural Capital	2.1. Non-deductive expenditures	2.1. R&D & Technology 2.2. Process & Procedures 2.3. Innovation as a Process 2.4. Cost Reduction 2.5. Information Technology 2.6. Administration and Management 2.7. Routines & Practices 3. Business Strategy
3. Relational Capital	3.1. Expos and Conferences 3.2. Inscription to Public Bids 3.3. Technical Assistance for Imports	2.1. Local Providers 2.2. International Providers 2.3. Customers

Q3. How are managers making decisions during the economic crisis and recession to influence on intangible assets?

Figure C.1. Case study IC taxonomy under economic crisis context

7.2 Future Research Lines of Investigation

During this research, there were found other lines of investigation that could be performed accordingly. The next list includes the most relevant around intellectual capital, as follows:

1. During the monitor of intangible assets, include all relevant during the economic crisis, like the quotation process described.

2. Continue the monitor of the picked intangible asset and consider the end of recession and respective growth; meaning to see its performance during phase 1 and phase 2 of the next economic cycle.

3. To open the scope and not only monitor the intangibles performance, but also to measure them and its respect contribution to the value of the organization.

If the previous lines would be considered in further research, then relevant contributions to the intellectual capital would be abounded.

CHAPTER VIII: CONCLUSION

After performing the present research there are general conclusions that needed to be stated on this chapter and also use this information to put the research on perspective.

At the beginning of this research, there was depicted a research question that was based on how the intangibles are behaving during an economic crisis. In this part were mentioned the main question, as well as complementary questions that were theoretically answered and later they were answered with the research findings. It is important to mention that the contrast between both approaches was related to the way decision makers react under a crisis situation. The relevant theory found mentioned that people usually make decision based on intuition and they are trying to be fast; but at the current research, people react based on the data and information coming from the context. Also they made their decisions focused and based on regular meetings. The theory mentions that the people change their way they interact in order to be faster, while in this research the people left their meeting with the same frequency but only adjusting the objective to sales and order entry.

Moreover, the methodology implemented helped to provide relevant data and information that were useful to answer the research question and also to conclude which intangible assets are becoming more relevant during the economic crisis and recession. The quantitative analysis of Polynomial method provided more highlights and more clear evidence about how the intangibles behave during such context. Beside and regarding the other methods uses, the statistical tools such as the ANNOVA, Standard Deviation, F-Test, T-Test and Pearson Correlation did not provide a clear answer to the research question. But this does not mean that they should not use during and quantitative analysis,

they could be used but with more data available and with high quality to perform design of experiments.

The qualitative analysis helped to get relevant information about the intangibles and the trend during the economic crisis. This happened while interviewing decision makers and using their answers to chart them into the matchings' graphs. With this interaction with decision maker, it was easily to identify those intangibles that were becoming significant during the economic crisis. But this does not mean that the rest of intangibles were not significant to the enterprise case study, this condition only applies during economic crisis and for this research.

As showed in this research, there was built a new appropriated taxonomy for the research case study. Furthermore, this new taxonomy was no different from the taxonomy described on chapters 3 and 5. This new taxonomy considered few intangible assets such as the theoretical ones.

Another conclusion is related to the economic cycle. It was relevant to identify an economic cycle that applies to the microeconomic and firm level concepts and also use that model to the research case study. The Akerman's theoretical model was useful because helped to identify the part of the crisis and the recession as well. This approach helped to identify the right moment of the crisis and consequently when the intangibles were becoming relevant for the organization and also they were elected to help the organization for being competitive and be safe. This happened in order to start at the organization a new economic cycle and start growing as soon as possible. This trend is documented in the research as a typical situation for an organization that is experiencing an downturn and is looking for the best time to start a new cycle. In this research was found that other elements that contribute to this situation of new cycle start are the intangible assets.

Up to this point, it has been concluded that the research case study helped to confirm the research theory about the intangibles and their performance during an economic crisis context. Also it has been found that for particular cases the set of intangibles that are significant during economic crisis change from case to case, but the set of intangibles belonging to the intellectual capital taxonomy are present and adapting depending on the situation. This means that for example in case study 1 the significant intangibles during an economic crisis context are A, B and C, while the D, and E are not; for chase study 2 the significant could be A, C and E, while B, and D are not. Moreover and for case study 3 could happened that those that are relevant are D and E, while the rest are not. In either case, the same set of intangibles is present and adjusting depending on decisions made inside the organization. However, this affirmation needs to be confirmed after analyzing such case studies and reporting them; this could be another line of investigation of this research, to expand the scope of case studies.

In order to put this research results in perspective to other efforts. It is relevant to review the activities that authorities such as the World Bank are doing in order to identify those intangible assets that are making the nation competitive or at least succeed the current international crisis. Like this report, the mentioned authority has a complete taxonomy of the intellectual capital in the Knowledge Assessment Methodology (www.worldbank.org/kam). This tool helps to measure those intangibles for the organization. As stated at the beginning, this report does not try to measure intangible assets but it tries to identify and monitor them during a specific context. And also this comparison should be done in the right proportion because the World Bank works with Nations and this report is for an organization. But at the end, both efforts are around intellectual capital behave.

Another example to complement the information provided above is the effort that the OECD (2010) is doing around intellectual capital. In a relevant report found at this organization, they mention:

"*The goal of the OECD project on intangible assets is to provide structured evidence of the economic value of intangible assets as a new source of growth, to assess the link between intangible assets and the economic crisis and to improve understanding of current and emerging challenges for policy*" (OECD, 2010).

As seen in this statement, the OECD project has a similar goal to the objective of this research, again in the right proportion. The main differences are as follows: for the OECD is about Nations and this report is for an organization, the OECD report tries to measure the value contribution of intangibles to the economy while this report only identify and monitors them. But there is one objective in common: the OECD has a link between the intangibles and the economic crisis, while this report not only links them but also monitors them on their behave.

So, this report contributes to other efforts that are trying to identify those intangible assets that are helping organization to survive under economic crisis. Moreover, the essence is the same: to identify relevant intangible assets, regardless if they are going to be measured or only monitored. For example and accordingly to Possoli et al (2011) report, it has been shown that during the financial crisis of 2007 that caused the economic crisis the organization case study experimented in 2009, some Italian Banks made more investment on intangibles such as goodwill. The documented consequence found in Possoli et al (2011) report is that those Banks that invested on goodwill and other intangibles had more ROI (Return on Investment) than those that did not considered it during the economic crisis. However, it is important to mention that for this report there is not a clear taxonomy of the complete taxonomy of the intellectual capital making available to group them in the three groups as follows: human, structural and relational capital. The author only considers the goodwill as the complete group of intangibles (Possoli et al,2011).

Therefore, this research contributes to the knowledge management and intellectual capital while documenting an enterprise intellectual capital taxonomy and also the value contribution to the organization after making decisions around them, especially during an economic crisis that involves an environment based on uncertainty, ambiguity and low quality information to react in consequence.

Also and per Corrado et al (2009) report, there is more interest in measuring the value contribution as a consequence of managing intangibles like those related to human and structural resources. For example the cost of employer-provided worker training and an estimate of management time devoted to enhancing the productivity of the organization. This paragraph is more related to the consideration of the new economy based on intellectual capital.

ANNEX 1 DECISION MAKING PROCESS

According to Malakooti (2010), the decision making process could be described as follows:

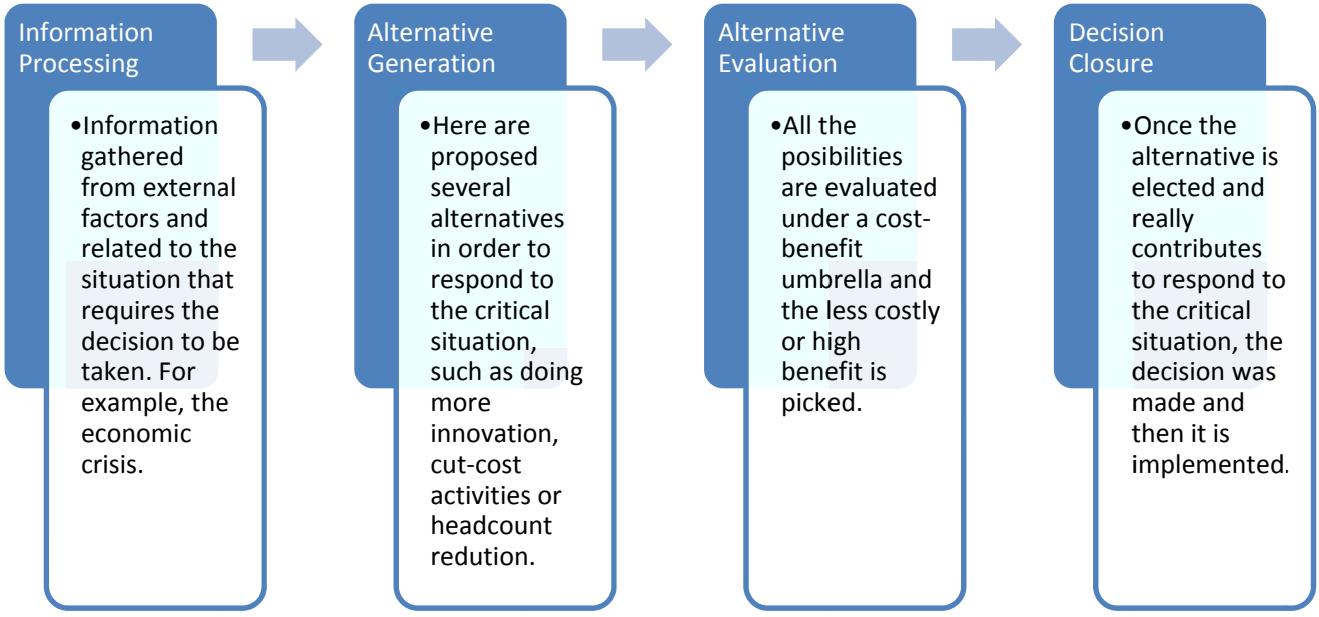

Figure A1.1 Decision making process.

It is important to mention that despite the process followed, the decisions are made mostly by intuition. So it is personal and in some cases arbitrary. The reason of this is because people trust in their experience and their decision make them feel confident (Clark, 2010).

ANNEX 2 INTANGIBLE ASSETS CLASSIFICATION: SOME SAMPLES

According to the IAS, the intangible assets are classified under the following headings (Petkov, 2011b):

a) Marketing-related intangible assets: trademark, trade names, service marks, certification marks, internet domains.

b) Customer- relates intangible assets: customer lists, production backlog, customer contracts.

c) Artistic-related intangible assets: copyright of books, films, music, pictures, photo; lyrics, video.

d) Contract-based intangible assets: licensing, royalty, advertising, management, franchise agreement.

e) Technology-based intangible assets: patented/unpatented technology, software, databases, process and recipes, secret formulas

Also and according to the Office of Australian Accounting Standards board (OAASB). The distinction is determined by management in the way it organizes its intangible asset generation activities (Petkov, 2011a):

a) Planned internally generated intangible assets: those created out of a discrete plan, the objective is to create the asset.

b) Unplanned internally generated intangible assets: other internally generated intangible assets that arise from the day-to-day operations of a business.

ANNEX 3 POLYNOMIAL EQUATIONS

Polynomial equations for sales (billing):

The polynomial equations used in this research followed the next steps:

1. Data series identification: For sales (billing) and expenditures were gathered the amount in dollar per month. This information came from the enterprise case study accountability databases.

2. Polynomial equation: per every data series, the data was captured in MS-Excel spread sheet and the charted in graphs using the “Chart” tool the software has. Then and with the data series captured, the “Trend Line” selection was activated with the “Polynomial” of the 6^{th} order selection and R^2 activated. This was used because after using other combinations on Excel, the trend line differed from the data series charted.

3. The “Equation” option was marked and then the f(x) was used for this analysis.

After this was performed, all the equations calculated using MS-Excel were confirmed using another software “Graph”. This new tool provided a similar equation per sales (billing) and expenditures, so they were confirmed and used during this analysis.

The surface obtained per equation were from the same software “Graph” and used in this analysis. All the results were used as follows.

Previous to the identification of the organization expenditures polynomial equations, next are show the result of the sales (billing). This exercise is to

confirm if the assumption that the subtraction of surface 3 less surface 6 should give a positive result.

Sales @ Phase 3:

f(x)=-6.0384E-06*x^6+0.0003*x^5-0.0071*x^4+0.0802*x^3-0.4716*x^2+1.3033*x-0.4199

Sales @ Phase 6:

f(x)=-8.8838E-06*x^6+0.0004*x^5-0.0102*x^4+0.1074*x^3-0.5727*x^2+1.3958x-0.4886

In Figure A3.1 is the corresponding graph of previous equations. It also shows the surface between both equations and corresponding to the difference of surfaces. For this case, it is clear that the sales (billing) at phase 3 are bigger than phase 6, so the result has a positive number as follows:

Phase 3 Surface 1: 11.3529 US Dollars by month
Phase 6 Surface 2: 9.0551 US Dollars by month

Surface 1 – Surface 2 = 2.2978 US Dollars by month

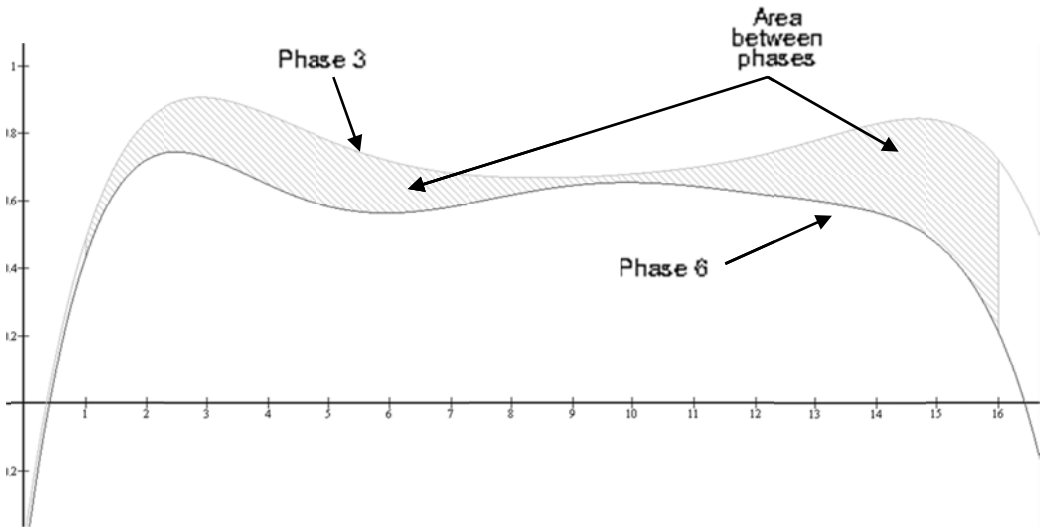

Figure A3.1. Sales (billing) polynomial equations

The result confirms that the sales (billing) of phase 6 is lower that the sales (billing) of phase 3, because in the first case the incomes have been diminished. So the assumption of using this approach is confirmed and this is a justification to continue with the rest of the expenditures hereinto.

Polynomial equations for structural capital:

Next, there are the equations for the expenditures related to structural capital. All the equations have the same time span of 16 months and also they are compared among them to identify which expenditures have relevance during the economic crisis.

1. Non-Deductive Expenditures

Phase 3:

f(x)=-1.4828E-05*x^6+0.0006*x^5-0.0123*x^4+0.1038*x^3-0.4189*x^2+0.7482*x-0.2583

Phase 6:

f(x)=6.8469E-06*x^6-0.0003*x^5+0.0055*x^4-0.0441*x^3+0.1514*x^2-0.1261*x+0.2420

2. Variable Expenditures

Phase 3:

f(x)=-3.4732E-06*x^6+0.0001*x^5-0.0006*x^4-0.0143*x^3+0.2177*x^2-0.9923*x+1.5635

Phase 6:

f(x)=1.9338E-05*x^6-0.0009*x^5+0.0178*x^4-0.1588*x^3+0.6889*x^2-1.3269*x+0.8545

3. Services and Taxes Related to the Product

Phase 3:

f(x)=-6.7862E-06*x^6+0.0003*x^5-0.00918*x^4+0.1024*x^3-0.5469*x^2+1.1446*x-0.2223

Phase 6:

f(x)=1.0304E-05*x^6-0.0005*x^5+0.0134*x^4-0.1468*x^3+0.7795*x^2-1.7092*x+1.1333

4.Telephony and Computer

Phase 3:

f(x)=8.0713E-06*x^6-0.0004*x^5+0.01003*x^4-0.1066*x^3+0.548*x^2-1.1674*x+1.2388

Phase 6:

f(x)=1.2917E-05*x^6-0.0006*x^5+0.0139*x^4-0.1347*x^3+0.6125*x^2-1.0981*x+0.7685

5. Rent of Special Equipment

Phase 3:

f(x)=5.6961E-06*x^6-0.0002*x^5+0.0018*x^4+0.0081*x^3-0.1929*x^2+0.8715*x-0.6551

Phase 6:

f(x)=3.19404E-05*x^6-0.0015*x^5+0.0286*x^4-0.2478*x^3+1.041*x^2-1.9499*x+1.3494

Polynomial equations for Relational capital:

Similar to the previous equation, the expenditures related to relational capital have a time span of 16 months.

1. Meetings

Phase 3:

f(x)=-9.6896E-06*x^6+0.0005*x^5-0.0117*x^4+0.1204*x^3-0.5852*x^2+1.2047*x-0.4397

Phase 6:

f(x)=2.6032E-07*x^6+7.8354E-05*x^5-0.0036*x^4+0.06005*x^3-0.4288*x^2+1.2986*x-0.921

2. Expos and Conferences

Phase 3:

f(x)=-4.9871E-05*x^6+0.0025*x^5-0.0476*x^4+0.428*x^3-1.8316*x^2+3.4027*x-1.9184

Phase 6:

f(x)=-1.1965E-05*x^6+0.0005*x^5-0.0116*x^4+0.115*x^3-0.6094*x^2+1.6147*x-1.1197

3. Travel Expenditures

Phase 3:

f(x)=-2.357E-05*x^6+0.0013*x^5-0.0281*x^4+0.2893*x^3-1.4605*x^2+3.2565*x-1.8756

Phase 6:

f(x)=-4.1805E-06*x^6+0.0002*x^5-0.0076*x^4+0.099*x^3-0.6314*x^2+1.7581*x-1.2988

4. Marketing and Promotion

Phase 3:

f(x)=-1.5526E-05*x^6+0.0007*x^5-0.0136*x^4+0.1228*x^3-0.5521*x^2+1.0605*x-0.1023

Phase 6:

f(x)=1.2359E-05*x^6-0.0005*x^5+0.0085*x^4-0.0653*x^3+0.2501*x^2-0.4714*x+0.3912

5. Assessors and Consultants

Phase 3:

f(x)=-7.0716E-06*x^6+0.0004*x^5-0.0098*x^4+0.1105*x^3-0.5843*x^2+1.1655*x-0.0842

Phase 6:

f(x)=-2.1168E-05*x^6+0.001*x^5-0.0185*x^4+0.1604*x^3-0.6744*x^2+1.2555*x-0.7475

6. Inscription to Public Bids

Phase 3:

f(x)=-3.7433E-05*x^6+0.0019*x^5-0.0375*x^4+0.3563*x^3-1.6604*x^2+3.4261*x-2.1054

Phase 6:

f(x)=3.6151E-06*x^6-0.0001*x^5+0.002*x^4-0.0085*x^3-0.021*x^2+0.1767*x+0.0849

7. Clubs and Associations Fees

Phase 3:

f(x)=-6.4918E-06*x^6+0.0004*x^5-0.011*x^4+0.1411*x^3-0.8012*x^2+1.8882*x-1.2537

Phase 6:

f(x)=-2.0394E-05*x^6+0.001*x^5-0.019*x^4+0.1764*x^3-0.7454*x^2+1.3552*x-0.7888

8. Technical Assistance for Imports

Phase 3:

f(x)=1.39748E-05*x^6-0.0006*x^5+0.0112*x^4-0.0955*x^3+0.3963*x^2-0.7314*x+0.437

Phase 6:

f(x)=-7.5291E-06*x^6+0.0003*x^5-0.005*x^4+0.0446*x^3-0.1903*x^2+0.391*x-0.2485

ANNEX 4 QUESTIONS TO DECISION MAKERS

This Annex 4 includes the questions applied top interviewed personnel. It is important to mention that all of these questions were applied accordingly to the qualitative analysis suggestions about qualitative research and interviews with decision makers.

All the answers provided by the managers involved were recorder in sentences that were read before closing each interview. This approach helped to confirm the information gathered and also to confirm that were using the same concepts and definitions and diminish any ambiguity or incorrect assumption.

1. At the previous month and considering your own process, which decisions were the most relevant?

2. Have you focused on a specific process or procedure during the last month?

3. During the last month, have you made any relevant decision and discussed it with the area Director?

4. Considering the answers provided so far, have you thought on the people involved inside the organization, on the process you have running now since the recession period, or in someone else external to the organization? (the knowledge required is inside with the current people, on the running process or outside with consultants)

5. During the last month and considering the amount of meeting you have had, their goal and objective, do you consider that they have changed? Have the session duration and participants changed?

6. Before making any decision that you make, what would you consider influenced yourself: the experience, intuition, hard data, or any other?

7. During the period of time from year 2008 to year 2009, were the meeting and team-backs mode intense? Meaning that the people that participated were more enthusiastic, energetic or desperate.

The answers provided were classified on the intellectual capital taxonomy and also the main idea of each sentence was matched to the intangible asset built for this research not only for the economic crisis context, but also for the general context. For example the interviewed provided an answer such as "*this last month we concentrate efforts on the quotation process and had several meeting to test and confirm the new process*". This was interpreted as a matching to the structural capital group and more specific to the process and procedure intangible asset.

ANNEX 5 INTANGIBLE ASSETS DEFINITIONS

Definitions of intellectual capital intangibles:

Next, there are some descriptions of the intangible assets used throughout the research case study. The definitions are taken from the Encarta Dictionary available on MSN Word 2010.

1. Human Capital Group

1.1 **Backlog Knowledge**: to accumulate knowledge that needs to be dealt with.

1.2 **Skills**: the ability to do something well, usually gained through training or experience.

1.3 **Innovation**: the act or process of inventing or introducing something new.

1.4 **Values**: the accepted principles or standards of a person or a group.

1.5 **Experience**: knowledge or skill gained through being involved in or exposed to something over a period of time.

1.6 **Know-how**: the practical skill and knowledge necessary to do something.

1.7 **Loyalty**: a feeling of devotion, duty, or attachment to somebody or something.

1.8 **Performance**: the manner in which something or somebody functions, operates, or behaves.

1.9 **Development**: the process of changing and becoming larger, stronger, or more impressive, successful, advanced or of causing somebody or something to change in this way.

1.10 **Attitude**: an opinion or general feeling about something.

1.11 **Other**: more assets that are not included in the list but are part of the human capital.

2. Structural Capital Group

2.1 **Investment in R&D**: activity of investing an amount of money invested in something for the purpose of making a profit. For this case is related to the activities around R&D.

2.2 **Investment in technology**: activity of investing an amount of money invested in something for the purpose of making a profit. For this case is related to the activities around new technology introduction.

2.3 **Process**: a series of actions directed toward a specific aim.
And **Procedure**: an established or correct method of doing something.

2.4 **Innovation process**: an established or correct method of doing innovation.

2.**5 Intellectual property**: original creative work manifested in a tangible form that can be legally protected, e.g. by a patent, trademark, or copyright.

2.6 **Cut cost process**: a series of actions directed toward the reduction of the cost of manufacturing goods.

2.7 **Culture**: a group of people whose shared beliefs and practices identify the particular place, class, or time to which they belong.

2.8 **Administration and management**: the management of the affairs of a business, organization, or institution.

2.9 **Information technology**: the use of technologies from computing, electronics, and telecommunications to process and distribute information in digital and other forms.

2.10 **Routines**: the usual sequence for a set of activities.
And **Practices**: to do something as an established custom or habit.

2.11 **Publications**: the act of making printed material, especially books, available for public, such as customers.

2.12 **Business strategy**: a plan that sets out the future strategy and financial development of a business, usually covering a period of several years.

2.13 **Other**: more assets that are not included in the list but are part of the structural capital.

3. Relational Capital Group

3.1 **International and local providers**: relationship in terms of commercial activities with suppliers in the same country or abroad.

3.2 **Customer**: relationship with a person or company that buys goods or services.

3.3 **Government participation**: an act whereas the local policy makers take part on the business operation directly or indirectly.

3.4 **Partners**: relationship with an owner of part of a company, usually a company he or she works in, who shares both the financial risks and the profits of the business.

3.5 **Stakeholders**: liaison with a person or group with a direct interest, involvement or investment in something, e.g. the employees, stockholders, and customers of a business concern.

3.6 **Stockholders**: relationship with somebody who owns one or more shares of a company's stock.

3.7 **International policies**: connection with law and policies outside the country where the main activities are performed.

3.8 **International operations**: relationship with business operations outside the country where the main activities are performed.

3.9 **Consultants and assessors**: link to an expert who charges a fee for providing advice or services in a particular field.

3.10 **Other**: additional assets that are not included in the list but are part of the relational capital.

Samples of the accounting expenditures concepts

Next are enlisted samples of the account terms used during the course of this research:

1. **Meetings**: Internal and external working sessions. i. e. Meeting at customer premises to sign a sales contract.

2. **Expos and Conferences**: Marketing activities such as sending abroad promotion articles, brochures and all costs related to send an employee to make a product presentation outside the organization.

3. **Travel Expenditures**: Expenditures related to travel and transportation, this includes airplane tickets, hotel, and meals and others.

4. **Marketing and Promotion**: Marketing activities inside the premises, such as Suppliers showcase, or other activities inside the organization premises.

5. **Assessors and Consultants**: Fees and other expenditures after interacting with external experts.

6. **Inscription to Public Bids**: costs and expenditures used to participate on public bids, such as subscriptions and other fees.

7. **Clubs and Associations Fees**: Fees for external organizations such as local or international chambers of commerce.

8. **Technical Assistance for Imports**: Interactions with external experts to the organization but related to import matters

9. **Non-Deductive Expenditures**: Other taxable expenditures that are not directly related to the business and they are not presented in a fiscal form, for example expenditures without receipt or invoice like taxi, bus, snacks.

10. **Variable Expenditures**: Other non-classified expenditures.

11. **Services and Taxes Related to the Product**: Expenditures on intangibles related to the selling product for example customs and duties paid after a product is imported outside the origin country.

12. **Telephone and Computer**: Expenditures related to It infrastructure like telephone long distance call fees or internet service charge.

13. **Rent of Special Equipment**: Rent of special equipment such as services of cranes and platforms to transport selling products.

ANNEX 6 QUALITATIVE RESEARCH METHOD

Qualitative research method used to gather relevant information.

For Berge (1998) to perform a qualitative research analysis, it is important to start designing it as follows in Figure A6.1:

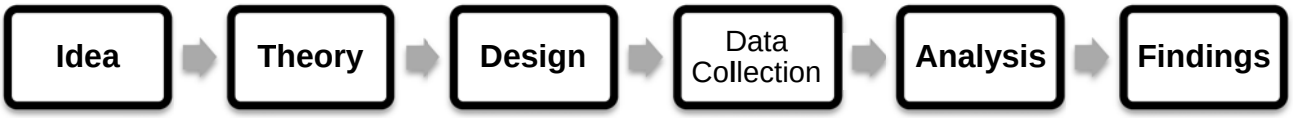

Figure A6.1 Qualitative research design

Moreover, the complete design requires a common language and definitions with the different actors in order to get the best information in a narrative way. Also, the questions and answers that would be used during the research process should be operationalized and communicated in a well understanding way among all.

For the previous Figure A6.1, next are the different elements indicated:

- **Idea** is related to the concepts that the researcher is trying to verify.
    - For this research case study, the idea is about those intangible assets that are present in any organization and in some way contribute to the value generation. Considering that those intangibles start at the people head.

- **Theory** is associated to the ground theory (Glaser and Strauss, 2009) whereas the idea and other concepts are located in and they define the social behave.

    - For this research case study, the theory is related to those intangible assets that are relevant during the economic crisis and also belong to the intellectual capital taxonomy indicated for that context.

- **Design** addresses to the type of information that would be gathered and the method used to acquire it.

    - For this case study, the information gathered was designed by regular verbal interviews with relevant actors of the organization. Those interactions were in a common language and using appropriated questions. The answers were collected and wrote down for verification and quality assurance.

- **Data Collection** is associated to the information provided by the interviewed people and also ordered in a way that wording makes sense to the analysis part.

    - During this research case study, the data collected were the wording expressed by the people after they answer to the questions and that information was wrote down. After the narrative was in paper, it was read in order to make sure that the message was correctly recorded. For the characteristics of the process, it was not possible to write down everything that was said, but only relevant ideas and arguments that in some cases were complemented after they were read.

- **Analysis** includes the usage of the information collected and showed in a way that it makes sense to the theory stated at the beginning.

    - For this case study, the analysis implied those matchings' of the answer to the different intangible assets. This means that after an answer was provided, it was associated to an intangible asset; if it matched to the concept of the asset, then it was considered as a matching and marked in an appropriated graph. It was relevant to identify that during the analysis not only were considered the intangible assets for the economic crisis, but also all other that belong to the general intellectual capital taxonomy. The idea was to consider as many as possible and confirm theory concepts found.

- **Findings** consist on reporting the analysis of the information collected and compared to the theory stated at the beginning. This approach helps to create a new theory or adjust the former one.

    - For this case study, the findings helped to identify those intangible assets that are relevant during an economic crisis of the organization and also that information was reported to the interviewed in order to confirm if it still was logic.

Also and as Berge (1998) mentions, after the interviews ended and the information was recorded, the analysis included intermediate steps to identify relevant data and then make an appropriate theory. There are different ways to perform the analysis form the qualitative information gathered during the data collection of the method, so next are some types of activities to consider on the information gathered and get relevant conclusions for the research. Also in this part are identified those types that were used during this research case study.

1. Word counts: in this case was not used because the information was verbally expressed and no narrative approach was used to report the answers provided.

2. Themes: this type was considered because included the association of the information expressed to the three groups of intellectual capital, such as human, structural or relational capital.

3. Characters and Paragraphs: similar to word counts

4. Concepts: similar to themes, because the information gathered could be associated to intangible assets concepts, definitions and consequently could be measured as matching for the appropriated graph.

5. Semantics: similar to word counts.

ANNEX 7 QUANTITATIVE ANALYSIS

Statistical tests for the T-Test and F-Test for Structural Capital

To find out which expenditures are having preference during the downturn, the first step was to identify per data series the median, average, minimum, maximum and standard deviation (MathIsFun, 2005) as shown in Table A7.1.

With the information contained in Table A7.1, the F-test and T-test were calculated after different test and next are shown the results obtained. However the information provided on Table A7.2 regarding F-test, the results data are that make difficult to conclude which intangible is relevant during the economic crisis. Mainly because the data series was too small and for make samples and run different tests, more data is required and it was not available.

In Table A7.3 are displayed the result after making the T-test calculation. Similar to the previous test, the results obtained are not clear to make a reliable conclusion to identify which intangible is relevant during the economic crisis of the organization. Also and due to its nature of this calculating, the Sales (billing) is not part of the comparison, meaning that only there is a comparison excluding this element.

	Phase 3 (Jan05-May08)					Phase 4&5 (Jun08-Dec08)					Phase 6 (Jan09-Apr10)				
	Mean	Median	Std.Dev	Min	Max	Mean	Median	Std.Dev	Min	Max	Mean	Median	Std.Dev	Min	Max
1. Non-Deductive Expenditures	0.1579	0.1322	0.1807	0.0021	1.0000	0.7553	0.7362	0.1371	0.6012	1.0000	0.4547	0.3930	0.2404	0.1296	1.0000
2. Variable Expenditures	0.2954	0.1954	0.2532	0.0000	1.0000	0.3897	0.3623	0.3550	0.0516	1.0000	0.0925	0.0268	0.2517	0.0000	1.0000
3. Services and Taxes Related to the Product	0.1766	0.0875	0.2307	0.0000	1.0000	0.2636	0.0402	0.4198	0.0057	1.0000	0.2373	0.1395	0.3058	0.0059	1.0000
4. Telephone and Computer	0.4862	0.4532	0.1684	0.2300	1.0000	0.7730	0.7561	0.2044	0.4227	1.0000	0.2687	0.2282	0.2191	0.0807	1.0000
5. Rent Of Special Equipment	0.3200	0.2797	0.1902	0.0030	1.0000	0.4738	0.4381	0.2933	0.0039	1.0000	0.3169	0.1595	0.3519	0.0010	1.0000
TOTAL SC EXPENDITURE	0.2653	0.1721	0.2142	0.0605	1.0000	0.3103	0.0983	0.3952	0.0484	1.0000	0.2800	0.1525	0.3020	0.0398	1.0000
TOTAL SALES	0.5121	0.5121	0.2427	0.1200	1.0000	0.6891	0.7808	0.2247	0.4065	1.0000	0.6043	0.6064	0.2345	0.2750	1.0000

Table A7.1. Structural capital and sales standard deviation

Structural Capital: Phase 3 (Jan05-May08) F-Test (ALPHA= 0.05)				
F-test	2. Variable Expenditures	3. Services and Taxes Related to the Product	4. Telephone and Computer	5. Rent Of Special Equipment
1. Non-Deductive Expenditures	35.46401	0.00919	1.78517	28.05838
2. Variable Expenditures	----------	0.00026	0.05034	0.79118
3. Services and Taxes Related to the Product		----------	194.18582	3052.10763
4. Telephone and Computer			----------	15.71746

Structural Capital: Phase 4&5 (Jun08-Dec08) F-Test (ALPHA= 0.05)				
F-test	2. Variable Expenditures	3. Services and Taxes Related to the Product	4. Telephone and Computer	5. Rent Of Special Equipment
1. Non-Deductive Expenditures	0.01021	0.00000	0.00797	0.03237
2. Variable Expenditures	----------	0.00019	0.78043	3.16920
3. Services and Taxes Related to the Product		----------	4126.99096	16759.07859
4. Telephone and Computer			----------	4.06085

Structural Capital: Phase 6 (Jan09-May10) F-Test (ALPHA= 0.05)				
F-test	2. Variable Expenditures	3. Services and Taxes Related to the Product	4. Telephone and Computer	5. Rent Of Special Equipment
1. Non-Deductive Expenditures	0.00235	0.00001	0.00228	0.00689
2. Variable Expenditures	----------	0.00324	0.97126	2.92933
3. Services and Taxes Related to the Product		----------	300.17856	905.34705
4. Telephone and Computer			----------	3.01603

Table A7.2. F-test results

Table A7.3 T-test results

Structual Capital			
T-test one-tail (alpha=0.05)	Phase 3 vs Phase 4&5	Phase 3 vs Phase 6	Phase 4&5 vs Phase 6
1. Non-Deductive Expenditures	0.00007557	0.00001705	0.00268288
2. Variable Expenditures	0.08487285	0.18409160	0.37603687
3. Services and Taxes Related to the Product	0.19868667	0.04383034	0.40545923
4. Telephone and Computer	0.01705450	0.35851238	0.23128826
5. Rent Of Special Equipment	0.33664306	0.02673506	0.04126404

Statistical tests for the T-Test and F-Test for Relational Capital

Considering the same analysis for the F-test and T-test as well as the criteria done for the structural capital, following are the results for the relational capital (GraphPad, 1999; Trochim, 2006; Diaz and Fernandez, 2001; La Brake, 1992). In the next Table A7.4 are shown the results of calculating the standard deviation of the expenditures related to this group of intangibles.

Moreover, in the next Tables A7.5 and A7.6 are the results for both tests applied. However and similar to the F-test and T-test analysis performed for the structural capital, for this case and with the data gathered is hard to conclude which intangible expenditures are relevant during the economic crisis and recession; this is due to the fact that the data obtained is not enough for trying some test and more data is required, but is unavailable. So, there is not a clear trend to identify relevant information. Consequently, these methods will not be used for the conclusion of the report and only is considered the other methods described in the methodology to have representative information that helps to provide answers to the research questions.

	Phase 3 (Jan05-May08)					Phase 4&5 (Jun08-Dec08)					Phase 6 (Jan09-May10)				
	Mean	Median	Std.Dev	Min	Max	Mean	Median	Std.Dev	Min	Max	Mean	Median	Std.Dev	Min	Max
1. Meetings	0.3562	0.3342	0.1883	0.0000	1.0000	0.4186	0.2160	0.4054	0.0000	1.0000	0.2875	0.1786	0.2971	0.0000	1.0000
2. Expos And Conferences	0.2388	0.1718	0.2538	0.0000	1.0000	0.3803	0.3709	0.3255	0.0605	1.0000	0.3839	0.3440	0.2891	0.0305	1.0000
3. Travel Expenditures	0.2773	0.2401	0.2270	0.0000	1.0000	0.1901	0.0000	0.3778	0.0000	1.0000	0.0874	0.0000	0.2579	0.0000	1.0000
4. Marketing and Promotion	0.2415	0.1279	0.2657	0.0000	1.0000	0.2160	0.0518	0.3523	0.0016	1.0000	0.2315	0.2119	0.3504	-0.4943	1.0000
5. Assessors And Consultants	0.0625	0.0000	0.1850	0.0000	1.0000	0.3479	0.1013	0.4534	0.0000	1.0000	0.0941	0.0000	0.2545	0.0000	1.0000
6. Inscription To Public Bids	0.1804	0.0607	0.2359	0.0000	1.0000	0.3742	0.3049	0.3078	0.0585	1.0000	0.2750	0.2621	0.3042	0.0000	1.0000
7. Clubs And Associations Fees	0.1611	0.0193	0.2581	-0.4514	1.0000	0.1605	0.0000	0.3730	0.0000	1.0000	0.1063	0.0000	0.2737	0.0000	1.0000
8. Technical Assistance For Imports	0.0300	0.0000	0.1594	0.0000	1.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0835	0.0000	0.2574	0.0000	1.0000
TOTAL RC EXPENDITURE	0.2558	0.1797	0.2028	0.0259	1.0000	0.4276	0.3781	0.2843	0.1506	1.0000	0.4605	0.4256	0.2444	0.1231	1.0000
TOTAL SALES	0.5121	0.5121	0.2427	0.1200	1.0000	0.6891	0.7808	0.2247	0.4065	1.0000	0.8043	0.8064	0.2345	0.2750	1.0000

Table A7.4. Relational capital and sales standard deviation

Relational Capital: Phase 3 (Jan05-May08) F-Test (ALPHA= 0.05)

F-test	2. Expos and Conferences	3. Travel Expenditures	4. Marketing and Promotion	5. Assessors and Consultants	6. Inscription to Public Bids	7. Clubs and Associations Fees	8. Technical Assistance for Imports
1. Meetings	0.22469	0.02965	0.96562	0.00953	1.46436	10.45099	33134.78681
2. Expos And Conferences	----------	0.13196	4.29755	0.04242	6.51720	46.51255	147467.58688
3. Travel Expenditures		----------	32.56608	0.32888	49.38620	352.46332	1117483.00432
4. Marketing and Promotion			----------	0.00987	1.51649	10.82303	34314.31396
5. Assessors And Consultants				----------	153.62323	1096.39180	3476099.19885
6. Inscription To Public Bids					----------	7.13683	22627.43157
7. Clubs And Associations Fees						----------	3170.48993

Relational Capital: Phase 4&5 (Jun08-Dec08) F-Test (ALPHA= 0.05)

F-test	2. Expos and Conferences	3. Travel Expenditures	4. Marketing and Promotion	5. Assessors and Consultants	6. Inscription to Public Bids	7. Clubs and Associations Fees	8. Technical Assistance for Imports
1. Meetings	0.00427	12.91547	0.02632	0.36949	0.23297	5.59516	65535.00000
2. Expos And Conferences	----------	3019.74152	6.15395	86.39062	54.47089	1308.19454	65535.00000
3. Travel Expenditures		----------	0.00203	0.02860	0.01803	0.43321	65535.00000
4. Marketing and Promotion			----------	14.03823	8.85136	212.57798	65535.00000
5. Assessors And Consultants				----------	0.63051	15.14278	65535.00000
6. Inscription To Public Bids					----------	24.01639	65535.00000
7. Clubs And Associations Fees						----------	65535.00000

Relational Capital: Phase 6 (Jan09-May10) F-Test (ALPHA= 0.05)

F-test	2. Expos and Conferences	3. Travel Expenditures	4. Marketing and Promotion	5. Assessors and Consultants	6. Inscription to Public Bids	7. Clubs and Associations Fees	8. Technical Assistance for Imports
1. Meetings	0.00265	2.13549	0.26774	0.02177	0.02247	0.39391	123.69336
2. Expos And Conferences	----------	805.16028	100.95081	8.20818	8.47270	148.52150	46636.95899
3. Travel Expenditures		----------	0.12537	0.01019	0.01052	0.18446	57.92257
4. Marketing and Promotion			----------	0.08130	0.08392	1.47122	461.97702
5. Assessors And Consultants				----------	1.03220	18.09433	5681.76376
6. Inscription To Public Bids					----------	17.52941	5504.37612
7. Clubs And Associations Fees						----------	314.00791

Table A7.5. F-test results

Relational Capital

T-test one-tail (alpha=0.05)	Phase 3 vs Phase 4&5	Phase 3 vs Phase 6	Phase 4&5 vs Phase 6
1. Meetings	0.00000279	0.00000000	0.26215388
2. Expos and Conferences	0.03043716	0.00066978	0.38238082
3. Travel Expenditures	0.00000000	0.00000000	0.41012379
4. Marketing and Promotion	0.24803076	0.02320273	0.14107322
5. Assessors and Consultants	0.04074827	0.06793364	0.32653006
6. Inscription to Public Bids	0.11159300	0.01533935	0.08935388
7. Clubs and Associations Fees	0.10906733	0.44518738	0.20702511
8. Technical Assistance for Imports	0.11747536	0.14061695	0.11485116

Table A7.6. T-test results

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