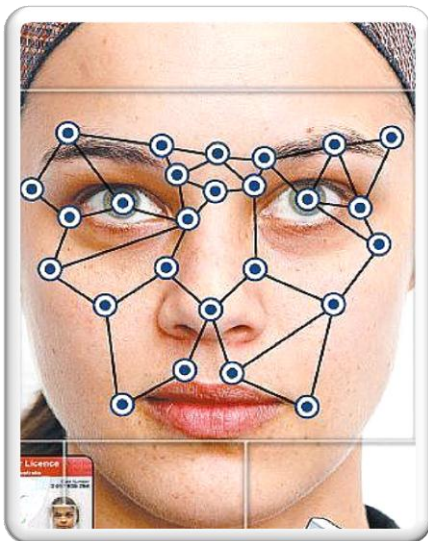




The impact of Facial Recognition technology on Customers Relationship Management and Value Creation

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Abstract

Title: The impact of Facial Recognition technology in Customer Relationship Management and Value Creation

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The present dissertation was created under the scope of the seminar “Strategic Use of Technology”, concerning the potential strategic impact of a certain technology when applied to business.

In the present study, the use of a Facial Recognition technology is proposed, as a way to improve the real-time interactions between organizations and their customers. Thus, the investigation field of this dissertation is the value creation strategic use and impact of this technology by enhancing their Customer Relationship Management (CRM) approach.

Furthermore, an analysis of the Portuguese market is performed, in order to find out which industries are more suitable to implement this technology. In this analysis, different financial ratios from the main industries of the Portuguese market were compared, as a way to define at least one industry that had potential and were suitable for this technology to be implemented in. In the end, the two industries selected were the retail and the banking industry.

Finally, it is also discussed the advantages of such system from a customer point-of-view on how it can positively impact the different CRM functionalities of an organization, and a research is performed on whether or not, Portuguese consumers are willing to accept its adoption.

This study concludes that the use of a facial recognition system can indeed add value and impact the overall performance of organizations, through the optimization and integration of its CRM Functionalities. Furthermore the results obtained also demonstrate that in general, Portuguese consumers are willing to accept the system and its implementation in retail stores and bank branches .

Resumo

Título: O impacto da tecnologia de reconhecimento facial no Customer Relationship Management (CRM) de uma organização e a sua criação de valor

Autor: Afonso Filipe Fontão Mendes Batista

Esta dissertação foi criada no âmbito do seminário “Strategic use of technology”, relativamente ao potencial impacto estratégico que uma determinada tecnologia poderá ter quando aplicada a áreas de negócio.

No presente estudo, é proposto que o uso da tecnologia de reconhecimento facial, pode melhorar o modo como as empresas interagem com os consumidores. Deste modo, o âmbito de estudo desta dissertação, é a criação de valor e o impacto estratégico que esta poderá ter nos processos de CRM da organização. Além disso, é realizada também uma análise do mercado português – através da comparação de diferentes rácios económico-financeiros das principais indústrias portuguesas, de modo a definir quais as indústrias em que esta tecnologia poderá ter mais viabilidade e sucesso. No final de mesma, as duas indústrias seleccionadas foram a indústria do retalho e da banca.

Por fim, a discussão engloba também as vantagens que a adopção deste sistema poderia trazer para os consumidores e como esta tecnologia poderá afectar positivamente todas as funcionalidades de CRM de uma organização, bem como é feita uma investigação de modo a averiguar se os consumidores portugueses estão ou não, dispostos a aceitar a introdução desta tecnologia.

Este estudo conclui que o sistema de reconhecimento facial, adiciona de facto valor para as organizações, bem como melhora a sua performance através da optimização e integração das diferentes funcionalidades de CRM.

Além disto, a investigação realizada conclui também que em geral, os consumidores portugueses estão dispostos a usar esta tecnologia, bem como a sua implementação no retalho e em balcões de instituições bancárias.

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I would like to dedicate this dissertation to my parents, for they unconditional support, comprehension and wise counselling throughout the entire process.

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I also must thank Dra. Silvina Valente for her availability and openness to share her knowledge regarding the legal background presented in this study.

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1. Introduction

1.1. Objective of this study

The main objective of this dissertation is to study the impact of using Facial Recognition technology on Customer Relationship Management (CRM). Moreover, this study aims to verify the main CRM processes that may be affected by this technology and if it can improve customer satisfaction.

This topic becomes relevant to explore because companies lose approx. 25% of their existing customers every year (Peppers and Rogers, 1996 cited in Lin, Tseng, Hung and Yen, 2009) and therefore in order to survive, retaining valuable customers is increasingly becoming as one of the most prized strategic capabilities that a company can aim for (Kale, 2004). Moreover, Parvatiyar and Seth (2001) affirmed that many companies are now realizing the need for in-depth customer knowledge to enable more cooperative relationships and also to identify the most profitable customers (Mukerjee and Singh, 2009).

One possible solution for those companies is to improve the loyalty of their larger customers, since "loyalty is inextricably linked to the creation of value" (Reichheld, et al., 2000), and also because companies should prioritize the retention of larger customers (Ryals, 2005).

Furthermore, if companies improve their customer loyalty, that will not only have a positive impact in their revenues and market shares, as it will also decrease its costs since it costs less to satisfy the existing customers, than to acquire new ones (Reichheld, Frederick R., Markey Jr., Robert G., 2000). Thus, if customer loyalty is improved, the employee's pride and satisfaction will also increase and that that will have a positive impact in employee's productivity and retention rate - the loyalty effect (Reichheld, Frederick R., Markey Jr., Robert G., 2000).

This idea is aligned with Bolton (1998) conclusions that firms that have stronger relationships with their customers, also enjoy higher profitability (Reinartz and Kumar, 2005, cited in Krasnikov, Jayachandran and Kumar, 2009).

Thus, in order to address this problem, companies are adapting their customer offerings and communications strategy according to their customer's individual expectations, and therefore they are moving from product-centric marketing toward a more customer-centered approach (Reinartz, Kraft and Hoyer, 2004). Hence, as stated by Lin, Tseng, Hung and Yen (2009) CRM is emerging as an effective strategic tool that addresses this problem with the use of advanced information technologies.

However, in most cases the problem is that executive managers' are not totally aware of the potential dangers and "sins" of a CRM project (Kale, 2004) and as matter of fact, in the past, few companies achieved the expected results from CRM investments. (Gordon, 2002). Moreover, according to previous CRM researches "60-80 percent of CRM projects end in failure." (Kale, 2004 cited in Mukerjee & Singh, 2009).

On the other hand, the potential success of the CRM can be increase up to 60%, if a proper CRM strategy is adopted towards the customer. (IBM's Global CRM Study, 2004 cited in Mukerjee & Singh, 2009). Furthermore, a solid CRM strategy and implementation have a positive effect in the company's performance (Reinartz, Kraft and Hoyer, 2004). Therefore, CRM practices can represent opportunities for companies to improve not only their business performance, but also to improve customer's satisfaction and loyalty.

Besides, Gordon (2002) claims that managers should take a special attention into CRM strategies, particularly by "bringing all customers data together in a single location, aligning processes (...) in the service of the end customer, and smoothly integrating CRM activities of others business and functional areas".

For those managers, a good alternative is to take into account new technologies, such as the biometrics technology (particularly in this case, the facial recognition technology) in order to improve its processes.

Biometric technology can represent a great opportunity for companies because it “has enjoyed a fast rate of development in recent years” (Helou,2007 cited in Morosan, 2011). Furthermore, according to a study performed by Singh and Kasavana (2005), there is a 71% probability that operations in industries like the lodging industry, will introduce futuristic technologies such as biometrics and wearable computers by 2027 – opposed to the estimated probability of 15% for the year 2007 .

Thus, the focus of this thesis is to gain a better insight into the impact that Facial Recognition technology can have on customer services and relationship and on organization’s performance. Hence, this work addresses the following research question:

1.2. Research Question

- 1. Does the use of Facial Recognition technology have a positive impact in Customer Relationship Management (CRM)? And if so, can it have a strategic impact for the organization?**

Moreover, we also explore this issue based on customer opinion. Therefore, we also try to answers the following related questions:

- 2. Are customers willing to accept the use of Facial Recognition technology?**
- 3. Is there any industry that would benefit from adopting the F.R. Technology?**

In order to answer to these questions, this dissertation poses the following hypotheses: (H1) The use of Facial Recognition (FR) technology can have a positive impact in CRM; (H2) The use of FR technology can have a strategic impact to the organizations; (H3) Portuguese consumers are willing to accept the use of facial recognition; (H4) Consumers are willing to accept the use of this technology in the Banking industry; (H5) Consumers are willing to accept the use of this technology in the Retail industry.

1.3. Structure and methodology

This dissertation is divided in three different parts: state of art, discussion and the conclusion.

The state of the art chapter addresses previous studies about the main problem of this dissertation in order to archive a reliable source of possible conclusions. First, this chapter focuses on the broad definitions of CRM, its processes, potential and also its limitations. Afterwards, the chapter focuses on literature regarding biometrics technologies, particularly about Facial Recognition - its use, potential, limitation and the potential problems with marketing permission.

Finally, this chapter concludes with the presentation of previous literature concerning the Resourced-Based View Model concept and its importance to companies in order to gain sustainable competitive advantage (Barney 1991).

This was the model chosen since it's the one that has been the one adopted among researchers as a theoretical basis and analysis of how resources can affect a company's performance (Nakatani and Teixeira, 2009).

Next, the discussion chapter starts by analysing the potential relation between the two concepts described in the previous chapter, through the analysis of the different CRM processes and we address which of these processes can be positively affected by the use of Facial Recognition. Then, through the analysis of data provided by Banco de Portugal, we infer which industries may benefit the most from the use of this technology.

Hereafter, and along with the conclusions obtained from the state of the art chapter, we elaborate hypotheses to address the research question.

Finally, in the end of the discussion chapter, we perform an empirical research – through online surveys (to a sample representative of the Portuguese population) to address the main research question. Afterwards, we use the Resourced-Based View model in order to understand if the Facial Recognition technology can be considered as a strategic resource by organizations.

The last chapter of this dissertation - the conclusion - emphasizes the conclusions drawn from the previous chapter, from the impact analysis to the potential success of its implementation and acceptance by the Portuguese customers and also points out the limitations of this study and that can be addressed in future research.

2. State of the Art

This chapter aims to give a background overview, regarding the needed theory, in order to better understand and define the main concepts to develop the future chapters of this dissertation.

In this chapter we review the existing academic and business literature on two different topics: Customer Relationship Management and Facial Recognition as well as explain the main concepts that aboard in this thesis.

This review is crucial because it will give some explanation about the main concepts, as it will also give a justification to study these two topics together.

2.1. Customer Relationship Management (CRM)

In the following main section, we analyse the previous research on Customer Relationship Management, including the most accepted definitions on CRM, as well as CRM man functionalities and its uses. However, we also explore the negative impact of CRM in the limitations and problems section.

Finally, we conclude this main section with some example of successful past CRM projects, and we also explore the topic of permission marketing and the problems that can arrive from it - this last section is going to be the starting point for the next chapter (in which, we are going to explain how Facial Recognition can be related with CRM and how it can impact it).

2.1.1. CRM Definition

The concept of CRM is commonly associated with the term “relationship marketing” (Parvatiyar and Seth, 2001 cited in Payne and Frow, 2005) and it has been a well-researched topic among both business and academic literature (Gronroos, 2001 cited in Hamid and Kassim, 2004 and Hennerberg, 2005). Despite this fact, there is still a lack of consensus on the definition of CRM (Payne and Frow, 2005).

Relationship marketing scholars have supported that substituting a transaction-oriented approach for long-term relationships with customers is more lucrative for firms (e.g., Morgan & Hunt, 1994 cited in Jayachadran, Kaufman, Pushkala & Sharma, 2005).

Hence, Hamid and Kassim, 2004 defined the purpose of relationship marketing as being to identify, established, maintain and enhance relationships with customers allowing the economics and other variables of all parties to be met. Aligned with this theory, Morgan and Hunt (1994) defined relationship marketing as all marketing activities directed toward establishing, developing and maintaining successful relational exchanges (Pressey & Tzokas, 2006).

On the other hand, according to Ryals and Payne (2001, cited in Payne and Frow, 2006) the main difference between relationship marketing and CRM is that relationship marketing is concerned with managing relationships with multiple stakeholders, while on the other hand CRM focus primarily on the customer (cf. Gumesson, 2002 cited in Payne and Frow, 2006).

Furthermore, CRM is the outcome of continuous changes in marketing ideas and newly available technologies, data and organizational approaches (Boulding et al., cited in Payne and Frow, 2006). Thus, the concept of CRM goes beyond relationship marketing and it has been addresses by many researchers.

For example, Ian Gordon (2004) defined CRM as a series of strategies and processes that create and delivers value for individual customers, builds preference for their

organizations and improves business results over a lifetime of association with their customers.

Aligned with this idea of a more customer centric approach, Gartner Inc. (2004, cited in Mukerjee & Singh, 2009) affirmed that CRM is a business strategy designed to optimized the company's performance and customer satisfaction, by organizing the organization around customer segments and implementing customer centric processes.

However, the modern concept of CRM is broaden than just that definition. Nowadays, the concept of CRM is associated with the use of technology that allows the organization to build a sustainable competitive advantage (Henneberg, 2005). Furthermore, CRM is seen as a technology-based business management tool that allows organizations to leverage the customer knowledge and to strengthen their relationships with them (Foss, Stone & Ekinci,2008).

Therefore, it's easy to conclude that among researchers there are many CRM definitions. In this dissertation we are going to use Adrian Payne and Pennie Frow (2006) definition, which is also shared among best practices companies. For them, CRM is a strategic approach that is concerned with improving stakeholders value through the development of appropriate relationships with key customers and customers segments. Moreover, CRM unites the potential of relationship marketing strategies with IT to create long-term relationships with customers through the use and "transformation" of customer data into customer knowledge. This requires a cross-functional integration of processes, people and capabilities across the many areas of the firm.

2.1.2. CRM Functionalities

In order to understand the impact of Facial Recognition on CRM, it is important to identify the functions that CRM should perform and what they are designed for.

In this section, it was decided to follow Michael Torggler (2008) approach because his model covers the relevant literature on this topic.

This approach provides an accurate theoretical overview of the structure of modern a CRM system (a system that is considered as a technological enabler which is designed to combine solutions and support for the company's business processes) and it also proposes a categorization of the currently available software functionality for all the CRM main areas.

First of all, it is important to highlight that Michael Torggler divided CRM into three main major functional areas:

- **Collaborative CRM:** This area covers the control and integration of all communication channels between the company and its customers;
- **Operational CRM:** This area adapts the business processes to the individual customers by having access to the data collected about the customers and controlling the information flow of the customer data for the business processes concerned. It contains functions for automating sales, marketing activities, and for customer service;
- **Analytical CRM:** This area focuses on the preparation, simulation, analysis and optimization of customer-oriented decision-making processes based on customer data previously collected and stored.

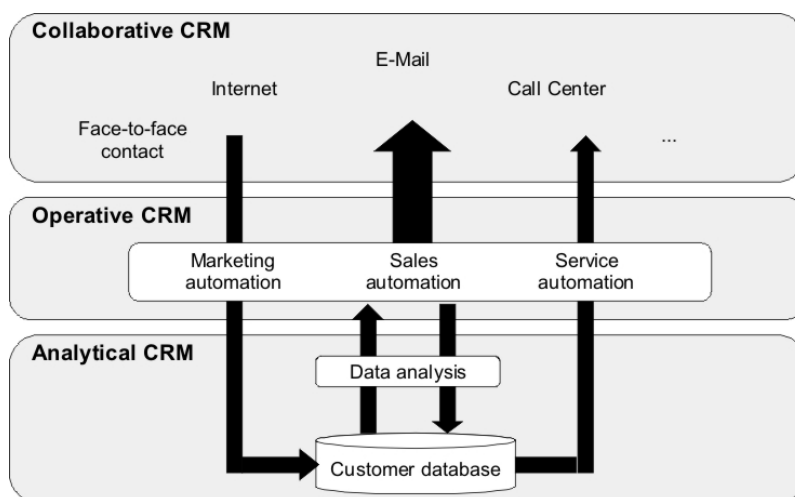


Figure 1 : The structure of the general CRM system.

Source: Fidis

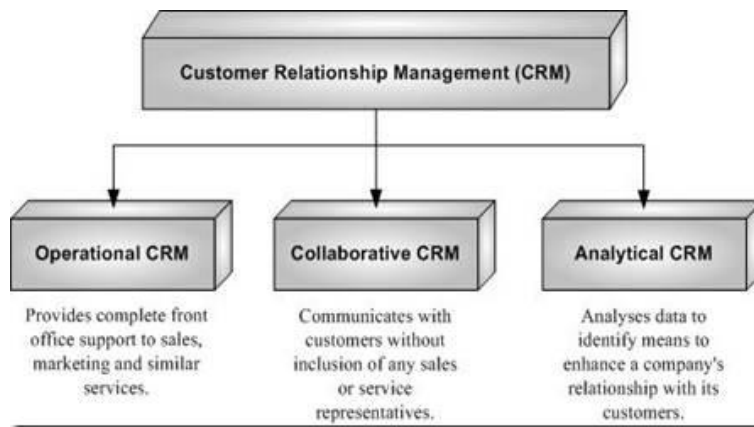


Figure 2 : The main functional areas of CRM and its definitions

➤ Collaborative CRM

CRM Functions	Processes	Activities
Collaborative CRM	<u>Contact Management</u>	This process includes all tools for managing and maintaining customer contacts; Example: addresses, contact persons, status of the relationship, etc.; In most cases all customer data is stored in a central database in order to provide these data for all customer-oriented processes in the company.
	<u>eCRM and Internet</u>	Customer data from online activities is integrated directly into the central database; It supports a variety of modern CRM activities such as: online availability checks, user tracking real time customer identification, virtual shops assistants and it also helps the planning and implementation of online catalogues and shops;
	<u>Customer Interaction Center</u>	It is considered the central process for customer service; This process uses modern technologies such as automatic call distribution or selection (by area or language) and it allows to gather all the contact channels in one big communication center.

Table 1: Description of the processes and activities in the CRM Collaborative function

➤ Operational CRM

CRM Functions	Processes	Activities
Operational CRM	<u>Marketing Automation</u>	<p>This activity is responsible for managing and supporting all customer-related marketing activities. The central aspect in this activity is campaign management which focuses on providing the right information at the right to the customer in order to ensure a continuous interaction with the customers;</p> <p>The campaign management is divided into three different sections:</p> <ul style="list-style-type: none"> • <u>Campaign Planning</u>: provides support in planning marketing activities (e.g. objective of the campaign, channel selection) and the campaign itself (e.g. target definitions, finance projections); • <u>Campaign Execution</u>: provides appropriate content for the selected communication channel and allows the system to be used to automate the execution and management of campaigns (e.g. personalization of the content, event-triggered content); • <u>Campaign Controlling</u>: allows the monitoring and analysis of the current ongoing campaigns.
	<u>Sales Automation</u>	<p>The main objective is to provide support to all sales activities (internal and external) associated with individual customer contact, through information and communication technology;</p> <p>It is divided into three main areas:</p> <ul style="list-style-type: none"> • <u>Order Management</u>: It includes assistance in the processing of customer requests, sales process (e.g. contract terms, pricing) and in the track of orders; • <u>Sales Force Support</u>: It allows the planning of sales activities to be done online and the data is to become directly available for the sales department. The sales force is also supported by functions which matches appointments and activities in real time, thus the available time for each customer visit can be optimally exploited (e.g. sales frequency, visit frequency, visit reports); • <u>Product Configuration</u>: allows the matching between products and services and the consumer's needs (it includes product configuration, design, presentation and others alternatives).
	<u>Service Automation</u>	<p>Its main objective is to support the service department and to simplify the contact with the customers. In order to do so, it is common to use advanced communications technologies such as contact history track, recording requests or automatic calls distribution);</p> <p>This activity can also be divided into three main areas:</p> <ul style="list-style-type: none"> • <u>Helpdesk</u>: It consider the first point of contact between customers and customer service. It allows to automatically identify some problems and assign the incoming requests to the appropriate staff (e.g. based on previous experiences /cases and solutions); • <u>Complaint Management</u>: This system can assist the complaint process by collecting and categorizing previous customers request /complaints. It also generates feedback from customers and can be used as a way to increase customer satisfaction through a positive image of the organization.; • <u>Service Requests</u>: offers a quick and straightforward solution to the customer's problem. This component can also use past information/requests in order to find the best solution for the problem.

Table 2: Description of the processes and activities in the CRM Operational function

➤ Analytical CRM

CRM Functions	Processes	Activities
Analytical CRM	<u>Marketing Analysis</u>	This process deals primarily with the evaluation of current campaigns; It is also used to review the campaign success and to measure customer satisfaction; This process estimates not only customer retention rates, as it also measures the impact of cross/upselling campaigns.
	<u>Sales Analysis</u>	It includes analysis of reports on sales activities that gives indicators of actual sales volume and also on lost order and future sales potential; It includes functions such as sales-pipeline analyses; shopping-card analyses and sales cycle analyses); These data is crucial for the planning of future sales activities.
	<u>Service Analysis</u>	It includes the evaluation of the different services and products as well as controlling others functions related to staff and operational monitoring (to avoid bottlenecks); Those include a variety of activities such as: service cycle analyses, damage and quality analyses, human resources activities, warning systems and forecasting.

Table 3: Description of the processes and activities in the CRM Analytical function

collaborative CRM	Contact Management		eCRM/Internet		Customer Interaction Center	
operational CRM	Marketing Automation	Campaign Development	Sales Automation	Order Management	Service Automation	Helpdesk
		Campaign Execution		Sales Force Support		Complaint Management
		Campaign Controlling		Product Configuration		Service Requests
analytical CRM	Marketing Analysis		Sales Analysis		Service Analysis	

Figure 3 : The classification of CRM Functionalities

2.1.3. CRM Applications and Uses

As stated before, CRM is usually used for four main purposes: to collect information about consumers preferences and shopping habits, use that information into knowledge for the purpose to offer the best products and services suitable to those customers, in order to create long-term relationships with them and increase the organization's profitability.

Through the organization and analysis this customer data, firm can not only develop and offer better products, services and business models to their customers (Slater and Narver, 1995 cited in Jayachandran, et al., 2004), as they can as well identify the most profitable group from those customers based on their previous purchasing history (Newell, cited in Mukerjee and Singh, 2009).

Moreover, Jayachandran, Hewett and Kaufman (2004) concluded that customer knowledge processes has a positive impact in the effectiveness and pace of a firm's customer response because allows the firm to manage and target their customers on the basis of evolving service experiences (rather than on the basis of gender or demographic criteria), resulting in an increase of the perceived value of the firm's products and services and decrease the possibility of customers defecting to the competitors (Mithas, et al., 2005).

According to Mithas, Krishnan and Fornell (2005) CRM applications help firms to use this customer knowledge through two mechanisms. First, it enables the organization's customer contact staff to record relevant information about each relevant customer transaction and to analyze it, in order to gain better insight regarding customer preferences. This information can not only be consulted by employees at any given time in the future enabling a faster customer response, as it can also help the organization to identify and isolate potentially valuable market segments. This will improve the level of expertise employed in responding to customers (Jayachandran, et al., 2004). Secondly, that same information can be used by organizations in a way that enables the organization to provide products and

services that suits that same segment of customers' needs, expectations and behaviours (Prahalad, Ramaswamy and Krishnan, 2000, cited in Mithas, et al., 2005).

Afterward, Mithas, Krishnan and Fornell (2005), also argued that the real value of CRM applications lies in the collection and dissemination of this customer knowledge gained through repeated interactions, that later allows firms to customize their products to their customers' needs and consequently increase their satisfaction.

But the importance of CRM applications goes beyond this point and can have a positive impact on other areas. For example, CRM applications can also assist organizations to better manage customer relationships in all of phases of relationship management (i.e. initiation, maintenance and termination phases), which is seen as a key factor in managing customer loyalty and satisfaction (Mithas et al., 2005).

This fact plays an important role due to the fact that according to Bolton (1998) customer satisfaction has a negative impact on customer complaints and a positive impact on usage behaviour and customer loyalty (Fornell,1992). Consequently, increased consumer loyalty may result in an increase of usage levels (Bolton, Kannan and Bramlett,2000 cited in Mithas, et al., 2005), secure future revenues (Rust, Moorman and Dickson, 2002 cited in Mithas, et al., 2005) and also decrease the probability of customer defection (Anderson and Sullivan, 1993; Mithas, Jones and Mitchell, 2002 cited in Mithas, et al., 2005). An increase of customer satisfaction may also result in a costs reduction related to warranties, complaints, defectives goods and field services costs (Fornell,1992 cited in Mithas, et al., 2005).

Moreover, from the use of this customer knowledge, organizations can take advantage from predicting product demand and cross-selling strategies (Mithas et al., 2005). Cross-selling strategy is the practice of selling an additional product or service to an existing customer (Li et al., 2011). Additionally, past research also pointed out that successful cross-selling requires customer intimacy and detailed information on customer preferences (Akcura and Srinivasan, 2005, cited in Mukerjee & Singh, 2009). From the use of customer knowledge gathered by CRM applications, organizations can start cross-selling campaigns by setting a time schedule (e.g., mail the promotional

material in one month) and then selecting a communication channel (e.g., phone, e-mail.) for the campaign (Li et al., 2011). This cross-selling strategy will allow the customer to realize enhanced value, and gets introduced to other products that he may have not purchased otherwise. (Gil & Spencer, 2008).

To conclude, it is easy to point out that this process of customer self-selection regarding service features, provides additional opportunities for organizations to understand more about their customer's needs and to extend their existing customer knowledge (Mithas et al., 2005) and it also enables a faster decision-making process (Jayachandran, et al., 2004).

2.1.4. CRM Best Practices

Over the past years, organizations have been realizing the importance of implementing a good CRM strategy and as a result companies are coming to believe that customer data are as important as financial data (Gordon 2002). Moreover, the CRM market value has also been growing, as it was estimated that its overall value went from \$6.4 billion in 2006, to nearly \$11 billion in 2010 (Foss, et al., 2008).

Thus, CRM represents an opportunity for organizations and those same organizations have to develop practices that allow them to take full advantage from CRM and customer knowledge. According to Mukerjee and Singh (2009) for CRM to be successfully implemented and used, organizations should define customer into different segments according to their purchasing behaviours and habits (e.g., purchase value, affinity towards product categories, channel preferences, purchase frequency).

McGovern and Panaro (2004) affirmed that CRM best practices can be summarized as four key steps to explore CRM's full potential for growth: (1) To account segmentation to determine the organization's key accounts that the organization should focus on, (2) To assess the customer relationship, by using all the customer gathered information and internal partners in order to measure and compare the current customer relationship with the future ideal state, (3) To look-back to key

stakeholders, a process that converts all the information used in the previous stage into a CRM strategy validated by all the other players involved (internal and external), (4) And to align the people systems that drive, reinforce and reward performance with behavioural requirements of the new CRM approach.

Nevertheless, as argued by Petersen (2004) in order to achieve success with CRM, organizations CRM practices must reflect and address the entire organization from top to bottom, namely: (1) Policy and Strategy, (2) Employees, (3) Customers, (4) Partners, (5) Processes, (6) Results, (7) Leadership, (8) Program Management and also (9) Change Management.

Following Gordon (2002), best practices companies do not first adapt a CRM technology solution and then built their CRM initiative around it. Instead, these companies develop their own approach to conceive and implement CRM strategic capabilities, that are divided into four main categories: (1) Technology that supports CRM, (2) The characteristics of the people (e.g. skills, abilities and attitudes) who manage CRM, (3) The processes companies use to access and interact with their customers in the pursuit of new value and mutual satisfaction and (4) The approaches the company develops to add value to customer data so that they acquire the knowledge and insight needed to deepen the customer relationships that matter the most.

Finally, CRM best practices also involve the development of competitive measures that helps the organization to decide how (e.g. channel, message) they are going to approach customers and how much money they are going to invest to attract new customers. Moreover, the use of CRM best practices has changed paradigm regarding customers costs, from “ dollars per thousand people” to “ dollars per priority customer” (Gordon, 2002).

2.1.5. CRM problems / limitations

Despite the fact that the use of CRM software has been increasing, highly publicized failures led to scepticism among managers about the potential added value CRM can generate to organizations (Ryals, 2005; Zablah, Bellenger and Johnson, 2004 cited in Krasnikov, et al., 2009). This comes as no surprise, since the success rate of a CRM project varies between 30 and 70 per cent (Verhoef & Langerak, 2002) and in addition, it is estimated that approx. 70% of CRM projects results in either losses or no improvement in organization's performance (Gartner Group, 2003 cited in Reinartz, et al., 2004) and it may also severely damage customer relationships (Rigby, Reichheld and Schefter, 2002 cited in Ryals, 2005)

Thus, there are some limitations and managerial misconceptions that lead to those losses and failures.

To start, many managers perceive the CRM practise as too expensive, unsatisfactory, and they believe that it does not deliver the desired results and it only leads to more complex processes (Henneberg, 2005).

According to Kale (2004), the most common errors when implementing a CRM project are: (1) viewing CRM as technology initiative; (2) the lack of a customer-centric vision; (3) unsatisfactory appreciation of CLV – customer lifetime value; (4) inadequate support form top management; (5) undervalue change management; (6) inflexible business processes and (7) misunderstanding the difficulties regarding data analysis (Mukerjee & Singh, 2009).

Regarding general managerial misconceptions, some managers believe that CRM alone can boost the organization's performance, when in fact CRM is more than just installing a software, it involves the full commitment from the entire organization, in particularly an organization with customer-oriented culture, in which all the departments and employees focus on creating added value to customers. Moreover, instead of building long-term relationship with their customers, most CRM software focuses only on optimising short-run response of customers. As a consequence, only

customers with the highest response probability are targeted, whom may become annoyed and inclined towards switching to a less interfering supplier. One possible solution for this problem might be the use of permission marketing because it enables the customer to direct the content of the offer, timing and type of communication used (Verhoef & Langerak, 2002).

Other important misconception is the fact that firms often assume that firms should only focus on customer relationship development which is not a good assumption because the organization also needs to create relationships with all the other consumers in order to acquire new clients.

This misconception is also connected to another one that is the fact that managers often have full confidence that long-lasting relationships with customers are always more profitable, when in fact this assumption is incorrect since long-tenure customers have more experience with the company and understand better the real proposed value, they are consequently more price sensitive than the ones not loyal to the organisation (Verhoef & Langerak, 2002).

Next, other important misconception regarding CRM is that many organizations consider customer acquisition and CRM as two unrelated activities, when in reality both need to be managed simultaneously because customer acquisition strategy impacts customer relationship development (Verhoef & Langerak, 2002).

Finally, it is also important to highlight the misconception that managers often believe that firms should concentrate all their marketing efforts on their most profitable customers and completely ignore other customers. Contrary to that, organizations should find the right balance in order to invest not only in their current most profitable customers, but also in customers that have the higher future potential value (Verhoef & Langerak, 2002).

2.1.6. Permission Marketing and Mobile Marketing

As stated in the previous section, one limitation that may affect CRM along with the use of technologies is the fact that some customers may become annoyed and feel disrespected due to the excessive amount of messages that they receive from companies.

Moreover, protection of personal information - including purchasing habits and behaviours - is among the top three most important issues for customers (Reed, 2006), because those customers are often concerned on how that information is being used by organizations (Marinova, Murphy and Massey, 2002).

Therefore it is important for organizations to take into account these concerns and a possible solution for that is permission marketing, since it is better and easy to ask customer's permission, than for his/her forgiveness (Scornavacca, 2004 cited in Cengiz & Tetik, 2010).

According to Godin, the main idea behind permission marketing is to encourage customers to participate in long-term, interactive marketing campaigns in which they are rewarded in some way for paying attention to increasingly relevant messages (Kavassalis et al., 2003). By other words, permission marketing can be seen as the new form of mobile communication, in which the customer gives full consent to the organization to use his information and then, the organization responds with customized advertising material and personal offers. This permission should be seen as combination of the customer's personal preferences (e.g. time, location, information) and the user should be able to indicate when, where and what type of information he should receive (Cengiz & Tetik, 2010).

Furthermore, Godin claimed that permission marketing enhances the trust of customers towards the organization as well as his loyalty in the long-term. Thus, this communication enables the company to take partial control of the customer, by influencing his attitudes and orienting his behavior and intentions (Yildiz, 2008).

But, the benefits from permission marketing go beyond this point. Through the use of the customer's information (e.g. age, sex, education, income, etc.) gathered, organizations can also improve their market segmentation, target precision and aim effective messages at individual consumers. (Tezinde, et al., 2002).

On the other hand, since one-to-one communication plays a major role in customer relationship management - CRM (Tezinde, et al., 2002), permission marketing can have an important impact in other marketing channels such as the mobile marketing. Mobile marketing is a form of one-to-one communication, in which a person after giving permission, received a personalized offer in their mobile phones and since they are carried by customers all the time, they provide advertisers the opportunity to reach their prospects when and where it is most appropriate (Kavassalis et al., 2002).

Nevertheless, mobile marketing should be considered as a complement to other marketing channels and CRM activities since it can be not only a mechanism for rapid and effective appreciation of prospects' reactions (SMS advertising response rate, loyalty in reply, etc.) as it is also used to collect customer's behaviour data - including time and location (Kavassalis, et al, 2002). Hence, this means that all the organization systems and processes must be interrelated, in a way that enables and facilitates the collection and analysis of the customer data collected.

The concepts of permission marketing and mobile marketing are important to study, since they are going to be explored along with the use of facial recognition technology, in the next chapter – “ 3. Discussion”.

2.2. Facial Recognition (FR) technology

In order to analyse the subject of this dissertation, we need to introduce some concepts regarding the facial recognition technology.

Firstly, this section presents a briefly introduction regarding previous researches on biometrics technologies and the different types of biometrics technologies that exist.

Then, this analysis proceeds through the breakdown of the facial recognition concept, features and how does the system works.

Finally, we conclude this section by presenting some example of businesses that already use the technology and we also point out some limitations that may affect negatively this technology.

2.2.1 A broaden vision regarding biometrics technologies

As stated by Lin Soh, Wong and Chan (2010), Biometrics have been used throughout past generations not only has a measurement but also as a way to facilitate people's identification. Yet, only in recent years this technology has been associated with information technologies and consumer solutions (Lam & Martey, 2007, cited in Morosan, 2011).

The term biometric refers to the human characteristics or body statistics that aren't shared by any other individual and rarely change (Inskeep & Claypole, 2007, cited in Morosan, 2011). Moreover, those characteristics can be divided into two different categories: physiological – that includes face, fingertips, iris and hand geometry; and behavioural – that includes voice and signature recognition. However, in recent years, other types of biometrics have been appearing such as DNA, lip motion, retina or ear shape. (McIntosh, 2009, cited in Morosan, 2011).

On the other hand, biometrics technologies are the automated methods and processes that recognize one or more biometric characteristics, distinguish them and identifies

the person through those characteristics that are unique to them (Költzsch, 2006) and non-transferable (Sarkar, et al., 2010). This fact allowed biometrics technology to be acknowledged as the most accurate authentication system to date (Lam & Martey, 2007, cited in Morosan, 2011). Moreover, this technology is also seen as a fast and uniform solution for identification because it is almost impossible to lose, steal, duplicate or alter the data collected (Sarkar, et al., 2010).

According to Helou (2007, cited in Morosan, 2011), the use and development of biometric technologies have been knowing a fast growing in recent years. Currently, the technology is being used in a large variety of sectors such as: immigration and border security authentication (Stana, 2007 cited in Morosan, 2011); Human Resource Management (Sturgeo, 2005 cited in Morosan, 2011), Banking (Költzsch, 2006); Airport security (Sarkar, Alisherov, Kim and Bhattacharyya, 2010); Governmental Issues and Business (Langenderfer and Linnhoff, 2005 cited in Lin Soh, et al., 2010), for example.

Other researchers such as Tsai and Lim (2007, cited in Morosan, 2011) affirmed that the adoption of these technologies can have a positive impact in the way people do business and it can improve the relation between customers and companies. According to them, "biometric payment systems seem to be promising consumer applications with notable benefits for customers (greater convenience, satisfaction and a faster service) and firms (reduced costs, higher consumer loyalty and increased sales).

Compared with traditional authentication methods, biometric technologies are considerably more reliable because they take advantage of mostly unchangeable characteristics (Költzsch, 2006).

Moreover, one of the biggest flaws of the traditional authentication methods is that sometimes, cards get stolen or people forget their PIN codes to have access to their accounts (Soh, et al.,). Thanks to the development of biometrics, people don't have to worry about those concerns because biometrics characters cannot be lost or forgotten (Gifford, McCartney and Seal, 1999 cited in Soh, et al., 2010).

Furthermore, Ahmed and Siyal (2005) summarized an extent list of benefits from the adoption of these technologies, that include: reduced risks, increased security, reduced fraud, reduced identity theft, increased convenience and accountability and enhanced service levels (Soh, et al., 2010).

Also, according to Helou (2007, cited in Morosan, 2011) “it is expected that the performance of this technology is going to improve in the near future leading to a broaden deployment of these systems.” Furthermore, Koltzsch (2007, cited in Morosan, 2011) highlighted this fact and affirmed that biometric systems look even more promising in the long term.

2.2.2 Facial Recognition concept and its main features

The Facial Recognition system can be defined as “near real-time, fully automated computer vision system developed in order to detect and recognise expressionless, frontal-view human faces in static images” (Balasuriya & Kodikara). This system it can also be described as a computer application that is commonly used as an automated process to identify and verify a person identity.

As Li and Jain (2011, pp.1-5) affirmed, a facial recognition system has several advantages comparing with other biometric technologies such as iris or fingertips, mainly because this system is not only natural and non-intrusive, as it can be captured at a distance and in a covert manner that does not bother the person as much as other recognition systems.

Moreover and as explained in appendix 1 “Facial Recognition illustrations”– Exhibit 1.1, among the biometric technologies, facial recognition was considered the most reliable and the one with the highest computability score in the MRTD system¹(Li & Jain, 2011, pp. 1-5).

¹ Machine Readable Travel Documents (MRTD) system – a system based on a number of evaluation factors such as enrolment, renewal, machine requirements and public perception.

This system is processed into two different phases. Firstly, the system collects the image of the individual's face and analyses it.

Then, the pixels of the analysed features are compared with the ones that already exist in the database, and in the case of a match, the system will identify the individual and retrieve the information.

The following pictures illustrate how the system works.

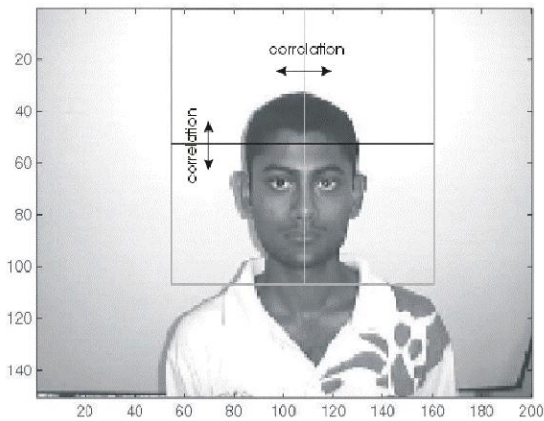


Figure 4: The system takes a picture of the individual.

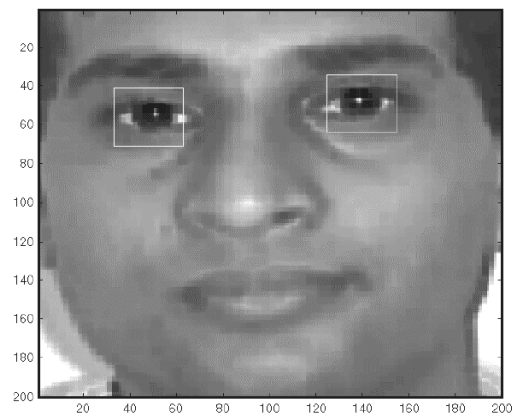


Figure 5: The process focuses on one or more physical characteristics of the individual's face such as: eyes, lips, nose, cheekbones or eyebrows.

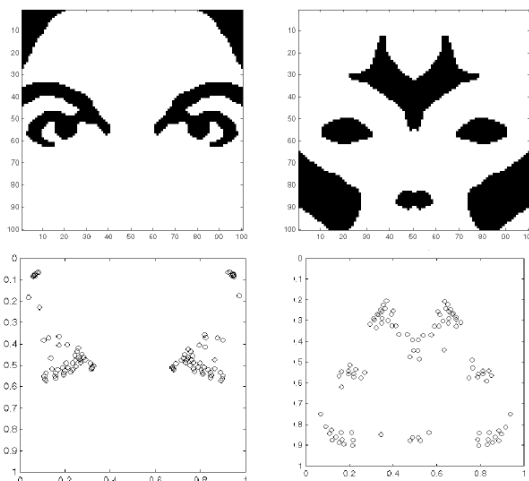


Figure 6: The facial features of the individual are then measured and analysed

'Faceness' heuristic	Location		
	x	y	width
978	74	31	60
1872	74	33	60
1994	75	32	58
2418	76	34	56
2389	79	32	50
2388	80	33	48
2622	81	33	46
2732	82	32	44
2936	84	33	40
2822 Actual Face location	85	58	38
2804	86	60	36
2903	86	62	36
3311	89	62	30
3373	91	63	26
3260	92	64	24

Figure 7: The data collected is compared with previous records and if the values of both are almost identically, then a positive match is created and the identification is made.

Source: Department of Computer Science

To summarize, the following picture describes how the individual information flow is processed:

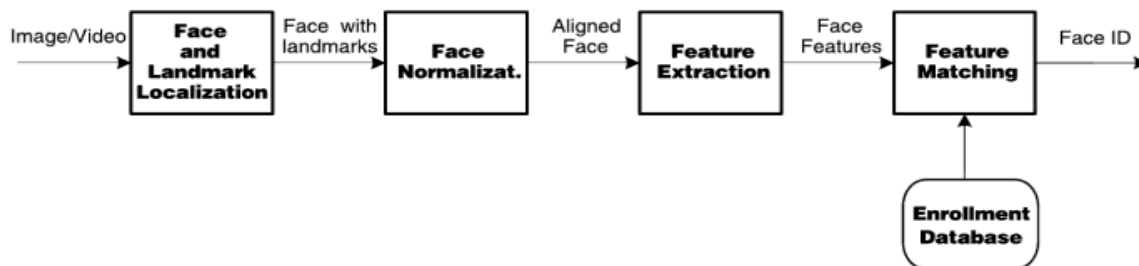


Figure 8 : Depiction of face recognition process flow

Source: Li & Jain (2011, p.5)

2.2.3 Facial Recognition potential uses

Although this technology is still seen as an issue by many entities and companies are still reluctant on its adoption (Chandra and Calderon, 2005 cited in Soh, Wong and Chan, 2010), this technology has great potential and it has been already tested and used in different industries.

For instance, the German Federal Police has been employing this system in the Frankfurt Airport, since 2005. The system works on a voluntary basis (individual can choose to use it or not) and it allows members to pass through the completely automated border security system in a shorter period of time (Fajfr, 2011).

This technology has also been used by the “Australian Customs Services” in its border process called “SmartGate”. The system compares the face of the individual with the image in the e-passport microchip, certifying that the holder of the passport is the rightful owner of the same (Warne, 2011)

Moreover, the technology has been also used as a way to improve national security and fight criminality. For example, at the 35th edition of the Super Bowl (2001), police in Tampa, Florida used facial recognition software to search for potential criminals and

terrorists in attendance at the event (McCullagh , 2001). Another good example is the case of China, where this technology is now only use in the border controls, and it was also used as a way to improve security in the last Olympic games – Beijing 2008 (Lin & Jain, 2011). This example can be observed in appendix 1 “Facial Recognition illustration” – Exhibit 1.2.

The technology has also been used both by companies and marketers in order to improve its customer’s loyalty towards the brand. For example, not only *Adidas* but also *Kraft* are planning the installation of a Facial Recognition system into their stores that will allow them to have digital ads to target runners and eaters with the right shoes and edible goods, respectively, based on age and gender (Miller, 2011).

Lastly, also Coca-Cola has been investing and testing the potential success of this technology. One of those experiences occurred in the “Summer Love” Music Festival, in Israel, where the main idea objective was to know the individuals and to integrate people’s online experience with real life. The campaign’s idea was to be able to log into the Facebook accounts of the attendees of Coca-Cola Summer Love using the special check-in places called FaceLook spread around the festival. Then, the machines placed in the check-in places would recognized and analyse the individual’s faces from their online profiles (Doyle, 2011). This example can be seen in appendix 1 “Facial Recognition illustration” – Exhibit 1.3.

Finally, it is important to highlight that the full potential of this technology hasn’t been explored yet. Moreover, as cited by Költzsch (2006), in the future this technology can have a big impact in different areas such as: the transaction authentication in bank branches or the access to safe deposit boxes and safes. Furthermore, Költzsch (2006) also affirms that the use of this technology applied to the banking industry will “play an important role in the market in future”.

2.2.4 Facial Recognition Concerns

Despite the fact that more organizations are using this technology, there is still many concerns regarding its adoption.

First, from a technological point of view, the system is not 100% reliable because there can be a large variety in facial appearances. The texture of a face is influenced by many factors that occasionally, cannot be controlled and may affect the recognition process since it jeopardizes the extraction of intrinsic information about the individual face. These factors include, not only the face's shape, but also reflectance, facial pose (or, equivalently, camera point of view) or the illumination of the space (Li & Jain, 2011).

However, there are still other non-technical factors that may affect negatively the adoption of this technology.

To a certain extent, the individual's values and personality can dictate the acceptance of a new technology. As a matter of fact, Soh, Wong and Chan (2010) claimed that the determination for the adoption of a new technology usually comes from the individual beliefs, attitudes, subjective norm, perspective of behavioural control, perceived usefulness and its perceived ease of use.

Consequently, in the case of facial recognition technologies, not all consumers are willing to be identified as soon as they pass by a security camera, and that may represent a problem for organizations.

For example, Helou (2007) studied the application of this technology in the restaurant industry and argued that given the sensitive nature of biometrics, consumers may raise security concerns and that may indeed impact their attitudes and intentions towards the use of these systems (S.H. Kim, 2009 cited in Morosan, 2011).

From this point of view, it is easy to conclude that the adoption of these technologies remain an issue, and the lack of understanding of these constraints and challenges hold organizations from investing more into these systems (Chandra and Calderon, 2005 cited in Soh, et al., 2010)

2.3 The Resourced-Based View (RBV) Model of the Firm.

In order to verify if Facial Recognition technology can have a strategic impact in organizations, we need to ascertain if this technology can be considered as a strategic resource or by other words, if its use can lead to a sustainable competitive advantage.

Thus, in the third chapter of this dissertation, we will analyse the potential use of this technology applied to business and comparing it to the Resourced-Based View (RBV) Model of the firm.

The RBV Model is “one of the most widely accepted theoretical perspectives in the strategic management field” (Powell, 2001; Priem and Buttler, 2001; Rose and Daellenbach, 2002; cited in Newbert, 2007).

Nevertheless, this model has also “faced” difficulties such as the fact that most managers weren’t aware of the concept until the early 90’s (Wernerfelt, 1995) and more recently, this model has been extremely criticized (Kraaijenbrink, Spender and Groen, 2010).

As cited by Armstrong and Shimizu (2007), the RBV model is a business framework that explains under what conditions can a firm gain sustainable competitive advantage over its competitors. The first researcher that launched the foundations for the model was Penrose (1959, cited in Brahma and Chakraborty, 2011 and Newbert, 2007) that represented a firm as a collection of resources and it was the heterogeneity of the services available of those resources that gave each firm its own unique identity and value.

The second important base to this topic was assigned by Wernerfelt (1984) when he described resources as any (tangible and intangible) asset that at any given time are tied semi permanently to the firm.

However, the first researcher that developed an universal and acceptable framework regarding the RBV model was Jay Barney. Taking into account the first definitions created by Penrose and Wernerfelt (that resources are heterogeneously distributed

among firms and are imperfectly mobile), Jay Barney developed the first conceptual model that explained how a firm could achieve sustainable competitive advantage.

Barney (1991) defined resources as “all assets, capabilities, organizational processes, firm attributes, information, knowledge, etc. controlled by a firm”. Those resources can be classified into three different categories: physical, human or organizational resources.

Furthermore, Barney (1995) also affirmed that in order to achieve sustainable competitive, a firm has to possess resources or capabilities that are not only valuable and rare, but they also need to be unique in a way that it would be impossible for a competitor to imitate those resources or substitute them with others equivalents.

By other words, according to this theory when the firm’s resources and capabilities are valuable, rare, costly to imitable and non-substitutable, those resources are likely to be sources of sustainable competitive advantages and therefore improve the firm’s efficiency and effectiveness (Barney, 1991).

This theory is also confirmed by Spanos and Lioukas (2001). Their research states that firm’s performance and success is directly affected and influenced by the firm’s assets and resources.

Hence, the RBV model emphasizes an internal analysis of the differences in resources characteristics across firms, explains how those differences can translate into sources of sustainable competitive advantage (Armstrong and Shimizu, 2007) and how it affect firms performance (Kraaijenbrink, Spender and Groen, 2010).

The concept of strategic resource as a resource that is valuable, rare, costly to imitate and non-substitutable, is important to this dissertation, due to the fact that in the final section of the next chapter - Section 3.5 The Strategic Impact and Value Creation of the technology, we will use the RBV Model and this concept, to assess if the facial recognition technology can indeed have a strategic impact to organisations when applied to business.

3. Discussion

The objective of this chapter is to understand the impact of facial recognition technology on Customer Relationships Management (CRM), and whether or not, it can be perceived as a strategic resource to organizations. Furthermore, this chapter also intends to check if Portuguese customers are willing to accept the use of this technology in the Portuguese market.

The first sections of this chapter address the legal limitations that may evolve this technology and it also analyses how and which CRM functionalities may be impacted by the adoption of this technology.

Then, we analyse the Portuguese market industries, in order to define which industries may be the most suitable and can gain the most from the implementation of the technology. Afterwards, we conduct our empirical research, through the hypothesis formulation, and we also perform our own research through surveys and interviews. Later, the results from this research are analysed.

Finally, this chapter concludes with the analysis of the impact of this technology on CRM, through the scope of the Real-Based View (RBV) Model with the main objective of deducing if the technology can be considered a strategic resource and if it can lead to a sustainable competitive advantage for the organization.

3.1 Legal Background

As stated in the state of the art chapter, one of the most important issues concerning the adoption of a new technology is the protection of customer's personal information and privacy. Therefore, before analysing the impact of the adoption of facial recognition technology on organizations, it is relevant to cover the legal background surrounding the use of this technology and how it may affect consumers.

Since the main object of this study is the Portuguese market and the Portuguese consumers, this section focus on the Portuguese law. In this case, this topic addresses the law nº 67/98 regarding protection of personal data that is exposed in appendix 2 “Legal environment” : Exhibit 2 – Portuguese law nº 67/98.

Nevertheless, it is important to highlight the fact that most of the presented laws are according to the Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 - protection of individuals with regard to the processing of personal data and on the free movement of such data.

The treatment of personal data, according to article number two, should be transparent in a way that enables the respect and privacy for the person’s rights and personal life.

According to the third article – line a) - of this law (67/98), customer personal data is defined as any type of information - including image or sound – relating to an identified person, in particular by reference to an identification number or related to other specific factors concerning his physical, physiological, mental, economic, cultural or social identity.

On the other hand, line b) of this same article, defines “treatment of personal data” as any type of operation over personal data with the use of automated devices such as: collecting, registering, organization, consulting, analysis and destruction of the information collected.

In the present study, this treatment of personal data will be the main focus of our analysis.

Nevertheless the most relevant article is number seven, which according to it, the information collected can be considered as “sensible data”. This means that this information should be treated with reservation since this information concerns the consumer private life, and consumer privacy should be respected.

Furthermore, according to the same article, there are three requirements that organisations need to address, before starting analysing the customer personal data collected.

To start, the data collected should not interfere with the measures explicit in article fifteen – special security measures (e.g. national security). Secondly, the consumer must agree to give his full consent to the treatment of his data. Finally, organizations also need to inform and validate the data collected with CNPD (Comissão Nacional para a Protecção de Dados).

Only after the achievement of these three requirements, organization can start implementing the facial recognition technology.

In order to proceed with our study, one can assume that the CNPD considers that there is no problem or objections with the data collected from this system, and consequently it would give full consent to organizations to implement the technology.

Hence, and along with this last assumption, we can conclude that there is no real legal limitation surrounding the adoption of the technology, and the only aspect that organizations need to address before implementing it, is the fact that they need to ask consumers for their full consent regarding the use of personal data that they provided. Regardless, it is also important to highlight that organisations should also respect consumer privacy and therefore consumer personal data should also be protected from third-party individuals.

3.2 The Impact of Facial Recognition technology on Customer Relationship Management

Previously, in section 2.1.2 – CRM Functionalities, Customer Relationship Management was divided into three major main functional areas (Collaborative, Operational and Analytical CRM) as well as its processes and activities.

This section aims to analyse not only how facial recognition technology may impact the way companies gain customer knowledge and interact with their customer, but also which of the CRM processes and activities may be affected by the implementation of this system.

3.2.1. The potential features of the technology if applied to business

In order to proceed with our analysis, we will assume that this system will be used by organizations to keep track of their customers: companies will know at what time the customer entered and left the store, and what direction do they follow inside the store and therefore will also know how much time they spent inside the store and what are the hot spots inside the store.

Nevertheless, the potential features of this technology go beyond this point. This technology can also be integrated into the different customer and marketing services that the company possesses. For example, assuming the system identifies the customer, this technology can improve the one-on-one interactions and the effectiveness of the sales force since the store employee would have access to the person information (e.g. name, number of visits in last month, last purchases, etc.) and that would enable the employee to provide fast and personalized help to the customer.

This would increase not only the quality and value of the service provided, but also the shopping experience for the customer and that would lead to an improvement of customer satisfaction.

Furthermore, other potential feature of this system is the potential alignment with other services (in particular marketing services) such as mobile marketing. As stated in chapter two, mobile marketing is a form of one-to-one communication, in which a person after giving permission, received a personalized offer in their mobile phones. So, in this case, marketing services could also benefit from the adoption of facial recognition system, since this system could identify the customer as soon as he enters the store, and that information could be used by marketing service to send a personalized offer to that customer mobile phone. This personalized offer could include not only past products purchased by the customer, but could also represent an opportunity to present the customer to new products suitable for his segment (cross and upselling strategy).

Therefore, the adoption of facial recognition technology can not only improve the service effectiveness and response and help companies keeping track of its customers, as it can also help companies to influence customer purchasing intentions and habits.

Thus, the following table summarizes this impact analysis and shows what areas may be affected:

CRM Functions	Processes	Areas	Facial Recognition Applications / Impact
Collaborative CRM	<u>Contact Management</u>	-	✓
	<u>eCRM and Internet</u>	-	N.A.
	<u>Customer Interaction Center</u>	-	✓
Operational CRM	<u>Marketing Automation</u>	Campaign Planning	✓
		Campaign Execution	✓
		Campaign Controlling	✓
	<u>Sales Automation</u>	Order Management	N.A.
		Sales Force Support	✓
		Product Configuration	N.A.
	Service Automation	Helpdesk	✓
		Complaint Management	N.A.
		Service Requests	✓
Analytical CRM	<u>Marketing Analysis</u>	-	✓
	<u>Sales Analysis</u>	-	✓
	<u>Service Analysis</u>	-	✓

Table 4: Impact Analysis of Facial Recognition technology in CRM Functions

3.2.1. Facial Recognition Impact on Collaborative CRM

This CRM function is responsible for the control of all communications channels between the company and its customers. In order to do so, companies need to integrate all the customer information, in a way that enables the company to transform that information into customer knowledge, and to improve the way the company communicate with its clients through the different communication channels available.

In the case of this study, the adoption of a facial recognition technology can have a positive impact in Collaborative CRM as well as in its main processes:

- **Contact Management:** This process can be directly affected because through the use of a facial recognition system, a new type of information could be added to the customer profile – his facial features.

This new type of information can also accelerate the time taken to retrieve the customer profile and other information since his facial features are unique (faster process).

- **Customer Interaction Center:** Since this process main objective is to be a central point of customer service that coordinates all the company's communication channels and services. Thus, the adoption of this technology, can not only increase the responsiveness of the marketing services (the system identifies the customer as soon as he enters the store allowing a faster response), as it also improves the customer segmentation and the coordination of the different channels (one example as stated before, is its potential alignment with services like mobile marketing).

On the other hand, since this technology is only going to be used in the stores main entrance, we can assume that it will not be used or have any impact in the company online platforms and therefore, there is no evidence concerning the impact of facial recognition system and applications in the **eCRM and Internet** processes.

3.2.2. Facial Recognition Impact on Operational CRM

As stated in the second chapter, Operational CRM is designed to adapt the customer data collected and the information flow of that same data into customer knowledge, in order to gain a better insight at customer habits and preferences. Moreover, it also supports, three main areas of the company: marketing, sales and customer service.

Firstly, regarding **marketing automation** process, we believe that Campaign Planning, Campaign Execution and Campaign Controlling activities can be affected by the adoption of a facial recognition system. By other words, all marketing automation main activities can be directly impacted by the use of this new technology because the system would indicate to the customer interaction center, when the consumer is in the store.

Marketing services could use this relevant information to know when is the appropriate time to interact with the customer. Moreover, through the access to customer past purchases, marketing services could understand what products and services to offer to that particular customer and how to communicate with him— Campaign Planning and Execution.

One possibility as highlighted before, is the possibility to offer personalized products to that customer via mobile phone – mobile marketing. Thus, the customer would receive a personalized real-time offer, at the beginning of his decision-making process, and that could enhance the purchase of the suggested products/services.

Furthermore, companies could also explore others possibilities such as cross-selling techniques. This means that in the personalized would include not only past purchased products by the customer, as it could also include suggestions and promotions of products suitable for the customer according to his segment (previously defined by the company).

This measure, would not only mean that the customer is introduced to a new product, and it could also translate into a potential additional sale for the company, and therefore adding value to the company.

Finally if implemented, the facial recognition system could also identify the customer at the precise moment he leaves the store and could warn marketing services. Then, these services could check and control what products did the customer buy and if the campaign was successful - if the customer bought or not any of the previously offered products and services.

Therefore, through this analysis we can affirm that the adoption of a facial recognition system can also have a positive impact in Campaign Controlling.

Regarding **sales automation**, only one of its three main activities is affected by the potential adoption of the technology and therefore the sales process is also affected:

- Order Management: Since this activity main propose is to deal and manage all of the company logistics issues, we can affirm that there is no evidence that this activity would be directly affected by the adoption of this new technology.

- Sales Force Support: If correctly implemented, a facial recognition system can identify customer as soon as they enter and leave the store, and consequently, can provide an indication of how many customers (with client account) are in the store at that precise moment. Furthermore, this process can occur at different periods during the day, providing a sample of the variations regarding customer flow inside the store.

Companies can use this information to predict what are the busiest periods during the day – the hours that most customers visit the store and consequently more store employees are needed to help customers. Therefore we can claim that the use of a facial recognition system can reduce operational costs with staff and improve the company responsiveness due to the fact that it would allow to optimize the number of employees needed in each period of the day.

- Product Configuration: As stated in chapter two, this activity is mainly responsible for the product external features (e.g. presentation, design, etc) and the main propose of a facial recognition system is to identify customers. Hence, we can affirm that both topics are completely distinct and there is no connection between both, and therefore there is no evidence that the adoption of a facial recognition system can directly impact product configuration.

Lastly, the **Services Automation** process main responsibility is to support the service department and to simplify the contact with the customers. Some of its main activities can also be affected by a potential adoption of a facial recognition system:

- Helpdesk: In our opinion, the implementation of a facial recognition system can have a positive impact in this activity, due to the fact that thanks to the implementation of new technology, store staff could rapidly know as soon as the customer enter the store, his name as well as other relevant information such as his visit frequency and his past purchases, or by other words, his preferences.

Thus, store employees could not only provide a better service and promotion, as it would also allow to provide personalized offers and service to that specific customer. Therefore this personalized service, would improve the overall shopping experience from a customer point of view, and that would lead to an increase of the value perceived by the customer.

- Complaint Management: Since this activity is responsible for dealing with customer complains, in our point of view, the adoption of a facial recognition system would not have any real impact in this activity.

Although the system could eventually reduce the number of complaints regarding store assistance and customer service, there would still exist complains about problems with the product quality (and this type of complains represent the majority of the total of customer complains).

- Services Requests: As explained in previous activities, the adoption of this new technology would allow store employees to have to a faster access to customer profile and past purchases and therefore to be better prepared to provide a better service to the customer. For example, the employee could forward customers to products suitable for his predefined target. This personalized service would decrease the probability of complaints and customer requests.

3.2.3. Facial Recognition impact on Analytical CRM

Finally, this CRM function is responsible for the data analysis concerning previous campaigns and sales history in order to find ways to improve the existent relationships with its customers.

As stated in the second chapter, this CRM function is constituted by three main processes: Marketing Analysis, Sales Analysis and Service Analysis, and in our opinion if a proper facial recognition system is implemented, these three processes can be positively affected by it.

To start and as claimed before, the adoption of a facial recognition system could help to define the expected number of customers (with client account) inside the store at a certain period of the day and so it could help to predict the customer flow periodicity in the store.

Hence, this technology would allow companies to estimate and optimize the number of employees needed at each period of the day to provide customer assistance – Service Analysis. On the other hand, and as we also suggested before, as this system could recognize customers at the precise moment they enter or leave the store as well as their movement inside the store, a warn could be sent to the marketing services with the information gathered.

This information has three potential uses. Firstly, marketing services could use this information to deliver real-time (using for example mobile devices) personalized offers to the customer. These offers would include not only past purchased products as also other products suitable for the customer target – cross and upselling strategy.

Secondly, the sales services could also use this information at the moment the customer leaves the store, to access his purchase report in order to verify the success of the campaign previously launched (when the customer entered the store). By other words, sales services could examine the purchase report to verify if the customer bought any of the suggested products – Marketing analysis and Sales analysis.

Lastly, as the system can capture the customer movement also inside the store, companies can use this information to identify the hot spots of the shop floor, and

consequently use this information to improve the disposal and promotion of the product/material. Ultimately, this information can also be used to measure the effectiveness of point of sale displays and marketing.

Finally, we can also point out that this analysis and follow-up by the marketing and sales services could not only measure customer retention, satisfaction and estimate sales volume, as it could also measure the impact of cross and upselling strategies.

3.2.4. Conclusions

In the previous sections we identified the different CRM functionalities and processes and we analysed the potential impact the adoption of a facial recognition system could have on them.

Throughout this analysis, we concluded that almost all CRM processes and activities can be positively affected by the introduction of this new technology.

Furthermore, not only can this technology impact all CRM functionalities (Collaborative, Operational and Analytical), as it can also increase the product/service perceived value on a customer point of view (through the improvement in service quality, responsiveness and the decrease of complaints and requests).

Besides this fact, the adoption of this technology can also imply a better insight regarding customer habits and preferences, thus allowing a better and more precise targeting selection.

Lastly, this superior customer knowledge would not only mean that companies could offer personalized real-time offers to the targeted customer and could identify the best spots inside the store to dispose a certain product, as it could also represent an advantage over its competitors, since this customer knowledge is not something easy to gather or copy – it would be an unique resource.

3.3 Portuguese Industry Analysis

3.3.1. Introductory Note

Before stating our empirical research, it is of great relevance to select which industries may have the more potential to implement a facial recognition system and apply it to business.

As stated in the state of the art chapter, Költzsch (2006) suggested that one potential industry that could benefit from the adoption of a facial recognition technology would be the banking industry and as a matter of fact, it has already been tested by Japanese Banks (e.g. the Bank of Kyoto, the Juroku Bank, Japan Post and the Bank of Tokyo-Mitsubishi).

According to him, in this particular industry the adoption of this system could improve the overall banking security. Költzsch also indicates that some of the fields that have the most potential would be to implement a biometric technology - in this case facial recognition - are: (1) when customers try to access safe deposit boxes and bank branches, and (2) in Automated Teller Machines (ATM).

Furthermore, in our point of view, the benefits of this adoption go beyond security improvement and can also represent an opportunity to increase customer commodity and the quality of customer service in this industry.

For example, if implemented in ATMs, there would be no need to use and memorize any PIN code, since the system would automatically identify the person through his/her facial features.

Hence this entire process would be simpler and more convenient, because the person's biometric data would be stored in the credit card.

On the other hand, if implemented in bank branches, the entire identification process would be simpler and faster because the system would replace the traditional identification procedures- signature and documents.

This would result in an increase of the overall responsiveness and commodity of the process and therefore increase customer satisfaction because customers would spend less time in waiting lines.

Nevertheless in our opinion, it is not enough to just use Költzsch's opinion that this technology would be mostly suitable on the banking industry. Therefore it is important to use other type of data (qualitative and quantitative data), and in this case we will analyse data that can provide a better insight about the different value of each main industry in order to choose at least one more industries suitable for this study.

Since our empirical research will mainly focus on the willingness of Portuguese consumers, it is important to do this industry analysis regarding the Portuguese market.

To do so, we will use and analyse data provided by Banco de Portugal regarding different economic indicators of the different Portuguese industries.

3.3.2. Industry Data Analysis

As referred, in this section we will proceed a careful analysis of quantitative data provided by Banco de Portugal. This data concerns different economic indicators of the Portuguese industries and we divided the industries through the CAE – classificação de actividade económica. The following figure shows which industries were analysed:

✓ Agriculture	✓ Information and Communication Activities
✓ Extractive Industry	✓ Real-State Activities
✓ Transforming Industry	✓ Consulting Activities
✓ Electricity, Water & Gas	✓ Administrative Activities
✓ Water Treatment	✓ Education
✓ Construction	✓ Health-care activities
✓ Retail	✓ Events and artistic activities
✓ Transportation and Storage	✓ Other services and activities
✓ Accommodation and Restaurants	

Figure 9: Portuguese Industries analysed

In order to validate the selected industries, the analysis was divided into two different phases.

In the first phase, we performed the analysis of the most relevant economic-financial ratios of the main Portuguese industries.

To do so, a criteria was establish for each indicator (the definition of each economic indicator is explicated in [appendix 3 "Financial Indicators" - exhibit 3.1](#)).

These economic-financial ratios as well as the criteria used, are summarized in the following table:

Economic-Financial Ratios	Criteria
Investment and Growth	
Sales and Services growth rate %	> 20%
Investment rate %	> 40%
Profitability	
Turnover (nº of times)	0.5
Sales operational profitability %	> 20%
Liquidity	
General Liquidity %	> 100%
Financial Structure	
Financial Autonomy %	> 59%
Debt rate %	< 41%
Activity payment terms	
Average receiving term (nº of days)	36 days is the average time
Average payment term (nº of days)	54.75 days is the average time

Table 5: Economic-Financial Ratios and Criteria used

Then, we applied this criteria to each one of the industries previously presented. In order to evaluate each industry, it was decided to create throughout our analysis, an evaluation system, in which it was attributed 1 point if the criteria was respected and 0 if not.

The detailed analysis is presented in the appendix 3 “Financial Indicators” – from Exhibit 3.2 to Exhibit 3.19.

Later, we needed to analyse the results obtained and to compare all industries in order to select the ones that achieved the better evaluation. Thus, it was decided to attribute different weight to each economic-financial ratio used, mainly because in our opinion some ratios have greater importance than others to the overall industry’s attractiveness.

Afterwards, an average of the sum of all the industries averages was calculated- resulting in the value of 31,41%.

Finally, in the last step, we defined a requirement in which, an industry would only be approved if that industry average was higher than the average of all the industries averages (31,41%). If this requirement is not met, then the industry is not approved.

Our findings and the culmination of this analysis are explicit in appendix 3 “Financial Indicators”: Exhibit 3.20 – Industries Final analysis and comparative.

From this first analysis, the following industries obtained positive results and therefore were approved in this first phase.

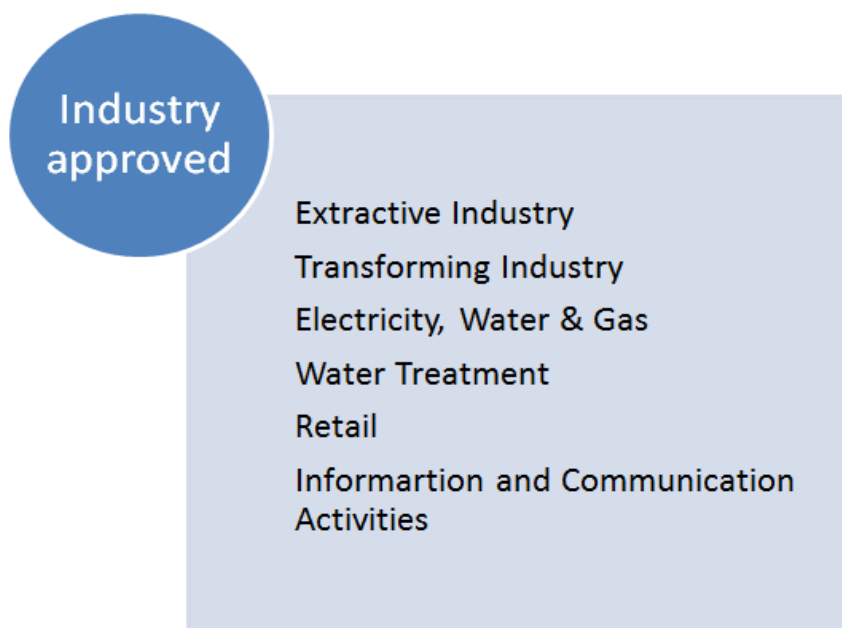


Figure 10: Industry Approved

From the six remaining industries, one can assume that the most suitable for our study and future empirical research is the Retail Industry, because not only is this an industry which everyone is familiar to (and affects more individuals than the other industries), as it does not have such a specific nature as the others (for example Information and Communication Industry).

Besides that, as we previously explained, this system is more appropriate for close spaces such as stores/point of sales that serve a considerable number of customers;

and in our opinion, the industry that fits the most into this requirement is the retail industry.

Finally, Phill Brown (2011) also takes the same view and points out that, nowadays, retailers have a great need to understand what works best to attract and engage customers and how they can improve their store's performance. Furthermore, according to him, this technology helps retailers identifying and analysing security issues, allocate resources accordingly, and thereby optimize their store performances

3.3.3. Conclusions

The main purpose of this section was to determine industries, which are suitable to adopt a facial recognition system. Throughout the section, we did not only address past literature and research on this subject, as we also performed our own analysis concerning qualitative data provided by a reliable source as Banco de Portugal.

This entire process led us to conclude that, two interesting industries to study and ascertain Portuguese population's willingness to accept the introduction of a facial recognition technology, are the **Banking Industry** and the **Retail Industry**.

But nevertheless, it is also important to highlight the fact that we are not excluding or refuting any of the other presented industries, instead, in the present study we assume that the banking and the retail industry, display greater potential comparing with others.

3.4. Empirical Research

In this section we execute and explain our empirical research – through the use of face-to-face questionnaires and online surveys in order to assess Portuguese consumers' willingness to accept the implementation of a facial recognition system.

The section starts with the construction of our study main hypothesis. Then we explain the methodology behind our survey as well as the theoretical model that supports it. Later, we analyse the survey results and furthermore, from that analysis we draw conclusions on Portuguese consumers opinion and willingness regarding the adoption of a facial recognition system

3.4.1. Hypothesis Formulation

Before starting with our survey, it is important to emphasize the fact that these hypotheses were drawn from our research questions. Therefore, to answer our first research question: **“1- Does the use of Facial Recognition technology have a positive impact in Customer Relationship Management (CRM)? And if so, can it have a strategic impact for the organization?”** – we created the following two hypotheses:

- (H1) The use of Facial Recognition (FR) technology can have a positive impact in CRM;
- (H2) The use of FR technology can have a strategic impact to the organizations;

This research question can be considered the main core of our study since it addresses the impact of the technology in CRM as well as its potential strategic use. Nevertheless, we also address other research questions.

For the second question: **“2 - Are customers willing to accept the use of Facial Recognition technology?”** – we proposed the following hypothesis that will be tested in our empirical research:

- (H3) Portuguese consumers are willing to accept the use of facial recognition;

For the finally research question: **“3 - Is there any industry that would benefit from adopting the F.R. Technology?”** - and after the analysis of qualitative data and previous literature on the topic (as explored in section 3.3- Portuguese Industry Analysis), we concluded that the two most suitable industries would be the Banking and the Retail industries, and therefore the following two hypotheses were proposed to be tested in our survey:

- (H4) Consumers are willing to accept the use of this technology in the Banking industry;
- (H5) Consumers are willing to accept the use of this technology in the Retail industry.

3.4.2. Survey Methodology

3.4.2.1. Section objective

The following section is dedicated to the description of the methods and procedures performed to obtain the data, how it will be analysed and interpreted in order to formulate conclusions on the subject on this study.

The section aims to justify the means in which the study was obtained, as well as it will give purpose and strength to our research and to the conclusions drawn.

This study was conducted in order to assess Portuguese consumers' willingness to accept the adoption of a facial recognition system. The main focus of the assessment was to uncover which CRM functionalities customer's value the most and to test some of the previously formulated hypothesis.

In order to gather the necessary data, we utilized the descriptive method, using different examples of qualitative approaches. A total of 120 participants took part on the online questionnaire created.

We decided to use this type of research, considering the desire of the researcher to obtain first hand data from the respondents so as to formulate rational and sound conclusions and recommendations for the study.

To consult the entire survey, as well as the theoretical model behind it, please read the next section – 3.2.4.2. Survey Methodology – and also check *Appendix 4 - Survey Methodology*, in particular: “Exhibit 4.2 – Facial Recognition Questionnaire – English version” and “Exhibit 4.3 – Survey Theoretical Model”. This model shows how the survey was created, as well as it illustrates which CRM functionalities and hypothesis are being tested, in the different parts of the questionnaire.

3.2.4.2 Survey Methodology

Before starting with the description of our questionnaire, it is important to emphasise the fact that throughout the survey presented the participants with a brief description and explanation of the system, as well as the potential benefits and advantages that could rise from its implementation.

The survey is divided in five main parts.

The first one is just a mere procedure to identify the person according to his age group, gender and country of residence. The second part of the survey aims to ascertain if consumers perceived value in the previously identified CRM functionalities and which ones do they value the most.

These first two parts address the second hypothesis of the study: (H2) The use of Facial Recognition technology can have a positive impact in CRM.

Then, we give examples of potentially real-life situations in which a facial recognition technology can be applied in the retail industry. The main purpose of it, is to identify which CRM functionalities do customers value the most in this industry, and also to

measure the overall acceptance level of the potential adoption of the system in the retail industry.

This part evaluates the following hypothesis: (H5) - Consumers are willing to accept the use of a Facial Recognition technology in the Retail industry.

Later, the next part of the survey intends to measure the overall acceptance level of customers, if a facial recognition system is implemented in the banking industry. In this case, the survey presents potential situations/examples in which the customer is confronted with this system in bank branches and ATM's.

With that, we want to test the fourth hypothesis of our study: (H4) - Consumers are willing to accept the use of a Facial Recognition technology in the Banking industry.

Finally, the last part of our survey aims to evaluate the overall acceptance level of technology and if people are willing to surpass privacy issues in order to benefit from the potential advantages of the system.

Consequently, the last hypothesis submitted to test will be hypothesis number one: (H1) Portuguese consumers are willing to accept the use of facial recognition.

But nevertheless, It is important to highlight important three facts concerning the questionnaire.

First, throughout the survey, a four level/choices Likert scale was used. We decided to do so, because the Likert scale is commonly used in survey research's and was designed to measure attitudes and opinions, which applies to this study. The choices represent the degree of agreement each respondent has on the given question. The scale below was used to interpret the total responses of all the respondents for every survey question by computing the weighted mean of their answers:

<u>Range</u>	<u>Interpretation</u>
3.51 – 4.00	Very Useful / Definitely Willing
2.51 – 3.50	Useful / Probably Willing
1.51 – 2.50	Useless / Probably not Willing
1.00 – 1.50	Completely Useless / Definitely not Willing

Figure 11 : Scale used in the Survey Analysis

Secondly, we supported our decision of using a four-point Likert scale on Malhotra and Birks (2006) opinion, that, “if the researcher wants to force a response or believes that no neutral or indifferent response exists, a rating scale with an even number of categories should be used”.

Thus, this is the case of our study, because we intend to verify the level of consumer willingness to accept the technology, and moreover we also want survey participants to take one side/opinion, and avoid neutral or indifferent answers.

Lastly, it is important to emphasize that 6 persons were submitted to a pre-test of this same questionnaire, in order to validate it and verify if the questions were clear and easy to understand from a participant point of view.

The results obtained from the survey were then analysed by using IBM SPSS data analysis program.

The next two sections cover our analysis, as well as the interpretation of the obtained results and the conclusions that we can elaborate from it.

3.4.3. Survey Analysis

The following section describes the results obtained from the survey.

The first part, concerns the participants demographic data (age, gender and location).

As referred, a total of 120 participants took part on the survey. Although we would prefer to have had more participants in our survey, we still believe that we can draw some general conclusions from the survey results.

The following figures show the distribution of the participants according to their age, gender and country of residence:

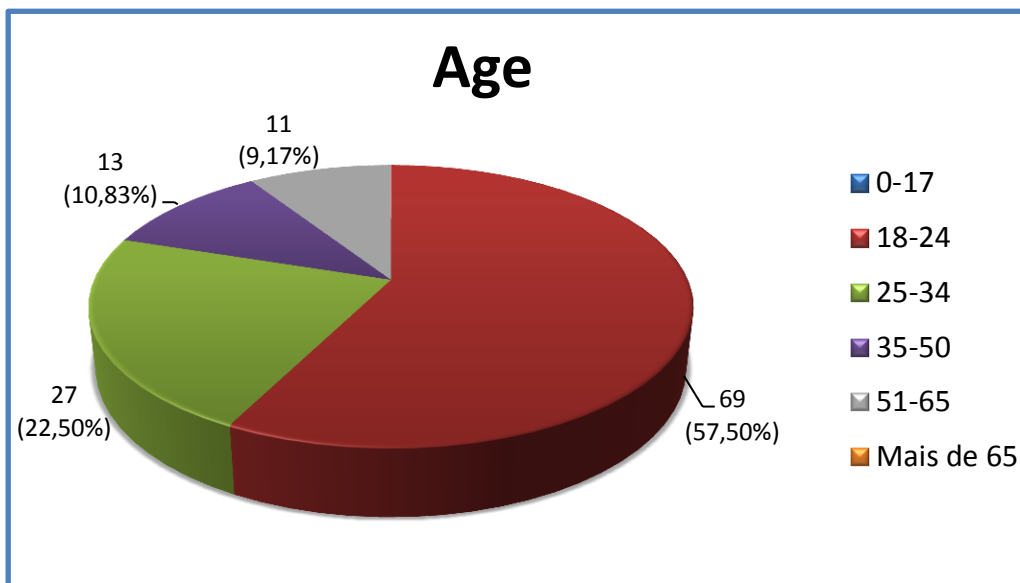


Figure 12 : Distribution by age

As we can observe, more than half - 69 persons- of the participants have ages between 18 and 24 years – approx. 57,50%. The rest of the participants are distributed among the following groups: 25-34 years (22,50%), 35-50 years (10,83%) and 51-65 years (9,17%).

It is also important to point out that in this survey not a single person with age between 0 and 17 years neither with more than 65 years old participated in our research, and therefore we cannot take any conclusions for these specific groups.

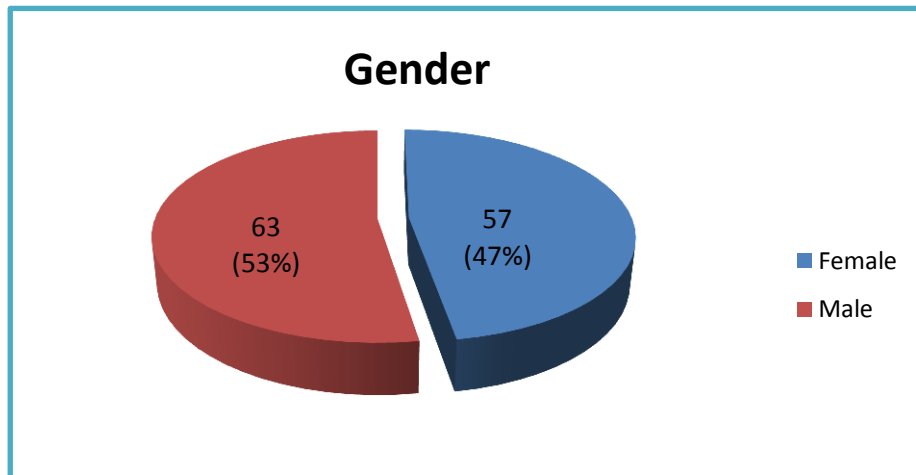


Figure 13 : Distribution by Gender

According to the survey results, the majority of the participants are male (53%). On the other hand, the females represent 47%.

Despite this fact, the sample is almost equally distributed between men and women, and therefore the overall results of our survey should reflect the general opinion concerning the use of facial recognition technology, and those results should also not be affected, by the differences that could occur from the variations in values and beliefs of each gender.

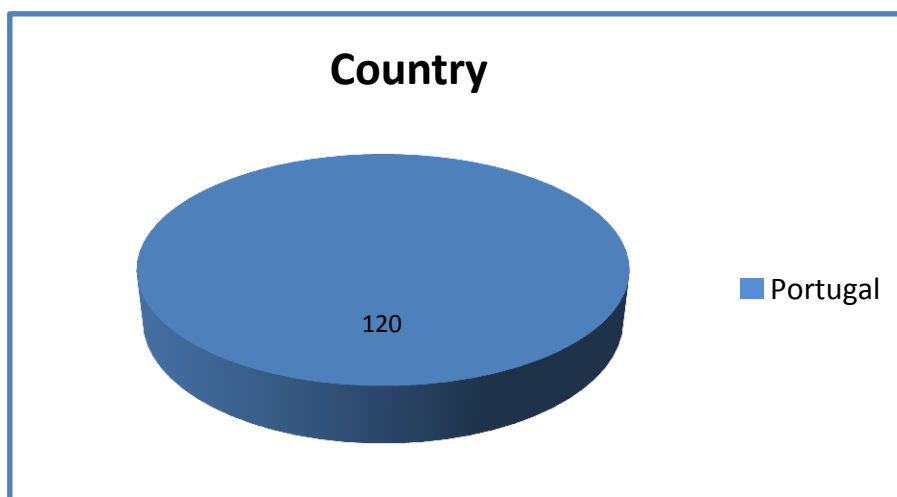


Figure 14 : Distribution by country

Finally, it is also important to enhance the fact that all of the survey participants are currently living in Portugal, and therefore one can assume that the results from the survey can be representative of the general opinion of Portuguese consumers.

The first part of the survey aim to check what CRM functions, Portuguese consumers value the most, and the results can be observed in “Appendix 5 – Survey Results”.

Hence, this part is directly related to section 3.2.1- “The potential features of the technology if applied to business”, in which we explained the different CRM functionalities, as well as, what potential impact could a facial recognition system play in the way organizations do business and interact with their clients in their stores.

First, Exhibit 5.1- “CRM Functionalities Survey Analysis Part 1” shows the results of the first six questions regarding CRM functionalities and its potential features. With these questions, we tried to find out what type of usefulness, was perceived by consumers. In other words, each question presented the participants with a certain benefit they could enjoy while shopping, and the consumer had to choose if they though that benefit would be useful or not to them.

These benefits are identical to the ones previously identified in section 3.2.1.

The following table describes the six proposed questions/options:

Question /Option	Description
1.1	Obtain additional information about a product you intend to purchase (or in other words, information about product details or comments from other consumers about the same product).
1.2	Obtain information or recommendations on other complementary products, of the ones you usually purchase (for example, when buying an ice cream box, you can get information on ice cream toppings or ice cream cones).
1.3	Get information on similar products of the ones you want to buy, in this case other competitor brands, allowing you to compare their features and prices.
1.4	Find the products you normally buy in places more visible and easier to access.
1.5	Get personalized discounts, i.e., discounts only offered to you on products that have value to you, according to your preferences and interests.
1.6	Get personalized help by an assistant, to reduce the search time taken and avoid unnecessary travelling inside the store.

Table 6 : First questions of the survey

- **Benefits that derive from CRM Functionalities**

From the results of this appendix, we can observe that all the presented benefits from CRM functionalities were considered at least as “Useful”.

Between all options, question 1.2 and question 1.6 received the **lowest score** - 2.917 and 2.833, respectively.

On the other hand, question 1.3 and question 1.5, were the ones that got the **highest score** – in this case they were considered, in general as “Very Useful” because their values were “3.567” for question 1.3, and 3.542 for question 1.5. All of the remaining features were classified in general as “**Useful**”.

Thus, it is possible to conclude from the first part of the survey, that **Portuguese consumers positively value all the features and benefits that can derive from CRM functionalities**.

Then, in the next phase, participants were faced with a decision to choose and order the three benefits that they considered to be the most important and useful to them. Exhibit 5.1- “CRM Functionalities Survey Analysis Part 2”, shows that **the option considered** to be the **most useful** was **option 1.3**. As a matter of fact, it was also the one that **received more votes as the most important feature** – a total of 45 participants ranked this feature with the value 3, the highest possible in this question. The following two options that achieved the highest score were option 1.5 and option 1.6.

- **Retail Industry**

The second part of the survey, aimed to check consumer willingness to accept the use of this technology in the **retail industry**, and the results are shown in Exhibit 5.3- "Retail Industry example".

In the first six questions (3.1 to 3.6), the participant was confronted with different features and benefits that would only be available if they accepted to be identified by the facial recognition system in a retail store. The participant then had to choose if they were willing to give their permission to be identified in order to take advantages from those same features and benefits.

These features included benefits explored in section 3.2.2 (e.g., the possibility to receive information about similar products on the participant smartphone, or the possibility of being approach by an employee that could indicate offers and promotions on complementary products of the ones the participant usually purchases).

From the results, we can observe that **apart from question 3.5, all questions received** positive feedback from participants (the lowest mean value observed was 2.583, and the highest one was 3.017, which means that in all of these questions, participants in general were "**Probably Willing**" to use the facial recognition system).

The only exception was question 3.5 - "After the store, you can be approached by an employee that indicates offers and promotions on products that are complementary to the ones you usually purchase". This question overall score was 2.217, which ranked the lowest comparing with the other questions. This score, also implies that **in general, participants were "Not Willing"** to use the facial recognition system in order to benefit from those features.

One possible explanation for this fact is that, contrary to what happens while they are receiving information about a product that they usually purchase, or recommendation

on similar products, consumers do not perceive any value in face-to-face interactions with employees, about information and offers regarding complementary products.

After presenting participants with different benefits and scenarios, it was important to assess consumers' overall willingness to accept the use of this technology in the retail industry.

Question 3.7 objective was precisely that one.

From the question's result, that is presented in Exhibit 5.4- General Acceptance level – Retail Industry, one can observe that **"Probably Willing"** was the most selected option – with 71 selections- and that the value of the mean is 2.683.

Then, from this second part of our survey – question 3.1 to 3.7 - we can conclude that **in general, people are probably willing to be identified by the system**, as soon as they enter the **Retail Store** in order to take advantages from the different features and benefits that can derive from it.

- **Banking Industry**

Next, we intended to assess participants willingness to use a facial recognition system in the **banking industry**.

Since previously literature stated that this technology could be implemented in both bank branches and ATM's, it was decided to divide this part into two different questions.

The first one is presented in Exhibit 5.5. – General Acceptance Level – Banking Industry Part1, and its main objective was to explain the potential advantages of the technology adoption in **bank branches** and to check people willingness to accept it.

For this question, question 4, the mean was 2.767, and 60% (72 participants) of the participants said that they were **"Probably in favour"** of its introduction in bank branches.

On the other hand, question 5 aimed to check the potential acceptance regarding the **implementation** of this technology in **ATM**. The results can be observed in Exhibit 5.6. – General Acceptance Level – Banking Industry Part2.

From the results, it is easy to observe that there is a strong division among participants, with 45 saying they would “Probably in favour” of its adoption, and 41 “Probably against”. But nevertheless, the overall mean of this question was the lowest in the entire survey, with 2.367 values – **“Probably Against”**.

Overall, regarding the Banking industry, one can conclude that, **in general, consumers are “probably willing”** to accept its use in bank branches, but on the other hand, they **“probably are not willing”** to accept its implementation in bank ATM.

- **Overall Acceptance**

Lastly, the final survey question, question 6, aimed to verify participants **overall willingness to grant permission to his personal information** in order to benefit from the previously presented benefits and from a personalized consumer experience.

According to results shown in Exhibit 5.7- Overall Acceptance Level, almost 65% of participants said that overall, they **“Probably would be Willing”** to give personal information and to be identified by the system. It is also important to say that the final mean for this question was 2.733 values.

Hence, one can assume that, regarding the **overall acceptance** of the technology and if people are **willing to give their information and to be identified**, Portuguese consumers are **“Probably Willing” to accept it**.

But nevertheless, in our opinion this analysis is not enough, specially four the last four questions of the survey that represent the most sensible and important part of the entire survey, since they measure consumers’ willingness to accept the use of the technology. Therefore, we decided to broaden our analysis, and divide the sample into different groups according to their age and by gender.

- **Age analysis**

First, to extract more information from the results and to gain a better inside concerning consumer willingness, we divided the sample into three different groups, according to their age:

- **18-24 years:** “Students” group,
- **25-34 years:** “Young Adults” group,
- **35-50, 50-65 years:** “Adults group”.

As there were no participants with age between 0-17 years or over 65 years, we didn't use those groups in our analysis.

Furthermore, as the number of participants that had age between 35 to 50 years (11%), and between 50 to 65 years (9%), wasn't significant enough, we decided to join this two groups into a new one, named “Adults”.

Regarding the survey results, in question 3.7, the “Adults” group achieved the lowest mean value, with 2.38. On the other hand, the “Young Adults” group mean was 2.93, and the “Students” group ranked a score of 2.78.

This means that participants from ages between 18 to 24 and 25 to 34 are “**probably willing**” to accept the use of this technology in the **Retail Industry**. In opposite, people from the “Adults” group are “**probably not willing**” to use it in a **Retail store**.

In question 4, the mean also varied according to the group: “Students” achieved mean of 2.76, “Young Adults” received the highest value with a total score of 2.93 and “Adults” 2.54. In other words, in general, **all groups are “Probably Willing”** to accept the use of a facial recognition system in **bank branches**.

Conversely, question 5 was the one that got the lowest mean in all groups “Students”, “Young Adults” and Adults, with 2.45, 2.41 and 2.08 respectively. Those values imply that **all groups would “Probably not be Willing”** to accept the use of this technology in **bank ATM**.

Therefore we can conclude, that as far as the facial recognition system implementation in the **banking industry** is concern, there is no real evidence that people's willingness change according to their age.

Finally, in question 6, the overall mean was 2.77 for "Students", 2.93 for "Young Adults" and 2.42 for "Adults".

Looking at these results, it is important to enhance the fact that, contrary to the other two groups, that in general, participants are "probably willing" to accept the use of this technology, in the "**Adults**" group, in general, participants indicated that they would be "**probably against**" providing information and to be identified by the facial recognition system.

Lastly, it is important to highlight Exhibit 5.7 – Age analysis: ANOVA test.

The ANOVA test is used to compare the means of the more than two samples /groups. In this case, we decided to apply this test because we segmented the sample into three different groups and this test could indicate in which questions, the groups means vary more.

By looking at Exhibit 5.7, one can observe that the questions that presented significant differences in the means among the three groups, were question 3.7 and question 6, because the value of their "Sig" is lower than 0.5 (0.047 for question 3.7 and 0.045 for question 6).

These values indicate that, the biggest variations between groups responses were in questions 3.7 and 6.

- **Gender analysis**

As explained before, we also decided to segment the survey sample into two other groups: female and male participants.

Exhibit 5.11 – Gender analysis – Group Statistics, indicates the two groups means for the last four questions of this survey.

As one can observe, **the female’s mean is lower than the male’s mean in all of four questions** – 2.58 against 2.78 in question 3.7; 2.60 against 2.92 in question 4; 2.23 against 2.49 in question 5; and finally, 2.56 against 2.89 in question 6.

Those values indicate that **both male and female groups** achieved the classification of **“Probably Willing”** in questions 3.7 (retail industry), question 4 (bank branches) and question 6 (overall acceptance).

In opposition, **both groups were “Probably not willing”** to use the system in banks ATM.

Thereby, we can imply that in all four questions, both means followed the overall means. This means that, in the presented scale, men and women means achieved the same classification, in the different questions of the survey.

Finally, we also performed an “independent samples t-test”, in order to measure in which question the mean values among the two groups changed the most.

As Exhibit 5.7 – Gender analysis: t-test shows that the two questions in which the mean varied the most between both groups, were in question 4 and in question 6, due to the fact that it was in these questions that the value of their “Sig. (2-tailed)” was lower than 0.5 – 0.17 for question 4 and 0.18 for question 6.

To conclude we can affirm that as far as segmentation by gender is concern, there is strong evidence that in general, **women are less willing to accept the adoption** of this technology in both retail and banking industry, **comparing with men’s** point of view.

3.4.4. Results summary

To summarize, from the previous facts, we can draw some **general conclusions** regarding Portuguese consumers and their willingness to accept the implementation of the system:

- **Portuguese consumers perceive value in all of the potential features and benefits** that derive from the impact of the technology on **CRM**;
- From a customer point of view, the **most important benefits** are the possibility of **receiving personalized discounts**, and **information on products similar** to the ones **they usually purchase**, allowing them to compare prices and features;
- In general, Portuguese consumers are **willing to provide their personal data and being identified** by the system;
- From our research, we can also affirm that in general, people are **willing to accept** the implementation of this system in the retail industry;
- Regarding the banking industry, although in general people are not **willing to accept** its use in **ATM**, there is **potential** for its adoption in **bank branches**;
- In general, **women are** somewhat **more sceptical and less willing to accept** the use of this technology, comparing with men;
- **Older people** (in this case, individuals with age between 35 and 65), are **more conservative and less willing to accept** the use of this technology. On the contrary, younger generations are more willing to use this system.

Hence, we can conclude that in the short-term, the potential success of this technology applied to business may not be as high, as comparing to what could happen in the long-run.

3.5. The Strategic Impact and Value Creation of the technology

As the reader may notice across the entire dissertation, a central idea is implied: a resource to be strategic has to add value to the organization in a differentiated and sustainable manner.

In this section we will assess if a facial recognition system can be considered as a strategic resource, and therefore have a strategic impact in the organization that implements such a system.

But, before starting with the discussion it is crucial to remind the fact that in order to be classified as strategic, the resource must be valuable, rare, costly to imitate and non-substitutable.

In order to reach clear and soundly conclusions, the conceptual model presented in Exhibit 6 – RBV Conceptual Model (Appendix 6), served as the foundation of our analysis and discussion.

As explained throughout this chapter, the use of **the facial recognition technology** would allow the organization to **gather and extract customer data and information**, concerning their shopping habits and preferences.

As our research results proved, in general, consumers are willing to accept the use of this technology and they perceive value in the benefits and impact that its use can have on their shopping experience.

Thereby, if organizations **use this customer data and transform it into customer knowledge**, they can take advantage from knowing and understanding their clients' shopping habits (such as visit and purchase frequency) and could adapt their offers and service to them.

Therefore, this would not only affect all CRM functionalities – collaborative, operational and analytical – and major activities (marketing, sales, etc.), as it would also allow the organization to target, attract and retain its clients, by offering personalized offers and services to them, according to their interests and preferences.

This would completely change the way consumers do their shopping, and it would allow the organization to interact in real-time with its clients in a much more rich, complete, immersive and personalized way.

Thus, and as our survey results proved, consumers do value the additional value that this personalized service would bring to their shopping experience. Moreover, this personalized shopping experience (and the improvement of CRM) would be something that only the organization could provide, since the customer knowledge would be from exclusive use of the organization.

Therefore, this improved service and CRM **would be perceived as something valuable and unique by customers.**

Furthermore, from a customer point of view, this technology would also not be viable to be imitable because of the high switching costs that it presents to customer.

If one organization has already developed the system and provides personalized offers to its clients at the moment they enter the store (strong relationship between organization and its clients), then there would be no real incentive, for a customer to change because the switching costs would be too high – in this case the switching cost would be proportional to the period of time that competitors would spend in trying to learn the correct way to interact with its customers.

After this explanation, we can conclude that **the personalized service and improvement in shopping experience and CRM that the facial recognition technology would enable the organization to present to its customers**, would be valuable and unique to that organization and would differentiate it from the competitors.

And, as referred in section 2.3, according to the Resource-Based View Model, if a resource creates additional value (valuable) and is unique the organization and it cannot duplicated by the competition, then that resource possesses the four characteristics needed to be considered a strategic resource : rare, inimitable and non-substitutable.

Therefore, the use of this technology would be **valuable, rare, inimitable and non-substitutable**, and therefore can be **considered a strategic resource**.

Consequently, we can also conclude that the use of a facial recognition technology, would allow the organization to have **long-term sustainable competitive advantage over its competitors**, and therefore it can be considered **as a source of competitive advantage**.

4. Conclusion

4.1. Main Conclusions of the study

The primary objective of this dissertation is to evaluate whether facial recognition technology can impact CRM and organisations in a strategic mode. Thus, the aim of this study was also to answer to the following research questions:

- 1. Does the use of Facial Recognition technology have a positive impact in Customer Relationship Management (CRM)? And if so, can it have a strategic impact for the organization?**
- 2. Are customers willing to accept the use of Facial Recognition technology?**
- 3. Is there any industry that would benefit from adopting the F.R. Technology?**

In order to answer to it, and after revising the literature and theory behind it, we formulated five hypotheses to determine in which way the facial recognition technology could impact CRM.

The five hypotheses created are the following: (H1) The use of Facial Recognition (FR) technology can have a positive impact in CRM; (H2) The use of FR technology can have a strategic impact to the organizations; (H3) Portuguese consumers are willing to accept the use of facial recognition; (H4) Consumers are willing to accept the use of this technology in the Banking industry; (H5) Consumers are willing to accept the use of this technology in the Retail industry.

From our study analysis and empirical research – [section 3.4.3 Survey Results](#) and [3.4.4 Results Summary](#), it was possible to conclude that apart from hypothesis 4, all the other hypothesis posed in the beginning of our study were confirmed.

On the other hand, hypothesis 4 (concerning the success of the technology in the banking industry) was just partly confirmed. Furthermore, as it is possible to observe in the [section 3.4.3](#) and [section 3.4.4](#), that had an impact in Research Question nº3, since the survey results demonstrated that Portuguese consumers are not totally willing to accept the technology adoption in the banking industry,.

- *Hypotheses*

- **(H1) The use of Facial Recognition (FR) technology can have a positive impact in CRM.**

As we can conclude from section 3.2 – “The Impact of Facial Recognition technology on CRM”, **this hypothesis was confirmed** because as demonstrated by our analysis of the CRM functionalities, a facial recognition system can indeed have a real impact in it. As a matter of fact and as it was explored throughout section 3.2, this technology would allow organizations to know more on their customer’s shopping habits and preferences. The use of this customer knowledge would allow organizations to provide real-time personalized offers to their customers. Moreover, as our analysis demonstrated in that same section, almost every CRM processes are positively affected by the adoption of this technology. In other words, the adoption of a facial recognition system impacts the organisation’s CRM, since it would have a positive impact into the main CRM functionalities – Collaborative, Operational and Analytical CRM.

- **(H2) The use of FR technology can have a strategic impact to the organizations.**

Hypothesis 2 was also confirmed. As the analysis presented in section 3.5 – “The Strategic Impact and Value Creation of the technology” proved that, if we take into account the customer knowledge organizations can acquire, concerning their shopping habits and preferences, we can affirm that this information and the strong relationship that organizations can create with customers from it, can be considered unique to that same organisation.

Moreover, as our survey results showed in section 3.4.3 and section 3.4.4, consumers do value the benefits and advantages, as well as the personalized shopping experience that can derive from the adoption of this system. Therefore they perceived it as a feature that is unique to the organization and that they also value.

Thus, we can conclude that consumers perceive this improvement in service and CRM as something valuable, rare, inimitable and non-substitutable.

Therefore, we can affirm that the facial recognition technology can be considered a strategic resource to the organization, and lead to a sustainable competitive advantage over its competitors.

➤ **(H3) Portuguese consumers are willing to accept the use of facial recognition.**

This hypothesis was also confirmed during the course of our empirical research, particularly in section 3.4.3- “Survey Analysis” and section 3.4.4- “Survey Conclusions”. As we concluded, in general, Portuguese consumers are probably willing to accept it and to provide their personal information in order to take advantage from the benefits that can derive from the use of this technology.

Nevertheless, in the present study, the sample was also segmented according to participants’ age and gender, allowing the deduction of some conclusions on present and futures trends regarding the acceptance of the technology.

Thus, one finding from our segmentation analysis displayed in section 3.4.3 and section 3.4.4, is that women are less willing to use the system when comparing with men.

Furthermore, the analysis presented in those same sections, showed that younger people are also more willing to accept the use of a facial recognition system, than older people – more than 35 years old.

Therefore one can claim that, despite the fact that our study showed that customers are probably willing to accept its use in the present, the results indicate that the potential and likelihood of this technology to succeed, is greater in the long-term.

- **(H4) Consumers are willing to accept the use of this technology in the Banking industry.**

This hypothesis was the only one that in our study, **was just partly confirmed.**

The empirical research conducted in sections 3.3- “ Portuguese Industry Analysis”, section 3.4.3- “Survey Analysis” and section 3.4.4- “Survey Conclusions”, proved that if on one hand, Portuguese consumers in general are indeed willing to accept the introduction of a facial recognition system in bank branches, on the other, they are not willing to use this system in bank’s ATM. From this fact, it is possible to conclude that Portuguese consumers are not willing to accept and use this technology in all of the interaction channel of the banking industry.

- **(H5) Consumers are willing to accept the use of this technology in the Retail industry.**

Finally, **this hypothesis was also confirmed** during our empirical research, namely in sections 3.3- “ Portuguese Industry Analysis”, section 3.4.3- “Survey Analysis” and section 3.4.4- “Survey Conclusions”.

Our study showed that in general, Portuguese consumers are also willing to accept the of a facial recognition system in the retail industry. Moreover, as research results explicit in section 3.4.3 and section 3.4.4 show, they are also willing to give their personal information and to be identified by the system, in order to take advantage from the potential benefits and customized offers/service that can derive from the adoption of such system in this industry.

- *Answer to the Research Questions*

The final objective of this dissertation was not only to gain a better insight on the research's topic, as it was also to answer the research questions:

1. Does the use of Facial Recognition technology have a positive impact in Customer Relationship Management (CRM)? And if so, can it have a strategic impact for the organization?

As it was possible to observe in section 3.2 and from the conclusion on hypothesis 1, indeed, the use of a facial recognition technology can affect the organization Customer Relationship Management main functionalities – Collaborative, Operational and Analytical, and therefore one can conclude that **the use of a facial recognition system can in fact, positively affect the organization Customer Relationship Management (CRM).**

Furthermore, as we demonstrated in section 3.5 and along with the conclusions from hypothesis 2, we can affirm that from a customer point of view, the personalized service and the improvement of CRM Functionalities that would derive from the adoption of this system would be perceived as valuable, rare, inimitable and non-substitutable.

Hence, it can be considered as a strategic resource, or by other words, **the facial recognition technology can have a strategic impact for organizations and lead to long-term sustainable competitive advantage over competitors.**

2. Are customers willing to accept the use of Facial Recognition technology?

As one can observe from the conclusions on hypothesis 2, and along with our survey results (section 3.4.3), we can claim that **in general, Portuguese consumers are willing to accept the adoption of this technology.**

3. Is there any industry that would benefit from adopting the F.R. Technology?

From our empirical research results presented in section 3.3 and 3.4, and along with the conclusions taken from hypotheses 4 and 5, it was possible to conclude that two industries that show attractiveness and potential, as well as consumer willingness to accept the use of this technology, and therefore could benefit from adopting the this system, are the **Retail Industry**, and the **Banking Industry**.

Concerning this last point - its implementation in the banking industry, our survey results, showed that Portuguese consumers probably are more willing to accept the use of the technology in bank branches, than in bank ATM. These results indicate that Portuguese consumers are still not totally convinced on the usefulness of this technology in the banking industry.

4.2. Limitations of the study and Future Research

Throughout this dissertation, we tried to explore the research topic from different perspectives. But despite this fact, there is still room for improvement. Moreover, this study still possesses some limitation that can be addressed in future researches:

1. **Other business industries** – In our empirical research, we only explore the potential success and utilization of this technology in the retail and banking industries. Although these two industries were the ones more suitable to study, it is still a very narrow view of the full potential of this technology. Furthermore, it would be interesting to see if consumer willingness would remain positive when asked about the implementation of this system in other industries – for example health care or accommodation and restaurants.
2. **Survey sample** – Despite the fact that from our survey results, we could extract valuable information regarding Portuguese consumers' willingness to accept and use this technology, the number of participants could still be higher than the 120 that took part on the survey.
Moreover, since this survey didn't include people with neither age under 18 or over 65, we can affirm that there is a small risk that it does not perfectly represent the opinion of the general Portuguese consumer. Thus, in future studies we recommend to use a larger sample and if possible to other types of interaction instead of online surveys, because people may not pay as much attention and honest as they would be in face-to-face interviews.
3. **Different Research Areas**- This work concerns the strategic use of technology, because the main topic of interest of this seminar is strategy. Nevertheless, to enhance the validity of this dissertation, it would be pertinent to explore this topic under other areas of research such as marketing, finance and other area that are somehow complementary with the one this study and could consequently, contribute to deepen knowledge.

4. **Costs** – Finally, one last limitation of this study that could be improved in future research is the fact that we did not address any subject related to the eventual costs of this technology. These costs would not only include initial investment in the equipment, as it would also bear with equipment maintenance and other costs (for example, costs associated with staff instruction) on how to use the system to gather the desired customer information.

We decided not to include these costs in our study, because they depend on many different factors (e.g. store size and dimensions, number of employees and number of clients that the visit the store during the day), that are not easy to measure and to estimate and therefore it would not be viable to include it in this dissertation.

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Other sources:

Banco de Portugal: <<http://www.bportugal.pt>>

Diário da Republica: < <http://dre.pt>>

VI- Appendixes

▪ Appendix 1 – Facial Recognition illustrations

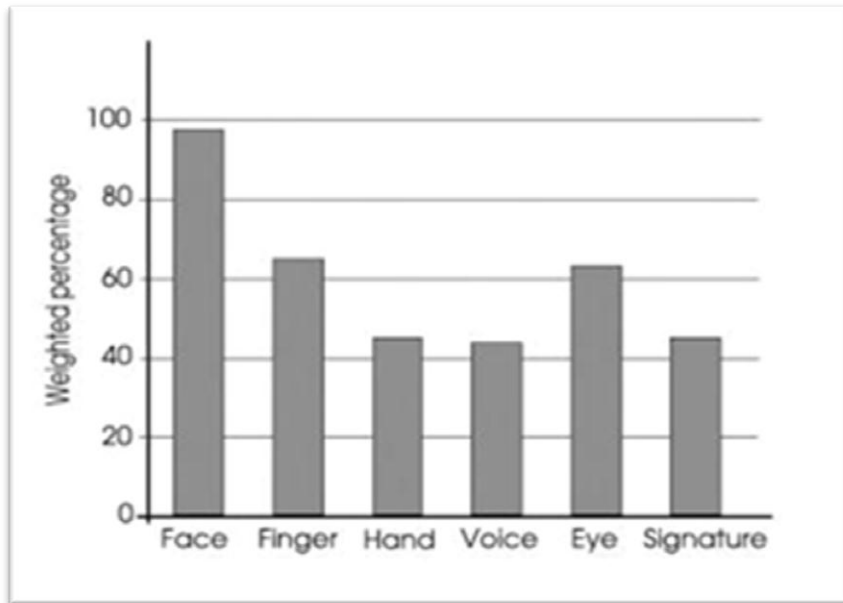


Exhibit 1.1 - Comparison of various biometric traits based on MRTD compatibility

Source: Li, S. Z., & Jain, A.K., 2011. *Handbook of Face Recognition* .

Exhibit 1.1. shows that facial traits have more potential of successfully identification than other biometrics traits. This graph was important because it allowed us to select face over other biometrics traits and it served as one of the basis of this study.



Exhibit 1.2 - Face Verification used at the 2008 Beijing Olympic Games and a Face Verification system used at China-Hong Kong border control

Source: Li, S. Z., & Jain, A.K., 2011. *Handbook of Face Recognition* .



Exhibit 1.3 - Coca-Cola face look campaign in Israel

Exhibit 1.2 and 1.3 show two examples of how the facial recognition technology has already been tested and used by not the police and governments but also by major companies.

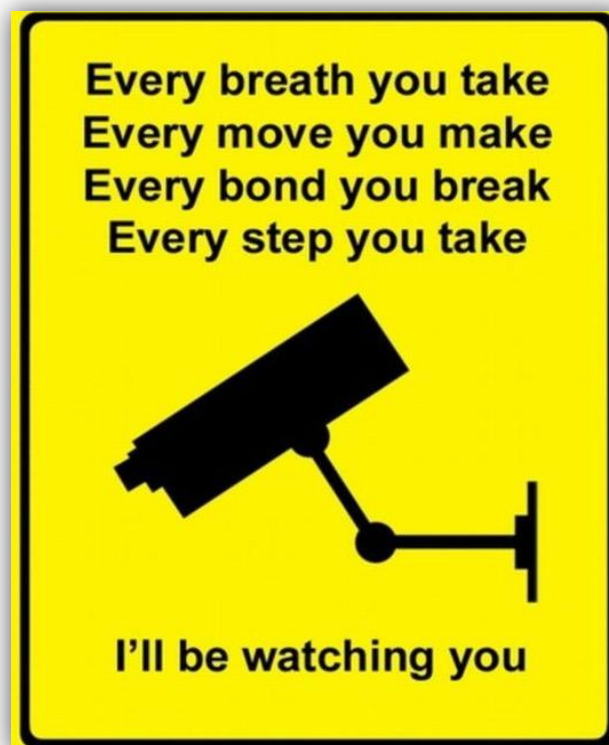


Exhibit 1.4 - The paradox of facial recognition

Source: <http://www.jokeroo.com/pictures/sign-ad/every-breath-you-take.html>

▪ Appendix 2 – Legal Environment

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DIÁRIO DA REPÚBLICA — I SÉRIE-A

N.º 247 — 26-10-1998

ASSEMBLEIA DA REPÚBLICA

Lei n.º 67/98

de 26 de Outubro

Lei da Protecção de Dados Pessoais (transpõe para a ordem jurídica portuguesa a Directiva n.º 95/46/CE, do Parlamento Europeu e do Conselho, de 24 de Outubro de 1995, relativa à protecção das pessoas singulares no que diz respeito ao tratamento dos dados pessoais e à livre circulação desses dados).

A Assembleia da República decreta, nos termos da alínea c) do artigo 161.º, das alíneas b) e c) do n.º 1 do artigo 165.º e do n.º 3 do artigo 166.º da Constituição, para valer como lei geral da República, o seguinte:

CAPÍTULO I

Disposições gerais

Artigo 1.º

Objecto

A presente lei transpõe para a ordem jurídica interna a Directiva n.º 95/46/CE, do Parlamento Europeu e do Conselho, de 24 de Outubro de 1995, relativa à protecção das pessoas singulares no que diz respeito ao tratamento de dados pessoais e à livre circulação desses dados.

Artigo 2.º

Princípio geral

O tratamento de dados pessoais deve processar-se de forma transparente e no estrito respeito pela reserva da vida privada, bem como pelos direitos, liberdades e garantias fundamentais.

Artigo 3.º

Definições

Para efeitos da presente lei, entende-se por:

- a) «Dados pessoais»: qualquer informação, de qualquer natureza e independentemente do respectivo suporte, incluindo som e imagem, relativa a uma pessoa singular identificada ou identificável («titular dos dados»); é considerada identificável a pessoa que possa ser identificada directa ou indirectamente, designadamente por referência a um número de identificação ou a um ou mais elementos específicos da sua identidade física, fisiológica, psíquica, económica, cultural ou social;
- b) «Tratamento de dados pessoais» («tratamento»): qualquer operação ou conjunto de operações sobre dados pessoais, efectuadas com ou sem meios automatizados, tais como a recolha, o registo, a organização, a conservação, a adaptação ou alteração, a recuperação, a consulta, a utilização, a comunicação por transmissão, por difusão ou por qualquer outra forma de colocação à disposição, com comparação ou interconexão, bem como o bloqueio, apagamento ou destruição;

- c) «Ficheiro de dados pessoais» («ficheiro»): qualquer conjunto estruturado de dados pessoais, acessível segundo critérios determinados, quer seja centralizado, descentralizado ou repartido de modo funcional ou geográfico;
- d) «Responsável pelo tratamento»: a pessoa singular ou colectiva, a autoridade pública, o serviço ou qualquer outro organismo que, individualmente ou em conjunto com outrem, determine as finalidades e os meios de tratamento dos dados pessoais; sempre que as finalidades e os meios do tratamento sejam determinados por disposições legislativas ou regulamentares, o responsável pelo tratamento deve ser indicado na lei de organização e funcionamento ou no estatuto da entidade legal ou estatutariamente competente para tratar os dados pessoais em causa;
- e) «Subcontratante»: a pessoa singular ou colectiva, a autoridade pública, o serviço ou qualquer outro organismo que trate os dados pessoais por conta do responsável pelo tratamento;
- f) «Terceiro»: a pessoa singular ou colectiva, a autoridade pública, o serviço ou qualquer outro organismo que, não sendo o titular dos dados, o responsável pelo tratamento, o subcontratante ou outra pessoa sob autoridade directa do responsável pelo tratamento ou do subcontratante, esteja habilitado a tratar os dados;
- g) «Destinatário»: a pessoa singular ou colectiva, a autoridade pública, o serviço ou qualquer outro organismo a quem sejam comunicados dados pessoais, independentemente de se tratar ou não de um terceiro, sem prejuízo de não serem consideradas destinatários as autoridades a quem sejam comunicados dados no âmbito de uma disposição legal;
- h) «Consentimento do titular dos dados»: qualquer manifestação de vontade, livre, específica e informada, nos termos da qual o titular aceita que os seus dados pessoais sejam objecto de tratamento;
- i) «Interconexão de dados»: forma de tratamento que consiste na possibilidade de relacionamento dos dados de um ficheiro com os dados de um ficheiro ou ficheiros mantidos por outro ou outros responsáveis, ou mantidos pelo mesmo responsável com outra finalidade.

Artigo 4.º

Âmbito de aplicação

1 — A presente lei aplica-se ao tratamento de dados pessoais por meios total ou parcialmente automatizados, bem como ao tratamento por meios não automatizados de dados pessoais contidos em ficheiros manuais ou a estes destinados.

2 — A presente lei não se aplica ao tratamento de dados pessoais efectuado por pessoa singular no exercício de actividades exclusivamente pessoais ou domésticas.

3 — A presente lei aplica-se ao tratamento de dados pessoais efectuado:

- a) No âmbito das actividades de estabelecimento do responsável do tratamento situado em território português;

- b) Fora do território nacional, em local onde a legislação portuguesa seja aplicável por força do direito internacional;
- c) Por responsável que, não estando estabelecido no território da União Europeia, recorra, para tratamento de dados pessoais, a meios, automatizados ou não, situados no território português, salvo se esses meios só forem utilizados para trânsito através do território da União Europeia.

4 — A presente lei aplica-se à videovigilância e outras formas de captação, tratamento e difusão de sons e imagens que permitam identificar pessoas sempre que o responsável pelo tratamento esteja domiciliado ou sediado em Portugal ou utilize um fornecedor de acesso a redes informáticas e telemáticas estabelecido em território português.

5 — No caso referido na alínea c) do n.º 3, o responsável pelo tratamento deve designar, mediante comunicação à Comissão Nacional de Protecção de Dados (CNPd), um representante estabelecido em Portugal, que se lhe substitua em todos os seus direitos e obrigações, sem prejuízo da sua própria responsabilidade.

6 — O disposto no número anterior aplica-se no caso de o responsável pelo tratamento estar abrangido por estatuto de extraterritorialidade, de imunidade ou por qualquer outro que impeça o procedimento criminal.

7 — A presente lei aplica-se ao tratamento de dados pessoais que tenham por objectivo a segurança pública, a defesa nacional e a segurança do Estado, sem prejuízo do disposto em normas especiais constantes de instrumentos de direito internacional a que Portugal se vincule e de legislação específica atinente aos respectivos sectores.

CAPÍTULO II

Tratamento de dados pessoais

SECÇÃO I

Qualidade dos dados e legitimidade do seu tratamento

Artigo 5.º

Qualidade dos dados

1 — Os dados pessoais devem ser:

- a) Tratados de forma lícita e com respeito pelo princípio da boa fé;
- b) Recolhidos para finalidades determinadas, explícitas e legítimas, não podendo ser posteriormente tratados de forma incompatível com essas finalidades;
- c) Adequados, pertinentes e não excessivos relativamente às finalidades para que são recolhidos e posteriormente tratados;
- d) Exactos e, se necessário, actualizados, devendo ser tomadas as medidas adequadas para assegurar que sejam apagados ou rectificadas os dados inexatos ou incompletos, tendo em conta as finalidades para que foram recolhidos ou para que são tratados posteriormente;
- e) Conservados de forma a permitir a identificação dos seus titulares apenas durante o período necessário para a prossecução das finalidades da recolha ou do tratamento posterior.

2 — Mediante requerimento do responsável pelo tratamento, e caso haja interesse legítimo, a CNPD pode autorizar a conservação de dados para fins históricos, estatísticos ou científicos por período superior ao referido na alínea e) do número anterior.

3 — Cabe ao responsável pelo tratamento assegurar a observância do disposto nos números anteriores.

Artigo 6.º

Condições de legitimidade do tratamento de dados

O tratamento de dados pessoais só pode ser efectuado se o seu titular tiver dado de forma inequívoca o seu consentimento ou se o tratamento for necessário para:

- a) Execução de contrato ou contratos em que o titular dos dados seja parte ou de diligências prévias à formação do contrato ou declaração da vontade negocial efectuadas a seu pedido;
- b) Cumprimento de obrigação legal a que o responsável pelo tratamento esteja sujeito;
- c) Protecção de interesses vitais do titular dos dados, se este estiver física ou legalmente incapaz de dar o seu consentimento;
- d) Execução de uma missão de interesse público ou no exercício de autoridade pública em que esteja investido o responsável pelo tratamento ou um terceiro a quem os dados sejam comunicados;
- e) Prossecução de interesses legítimos do responsável pelo tratamento ou de terceiro a quem os dados sejam comunicados, desde que não devam prevalecer os interesses ou os direitos, liberdades e garantias do titular dos dados.

Artigo 7.º

Tratamento de dados sensíveis

1 — É proibido o tratamento de dados pessoais referentes a convicções filosóficas ou políticas, filiação partidária ou sindical, fé religiosa, vida privada e origem racial ou étnica, bem como o tratamento de dados relativos à saúde e à vida sexual, incluindo os dados genéticos.

2 — Mediante disposição legal ou autorização da CNPD, pode ser permitido o tratamento dos dados referidos no número anterior quando por motivos de interesse público importante esse tratamento for indispensável ao exercício das atribuições legais ou estatutárias do seu responsável, ou quando o titular dos dados tiver dado o seu consentimento expresso para esse tratamento, em ambos os casos com garantias de não discriminação e com as medidas de segurança previstas no artigo 15.º

3 — O tratamento dos dados referidos no n.º 1 é ainda permitido quando se verificar uma das seguintes condições:

- a) Ser necessário para proteger interesses vitais do titular dos dados ou de uma outra pessoa e o titular dos dados estiver física ou legalmente incapaz de dar o seu consentimento;
- b) Ser efectuado, com o consentimento do titular, por fundação, associação ou organismo sem fins lucrativos de carácter político, filosófico, religioso ou sindical, no âmbito das suas actividades legítimas, sob condição de o tratamento respeitar

tar apenas aos membros desse organismo ou às pessoas que com ele mantenham contactos periódicos ligados às suas finalidades, e de os dados não serem comunicados a terceiros sem consentimento dos seus titulares;

- c) Dizer respeito a dados manifestamente tornados públicos pelo seu titular, desde que se possa legitimamente deduzir das suas declarações o consentimento para o tratamento dos mesmos;
- d) Ser necessário à declaração, exercício ou defesa de um direito em processo judicial e for efectuado exclusivamente com essa finalidade.

4 — O tratamento dos dados referentes à saúde e à vida sexual, incluindo os dados genéticos, é permitido quando for necessário para efeitos de medicina preventiva, de diagnóstico médico, de prestação de cuidados ou tratamentos médicos ou de gestão de serviços de saúde, desde que o tratamento desses dados seja efectuado por um profissional de saúde obrigado a sigilo ou por outra pessoa sujeita igualmente a segredo profissional, seja notificado à CNPD, nos termos do artigo 27.º, e sejam garantidas medidas adequadas de segurança da informação.

Artigo 8.º

Suspeitas de actividades ilícitas, infracções penais e contra-ordenações

1 — A criação e a manutenção de registos centrais relativos a pessoas suspeitas de actividades ilícitas, infracções penais, contra-ordenações e decisões que apliquem penas, medidas de segurança, coimas e sanções acessórias só podem ser mantidas por serviços públicos com competência específica prevista na respectiva lei de organização e funcionamento, observando normas procedimentais e de protecção de dados previstas em diploma legal, com prévio parecer da CNPD.

2 — O tratamento de dados pessoais relativos a suspeitas de actividades ilícitas, infracções penais, contra-ordenações e decisões que apliquem penas, medidas de segurança, coimas e sanções acessórias pode ser autorizado pela CNPD, observadas as normas de protecção de dados e de segurança da informação, quando tal tratamento for necessário à execução de finalidades legítimas do seu responsável, desde que não prevaleçam os direitos, liberdades e garantias do titular dos dados.

3 — O tratamento de dados pessoais para fins de investigação policial deve limitar-se ao necessário para a prevenção de um perigo concreto ou repressão de uma infracção determinada, para o exercício de competências previstas no respectivo estatuto orgânico ou noutra disposição legal e ainda nos termos de acordo ou convenção internacional de que Portugal seja parte.

Artigo 9.º

Interconexão de dados pessoais

1 — A interconexão de dados pessoais que não esteja prevista em disposição legal está sujeita a autorização da CNPD solicitada pelo responsável ou em conjunto pelos correspondentes responsáveis dos tratamentos, nos termos previstos no artigo 27.º

2 — A interconexão de dados pessoais deve ser adequada à prossecução das finalidades legais ou estatu-

tárias e de interesses legítimos dos responsáveis dos tratamentos, não implicar discriminação ou diminuição dos direitos, liberdades e garantias dos titulares dos dados, ser rodeada de adequadas medidas de segurança e ter em conta o tipo de dados objecto de interconexão.

SECÇÃO II

Direitos do titular dos dados

Artigo 10.º

Direito de informação

1 — Quando recolher dados pessoais directamente do seu titular, o responsável pelo tratamento ou o seu representante deve prestar-lhe, salvo se já dele forem conhecidas, as seguintes informações:

- Identidade do responsável pelo tratamento e, se for caso disso, do seu representante;
- Finalidades do tratamento;
- Outras informações, tais como:

Os destinatários ou categorias de destinatários dos dados;

O carácter obrigatório ou facultativo da resposta, bem como as possíveis consequências se não responder;

A existência e as condições do direito de acesso e de rectificação, desde que sejam necessárias, tendo em conta as circunstâncias específicas da recolha dos dados, para garantir ao seu titular um tratamento leal dos mesmos.

2 — Os documentos que sirvam de base à recolha de dados pessoais devem conter as informações constantes do número anterior.

3 — Se os dados não forem recolhidos junto do seu titular, e salvo se dele já forem conhecidas, o responsável pelo tratamento, ou o seu representante, deve prestar-lhe as informações previstas no n.º 1 no momento do registo dos dados ou, se estiver prevista a comunicação a terceiros, o mais tardar aquando da primeira comunicação desses dados.

4 — No caso de recolha de dados em redes abertas, o titular dos dados deve ser informado, salvo se disso já tiver conhecimento, de que os seus dados pessoais podem circular na rede sem condições de segurança, correndo o risco de serem vistos e utilizados por terceiros não autorizados.

5 — A obrigação de informação pode ser dispensada, mediante disposição legal ou deliberação da CNPD, por motivos de segurança do Estado e prevenção ou investigação criminal, e, bem assim, quando, nomeadamente no caso do tratamento de dados com finalidades estatísticas, históricas ou de investigação científica, a informação do titular dos dados se revelar impossível ou implicar esforços desproporcionados ou ainda quando a lei determinar expressamente o registo dos dados ou a sua divulgação.

6 — A obrigação de informação, nos termos previstos no presente artigo, não se aplica ao tratamento de dados efectuado para fins exclusivamente jornalísticos ou de expressão artística ou literária.

▪ Appendix 3 – Financial Indicators

Economic-Financial Ratios		Criteria
Investment and Growth		
Sales and Services Growth rate %	This ratio enables the measurement of the increase or decrease the activity. It also gives an overview of the company's evolution in terms of recession, stagnation, growth or expansion.	>20%
Investment rate %	Represents the application of capital in production means, aiming to increase the productive capacity (plant, machinery, transportation, infrastructure) .	>40%
Profitability		
Turnover (nº de vezes)	Economic-financial indicator that reflects the speed of transformation of the company's total assets in liquid media, expressing the number of times a year the asset was reconstituted through sales.	0.5
Sales Operational profitability %	This indicator examines the relationship between operational results and sales, which allows the measurement of value added by the sales activity before the and before taxes and other extraordinary costs.	>20%
Liquidity		
General Liquidity %	It measures the ability of the company's operational activities (current assets) in order to free enough cash flow to meet short term liabilities (liabilities).	>100%
Financial Structure		
Financial Autonomy %	The financial autonomy ratio is a ratio that measures the financial solvency of the company by determining the proportion of assets that are financed with equity. With everything else being equal, the higher this ratio, the greater the company's financial stability. The lower, greater vulnerability. Equity/liquid assets; Equity/ passive	>59%
Debt rate %	This ratio is similar to the previous one, but inverted. This means that the higher the value, the more vulnerable is the company.	<41%
Receiving term (nº of days)	An increase in the average receiving period also exposes the company to greater (credit) risk .	36 days - average receiving term
Payment term (nº of days)	The higher the average payment period, the greater the share of the business that is financed by suppliers, and therefore the less money is needed for working capital.	54,75 days - average payment term

Exhibit 3.1 – Economic-Financial ratios and criteria defined

These economic-financial ratio were used in our analysis to evaluate which Portuguese industries had the most potential value for the adoption of a facial recognition technology. On the other hand, the criteria showed was used to evaluate the different industries in each ratio – we attributed one point if the criteria was met, and zero if not.

The use of this criteria was an important part of the entire study because it did not only provided us a way to compare the different industries, as it may also make our study more reliable for future comparisons.

Central Balanços Rubricas 2006

Unidade:

	2007					Média Anual	2008					Média Anual
	Número de Empresas	Q1	Q2	Q3			Número de Empresas	Q1	Q2	Q3		
Rátios Económico-Financeiros												
Crescimento e investimento												
Taxa de variação das vendas e prestações de serviços %	6,651	-19.62	7.67	41.81	9.95	0	6,895	-23.54	4.69	36.11	5.75	0
Taxa de investimento %	6,657	-3.12	29.66	94.76	40.43	1	6,772	-3.15	29.64	95.98	40.82	1
Rendibilidade												
Rotação do activo líquido (nº de vezes)	8,281	0.04	0.29	0.8	0.38	0	8,529	0.04	0.29	0.82	0.38	0
Rendibilidade operacional das vendas %	6,691	-15.72	3.26	15.5	1.01	0	6,949	-18.11	2.81	15.04	-0.09	0
Liquidez												
Liquidez geral %	7,659	46.91	98.22	224.51	123.21	1	7,930	47.43	100.74	235.08	127.75	1
Estrutura financeira												
Autonomia financeira %	8,273	1.04	20.97	53.49	25.17	0	8,523	1.01	22.51	55.08	26.20	0
Taxa de endividamento %	7,252	18.45	66.05	178.37	87.62	1	7,449	17.64	62.49	164.03	81.39	1
Actividade												
Prazo médio de recebimentos (nº de dias)	6,617	0	41	135	58.67	0	6,870	0	40	141	60.33	0
Prazo médio de pagamentos (nº de dias)	7,592	9	60	169	79.33	0	7,818	9	57	163	76.33	0

Central Balanços Rubricas 2006

Unidade:

	2009				Média Anual		Média dos três anos	Validação	
	Número de Empresas	Q1	Q2	Q3					
Rátios Económico-Financeiros									
Crescimento e investimento									
Taxa de variação das vendas e prestações de serviços %		7,032	-35.75	-10.53	18.41	-9.29	0	2.138888889	0
Taxa de investimento %		7,011	-5.02	30.04	94.66	39.89333333	0	40.38333333	1
Rendibilidade									
Rotação do activo líquido (nº de vezes)		8,755	0.03	0.26	0.74	0.343333333	0	0.367777778	0
Rendibilidade operacional das vendas %		7,101	-25.15	1.63	12.04	-3.826666667	0	-0.966666667	0
Liquidez									
Liquidez geral %		8,101	47.65	102.86	250.25	133.5866667	1	128.1833333	1
Estrutura financeira									
Autonomia financeira %		8,749	0.95	23.59	57.95	27.49666667	0	26.28777778	0
Taxa de endividamento %		7,613	15.66	59.39	157.8	77.61666667	1	82.20888889	1
Actividade									
Prazo médio de recebimentos (nº de dias)		7,002	0	47	157	68	0	62.33333333	0
Prazo médio de pagamentos (nº de dias)		7,972	9	61	172	80.66666667	0	78.77777778	0
								TOTAL:	3

Fonte: Banco de Portugal

Informação disponível em: 25-03-2011 11:48:55

Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: A - Agricultura, produção animal, caça, floresta e pesca

Exhibit 3.2 – Agriculture Industry analysis

Central Balanços Rubricas 2006

Unidade:

	2007				Média Anual	2008				Média Anual		
	Número de Empres	Q1	Q2	Q3		Número de Empres	Q1	Q2	Q3			
Ráeios Económico-Financeiros												
Crescimento e investimento												
Taxa de variação das vendas e prestações de serviços %	752	-18.43	2.32	26.3	3.396666667	0	736	-24.37	-3.19	16.62	-3.646666667	0
Taxa de investimento %	748	0.87	31.69	75.71	36.09	0	730	-4.18	25.45	63.37	28.213333333	0
Rendibilidade												
Rotação do activo líquido (nº de vezes)	911	0.14	0.49	0.85	0.493333333	0	891	0.13	0.47	0.84	0.48	0
Rendibilidade operacional das vendas %	746	-3.17	4.4	10.21	3.813333333	0	719	-3.3	4.01	9.89	3.533333333	0
Liquidez												
Liquidez geral %	849	70.91	120.96	233.52	141.7966667	1	839	70.01	119.77	245.31	145.03	1
Estrutura financeira												
Autonomia financeira %	910	8.74	29.42	59.01	32.39	0	890	10.46	30.33	58.76	33.183333333	0
Taxa de endividamento %	833	11.34	34.47	83.96	43.2566667	1	817	11.64	33.95	84.5	43.363333333	1
Actividade												
Prazo médio de recebimentos (nº de dias)	729	70	136	251	152.3333333	0	711	74	144	261	159.6666667	0
Prazo médio de pagamentos (nº de dias)	799	40	103	204	115.6666667	0	793	37	93	211	113.6666667	0

Central Balanços Rubricas 2006

Unidade:

	2009				Média Anual		Média dos três anos	Validação	
	Número de Empres	Q1	Q2	Q3					
Ráeios Económico-Financeiros									
Crescimento e investimento									
Taxa de variação das vendas e prestações de serviços %		717	-34.5	-12.24	9.64	-12.36666667	0	-4.205555556	0
Taxa de investimento %		702	-4.3	28.77	62.93	29.13333333	0	31.145555556	0
Rendibilidade									
Rotação do activo líquido (nº de vezes)		887	0.08	0.42	0.78	0.426666667	0	0.466666667	0
Rendibilidade operacional das vendas %		709	-5.81	3.91	10.02	2.706666667	0	3.351111111	0
Liquidez									
Liquidez geral %		823	71.85	127.67	248.15	149.2233333	1	145.35	1
Estrutura financeira									
Autonomia financeira %		886	10.45	31.87	61.33	34.55	0	33.374444444	0
Taxa de endividamento %		811	10.89	34.91	91.88	45.89333333	1	44.171111111	1
Actividade									
Prazo médio de recebimentos (nº de dias)		688	74	151.5	266.5	164	0	158.6666667	0
Prazo médio de pagamentos (nº de dias)		786	34	104.5	219	119.1666667	0	116.1666667	0
								TOTAL:	2

Fonte: Banco de Portugal

Informação disponível em: 25-03-2011 11:52:03

Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: B - Indústrias extractivas

Exhibit 3.3 – Extractive Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007					2008						
		Número de Empresas	Q1	Q2	Q3	Média Anual	Número de Empresas	Q1	Q2	Q3	Média Anual		
Rátios Económico-Financeiros	Rátios Económico-Financeiros												
Rátios Económico-Financeiros	Crescimento e investimento												
Rátios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	36,063	-11.33	4.74	22.74	5.383333333	0	35,705	-18.23	-1.28	15.93	-1.193333333	0
Rátios Económico-Financeiros	Taxa de investimento %	35,002	-6.84	14.28	46.08	17.84	0	34,484	-8.52	13.38	45.3	16.72	0
Rátios Económico-Financeiros	Rendibilidade												
Rátios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	38,929	0.5	0.95	1.51	0.986666667	1	38,703	0.48	0.93	1.5	0.97	1
Rátios Económico-Financeiros	Rendibilidade operacional das vendas %	35,749	-2.28	3.2	7.47	2.796666667	0	35,254	-4.69	2.83	7.11	1.75	0
Rátios Económico-Financeiros	Liquidez												
Rátios Económico-Financeiros	Liquidez geral %	37,378	77.18	120.65	203.11	133.6466667	1	37,249	76.6	122.5	212.94	137.3466667	1
Rátios Económico-Financeiros	Estrutura financeira												
Rátios Económico-Financeiros	Autonomia financeira %	38,909	4.61	22.96	45.39	24.32	0	38,672	3.92	23.31	46.67	24.63333333	0
Rátios Económico-Financeiros	Taxa de endividamento %	34,701	18.4	49.33	116.29	61.34	1	34,246	17.89	48.75	115.34	60.66	1
Rátios Económico-Financeiros	Actividade												
Rátios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	35,399	31	89	159	93	0	34,850	31	89	160	93.33333333	0
Rátios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	36,484	36	91	170	99	0	36,062	34	87	166	95.66666667	0

Central Balanços Rubricas 2006

Unidade:

		2009								
		Número de Empresas	Q1	Q2	Q3	Média Anual		Média dos três anos	Validação	
Rátios Económico-Financeiros	Rátios Económico-Financeiros									
Rátios Económico-Financeiros	Crescimento e investimento									
Rátios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço		34,338	-26.66	-8.68	7.29	-9.35	0	-1.72	0
Rátios Económico-Financeiros	Taxa de investimento %		33,020	-10.88	11.38	42.21	14.23666667	0	16.26555556	0
Rátios Económico-Financeiros	Rendibilidade									
Rátios Económico-Financeiros	Rotação do activo líquido (nº de vezes)		37,451	0.42	0.85	1.39	0.886666667	1	0.947777778	1
Rátios Económico-Financeiros	Rendibilidade operacional das vendas %		33,795	-6.44	2.59	6.95	1.033333333	0	1.86	0
Rátios Económico-Financeiros	Liquidez									
Rátios Económico-Financeiros	Liquidez geral %		36,024	77.77	127.53	229.67	144.99	1	138.6611111	1
Rátios Económico-Financeiros	Estrutura financeira									
Rátios Económico-Financeiros	Autonomia financeira %		37,425	4.05	24.32	48.45	25.60666667	0	24.85333333	0
Rátios Económico-Financeiros	Taxa de endividamento %		33,078	17.44	48.3	112.33	59.35666667	1	60.45222222	1
Rátios Económico-Financeiros	Actividade									
Rátios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)		33,405	34	97	176	102.3333333	0	96.22222222	0
Rátios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)		34,558	35	90	174	99.66666667	0	98.11111111	0
								TOTAL:	3	

Fonte: Banco de Portugal

Informação disponível em: 25-03-2011 11:53:24

Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: C - Indústrias transformadoras

Exhibit 3.4 – Transforming Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007	2007	2007	2007	2008	2008	2008	2008		
		Número de Empresas	Q1	Q2	Q3	Número de Empresas	Q1	Q2	Q3	Média Anual	
Rácios Económico-Financeiros	Rácios Económico-Financeiros										
Rácios Económico-Financeiros	Crescimento e investimento										
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviços %					338	-2.8	10.71	26.8	11.57	0
Rácios Económico-Financeiros	Taxa de investimento %					373	-1.07	20.49	116.17	45.19666667	1
Rácios Económico-Financeiros	Rendibilidade										
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)					550	0	0.14	0.4	0.18	0
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %					347	2.69	19.84	42.09	21.54	1
Rácios Económico-Financeiros	Liquidez										
Rácios Económico-Financeiros	Liquidez geral %					511	41.23	115.86	240.76	132.6166667	1
Rácios Económico-Financeiros	Estrutura financeira										
Rácios Económico-Financeiros	Autonomia financeira %					550	3.55	20.35	55.98	26.62666667	0
Rácios Económico-Financeiros	Taxa de endividamento %					473	14.12	79.43	229.49	107.68	1
Rácios Económico-Financeiros	Actividade										
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)					347	36	53	77	55.33333333	0
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)					497	3	37	91	43.66666667	1

Central Balanços Rubricas 2006

Unidade:

		2009	2009	2009	2009				
		Número de Empresas	Q1	Q2	Q3	Média Anual		Média dos três anos	Validação
Rácios Económico-Financeiros	Rácios Económico-Financeiros								
Rácios Económico-Financeiros	Crescimento e investimento								
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviços %	356	-17	-0.9	14.13	-1.256666667	0	5.156666667	0
Rácios Económico-Financeiros	Taxa de investimento %	395	0.47	24.54	80.12	35.04333333	0	40.12	1
Rácios Económico-Financeiros	Rendibilidade								
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	591	0	0.14	0.38	0.173333333	0	0.176666667	0
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	386	3.34	22.04	42.03	22.47	1	22.005	1
Rácios Económico-Financeiros	Liquidez								
Rácios Económico-Financeiros	Liquidez geral %	544	43.47	118.34	272.98	144.93	1	138.7733333	1
Rácios Económico-Financeiros	Estrutura financeira								
Rácios Económico-Financeiros	Autonomia financeira %	590	3.43	19.72	53.23	25.46	0	26.04333333	0
Rácios Económico-Financeiros	Taxa de endividamento %	519	16.29	90	288.65	131.6466667	1	119.6633333	1
Rácios Económico-Financeiros	Actividade								
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	376	39	62.5	109	70.16666667	0	62.75	0
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	533	7	52	118	59	0	51.33333333	1
TOTAL:									5

Fonte: Banco de Portugal

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Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: D - Electricidade, gás, vapor, água quente e fria e ar frio

Exhibit 3.5 – Electricity, Water & Gas Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007					2008						
		Número de Empresas	Q1	Q2	Q3	Média Anual	Número de Empresas	Q1	Q2	Q3	Média Anual		
Rácios Económico-Financeiros	Rácios Económico-Financeiros												
Rácios Económico-Financeiros	Crescimento e investimento												
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	603	-3.56	11.06	34.21	13.90333333	0	624	-6.98	9.1	35.64	12.58666667	0
Rácios Económico-Financeiros	Taxa de investimento %	608	4.44	39.55	97.34	47.11	1	624	7.76	38.72	91.63	46.03666667	1
Rácios Económico-Financeiros	Rendibilidade												
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	693	0.2	0.73	1.35	0.76	1	740	0.2	0.68	1.36	0.74666667	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	605	-2.13	3.85	10.59	4.103333333	0	635	-4.17	4.36	11.84	4.01	0
Rácios Económico-Financeiros	Liquidez												
Rácios Económico-Financeiros	Liquidez geral %	649	60.54	109.57	207.36	125.8233333	1	698	57.01	107.34	204.06	122.8033333	1
Rácios Económico-Financeiros	Estrutura financeira												
Rácios Económico-Financeiros	Autonomia financeira %	691	7.82	24.73	51.51	28.02	0	739	5.95	22.86	51.63	26.81333333	0
Rácios Económico-Financeiros	Taxa de endividamento %	639	19.45	62.51	177.94	86.63333333	1	664	20.04	64.3	171.29	85.21	1
Rácios Económico-Financeiros	Actividade												
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	602	47	92.5	171	103.5	0	632	34	88	166.5	96.16666667	0
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	653	28	70	144	80.66666667	0	686	25	69	148	80.66666667	0

Central Balanços Rubricas 2006

Unidade:

		2009						
		Número de Empresas	Q1	Q2	Q3	Média Anual	Média dos três anos	Validação
Rácios Económico-Financeiros	Rácios Económico-Financeiros							
Rácios Económico-Financeiros	Crescimento e investimento							
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço		650	-26.99	0	19.61	-2.46	0
Rácios Económico-Financeiros	Taxa de investimento %		639	0.94	35.31	99.26	45.17	1
Rácios Económico-Financeiros	Rendibilidade							
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)		794	0.14	0.57	1.15	0.62	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %		672	-6.93	3.48	11.03	2.526666667	0
Rácios Económico-Financeiros	Liquidez							
Rácios Económico-Financeiros	Liquidez geral %		741	57.5	109.63	200.73	122.62	1
Rácios Económico-Financeiros	Estrutura financeira							
Rácios Económico-Financeiros	Autonomia financeira %		794	4.81	23.23	52.23	26.75666667	0
Rácios Económico-Financeiros	Taxa de endividamento %		704	19.52	65.52	174.84	86.62666667	1
Rácios Económico-Financeiros	Actividade							
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)		666	44	97	190	110.3333333	0
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)		726	26	73	158	85.66666667	0
							TOTAL:	4

Fonte: Banco de Portugal

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Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: E - Captação, tratamento e distribuição de água; saneamento, gestão de resíduos e despoluição

Exhibit 3.6 – Water Treatment Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007	2007	2007	2007			2008	2008	2008	2008		
		Número de Empresas	Q1	Q2	Q3	Média Anual		Número de Empresas	Q1	Q2	Q3	Média Anual	
Rácios Económico-Financeiros	Rácios Económico-Financeiros												
Rácios Económico-Financeiros	Crescimento e investimento												
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	36,083	-33.49	2.8	44.49	4.6	0	36,421	-39.85	-3.39	35.11	-2.71	0
Rácios Económico-Financeiros	Taxa de investimento %	36,683	-16.83	19.26	76.13	26.18666667	0	36,488	-15.88	18.04	71.51	24.55666667	0
Rácios Económico-Financeiros	Rendibilidade												
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	44,355	0.11	0.72	1.43	0.753333333	1	44,977	0.06	0.69	1.41	0.72	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	36,069	0.5	4.64	11.32	5.486666667	0	35,720	-0.68	4.19	10.71	4.74	0
Rácios Económico-Financeiros	Liquidez												
Rácios Económico-Financeiros	Liquidez geral %	41,359	97.49	134.66	250.32	160.8233333	1	41,841	98.12	138.27	266.16	167.5166667	1
Rácios Económico-Financeiros	Estrutura financeira												
Rácios Económico-Financeiros	Autonomia financeira %	44,344	5.11	20.47	43.92	23.16666667	0	44,963	4.87	20.99	45.67	23.84333333	0
Rácios Económico-Financeiros	Taxa de endividamento %	38,678	26.01	84.6	235.28	115.2966667	1	39,023	24.49	81.54	228.2	111.41	1
Rácios Económico-Financeiros	Actividade												
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	35,721	0	49	136	61.66666667	0	35,329	0	57	145	67.33333333	0
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	40,636	8	67	163	79.33333333	0	40,765	7	65	161	77.66666667	0

		2009	2009	2009	2009				
		Número de Empresas	Q1	Q2	Q3	Média Anual		Média dos três anos	Validação
Rácios Económico-Financeiros	Rácios Económico-Financeiros								
Rácios Económico-Financeiros	Crescimento e investimento								
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	34,781	-47.46	-13.19	21.56	-13.03	0	-3.713333333	0
Rácios Económico-Financeiros	Taxa de investimento %	34,396	-23.31	13.46	61.11	17.08666667	0	22.61	0
Rácios Económico-Financeiros	Rendibilidade								
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	43,498	0.04	0.62	1.3	0.653333333	1	0.708888889	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	34,118	-3.47	3.72	9.9	3.383333333	0	4.536666667	0
Rácios Económico-Financeiros	Liquidez								
Rácios Económico-Financeiros	Liquidez geral %	40,393	98.52	142.13	280.24	173.63	1	167.3233333	1
Rácios Económico-Financeiros	Estrutura financeira								
Rácios Económico-Financeiros	Autonomia financeira %	43,497	4.75	22.23	48.2	25.06	0	24.02333333	0
Rácios Económico-Financeiros	Taxa de endividamento %	37,488	23.12	77.25	211.17	103.8466667	1	110.1844444	1
Rácios Económico-Financeiros	Actividade								
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	33,636	0	67	165	77.33333333	0	68.77777778	0
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	38,762	7	69	174	83.33333333	0	80.11111111	0
								TOTAL:	3

Fonte: Banco de Portugal

Informação disponível em: 25-03-2011 11:57:08

Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: F - Construção

Exhibit 3.7 – Construction Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007					2008						
		Número de Empresas	Q1	Q2	Q3	Média Anual	Número de Empresas	Q1	Q2	Q3	Média Anual		
Rácios Económico-Financeiros	Rácios Económico-Financeiros												
Rácios Económico-Financeiros	Crescimento e investimento												
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviços	83,024	-14.04	0.99	18.37	1.773333333	0	83,560	-19.47	-2.77	12.87	-3.123333333	0
Rácios Económico-Financeiros	Taxa de investimento %	75,984	-16.89	16.33	64.34	21.26	0	75,500	-17.33	16.54	65.09	21.43333333	0
Rácios Económico-Financeiros	Rendibilidade												
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	90,177	0.51	1.08	1.91	1.166666667	1	90,696	0.47	1.06	1.9	1.143333333	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	82,298	-5.32	1.72	5.29	0.563333333	0	82,344	-6.93	1.44	5.04	-0.15	0
Rácios Económico-Financeiros	Liquidez												
Rácios Económico-Financeiros	Liquidez geral %	85,594	77.21	117.68	202.43	132.44	1	86,313	75.42	118.21	208	133.8766667	1
Rácios Económico-Financeiros	Estrutura financeira												
Rácios Económico-Financeiros	Autonomia financeira %	90,141	-1.08	18.14	43.39	20.15	0	90,685	-2.59	18.21	44.61	20.0766667	0
Rácios Económico-Financeiros	Taxa de endividamento %	74,464	18.92	67.54	174.94	87.13333333	1	74,158	18.32	66.03	173.32	85.89	1
Rácios Económico-Financeiros	Actividade												
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	81,602	0	26	104	43.33333333	0	81,610	0	27	105	44	0
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	84,018	19	70	151	80	0	84,336	18	67	148	77.6666667	0

Central Balanços Rubricas 2006

Unidade:

		2009								
		Número de Empresas	Q1	Q2	Q3	Média Anual		Média dos três anos	Validação	
Rácios Económico-Financeiros	Rácios Económico-Financeiros									
Rácios Económico-Financeiros	Crescimento e investimento									
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviços	81,510	-24.29	-7.12	7.9	-7.836666667	0	-3.062222222	0	
Rácios Económico-Financeiros	Taxa de investimento %	73,531	-19.79	13.2	59.08	17.49666667	0	20.06333333	0	
Rácios Económico-Financeiros	Rendibilidade									
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	88,828	0.43	1	1.8	1.076666667	1	1.128888889	1	
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	80,081	-7.61	1.45	5.17	-0.33	0	0.027777778	0	
Rácios Económico-Financeiros	Liquidez									
Rácios Económico-Financeiros	Liquidez geral %	84,606	76.16	121.92	221.11	139.73	1	135.3488889	1	
Rácios Económico-Financeiros	Estrutura financeira									
Rácios Económico-Financeiros	Autonomia financeira %	88,798	-2.4	19.24	46.27	21.03666667	0	20.42111111	0	
Rácios Económico-Financeiros	Taxa de endividamento %	72,544	17.94	64.65	169.33	83.97333333	1	85.66555556	1	
Rácios Económico-Financeiros	Actividade									
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	79,306	0	30	113	47.66666667	0	45	0	
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	81,936	18	68	150	78.66666667	0	78.77777778	0	
Fonte: Banco de Portugal								TOTAL:	3	

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Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: G - Comércio por grosso e a retalho; reparação de veículos automóveis e motociclos

Exhibit 3.8 – Retail Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007	2007	2007	2007		2008	2008	2008	2008			
		Número de Empresas	Q1	Q2	Q3	Média Anual	Número de Empresas	Q1	Q2	Q3	Média Anual		
Rádios Económico-Financeiros	Rádios Económico-Financeiros												
Rádios Económico-Financeiros	Crescimento e investimento												
Rádios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	17,895	-7.97	4.6	22.24	6.29	0	17,852	-12.19	1.43	17.37	2.20333	0
Rádios Económico-Financeiros	Taxa de investimento %	17,613	-1.39	13.49	52.77	21.62333333	0	17,478	-1.8	13.36	53.4	21.6533	0
Rádios Económico-Financeiros	Rendibilidade												
Rádios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	18,987	0.57	0.98	1.48	1.01	1	18,992	0.51	0.91	1.41	0.94333	1
Rádios Económico-Financeiros	Rendibilidade operacional das vendas %	17,738	-0.78	5.31	14.53	6.35333333	0	17,643	-3.75	4.07	12.88	4.4	0
Rádios Económico-Financeiros	Liquidez												
Rádios Económico-Financeiros	Liquidez geral %	17,189	85.15	168.24	550.79	268.06	1	17,153	86.94	177.55	589.23	284.573	1
Rádios Económico-Financeiros	Estrutura financeira												
Rádios Económico-Financeiros	Autonomia financeira %	18,978	18.05	48.75	84.26	50.35333333	0	18,985	19.65	51.91	85.61	52.39	0
Rádios Económico-Financeiros	Taxa de endividamento %	17,922	2.43	23.98	71.07	32.49333333	0	17,870	2.36	23.14	67.43	30.9767	0
Rádios Económico-Financeiros	Actividade												
Rádios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	17,642	0	11	102	37.66666667	0	17,525	0	18	102	40	0
Rádios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	18,178	0	8	66	24.66666667	1	18,078	0	8	61	23	1

Unidade:

		2009	2009	2009	2009				
		Número de Empresas	Q1	Q2	Q3	Média Anual		Média dos três anos	Validação
Rádios Económico-Financeiros	Rádios Económico-Financeiros								
Rádios Económico-Financeiros	Crescimento e investimento								
Rádios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	17,376	-21.32	-5.83	7.72	-6.47666667	0	0.67222222	0
Rádios Económico-Financeiros	Taxa de investimento %	16,868	-3.95	9.89	44.5	16.81333333	0	20.03	0
Rádios Económico-Financeiros	Rendibilidade								
Rádios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	18,510	0.44	0.81	1.28	0.84333333	1	0.93222222	1
Rádios Económico-Financeiros	Rendibilidade operacional das vendas %	17,064	-3.5	4.49	13.62	4.87	0	5.20777778	0
Rádios Económico-Financeiros	Liquidez								
Rádios Económico-Financeiros	Liquidez geral %	16,667	90.46	187.31	647.93	308.566667	1	287.066667	1
Rádios Económico-Financeiros	Estrutura financeira								
Rádios Económico-Financeiros	Autonomia financeira %	18,502	20.82	53.89	87.16	53.95666667	0	52.23333333	0
Rádios Económico-Financeiros	Taxa de endividamento %	17,416	2.22	21.91	64.79	29.64	0	31.03666667	0
Rádios Económico-Financeiros	Actividade								
Rádios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	16,953	0	24	114	46	0	41.22222222	0
Rádios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	17,474	0	9	68	25.66666667	1	24.44444444	1
								TOTAL:	3

Fonte: Banco de Portugal

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Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: H - Transportes e armazenagem

Exhibit 3.9 – Transportation and Storage Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007					2008						
		Número de Empresas	Q1	Q2	Q3	Média Anual	Número de Empresas	Q1	Q2	Q3	Média Anual		
Rácios Económico-Financeiros	Rácios Económico-Financeiros												
Rácios Económico-Financeiros	Crescimento e investimento												
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	24,577	-9.27	3.6	17.72	4.016666667	0	24,987	-14.88	-1.32	11.92	-1.4267	0
Rácios Económico-Financeiros	Taxa de investimento %	23,605	-6.86	6.66	32.18	10.66	0	23,583	-6.56	7.66	34.61	11.9033	0
Rácios Económico-Financeiros	Rendibilidade												
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	27,572	0.51	1.36	2.53	1.466666667	1	28,107	0.46	1.3	2.51	1.42333	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	24,528	-10.47	1.42	5.96	-1.03	0	24,797	-14.14	0.43	4.87	-2.9467	0
Rácios Económico-Financeiros	Liquidez												
Rácios Económico-Financeiros	Liquidez geral %	25,932	32.11	84.28	242.14	119.51	1	26,585	28.78	79.4	230.26	112.813	1
Rácios Económico-Financeiros	Estrutura financeira												
Rácios Económico-Financeiros	Autonomia financeira %	27,562	-22.16	17.58	56.18	17.2	0	28,098	-27.32	15.38	54.92	14.3267	0
Rácios Económico-Financeiros	Taxa de endividamento %	22,336	10.61	49.58	160.28	73.49	1	22,334	10.61	50.91	164.42	75.3133	1
Rácios Económico-Financeiros	Actividade												
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	24,512	0	0	0	0	1	24,779	0	0	0	0	1
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	26,092	0	12	46	19.33333333	1	26,458	0	13	48	20.3333	1

Unidade:

		2009					Média dos três anos		Validação
		Número de Empresas	Q1	Q2	Q3	Média Anual			
Rácios Económico-Financeiros	Rácios Económico-Financeiros								
Rácios Económico-Financeiros	Crescimento e investimento								
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	24,790	-17.24	-3.65	8.65	-4.08	0	-0.496666667	0
Rácios Económico-Financeiros	Taxa de investimento %	23,440	-8.2	5.26	29.3	8.786666667	0	10.45	0
Rácios Económico-Financeiros	Rendibilidade								
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	27,995	0.42	1.25	2.47	1.38	1	1.423333333	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	24,575	-15.15	0.34	4.84	-3.323333333	0	-2.433333333	0
Rácios Económico-Financeiros	Liquidez								
Rácios Económico-Financeiros	Liquidez geral %	26,472	28.06	78.1	223.21	109.79	1	114.0377778	1
Rácios Económico-Financeiros	Estrutura financeira								
Rácios Económico-Financeiros	Autonomia financeira %	27,976	-29.9	14.76	53.64	12.83333333	0	14.78666667	0
Rácios Económico-Financeiros	Taxa de endividamento %	22,043	11.22	52.91	163.47	75.86666667	1	74.89	1
Rácios Económico-Financeiros	Actividade								
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	24,538	0	0	0	0	1	0	1
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	26,240	0	14	49	21	1	20.22222222	1
							TOTAL:	5	

Fonte: Banco de Portugal

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Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: I - Alojamento, restauração e similares

Exhibit 3.10 – Accommodation and Restaurants Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007	2007	2007	2007			2008	2008	2008	2008		
		Número de Empresas	Q1	Q2	Q3	Média Anual		Número de Empresas	Q1	Q2	Q3	Média Anual	
Rádios Económico-Financeiros	Rádios Económico-Financeiros												
Rádios Económico-Financeiros	Crescimento e investimento												
Rádios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	5,224	-20.99	3.98	40.81	7.93333	0	5,487	-25.76	0.65	32.45	2.44667	0
Rádios Económico-Financeiros	Taxa de investimento %	4,805	-8.12	18.67	63.99	24.8467	0	5,059	-8.85	16.38	60.68	22.7367	0
Rádios Económico-Financeiros	Rendibilidade												
Rádios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	5,906	0.34	0.87	1.54	0.91667	1	6,208	0.32	0.86	1.57	0.91667	1
Rádios Económico-Financeiros	Rendibilidade operacional das vendas %	5,180	-9.98	3.71	12.11	1.94667	0	5,422	-10.01	3.61	12.94	2.18	0
Rádios Económico-Financeiros	Liquidez												
Rádios Económico-Financeiros	Liquidez geral %	5,543	58.84	116.95	226.31	134.033	1	5,841	60.6	119.33	238.61	139.513	1
Rádios Económico-Financeiros	Estrutura financeira												
Rádios Económico-Financeiros	Autonomia financeira %	5,902	-5.84	20.63	50.77	21.8533	0	6,200	-5.78	21.73	52.7	22.8833	0
Rádios Económico-Financeiros	Taxa de endividamento %	4,907	15.47	54.86	148.49	72.94	1	5,138	15	54.9	147.16	72.3533	1
Rádios Económico-Financeiros	Actividade												
Rádios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	5,102	29	95	180	101.333	0	5,346	30	91	174	98.3333	0
Rádios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	5,417	2	46	125	57.6667	0	5,695	2	40	119	53.6667	1

Central Balanços Rubricas 2006

Unidade:

		2009	2009	2009	2009				
		Número de Empresas	Q1	Q2	Q3	Média Anual		Média dos três anos	Validação
Rádios Económico-Financeiros	Rádios Económico-Financeiros								
Rádios Económico-Financeiros	Crescimento e investimento								
Rádios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	5,599	-30.81	-3.7	27.98	-2.1766667	0	2.734444444	0
Rádios Económico-Financeiros	Taxa de investimento %	5,157	-8.59	16.97	59.81	22.73	0	23.43777778	0
Rádios Económico-Financeiros	Rendibilidade								
Rádios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	6,350	0.3	0.83	1.51	0.88	1	0.904444444	1
Rádios Económico-Financeiros	Rendibilidade operacional das vendas %	5,522	-11.37	3.5	13.01	1.713333333	0	1.946666667	0
Rádios Económico-Financeiros	Liquidez								
Rádios Económico-Financeiros	Liquidez geral %	5,996	62.98	123.32	252.29	146.1966667	1	139.9144444	1
Rádios Económico-Financeiros	Estrutura financeira								
Rádios Económico-Financeiros	Autonomia financeira %	6,344	-5.39	22.97	55.75	24.44333333	0	23.06	0
Rádios Económico-Financeiros	Taxa de endividamento %	5,214	14.18	52.5	138.79	68.49	1	71.26111111	1
Rádios Económico-Financeiros	Actividade								
Rádios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	5,429	32	97	184	104.3333333	0	101.3333333	0
Rádios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	5,795	1	40	121	54	1	55.11111111	0
								TOTAL:	3

Fonte: Banco de Portugal

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Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: J - Actividades de informação e de comunicação

Exhibit 3.11 – Information and Communication activities Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007	2007	2007	2007			2008	2008	2008	2008		
		Número de Empresas	Q1	Q2	Q3	Média Anual		Número de Empresas	Q1	Q2	Q3	Média Anual	
Rácios Económico-Financeiros	Rácios Económico-Financeiros												
Rácios Económico-Financeiros	Crescimento e investimento												
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	11,892	-58.33	-0.29	39.13	-6.4967	0	12,523	-67.72	-11.34	19.88	-19.727	0
Rácios Económico-Financeiros	Taxa de investimento %	13,922	-10.15	19.37	143.82	51.0133	1	14,098	-10.02	19.88	149.13	52.9967	1
Rácios Económico-Financeiros	Rendibilidade												
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	21,167	0	0.04	0.49	0.17667	0	22,388	0	0.03	0.4	0.14333	0
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	12,467	-16.6	7.1	26.93	5.81	0	12,820	-28.36	4.06	24.73	0.14333	0
Rácios Económico-Financeiros	Liquidez												
Rácios Económico-Financeiros	Liquidez geral %	18,503	54.9	114.8	327.46	165.72	1	19,652	50.3	110.34	320.55	160.397	1
Rácios Económico-Financeiros	Estrutura financeira												
Rácios Económico-Financeiros	Autonomia financeira %	21,161	1.44	19.27	59.56	26.7567	0	22,374	0.48	17.7	57.88	25.3533	0
Rácios Económico-Financeiros	Taxa de endividamento %	17,374	18.57	121.37	448.38	196.107	1	17,922	19.33	124.87	460.57	201.59	1
Rácios Económico-Financeiros	Actividade												
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	12,347	0	0	46	15.3333	1	12,687	0	0	51	17	1
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	19,047	0	5	61	22	1	20,173	0	6	66	24	1

Central Balanços Rubricas 2006

Unidade:

		2009	2009	2009	2009			Média dos três anos	Validação
		Número de Empresas	Q1	Q2	Q3	Média Anual			
Rácios Económico-Financeiros	Rácios Económico-Financeiros								
Rácios Económico-Financeiros	Crescimento e investimento								
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	12,380	-67.75	-8.38	22.82	-17.77	0	-14.66444444	0
Rácios Económico-Financeiros	Taxa de investimento %	13,972	-13.12	13.53	118.61	39.67333333	0	47.89444444	1
Rácios Económico-Financeiros	Rendibilidade								
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	22,482	0	0.02	0.33	0.116666667	0	0.145555556	0
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	12,641	-27.59	4.12	25.13	0.553333333	0	2.168888889	0
Rácios Económico-Financeiros	Liquidez								
Rácios Económico-Financeiros	Liquidez geral %	19,617	49.32	109.83	312.58	157.2433333	1	161.12	1
Rácios Económico-Financeiros	Estrutura financeira								
Rácios Económico-Financeiros	Autonomia financeira %	22,475	0.5	18.02	58.9	25.80666667	0	25.97222222	0
Rácios Económico-Financeiros	Taxa de endividamento %	17,969	19.43	118.85	438.22	192.1666667	1	196.6211111	1
Rácios Económico-Financeiros	Actividade								
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	12,479	0	0	60	20	1	17.44444444	1
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	19,929	0	6	72	26	1	24	1
Fonte: Banco de Portugal								TOTAL:	5

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Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: L - Actividades imobiliárias

Exhibit 3.12 – Retail Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007	2007	2007	2007			2008	2008	2008	2008		
		Número de Empresas	Q1	Q2	Q3	Média Anual		Número de Empresas	Q1	Q2	Q3	Média Anual	
Rácios Económico-Financeiros	Rácios Económico-Financeiros												
Rácios Económico-Financeiros	Crescimento e investimento												
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviços	23,364	-14.93	4.01	30.23	6.43667	0	24,625	-18.77	1.88	27.84	3.65	0
Rácios Económico-Financeiros	Taxa de investimento %	22,893	-3.25	14.02	54.42	21.73	0	23,926	-3.84	14.09	51.87	20.7067	0
Rácios Económico-Financeiros	Rendibilidade												
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	26,638	0.32	0.81	1.41	0.84667	1	27,989	0.31	0.81	1.44	0.85333	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	23,249	-2.3	6.24	16.93	6.95667	0	24,438	-3.84	5.96	17.15	6.42333	0
Rácios Económico-Financeiros	Liquidez												
Rácios Económico-Financeiros	Liquidez geral %	24,685	60.09	124.32	284.79	156.4	1	26,038	60.38	127.89	296.66	161.643	1
Rácios Económico-Financeiros	Estrutura financeira												
Rácios Económico-Financeiros	Autonomia financeira %	26,637	5.9	31.02	63.66	33.5267	0	27,969	5.7	31.35	64.56	33.87	0
Rácios Económico-Financeiros	Taxa de endividamento %	23,594	11.14	45.56	124.75	60.4833	1	24,600	11.22	45.12	122.8	59.7133	1
Rácios Económico-Financeiros	Actividade												
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	23,049	13	81	167	87	0	24,186	13	80	165	86	0
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	25,114	0	13	74	29	1	26,405	0	13	72	28.3333	1

Central Balanços Rubricas 2006

Unidade:

		2009	2009	2009	2009			Média dos três anos	Validação
		Número de Empresas	Q1	Q2	Q3	Média Anual			
Rácios Económico-Financeiros	Rácios Económico-Financeiros								
Rácios Económico-Financeiros	Crescimento e investimento								
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviços	25,497	-24.77	-1.94	21.9	-1.6033	0	2.827777778	0
Rácios Económico-Financeiros	Taxa de investimento %	24,443	-4.44	13.15	49.92	19.5433	0	20.66	0
Rácios Económico-Financeiros	Rendibilidade								
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	28,907	0.29	0.78	1.38	0.8167	1	0.838888889	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	25,238	-5.78	5.39	16.91	5.5067	0	6.295555556	0
Rácios Económico-Financeiros	Liquidez								
Rácios Económico-Financeiros	Liquidez geral %	26,951	62.21	132.81	313.47	169.4967	1	162.5133333	1
Rácios Económico-Financeiros	Estrutura financeira								
Rácios Económico-Financeiros	Autonomia financeira %	28,896	5.92	32.21	65.3	34.4767	0	33.95777778	0
Rácios Económico-Financeiros	Taxa de endividamento %	25,300	11.16	45.51	123.01	59.8933	1	60.03	1
Rácios Económico-Financeiros	Actividade								
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	24,955	15	85	178	92.6667	0	88.55555556	0
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	27,222	0	13	75	29.3333	1	28.88888889	1
Fonte: Banco de Portugal								TOTAL:	4

Informação disponível em: 25-03-2011 11:59:44

Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: M - Actividades de consultoria, científicas, técnicas e similares

Exhibit 3.13 – Consulting Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007	2007	2007	2007			2008	2008	2008	2008		
		Número de Empresas	Q1	Q2	Q3	Média Anual		Número de Empresas	Q1	Q2	Q3	Média Anual	
Rátios Económico-Financeiros	Rátios Económico-Financeiros												
Rátios Económico-Financeiros	Crescimento e investimento												
Rátios Económico-Financeiros	Taxa de variação das vendas e prestações de serviços	8,401	-17.36	5.76	39.81	9.40333	0	8,981	-22.41	2.48	34.25	4.77333	0
Rátios Económico-Financeiros	Taxa de investimento %	8,048	-6.29	16.72	65.99	25.4733	0	8,525	-7.34	15.21	62.92	23.5967	0
Rátios Económico-Financeiros	Rendibilidade												
Rátios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	9,597	0.34	0.92	1.8	1.02	1	10,256	0.33	0.93	1.8	1.02	1
Rátios Económico-Financeiros	Rendibilidade operacional das vendas %	8,388	-7.27	3.21	11.46	2.46667	0	8,929	-9.29	2.67	10.58	1.32	0
Rátios Económico-Financeiros	Liquidez												
Rátios Económico-Financeiros	Liquidez geral %	8,986	54.31	110.3	215.54	126.717	1	9,645	53.57	111.9	220.97	128.813	1
Rátios Económico-Financeiros	Estrutura financeira												
Rátios Económico-Financeiros	Autonomia financeira %	9,586	-4.49	21.22	51.27	22.6667	0	10,245	-6.27	21.48	53.21	22.8067	0
Rátios Económico-Financeiros	Taxa de endividamento %	7,952	15.99	56.51	150.77	74.4233	1	8,370	15.16	55.43	147.33	72.64	1
Rátios Económico-Financeiros	Actividade												
Rátios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	8,302	4	63	139	68.6667	0	8,828	4	61	137	67.3333	0
Rátios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	8,909	0	31	111	47.3333	1	9,474	0	29	107	45.3333	1

Central Balanços Rubricas 2006

Unidade:

		2009	2009	2009	2009			Média dos Validação		
		Número de Empresas	Q1	Q2	Q3	Média Anual				
Rátios Económico-Financeiros	Rátios Económico-Financeiros									
Rátios Económico-Financeiros	Crescimento e investimento									
Rátios Económico-Financeiros	Taxa de variação das vendas e prestações de serviços		8,996	-31.58	-6.19	19.91	-5.95	0	2.741111	0
Rátios Económico-Financeiros	Taxa de investimento %		8,407	-9.2	12.89	55.2	19.63	0	22.9	0
Rátios Económico-Financeiros	Rendibilidade									
Rátios Económico-Financeiros	Rotação do activo líquido (nº de vezes)		10,159	0.29	0.87	1.74	0.97	1	1.002222	1
Rátios Económico-Financeiros	Rendibilidade operacional das vendas %		8,796	-12.35	2.33	10.32	0.10	0	1.295556	0
Rátios Económico-Financeiros	Liquidez									
Rátios Económico-Financeiros	Liquidez geral %		9,505	53.25	114.95	237.34	135.18	1	130.2367	1
Rátios Económico-Financeiros	Estrutura financeira									
Rátios Económico-Financeiros	Autonomia financeira %		10,151	-7.15	22.18	54.88	23.30	0	22.92556	0
Rátios Económico-Financeiros	Taxa de endividamento %		8,231	13.9	52.44	140.62	68.99	1	72.01667	1
Rátios Económico-Financeiros	Actividade									
Rátios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)		8,686	6	66	148	73.33	0	69.77778	0
Rátios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)		9,330	0	31	111	47.33	1	46.66667	1
								TOTAL:	4	

Fonte: Banco de Portugal

Informação disponível em: 25-03-2011 12:00:56

Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: N - Actividades administrativas e dos serviços de apoio

Exhibit 3.14 – Administrative Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007	2007	2007	2007			2008	2008	2008	2008		
		Número de Empresas	Q1	Q2	Q3	Média Anual		Número de Empresas	Q1	Q2	Q3	Média Anual	
Rácios Económico-Financeiros	Rácios Económico-Financeiros												
Rácios Económico-Financeiros	Crescimento e investimento												
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	3,454	-11.12	5.52	31.59	8.66333	0	3,579	-13.78	2.98	24.99	4.73	0
Rácios Económico-Financeiros	Taxa de investimento %	3,239	-1.6	7.5	36.54	14.1467	0	3,336	-1.52	8.16	35.46	14.0333	0
Rácios Económico-Financeiros	Rendibilidade												
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	3,854	0.39	0.96	1.87	1.07333	1	3,953	0.39	0.97	1.89	1.08333	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	3,491	-23.69	1.11	8.93	-4.55	0	3,593	-24.28	1.08	8.87	-4.7767	0
Rácios Económico-Financeiros	Liquidez												
Rácios Económico-Financeiros	Liquidez geral %	3,623	20.2	67.5	189.19	92.2967	0	3,734	20.84	69.2	194.79	94.9433	0
Rácios Económico-Financeiros	Estrutura financeira												
Rácios Económico-Financeiros	Autonomia financeira %	3,852	-39.02	12.49	47	6.82333	0	3,949	-39.48	10.9	44.6	5.34	0
Rácios Económico-Financeiros	Taxa de endividamento %	2,918	19.28	62.4	169.49	83.7233	1	2,984	19.44	67.84	194.88	94.0533	1
Rácios Económico-Financeiros	Actividade												
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	3,476	0	0	12	4	1	3,578	0	0	16	5.33333	1
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	3,659	0	7	33	13.3333	1	3,761	0	8	37	15	1

Central Balanços Rubricas 2006

Unidade:

		2009	2009	2009	2009			Média dos Validação		
		Número de Empresas	Q1	Q2	Q3	Média Anual				
Rácios Económico-Financeiros	Rácios Económico-Financeiros									
Rácios Económico-Financeiros	Crescimento e investimento									
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço		3,686	-14.45	1.87	25.86	4.43	0	5.94	
Rácios Económico-Financeiros	Taxa de investimento %		3,457	-2.58	5.26	29.04	10.57	0	12.91778	
Rácios Económico-Financeiros	Rendibilidade									
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)		4,049	0.39	0.99	1.87	1.08	1	1.08	
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %		3,671	-18.2	2.24	10.76	-1.73	0	-3.68667	
Rácios Económico-Financeiros	Liquidez									
Rácios Económico-Financeiros	Liquidez geral %		3,837	20.52	72.15	199.14	97.27	0	94.83667	
Rácios Económico-Financeiros	Estrutura financeira									
Rácios Económico-Financeiros	Autonomia financeira %		4,042	-40.4	13.38	45.15	6.04	0	6.068889	
Rácios Económico-Financeiros	Taxa de endividamento %		3,063	20.4	63.46	182.01	88.62	1	88.8	
Rácios Económico-Financeiros	Actividade									
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)		3,654	0	0	20	6.67	1	5.333333	
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)		3,834	0	7	35	14.00	1	14.11111	
									TOTAL:	4

Exhibit 3.15 – Education Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007	2007	2007	2007			2008	2008	2008	2008		
		Número de Empresas	Q1	Q2	Q3	Média Anual		Número de Empresas	Q1	Q2	Q3	Média Anual	
Rácios Económico-Financeiros	Rácios Económico-Financeiros												
Rácios Económico-Financeiros	Crescimento e investimento												
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviços	12,595	-7.34	4.81	22.16	6.54333	0	13,219	-8.47	3.69	20.86	5.36	0
Rácios Económico-Financeiros	Taxa de investimento %	12,340	-1.25	9.59	41.73	16.69	0	12,918	-1.1	9.74	41.05	16.5633	0
Rácios Económico-Financeiros	Rendibilidade												
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	13,308	0.45	0.86	1.48	0.93	1	13,975	0.42	0.85	1.5	0.92333	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	12,694	1.84	10.82	29	13.8867	0	13,281	2.01	10.93	29.16	14.0333	0
Rácios Económico-Financeiros	Liquidez												
Rácios Económico-Financeiros	Liquidez geral %	12,222	53.8	167.25	601.34	274.13	1	12,882	54.78	174.41	638.98	289.39	1
Rácios Económico-Financeiros	Estrutura financeira												
Rácios Económico-Financeiros	Autonomia financeira %	13,305	15.57	51.84	85.46	50.9567	0	13,973	15.25	52.8	86.17	51.4067	0
Rácios Económico-Financeiros	Taxa de endividamento %	12,346	3.14	21.46	73.2	32.6	0	12,906	2.95	20.38	70.72	31.35	0
Rácios Económico-Financeiros	Actividade												
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	12,677	0	0	29	9.66667	1	13,262	0	0	29	9.66667	1
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	12,959	0	4	29	11	1	13,618	0	4	28	10.6667	1

Central Balanços Rubricas 2006

Unidade:

		2009	2009	2009	2009			Média dos Validação		
		Número de Empresas	Q1	Q2	Q3	Média Anual				
Rácios Económico-Financeiros	Rácios Económico-Financeiros									
Rácios Económico-Financeiros	Crescimento e investimento									
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviços		13,848	-9.87	2.71	20.81	4.55	0	5.484444	0
Rácios Económico-Financeiros	Taxa de investimento %		13,598	-1.06	9.48	39.23	15.88333333	0	16.37889	0
Rácios Económico-Financeiros	Rendibilidade									
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)		14,708	0.42	0.83	1.47	0.906666667	1	0.92	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %		13,934	2.31	12	31.82	15.37666667	0	14.43222	0
Rácios Económico-Financeiros	Liquidez									
Rácios Económico-Financeiros	Liquidez geral %		13,526	58.76	187.84	701.58	316.06	1	293.1933	1
Rácios Económico-Financeiros	Estrutura financeira									
Rácios Económico-Financeiros	Autonomia financeira %		14,701	17.12	55.18	87.18	53.16	0	51.84111	0
Rácios Económico-Financeiros	Taxa de endividamento %		13,565	2.56	19.55	69.07	30.39333333	0	31.44778	0
Rácios Económico-Financeiros	Actividade									
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)		13,916	0	0	32	10.66666667	1	10	1
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)		14,271	0	4	28	10.66666667	1	10.77778	1
									TOTAL:	4

Exhibit 3.16 – Health Care Industry analysis

Central Balanços Rubricas 2006

Unidade:

		2007				2008		2008					
		Número de Empresas	Q1	Q2	Q3	Média Anual	Número de Empresas	Q1	Q2	Q3	Média Anual		
Rácios Económico-Financeiros	Rácios Económico-Financeiros												
Rácios Económico-Financeiros	Crescimento e investimento												
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	2,557	-21.82	5.46	43.11	8.91667	0	2,728	-22.94	3.57	48.85	9.82667	0
Rácios Económico-Financeiros	Taxa de investimento %	2,292	-6.52	18.23	77.08	29.5967	0	2,481	-5.14	21.62	85.05	33.8433	0
Rácios Económico-Financeiros	Rendibilidade												
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	3,081	0.14	0.59	1.33	0.68667	1	3,241	0.15	0.62	1.38	0.71667	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	2,579	-34.85	1.05	10.38	-7.8067	0	2,743	-27.17	1.25	10.82	-5.0333	0
Rácios Económico-Financeiros	Liquidez												
Rácios Económico-Financeiros	Liquidez geral %	2,836	22.1	65.84	171.1	86.3467	0	2,982	23.98	68.57	166.51	86.3533	0
Rácios Económico-Financeiros	Estrutura financeira												
Rácios Económico-Financeiros	Autonomia financeira %	3,078	-26.39	12.35	49.87	11.9433	0	3,239	-26.06	13.18	49.12	12.08	0
Rácios Económico-Financeiros	Taxa de endividamento %	2,391	13.99	67.64	205.26	95.63	1	2,510	13.38	71.64	211.57	98.8633	1
Rácios Económico-Financeiros	Actividade												
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	2,565	0	0	51	17	1	2,725	0	0	56	18.6667	1
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	2,826	0	18	83	33.6667	1	2,974	0	17	80	32.3333	1

Unidade:

		2009				Média dos Validação			
		Número de Empresas	Q1	Q2	Q3	Média Anual			
Rácios Económico-Financeiros	Rácios Económico-Financeiros								
Rácios Económico-Financeiros	Crescimento e investimento								
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	2,874	-28.38	-0.77	37	2.616666667	0	7.12	0
Rácios Económico-Financeiros	Taxa de investimento %	2,609	-6.58	15.83	68.04	25.76333333	0	29.73444	0
Rácios Económico-Financeiros	Rendibilidade								
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	3,433	0.14	0.62	1.38	0.713333333	1	0.705556	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	2,891	-28.37	1.3	11.2	-5.29	0	-6.04333	0
Rácios Económico-Financeiros	Liquidez								
Rácios Económico-Financeiros	Liquidez geral %	3,160	24.42	73.38	189.94	95.91333333	0	89.53778	0
Rácios Económico-Financeiros	Estrutura financeira								
Rácios Económico-Financeiros	Autonomia financeira %	3,427	-26.08	14.79	51.35	13.35333333	0	12.45889	0
Rácios Económico-Financeiros	Taxa de endividamento %	2,681	13.49	65.77	201.12	93.46	1	95.98444	1
Rácios Económico-Financeiros	Actividade								
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	2,870	0	0	62	20.66666667	1	18.77778	1
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	3,121	0	16	77	31	1	32.33333	1
TOTAL:									4

Fonte: Banco de Portugal

Informação disponível em: 25-03-2011 12:00:33

Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: R - Actividades artísticas, de espectáculos, desportivas e recreativas

Exhibit 3.17 – Events and artistic activities Industry

Central Balanços Rubricas 2006

Unidade:

		2007	2007	2007	2007			2008	2008	2008	2008		
		Número de Empresas	Q1	Q2	Q3	Média Anual		Número de Empresas	Q1	Q2	Q3	Média Anual	
Rácios Económico-Financeiros	Rácios Económico-Financeiros												
Rácios Económico-Financeiros	Crescimento e investimento												
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	6,171	-11	2.85	21.11	4.32	0	6,490	-14.67	0.06	18.52	1.30333	0
Rácios Económico-Financeiros	Taxa de investimento %	5,747	-6.75	7.17	32.35	10.9233	0	5,955	-7.22	7.3	34.91	11.6633	0
Rácios Económico-Financeiros	Rendibilidade												
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	6,574	0.53	1.04	1.79	1.12	1	6,867	0.51	1.02	1.78	1.10333	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	6,209	-28.4	0.29	7.8	-6.77	0	6,489	-34.68	-2.16	7.27	-9.8567	0
Rácios Económico-Financeiros	Liquidez												
Rácios Económico-Financeiros	Liquidez geral %	6,195	26.29	77.83	205.57	103.23	1	6,544	22.33	70.35	188.49	93.7233	0
Rácios Económico-Financeiros	Estrutura financeira												
Rácios Económico-Financeiros	Autonomia financeira %	6,568	-57.32	8.01	49.26	-0.0167	0	6,851	-73.13	4.39	46.68	-7.3533	0
Rácios Económico-Financeiros	Taxa de endividamento %	4,645	11.16	50.59	161.56	74.4367	1	4,651	11.68	51.67	170.4	77.9167	1
Rácios Económico-Financeiros	Actividade												
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	6,203	0	0	3	1	1	6,484	0	0	4	1.33333	1
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	6,362	2	30	88	40	1	6,632	2	31	89	40.6667	1

Central Balanços Rubricas 2006

Unidade:

		2009	2009	2009	2009				
		Número de Empresas	Q1	Q2	Q3	Média Anual		Média dos três anos	Validação
Rácios Económico-Financeiros	Rácios Económico-Financeiros								
Rácios Económico-Financeiros	Crescimento e investimento								
Rácios Económico-Financeiros	Taxa de variação das vendas e prestações de serviço	6,617	-16.69	-1.64	14.27	-1.35333333	0	1.423333333	0
Rácios Económico-Financeiros	Taxa de investimento %	6,058	-9.26	5.52	31.51	9.25666667	0	10.61444444	0
Rácios Económico-Financeiros	Rendibilidade								
Rácios Económico-Financeiros	Rotação do activo líquido (nº de vezes)	7,023	0.48	1	1.75	1.07666667	1	1.1	1
Rácios Económico-Financeiros	Rendibilidade operacional das vendas %	6,596	-36.17	-2.26	7.33	-10.366667	0	-8.997777778	0
Rácios Económico-Financeiros	Liquidez								
Rácios Económico-Financeiros	Liquidez geral %	6,691	20.98	67.56	193.3	93.9466667	0	96.9666667	0
Rácios Económico-Financeiros	Estrutura financeira								
Rácios Económico-Financeiros	Autonomia financeira %	7,009	-80.54	4.96	47.38	-9.4	0	-5.59	0
Rácios Económico-Financeiros	Taxa de endividamento %	4,742	11.34	51.5	170.04	77.6266667	1	76.66	1
Rácios Económico-Financeiros	Actividade								
Rácios Económico-Financeiros	Prazo médio de recebimentos (nº de dias)	6,585	0	0	4	1.33333333	1	1.22222222	1
Rácios Económico-Financeiros	Prazo médio de pagamentos (nº de dias)	6,741	2	29	92	41	1	40.55555556	1
								TOTAL:	4

Fonte: Banco de Portugal

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Measures: Número de Empresas, Q1, Q2, Q3

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

CAE: S - Outras actividades de serviços

Exhibit 3.18 – Other activities and services Industry analysis

The previous exhibits show our detailed analysis on the different economic ratios (as well as sales and net profit indicator) regarding each main industry of the Portuguese industry. This individual analysis was crucial to determine which industry could represent or have the biggest potential for the implementation of a facial recognition system.

Central Balanços Rubricas 2006

Unidade:		2007	2008	2009	Critérios		Vendas	RL
A - Agricultura, produção animal, caça, floresta e pesca	Indicadores de Síntese							
A - Agricultura, produção animal, caça, floresta e pesca	Resultado líquido do exercício (em euros)	3,339.12	-6,307.13	-5,664.46	-2,877.49	45,992.19	0	0
A - Agricultura, produção animal, caça, floresta e pesca	Vendas e prestações de serviços (em euros)	330,224.39	342,173.45	312,718.03	328,371.96	940,403.39	0	0
B - Indústrias extractivas	Resultado líquido do exercício (em euros)	532,394.83	191,591.67	82,626.28	268,870.93		0	1
B - Indústrias extractivas	Vendas e prestações de serviços (em euros)	2,672,610.59	2,898,625.66	1,243,513.77	2,271,583.34		1	0
C - Indústrias transformadoras	Resultado líquido do exercício (em euros)	57,162.42	35,570.52	11,675.98	34,802.97		0	0
C - Indústrias transformadoras	Vendas e prestações de serviços (em euros)	1,848,225.95	1,949,078.81	1,624,471.91	1,807,258.89		1	0
D - Electricidade, gás, vapor, água quente e fria e ar frio	Resultado líquido do exercício (em euros)		1,612,400.91	2,647,551.69	2,129,976.30		1	1
D - Electricidade, gás, vapor, água quente e fria e ar frio	Vendas e prestações de serviços (em euros)		26,476,589.98	18,527,697.58	22,502,143.78		1	0
E - Captação, tratamento e distribuição de água; saneamento, gestão de resíduos e despoluição	Resultado líquido do exercício (em euros)	173,760.26	128,141.22	163,177.18	155,026.22		0	1
E - Captação, tratamento e distribuição de água; saneamento, gestão de resíduos e despoluição	Vendas e prestações de serviços (em euros)	3,284,739.09	3,390,213.41	2,596,805.59	3,090,586.03		1	0
F - Construção	Resultado líquido do exercício (em euros)	15,205.24	-1,979.10	1,438.43	4,888.19		0	0
F - Construção	Vendas e prestações de serviços (em euros)	693,915.85	680,304.52	654,983.82	676,401.40		0	0
G - Comércio por grosso e a retalho; reparação de veículos automóveis e motociclos	Resultado líquido do exercício (em euros)	24,525.03	11,972.61	22,712.25	19,736.63		0	0
G - Comércio por grosso e a retalho; reparação de veículos automóveis e motociclos	Vendas e prestações de serviços (em euros)	1,250,396.56	1,279,890.49	1,199,299.77	1,243,195.61		1	0
H - Transportes e armazenagem	Resultado líquido do exercício (em euros)	11,974.80	-18,575.57	-15,759.37	-7,453.38		0	0
H - Transportes e armazenagem	Vendas e prestações de serviços (em euros)	799,188.64	946,245.54	815,571.95	853,668.71		0	0
I - Alojamento, restauração e similares	Resultado líquido do exercício (em euros)	283.92	-8,218.87	-8,017.64	-5,317.53		0	0
I - Alojamento, restauração e similares	Vendas e prestações de serviços (em euros)	248,915.51	259,275.88	249,725.97	252,639.12		0	0
I - Alojamento, restauração e similares	Vendas e prestações de serviços (em euros)	248,915.51	259,275.88	249,725.97	252,639.12		0	0
J - Actividades de informação e de comunicação	Resultado líquido do exercício (em euros)	132,957.53	108,682.34	79,007.65	106,882.51		0	1
J - Actividades de informação e de comunicação	Vendas e prestações de serviços (em euros)	1,998,404.16	1,588,860.99	1,549,851.56	1,712,372.24		1	0
L - Actividades imobiliárias	Resultado líquido do exercício (em euros)	15,202.37	-13,170.30	9,276.04	3,769.37		0	0
L - Actividades imobiliárias	Vendas e prestações de serviços (em euros)	314,276.52	261,954.34	232,709.92	269,646.93		0	0
M - Actividades de consultoria, científicas, técnicas e similares	Resultado líquido do exercício (em euros)	284,419.20	79,137.70	61,100.08	141,552.33		0	1
M - Actividades de consultoria, científicas, técnicas e similares	Vendas e prestações de serviços (em euros)	485,720.31	391,964.59	375,305.58	417,663.49		0	0
N - Actividades administrativas e dos serviços de apoio	Resultado líquido do exercício (em euros)	11,829.29	19,897.06	22,301.24	18,009.20		0	0
N - Actividades administrativas e dos serviços de apoio	Vendas e prestações de serviços (em euros)	905,407.75	883,762.84	797,809.18	862,326.59		0	0
P - Educação	Resultado líquido do exercício (em euros)	744.38	88.02	5,613.21	2,148.54		0	0
P - Educação	Vendas e prestações de serviços (em euros)	246,544.41	252,646.01	251,243.69	250,144.70		0	0
Q - Actividades de saúde humana e apoio social	Resultado líquido do exercício (em euros)	19,181.31	12,451.98	3,081.76	11,571.68		0	0
Q - Actividades de saúde humana e apoio social	Vendas e prestações de serviços (em euros)	466,556.61	466,312.93	522,373.57	485,081.04		0	0
R - Actividades artísticas, de espectáculos, desportivas e recreativas	Resultado líquido do exercício (em euros)	4,750.29	-29,258.20	-13,085.23	-12,531.05		0	0
R - Actividades artísticas, de espectáculos, desportivas e recreativas	Vendas e prestações de serviços (em euros)	436,154.08	461,366.87	320,909.29	406,143.41		0	0
S - Outras actividades de serviços	Resultado líquido do exercício (em euros)	-1,443.60	-4,098.57	-4,070.20	-3,204.12		0	0
S - Outras actividades de serviços	Vendas e prestações de serviços (em euros)	117,142.83	121,606.79	119,362.97	119,370.86		0	0

Fonte: Banco de Portugal

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Rubrica: Indicadores de Síntese, Activo de exploração (em euros), Capital próprio (em euros), Resultado líquido do exercício (em euros),

Vendas e prestações de serviços (em euros), Valor acrescentado bruto (em euros), Nº de pessoas ao serviço

CAE: A - Agricultura, produção animal, caça, floresta e pesca, B - Indústrias extractivas, C - Indústrias transformadoras, D - Electricidade, gás, vapor, água quente e fria e ar frio, E - Captação, tratamento e distribuição de água; saneamento, gestão de resíduos e despoluição, F - Construção, G - Comércio por

Período: 2007, 2008, 2009

Dimensão Empresa: Todas as Empresas

Exhibit 3.19 – Net Profit and Sales Analysis

Criteria	Weight	Agriculture	Extractive Industry	Transforming Industry	Electricity, Water & Gas	Water treatment	Construction	Retail	Transportation and Storage	Accommodation and Restaurants
Sales and Services growth rate %	7.00%	0	0	0	0	0	0	0	0	0
Investment rate %	10.00%	1	0	0	1	1	0	0	0	0
		0	0	0	0	0	0	0	0	0
Turnover (nº of times)	2.00%	0	0	1	0	1	1	1	1	1
Sales operational profitability%	10.00%	0	0	0	1	0	0	0	0	0
		0	0	0	0	0	0	0	0	0
General Liquidity %	10.00%	1	1	1	1	1	1	1	1	1
		0	0	0	0	0	0	0	0	0
Autonomia financeira %	5.00%	0	0	0	0	0	0	0	0	0
Debt rate %	5.00%	1	1	1	1	1	1	1	0	1
		0	0	0	0	0	0	0	0	0
Payment term (nº of days)	3.00%	0	0	0	0	0	0	0	0	1
Receiving term (nº of days)	3.00%	0	0	0	1	0	0	0	1	1
Net Income (in euros)	15.00%	0	0	0	1	0	0	0	0	0
Net Sales (in euros)	30.00%	0	1	1	1	1	0	1	0	0
	100.00%	0.25	0.45	0.47	0.83	0.57	0.17	0.47	0.15	0.23
	31.41%	0	1	1	1	1	0	1	0	0

Criteria	Weight	Information and Communication Act	Real State	Consulting	Administrative	Education	Health-Care	Events and artistic activities	Others activities and services
Sales and Services growth rate %	7.00%	0	0	0	0	0	0	0	0
Investment rate %	10.00%	0	1	0	0	0	0	0	0
		0	0	0	0	0	0	0	0
Turnover (nº of times)	2.00%	1	0	1	1	1	1	1	1
Sales operational profitability%	10.00%	0	0	0	0	0	0	0	0
		0	0	0	0	0	0	0	0
General Liquidity %	10.00%	1	1	1	1	0	1	0	0
		0	0	0	0	0	0	0	0
Autonomia financeira %	5.00%	0	0	0	0	0	0	0	0
Debt rate %	5.00%	1	1	1	1	1	0	1	1
		0	0	0	0	0	0	0	0
Payment term (nº of days)	3.00%	0	1	0	0	1	1	1	1
Receiving term (nº of days)	3.00%	0	1	1	1	1	1	1	1
Net Income (in euros)	15.00%	0	0	0	0	0	0	0	0
Net Sales (in euros)	30.00%	1	0	0	0	0	0	0	0
	100.00%	0.47	0.31	0.2	0.2	0.13	0.18	0.13	0.13
	31.41%	1	0	0	0	0	0	0	0

Exhibit 3.20 – Industries Final analysis and Comparative

Exhibit 3.20 illustrates the final part of the industry analysis. In this part, defined different weight for the economic ratios used, because in our opinion, some are more important than others for the implementation of this technology (e.g., investment rate plays a bigger role than turnover ratio).

After that, we follow the evaluation assigned in previous exhibits and we calculated the final value for each industry (e.g., Agriculture =0.25). Then, we calculated the average of the sum of all the presented industries. Finally in the last step, the industries that ranked higher than that average, would be approved.

- **Appendix 4 – Survey Methodology**

Caro participante,

Sou aluno da Universidade Católica Portuguesa e estou neste momento a concluir a minha tese de mestrado, e para tal gostaria, se possível, que respondesse ao seguinte questionário, o que não o ocupará mais de 5 minutos.

Não existem respostas certas nem erradas, o mais importante é que responda com a maior sinceridade possível.

Desde já os meus agradecimentos pelo tempo despendido.

O Reconhecimento Facial é um sistema que permite através de uma câmara de segurança, identificar pessoas segundo os respectivos traços do rosto das mesmas.

De entre muitas vantagens, este sistema permite reduzir o tempo de espera em locais tais como aeroportos ou bancos.

Este processo de identificação é mais rápido que os tradicionais cartões de identificação.

(Se quiser obter mais informações acerca do sistema, poderá visualizar o seguinte vídeo: <http://www.youtube.com/watch?v=EVSkhYHk6TQ>)

Por favor indique:

Idade:

- 0-17
- 18-24
- 25-34
- 35-50
- 51-65
- Mais de 65 anos

Sexo:

- Feminino
- Masculino

País de Residência:

- Portugal
- Espanha
- Reino Unido
- Brasil
- Outro (indique)

Questionário

1- Imagine que está numa loja ou supermercado a fazer compras. Para as próximas 6 questões, por favor considere uma escala de "Completamente inútil" a "Muito útil" e indique a importância que as seguintes funcionalidades teriam:

	Completamente Inútil	Inútil	Útil	Muito Útil
1.1-Obter informação adicional sobre um produto que pretende comprar (ou seja, informações sobre detalhes do produto ou comentários de outros consumidores sobre o mesmo produto).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Completamente Inútil	Inútil	Útil	Muito Útil
1.2-Obter informações ou recomendações de outros produtos complementares dos produtos que normalmente compra (por exemplo, ao comprar uma caixa de gelado, poderá obter informações de toppings de vários sabores ou de cones de gelado).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Completamente Inútil	Inútil	Útil	Muito Útil
1.3-Obter informação de produtos similares ao que pretende comprar, mas de marcas concorrentes, podendo assim comparar características e preços.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Completamente Inútil	Inútil	Útil	Muito útil
1.4- Encontrar os produtos que normalmente compra, em locais mais visíveis e de mais fácil acesso .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Completamente Inútil	Inútil	Útil	Muito Útil
1.5- Obter descontos personalizados, i.e., descontos apenas oferecidos a si nos produtos que tenham valor para si, de acordo com os seus gostos e interesses.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Completamente Inútil	Inútil	Útil	Muito Útil
1.6- Obter ajuda personalizada por parte de um assistente, de maneira a diminuir o tempo de procura e evitar deslocações desnecessárias	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2- Escolha **três e apenas três** das funcionalidades seguintes, que considera mais uteis.

Utilize os número 1 2 e 3, onde “1” representa a funcionalidade menos importante e “3” a mais importante na sua opinião:

Obter informação adicional sobre um produto que pretende comprar.

Obter informações ou recomendações de outros produtos complementares dos produtos que normalmente compra.

Obter informação de produtos similares ao que pretende comprar, mas de marcas concorrentes, podendo assim comparar características e preços.

Encontrar os produtos que normalmente compra, em locais mais visíveis e de mais fácil acesso.

Obter descontos personalizados, i.e., descontos apenas oferecidos a si nos produtos que tenham valor para si, de acordo com os seus gostos e interesses.

Obter ajuda personalizada por parte de um assistente.

O valor da posição de ordem vai de 1 a 3

Para poder ter uma experiência de compra personalizada, tal como acontece com os cartões de fidelização, a informação do consumidor relativamente às suas preferências e escolhas tem de ser gravada.

Neste caso a sua identificação facial seria associada à sua conta cliente da loja. Assim a sua conta cliente teria não só a sua identificação e traços faciais, bem como o registo das suas compras e preferências (podendo beneficiar assim de ofertas personalizadas).

De notar que esta identificação seria automática e não causaria qualquer transtorno para o consumidor.

Para as próximas questões, assuma que ao entrar na loja o sistema o identifica no momento.

3- Usando uma escala de "Não estaria definitivamente disposto" a "Estaria totalmente disposto", indique se permitiria a sua identificação quando entrasse na loja/supermercado, bem como a gravação das suas escolhas de compra (tal como acontece com os cartões de fidelidade) para beneficiar das seguintes situações:

	Não estaria definitivamente disposto	Provavelmente não estaria disposto	Provavelmente estaria disposto	Estaria definitivamente disposto
3.1- Imagine que é uma pessoa que se preocupa bastante com a saúde. Ao adquirir um sumo "Light", receber (por sms ou através de um assistente) informação sobre promoções de outros produtos "Light", como por exemplo cereais "Light".	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Não estaria definitivamente disposto	Provavelmente não estaria disposto	Provavelmente estaria disposto	Estaria definitivamente disposto
3.2- Após entrar na loja, receber no seu <u>telemóvel/smartphone</u> informação de promoções e ofertas nos iogurtes da sua marca preferida , em vez de outra que não consome (ou seja receber promoções em produtos que usualmente compra). <u>Assuma que receberá no máximo apenas 1 mensagem por visita.</u>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Não estaria definitivamente disposto	Provavelmente não estaria disposto	Provavelmente estaria disposto	Estaria definitivamente disposto
3.3- Após entrar na loja, poder ser abordado por um <u>empregado</u> que indica informação de promoções e ofertas nos iogurtes da sua marca preferida , em vez de outra que não consome.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Não estaria definitivamente disposto	Provavelmente não estaria disposto	Provavelmente estaria disposto	Estaria definitivamente disposto
3.4- Após entrar na loja, receber no seu <u>telemóvel/smartphone</u> informação de promoções e ofertas em produtos complementares ao que normalmente adquire (por exemplo, ao comprar manteiga, receber promoções referentes a mini-tostas). <u>Assuma que receberá no máximo apenas 1 mensagem por visita.</u>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Não estaria definitivamente disposto	Provavelmente não estaria disposto	Provavelmente estaria disposto	Estaria definitivamente disposto
3.5- Após entrar na loja, poder ser abordado por <u>um empregado</u> que indica promoções e ofertas em produtos complementares ao que normalmente adquire.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Não estaria definitivamente disposto	Provavelmente não estaria disposto	Provavelmente estaria disposto	Estaria definitivamente disposto
3.6- Após entrar na loja, ser abordado por um empregado que o informa da nova localização de um produto que normalmente compra, reduzindo assim o seu tempo perdido à procura do mesmo.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Não estaria definitivamente disposto	Provavelmente não estaria disposto	Provavelmente estaria disposto	Estaria definitivamente disposto
3.7- De uma forma geral e tendo em conta as vantagens apresentadas, estaria disposto a ser identificado pelo sistema de reconhecimento facial após entrar na loja/supermercado.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4- Suponha que é implementado o sistema de reconhecimento facial no balcão da entidade bancária e que é cliente. Neste caso, em vez da sua assinatura e apresentação de documentos, apenas seria necessário que o sistema fizesse o seu reconhecimento facial.

A partir desse momento passaria a ter um atendimento mais personalizado, e diminuiria o tempo que demora a efectuar as suas movimentações bancárias no balcão.

Estaria disposto a usar este sistema?

- Totalmente contra o seu uso
 - Contra o seu uso
 - A favor do seu uso
 - Totalmente a favor do seu uso
-

5- Imagine agora que este sistema é implementado nas caixas multibanco. Em vez de introduzir o PIN do cartão, bastaria apenas olhar para a câmara.

Tendo em conta que através deste processo, os seus pagamentos/levantamentos/consultas demorariam menos tempo, consideraria usar o sistema?

- Totalmente contra o seu uso
 - Contra o seu uso
 - A favor do seu uso
 - Totalmente a favor do seu uso
-

6- Tendo em conta as características do sistema e as vantagens apresentadas, de uma forma geral, estaria disposto a ceder informação / identificação dos seus traços faciais, de modo a beneficiar destas mesmas vantagens e de uma experiência de consumo personalizada?

- Definitivamente não estaria disposto
 - Provavelmente não estaria disposto
 - Provavelmente estaria disposto
 - Estaria Totalmente disposto
-

Chegou ao fim do questionário.

Obrigado por ter respondido.

Exhibit 4.1 – Facial Recognition Questionnaire – Portuguese version

Dear participant,

I am a student at Catholic University and currently I am about to finish my master's thesis. I would like you to answer the following survey that will not take more than 5 minutes to complete.

There are no right or wrong answers, the most important thing is to respond with the most sincerity as possible.

Thank you.

Facial Recognition is an identification system that allows to identify people according to their facial features, through the use of a security camera

Among many advantages, this system can reduce the waiting time in places such as airports or banks. This identification process is faster than traditional ID cards.

(If you want more information about the system, you can view the following video:
<http://www.youtube.com/watch?v=EVSkhYHk6TQ>)

Please select your:

Age:

- 0-17
- 18-24
- 25-34
- 35-50
- 51-65
- Over 65 years

Gender:

- Female
- Male

Country:

- Portugal
- Spain
- U.K.
- Brazil
- Other

Survey

1- Imagine you are in a store or supermarket. For the next six issues, please consider a range between "completely useless" to "very helpful" and indicate the importance that each functionality would have to you:

	Completely Useless	Useless	Useful	Very Useful
1.1-Obtain additional information about a product you intend to purchase (or in other words, information about product details or comments from other consumers about the same product).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Completely Useless	Useless	Useful	Very Useful
1.2-Obtain information or recommendations on other complementary products, of the ones you usually purchase (for example, when buying an ice cream box, you can get information on ice cream toppings or ice cream cones).	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Completely Useless	Useless	Useful	Very Useful
1.3-Get information on similar products of the ones you want to buy, in this case other competitor brands, allowing you to compare their features and prices.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Completely Useless	Useless	Useful	Very Useful
1.4-Find the products you normally buy in places more visible and easier to access.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Completely Useless	Useless	Useful	Very Useful
1.5-Get personalized discounts, i.e., discounts only offered to you on products that have value to you, according to your preferences and interests.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Completely Useless	Useless	Useful	Very Useful
1.6-Get personalized help by an assistant, to reduce the search time taken and avoid unnecessary travelling inside the store.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

2- **Choose three and only three** of the following features, which considers the most useful.

Use the numbers 1 2 and 3, where "1" represents the least important feature, "3" the most important in your opinion:

Additional information on a product you usually buy.

Information or recommendations of other complementary products of the ones you usually purchase.

Get information on similar products of the ones you want to buy, in this case other competitor brands, allowing you to compare their features and prices.

Find the products you normally purchase in places more visible and easier to access.

Get personalized discounts, i.e., discounts only offered to you on products that you value, according to their tastes and interests.

Get personalized help from an assistant.

Rank values must be between 1 and 3

In order to get a personalized shopping experience (like the one you have with loyalty card), consumer information concerning your preferences and choices must be recorded and stored.

In this case your facial identification would be associated with your client account. Thus, your client account would have your identification and facial features as it would also be associated records of your purchases and preference history (which may result in personalized offers).

Note that this identification would be automatic and would not cause any inconvenience to the consumer.

For the following questions, please assume that the system identifies you right after the moment you enter the store.

3- Using a scale between "Definitely not willing" and "Definitely willing," please indicate how would you feel about allowing being identified when entering in a store / supermarket, as well as recording your purchase choices (exactly like what happens with loyalty cards) to benefit from the following situations:

	Definitely not willing	Probably not willing	Probably willing	Definitely willing
3.1- Assume you're a person who cares a lot about your health. Suppose that when purchasing a "Light" product, you can also receive (by sms or through an assistant) information about promotions of other products "Light", such as "Light" cereal.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Definitely not willing	Probably not willing	Probably willing	Definitely willing
3.2- After entering the store, receive on your <u>smartphone</u> information regarding deals and offers on your favourite brand of yogurt instead of others that you normally do not consume(i.e., receive promotions on products that usually purchase). <u>Assume that at most you would only receive one message per visit.</u>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Definitely not willing	Probably not willing	Probably willing	Definitely willing
3.3- After entering the store, you can be approached by <u>an employee</u> , who could give you information about deals and offers on your favourite brand of yogurt, instead of others you usually don't purchase.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Definitely not willing	Probably not willing	Probably willing	Definitely willing
3.4- After entering the store, you can receive on your <u>smartphone</u> information concerning promotions and offers on complementary products to the ones you normally purchase (for example, when buying butter, you can receive promotions related to mini-sandwiches). <u>Assume that at most you would only receive one message per visit.</u>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Definitely not willing	Probably not willing	Probably willing	Definitely willing
3.5- After entering the store, you can be approached by <u>an employee</u> that indicates deals and offers on products that are complementary to the ones you usually purchase.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Definitely not willing	Probably not willing	Probably willing	Definitely willing
3.6- After entering the store, you can be approached by <u>an employee</u> who informs you of the new location of a product that would usually purchase, thus reducing the time you would normally waste searching for it.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

	Definitely not willing	Probably not willing	Probably willing	Definitely willing
3.7- In general, and taking into account the advantages previously presented, would you be willing to be identified by the facial recognition system next time you walk into store / supermarket.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

4- Suppose the facial recognition system is implemented in the branch of your bank. In that case, instead of signing and presenting your documents, in which you would only have to be identified by the system (by looking at a camera).

From that moment on, you would benefit from a more personalized service and assistance, as it would also decrease the time taken to operate your bank account.

Would you use this system?

- Totally against its use
 - Probably against
 - Probably in favour
 - Totally in favour of its use
-

5- Suppose now, that this system is implemented in ATMs. Instead of entering the PIN code of your bank card, you would just need to look at the ATM's camera.

Thus, this would allow to reduce the time taken to process your payments and other operations.

Would you use the system?

- Totally against its use
- Probably against
- Probably in favour
- Totally in favour of its use

6- Taking into account the characteristics of the system and the advantages presented, in general, would you be willing to give information / identification of your facial features in order to benefit from this advantages and a personalized consumer experience?

- Definitely would not be willing
 - Probably would not be willing
 - Probably would be willing
 - Definitely would be willing
-

You have just completed the questionnaire.

Thank You for completing this survey

Exhibit 4.2 – Facial Recognition Questionnaire – English version

Hypothesis	CRM Functionality	Process	Issue	Questions	Questionnaire (Question)
(H1) Portuguese consumers are willing to accept the use of facial recognition	Collaborative CRM	Contact Management	Privacy Issues	<p>If customers are willing to give some personal information in order to:</p> <ul style="list-style-type: none"> ○ gain discounts on certain products; ○ have a personalized shopping experience ○ To get additional information concerning a certain product ○ To have personalized shopping assistance. 	Question 6
(H2) The use of Facial Recognition technology can have a positive impact in CRM	<p>Operational CRM</p> <p>Analytical CRM</p>	<ul style="list-style-type: none"> ✓ Marketing Automation ✓ Sales Automation ✓ Service Automation ✓ Marketing Analysis ✓ Sales Analysis ✓ Service Analysis 	<ul style="list-style-type: none"> • Additional product information • Presentation of Complementary products • Optimization of shopping routes and shop item disposal • Presentation and comparison of prices of similar products • Discounts and promotions 	<ul style="list-style-type: none"> ○ To get additional product information; ○ To get information about complementary products to the product you are looking for; ○ To get help on your path to get the products you are looking for (reducing the time spent); ○ To get to know which products in the store are under discount ○ To get the prices of similar products (e.g. competing brands) (allowing you to make price comparisons); ○ To get personalized discounts i.e. on products that are meaningful to the customer. 	Question 1 and 2

<p>H4 - Consumers are willing to accept the use of a Facial Recognition technology in the Banking industry</p>	<p>-</p>	<p>-</p>	<ul style="list-style-type: none"> • Improve responsiveness and security of bank's branches • Improve responsiveness and security of ATM's 	<p>If customers are willing to give personal information to bank companies in order to have an improved and faster service:</p> <ul style="list-style-type: none"> ○ transfers ○ payments ○ other bank services 	<p>Question 4 and 5</p>
<p>H5 - Consumers are willing to accept the use of a Facial Recognition technology in the Retail industry</p>	<p>-</p>	<p>-</p>	<p>Personalized shopping experience and discounts</p> <p>VS</p> <p>Personal Privacy</p>	<p>If customers are willing to give personal information to retail companies to gain a personalized shopping experience and customized discounts</p>	<p>Question 3</p>

▪ **Appendix 5 – Survey Results**

Overall Matrix Scorecard : SurveyImagine you are in a store or supermarket. For the next six issues, please consider a range between completely useless to very helpful and indicate the importance that each functionality would have to you:

Question	Count	Score	Completely Useless	Useless	Useful	Very Useful
1.1 Obtain additional information about a product you intend to purchase (or in other words, information about product details or comments from other consumers about the same product).	120	3.192				
1.2 Obtain information or recommendations on other complementary products, of the ones you usually purchase (for example, when buying an ice cream box, you can get information on ice cream toppings or ice cream cones).	120	2.917				
1.3 Get information on similar products of the ones you want to buy, in this case other competitor brands, allowing you to compare their features and prices.	120	3.567				
1.4 Find the products you normally buy in places more visible and easier to access.	120	3.183				
1.5 Get personalized discounts, i.e., discounts only offered to you on products that have value to you, according to your preferences and interests.	120	3.542				
1.6 Get personalized help by an assistant, to reduce the search time taken and avoid unnecessary travelling inside the store.	120	2.833				

Exhibit 5.1 – CRM Functionalities Survey Analysis – Part 1

2 Choose three and only three of the following features, which considers the most useful. Use the numbers 1 2 and 3, where "1" represents the least important feature, "3" the most important in your opinion:

Average Rank	1	2	3	4	5	6						
Additional informati ...	1.75											
Information or recom ...	1.76											
Get information on s ...	2.27											
Find the products yo ...	1.74											
Get personalized dis ...	2.15											
Get personalized hel ...	2.10											
Data Table												
Additional informati ...	34	28.33%	28	23.33%	15	12.50%	0	0.00%	0	0.00%	0	0.00%
Information or recom ...	19	15.83%	19	15.83%	8	6.67%	0	0.00%	0	0.00%	0	0.00%
Get information on s ...	20	16.67%	29	24.17%	45	37.50%	0	0.00%	0	0.00%	0	0.00%
Find the products yo ...	16	13.33%	16	13.33%	6	5.00%	0	0.00%	0	0.00%	0	0.00%
Get personalized dis ...	23	19.17%	26	21.67%	36	30.00%	0	0.00%	0	0.00%	0	0.00%
Get personalized hel ...	8	6.67%	2	1.67%	10	8.33%	0	0.00%	0	0.00%	0	0.00%

Exhibit 5.2 – CRM Functionalities Survey Analysis – Part 2

Overall Matrix Scorecard : Using a scale between Definitely not willing and Definitely willing, please indicate how would you feel about allowing being identified when entering in a store / supermarket, as well as recording your purchase choices (exactly like what happens with loyalty cards) to benefit from the following situations:

Question	Count	Score	Definitely not willing	Probably not willing	Probably willing	Definitely willing
3.1 Assume you're a person who cares a lot about your health. Suppose that when purchasing a "Light" product, you can also receive (by sms or through an assistant) information about promotions of other products "Light", such as "Light" cereal.	120	2.583				
3.2 After entering the store, receive on your <u>smartphone</u> information regarding deals and offers on your favourite brand of yogurt instead of others that you normally do not consume(i.e., receive promotions on products that usually purchase). <u>Assume that at most you would only receive one message per visit.</u>	120	3.017				
3.3 After entering the store, you can be approached by <u>an employee</u> , who could give you information about deals and offers on your favourite brand of yogurt, instead of others you usually don't purchase.	120	2.517				
3.4 After entering the store, you can receive on your <u>smartphone</u> information concerning promotions and offers on complementary products to the ones you normally purchase (for example, when buying butter, you can receive promotions related to mini-sandwiches). <u>Assume that at most you would only receive one message per visit.</u>	120	2.592				
3.5 After entering the store, you can be approached by <u>an employee</u> that indicates deals and offers on products that are complementary to the ones you usually purchase.	120	2.217				
3.6 After entering the store, you can be approached by <u>an employee</u> who informs you of the new location of a product that would usually purchase, thus reducing the time you would normally waste searching for it.	120	2.750				

Exhibit 5.3 – Retail Industry examples

In general, and taking into account the advantages previously presented, would you be willing to be identified by the facial recognition system next time you walk into store / supermarket.

Answer	Count	Percent	20%	40%	60%	80%	100%
1. Definitely not willing	13	10.83%					
2. Probably not willing	24	20.00%					
3. Probably willing	71	59.17%					
4. Definitely willing	12	10.00%					
Total	120	100%					
Mean : 2.683	Confidence Interval @ 95% : [2.540 - 2.826]		Standard Deviation : 0.799		Standard Error : 0.073		

Exhibit 5.4 – General Acceptance level - Retail Industry

Suppose the facial recognition system is implemented in the branch of your bank. In that case, instead of signing and presenting your documents, in which you would only have to be identified by the system (by looking at a camera). From that moment on, you would benefit from a more personalized service and assistance, as it would also decrease the time taken to operate your bank account. Would you use this system?

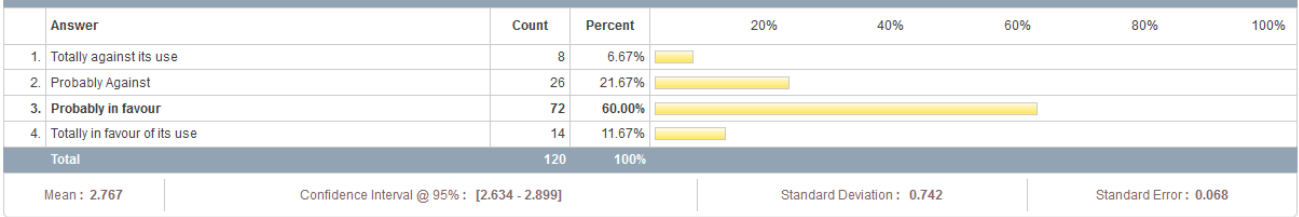


Exhibit 5.5 – General Acceptance level – Banking Industry Part 1

Suppose now, that this system is implemented in ATMs. Instead of entering the PIN code of your bank card, you would just need to look at the ATM’s camera. Thus, this would allow to reduce the time taken to process your payments and other operations. Would you use the system?

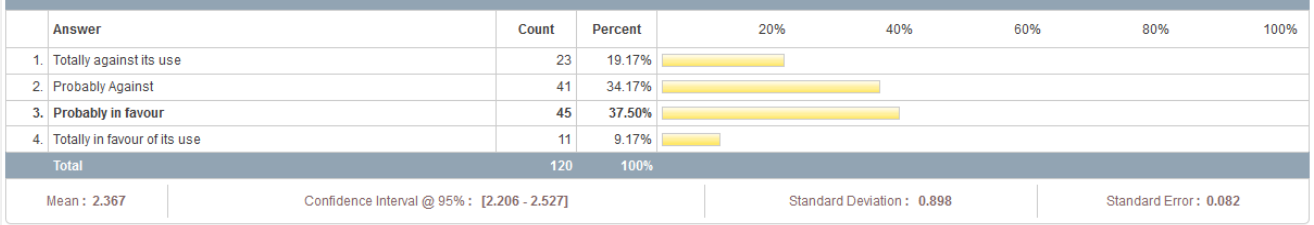


Exhibit 5.6 – General Acceptance level – Banking Industry Part 2

Taking into account the characteristics of the system and the advantages presented, in general, would you be willing to give information / identification of your facial features in order to benefit from this advantages and from a personalized consumer experience?

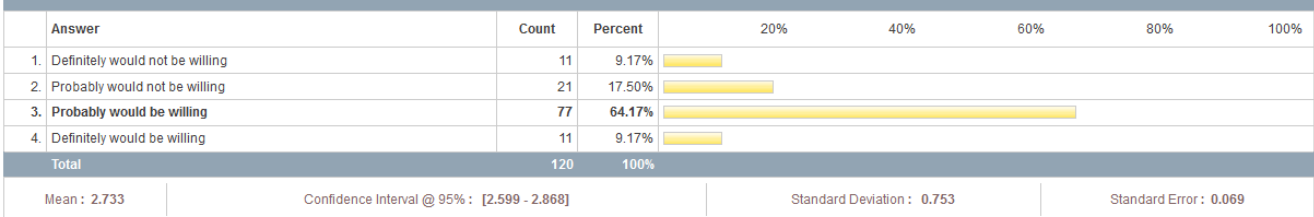


Exhibit 5.7 – Overall Acceptance level

Descriptive Statisticsa						
Question	N	Minimum	Maximum	Mean	Std. Deviation	
3.7. In general and taking into account the advantages previously presented would you be willing to be identified by the facial recognition system next time you walk into store / supermarket?	69	1	4	2.70	.773	
4. Suppose the facial recognition system is implemented in the branch of your bank. In that case, instead of signing and presenting your documents, in which you would only have to be identified by the system (by looking at a camera). From that moment on, you would benefit from a more personalized service and assistance, as it would also decrease the time taken to operate your bank account. Would you use this system?	69	1	4	2.75	.736	
5. Instead of entering the PIN code of your bank card, you would just need to look at the ATM's camera. Thus, this would allow to reduce the time taken to process your payments and other operations. Would you use the system?	69	1	4	2.45	.916	
6. Taking into account the characteristics of the system and the advantages presented, in general, would you be willing to give information / identification of your facial features in order to benefit from this advantages and a personalized consumer experience?	69	1	4	2.77	.731	
Valid N (listwise)	69					

Exhibit 5.8 – Age analysis: 18-24

Descriptive Statisticsa						
Question	N	Minimum	Maximum	Mean	Std. Deviation	
3.7. In general and taking into account the advantages previously presented would you be willing to be identified by the facial recognition system next time you walk into store / supermarket?	27	1	4	2.93	.829	
4. Suppose the facial recognition system is implemented in the branch of your bank. In that case, instead of signing and presenting your documents, in which you would only have to be identified by the system (by looking at a camera). From that moment on, you would benefit from a more personalized service and assistance, as it would also decrease the time taken to operate your bank account. Would you use this system?	27	1	4	3.00	.734	
5. Instead of entering the PIN code of your bank card, you would just need to look at the ATM's camera. Thus, this would allow to reduce the time taken to process your payments and other operations. Would you use the system?	27	1	4	2.41	.747	
6. Taking into account the characteristics of the system and the advantages presented, in general, would you be willing to give information / identification of your facial features in order to benefit from this advantages and a personalized consumer experience?	27	1	4	2.93	.675	
Valid N (listwise)	27					

Exhibit 5.9 – Age analysis: 25-34

Descriptive Statisticsa						
Question	N	Minimum	Maximum	Mean	Std. Deviation	
3.7. In general and taking into account the advantages previously presented would you be willing to be identified by the facial recognition system next time you walk into store / supermarket?	24	1	4	2.38	.770	
4. Suppose the facial recognition system is implemented in the branch of your bank. In that case, instead of signing and presenting your documents, in which you would only have to be identified by the system (by looking at a camera). From that moment on, you would benefit from a more personalized service and assistance, as it would also decrease the time taken to operate your bank account. Would you use this system?	24	1	4	2.54	.721	
5. Instead of entering the PIN code of your bank card, you would just need to look at the ATM's camera. Thus, this would allow to reduce the time taken to process your payments and other operations. Would you use the system?	24	1	4	2.08	.974	
6. Taking into account the characteristics of the system and the advantages presented, in general, would you be willing to give information / identification of your facial features in order to benefit from this advantages and a personalized consumer experience?	24	1	4	2.42	.830	
Valid N (listwise)	24					

Exhibit 5.10 – Age analysis: 35-50 + 50-65

Group Statistics						
Question	Gender	N	Mean	Std. Deviation	Std. Error Mean	
3.7. In general and taking into account the advantages previously presented would you be willing to be identified by the facial recognition system next time you walk into store / supermarket?	Female	57	2.58	.865	.115	
	Male	63	2.78	.728	.092	
4. Suppose the facial recognition system is implemented in the branch of your bank. In that case, instead of signing and presenting your documents, in which you would only have to be identified by the system (by looking at a camera). From that moment on, you would benefit from a more personalized service and assistance, as it would also decrease the time taken to operate your bank account. Would you use this system?	Female	57	2.60	.776	.103	
	Male	63	2.92	.679	.086	
5. Suppose now, that this system is implemented in ATMs. Instead of entering the PIN code of your bank card, you would just need to look at the ATM's camera. Thus, this would allow to reduce the time taken to process your payments and other operations. Would you use the system?	Female	57	2.23	.866	.115	
	Male	63	2.49	.914	.115	
6. Taking into account the characteristics of the system and the advantages presented, in general, would you be willing to give information / identification of your facial features in order to benefit from this advantages and a personalized consumer experience?	Female	57	2.56	.802	.106	
	Male	63	2.89	.675	.085	

Exhibit 5.11 – Gender analysis: Group Statistics

Independent Samples Test											
Question			Equality of Variances		t-test for Equality of Means						
			F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Interval of the	
										Lower	Upper
3.7.	In general and taking into account the advantages previously presented would you be willing to be identified by the facial recognition system next time you walk into store / supermarket?	Equal variances assumed	4.138	.044	-1.366	118	.174	-.199	.146	-.487	.089
		Equal variances not assumed			-1.355	110.006	.178	-.199	.147	-.490	.092
4	Suppose the facial recognition system is implemented in the branch of your bank. In that case, instead of signing and presenting your documents, in which you would only have to be identified by the system (by looking at a camera). From that moment on, you would benefit from a more personalized service and assistance, as it would also decrease the time taken to operate your bank account. Would you use this system?	Equal variances assumed	5.832	.017	-2.440	118	.016	-.324	.133	-.587	-.061
		Equal variances not assumed			-2.424	111.957	.017	-.324	.134	-.589	-.059
5	Suppose now, that this system is implemented in ATMs. Instead of entering the PIN code of your bank card, you would just need to look at the ATM's camera. Thus, this would allow to reduce the time taken to process your payments and other operations. Would you use the system?	Equal variances assumed	.224	.637	-1.620	118	.108	-.264	.163	-.587	.059
		Equal variances not assumed			-1.624	117.730	.107	-.264	.163	-.586	.058
6	Taking into account the characteristics of the system and the advantages presented, in general, would you be willing to give information / identification of your facial features in order to benefit from this advantages and a personalized consumer experience?	Equal variances assumed	7.741	.006	-2.428	118	.017	-.327	.135	-.595	-.060
		Equal variances not assumed			-2.407	109.944	.018	-.327	.136	-.597	-.058

Exhibit 5.12 – Gender analysis: t-test

ANOVA							
Question			Sum of Squares	df	Mean Square	F	Sig.
3.7.	In general and taking into account the advantages previously presented would you be willing to be identified by the facial recognition system next time you walk into store / supermarket?	Between Groups	3.881	2	1.941	3.150	.047
		Within Groups	72.086	117	.616		
		Total	75.967	119			
4	Suppose the facial recognition system is implemented in the branch of your bank. In that case, instead of signing and presenting your documents, in which you would only have to be identified by the system (by looking at a camera). From that moment on, you would benefit from a more personalized service and assistance, as it would also decrease the time taken to operate your bank account. Would you use this system?	Between Groups	2.697	2	1.348	2.513	.085
		Within Groups	62.770	117	.536		
		Total	65.467	119			
5	Suppose now, that this system is implemented in ATMs. Instead of entering the PIN code of your bank card, you would just need to look at the ATM's camera. Thus, this would allow to reduce the time taken to process your payments and other operations. Would you use the system?	Between Groups	2.442	2	1.221	1.529	.221
		Within Groups	93.424	117	.798		
		Total	95.867	119			
6	Taking into account the characteristics of the system and the advantages presented, in general, would you be willing to give information / identification of your facial features in order to benefit from this advantages and a personalized consumer experience?	Between Groups	3.492	2	1.746	3.193	.045
		Within Groups	63.975	117	.547		
		Total	67.467	119			

Exhibit 5.13 – Age analysis: ANOVA test

▪ **Appendix 6 – Resource-Based View Model (RBV)**

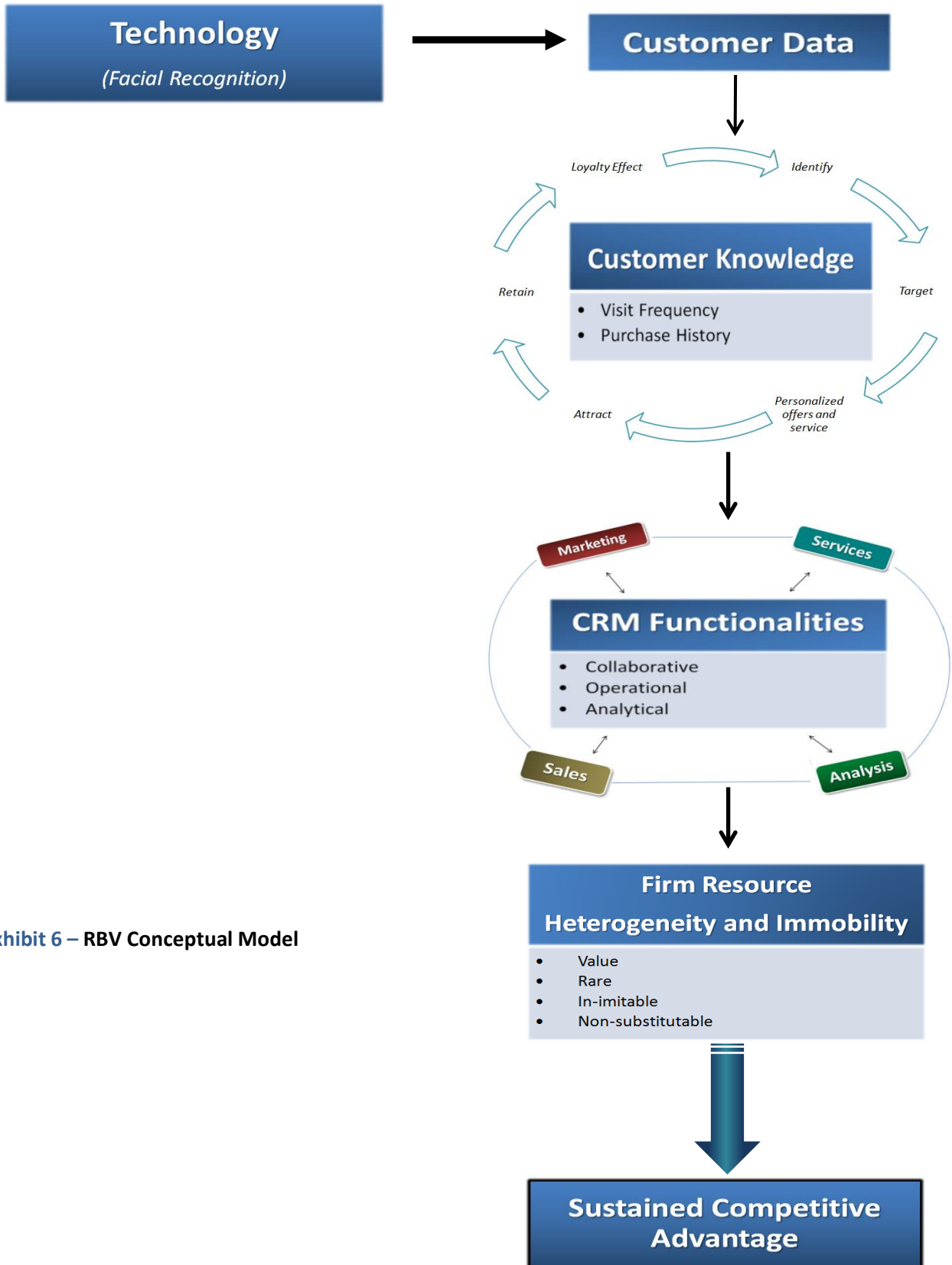


Exhibit 6 – RBV Conceptual Model

