UNIVERSIDADE DE SÃO PAULO
ESCOLA POLITÉCNICA

TIAGO SEITI HISATSUGA

Development of a competitive intelligence solution for a subacquirer

São Paulo
2018

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Orientador: Prof. Dr. Marcelo Schneck de Paula Pessôa

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For those who have been using data for good and improving people's lives

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“In God we trust. All others must bring data.”

(Deming)

RESUMO

HISATSUGA, Tiago Seiti. **Development of a competitive intelligence solution for a subacquirer**. 2018. 112 p. Trabalho de Formatura (Bacharelado em Engenharia de Produção) – Escola Politécnica, Universidade de São Paulo, São Paulo, 2018.

O setor financeiro está sob transformação. No Brasil, uma área que tem crescido nos últimos anos são os meios de pagamento e, em particular, o mercado de adquirentes e subadquirentes. A competição é intensa nesse campo e, para uma empresa, é importante conhecer o ambiente competitivo (mercado, clientes, competidores e outros atores). Além disso, é importante monitorar e ter informações objetivas sobre todos esses elementos. O presente trabalho desenvolveu uma solução de inteligência competitiva para uma subadquirente. O ponto de partida é uma análise estratégica da empresa. A partir das perspectivas estratégicas da competição e do mercado, determina-se quais elementos devem ser monitorados pela inteligência competitiva, Em seguida, usando conceitos como Inteligência de Negócios, soluções práticas são propostas para a implementação do sistema de inteligência competitiva, desde a coleta de dados até a sua estruturação. Também se descreve como o autor projetou e implementou as partes da solução. Os problemas e dificuldades encontrados nesse processo são, então, identificados e discutidos, com as soluções secundárias propostas ou implementadas.

Palavras-chave: Inteligência competitiva. Estratégia organizacional.

ABSTRACT

HISATSUGA, Tiago Seiti. **Development of a competitive intelligence solution for a subacquirer**. 2018. 112 p. Trabalho de Formatura (Bacharelado em Engenharia de Produção) – Escola Politécnica, Universidade de São Paulo, São Paulo, 2018.

The financial sector is under transformation. In Brazil, one area that has been growing in the recent years is the payments industry and, in particular, the market of acquirers and subacquirers. Competition is fierce in this field and, for a company, it is important to know the competitive environment (the market, customers, competitors and other stakeholders). Moreover, it is important to monitor and have objective information about all these elements. The present work developed a competitive intelligence solution for a subacquirer. The starting point is a strategic analysis of the company. From the strategic perspectives on competition and market, it is determined what elements should be monitored by the competitive intelligence. Thereafter, using concepts such as Business Intelligence, practical solutions are proposed for implementing the competitive intelligence system, from collecting the data to structuring it. It is also described how the author designed and implemented the parts of the solution. The problems and difficulties encountered in this process are then identified and discussed, with the proposed or implemented secondary solutions.

Keywords: Competitive intelligence. Organizational strategy.

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LIST OF ABBREVIATIONS

ABECS	Associação Brasileira das Empresas de Cartões de Crédito e Serviços
ANATEL	Agência Nacional de Telecomunicações
API	Application Programming Interface
B2B	Business-to-Business
BACEN	Banco Central do Brasil
BI	Business Intelligence
CEMPRE	Cadastro Central de Empresas
CRM	Customer Relationship Management
DM	Data Mart
DW	Data Warehouse
ERP	Enterprise Resources Planning
FIDC	Fundo de Investimentos em Direitos Creditórios
GDPR	General Data Protection Regulation
IBGE	Instituto Brasileiro de Geografia e Estatística
JSON	JavaScript Object Notation
MCC	Merchant Category Code
MDR	Merchant Discount Rate
MEI	Microempreendedor Individual
NFC	Near Field Communication
OLAP	On-line Analytical Processing
OLTP	On-line Transactional Processing
P2P	Peer-to-Peer
PAC	Pesquisa Anual de Comércio

PAS	Pesquisa Anual de Serviços
PC	Personal Computer
PESTEL	Political, Economic, Social, Technological, Ecological and Legal
PIN	Personal Identification Number
PMC	Pesquisa Mensal de Comércio
PMS	Pesquisa Mensal de Serviços
POS	Point Of Sale
PSP	Payment Service Provider
SBU	Strategic Business Unit
SQL	Structured Query Language
SWOT	Strengths, Weaknesses, Opportunities and Threats
TPV	Total Payments Volume

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1. INTRODUCTION

The financial services industry accounts for 15-20% of the overall economic activities in the world, according to estimates (INVESTOPEDIA, 2016). It has an important and central role in global economy, being connected to almost any other sector or industry and providing them with its services or resources. Its current configuration is the result of centuries of evolution, after periods of growth, years of generalized crisis, new policies, among others. It is a complex system composed of several areas, as shown in Figure 1, often inter-related or belonging to a same corporation.

Figure 1: Segments within the financial services industry

Source: Loesch (2018)

In the same way it happened to other economic fields, over the last few decades, this sector has been going through digital transformation in many dimensions – from replacing brick and mortar bank agencies with online solutions to implementing sophisticated credit scoring algorithms that gather and process lots of data about the consumer. This transformation has been intensifying lately and, nowadays, it is easy to find retail banks promoting innovative digital services that can be totally managed via smartphones or tablets, in many cases at competitive prices.

Regarding retail banking platforms, for instance, Figure 2 presents the diversity of possible channels and tools that are possible nowadays.

Customers can be reached through the web, physical branches or ATMs placed over the cities. For each option, there are specific channels, such as e-mails, mobile applications, text messages, call centers, chatbots, social media pages on the internet, self-service kiosks in branches, etc.

An interesting observation is that digital channels can use and incorporate technologies such as advanced analytics and automated decision-making, processing data that was also collected or retrieved through virtual interactions with consumers.

Another important point is that digital channels might be economic alternatives for delivering services to a bigger number of customers, thanks to the availability of new platforms and their adoption by individuals. For example, mobile devices are a viable channel because many people have a smartphone nowadays.

Figure 2: An example of a digital retail banking platform

Source: Didur (2017)

Among the new players competing in this digital landscape, there are thousands of fintechs (which is a relatively old term, found in early 2000's documents[1]) – companies that create value by combining technological and financial products – offering a wide variety of products. Some of the most developed or high growth sectors at the moment can be found in

Figure 3, which represents a summarized view of the Fintech Brazilian Market. It also features examples of companies belonging to each cluster, among:

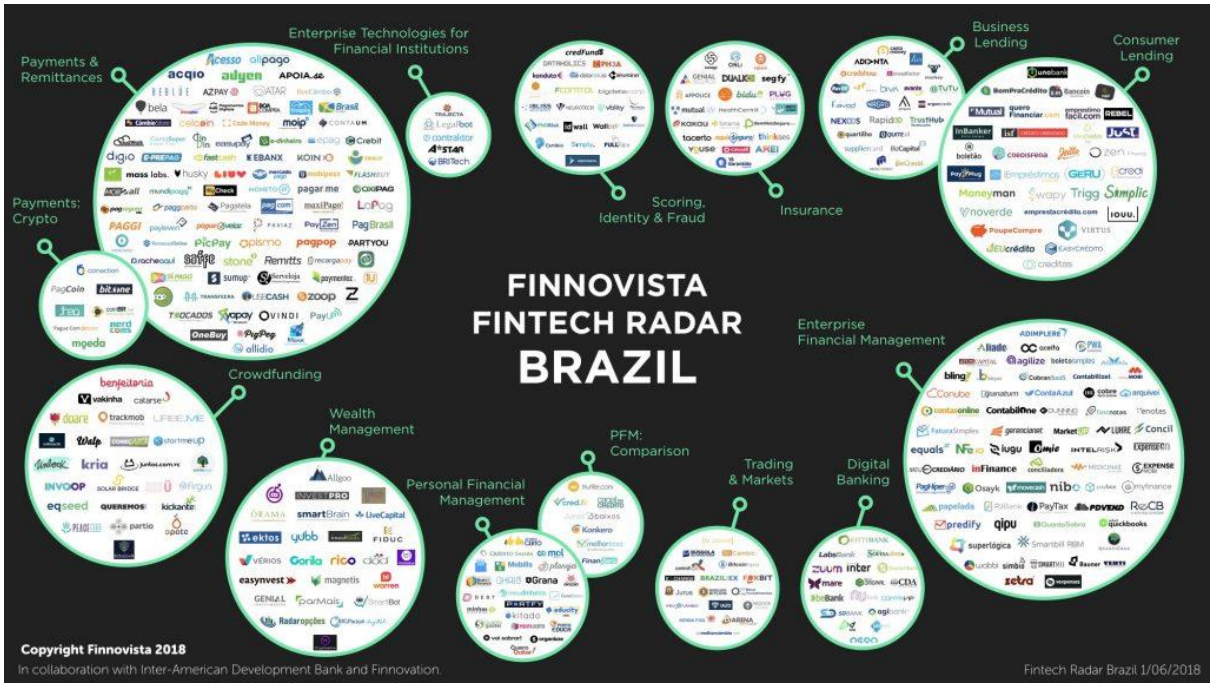
- Payments and Remittances
- Enterprise Technologies for Financial Institutions
- Scoring, Identity & Fraud
- Insurance
- Business Lending
- Consumer Lending
- Enterprise Financial Management
- Digital Banking
- Trading & Markets
- Personal Financial Management: Comparison Platforms
- Personal Financial Management
- Wealth Management
- Crowdfunding
- Payments: Cryptocurrencies

Each of those parts of the market has been evolving along the maturity curve at a different velocity, due to a number of conditions: local regulatory constraints, market structures, technology adoption, among others.

Businesses such as cryptocurrencies and related traders are still uncertain and lack some trust. The digital banking segment had a great development and include valuable companies. Other areas, such as wealth management, personal financial management and consumer lending also have some notable cases of success.

[1] See http://logophilialimited.com/index.php/index.php?word=fintech for further information

Figure 3: Selected fintech segments and examples in Brazil

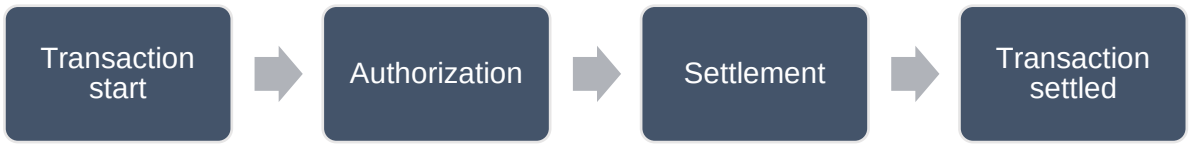


Source: FINNOVISTA (2018)

More recently, one sector that has been growing fast is the payment card. According to ABECS (*Associação Brasileira das Empresas de Cartões de Crédito e Serviços*, the Brazilian Association of Credit Card and Related Services Companies), Brazilians spent R$ 749.67 billions on credit cards in 2016 and R$ 842.60 billions in 2017, a growth rate of rates of approximately 12% in one year. On debit cards, spending increased almost 13% from R$ 451.30 billions in 2016 to R$ 508.05 billions in 2017 (ABECS, 2018). The payment industry has experienced a simultaneous expansion as well.

As previously mentioned, this industry is part of the financial services industry and it can be represented by the set of all companies involved in processing non-cash payments with various methods: credit cards, debit cards, prepaid cards, checks, wire transfers, direct debit, phone payments, mobile virtual wallets, etc. Depending on the payment method, there is a particular chain of institutions that operates the information and money flow when a transaction is made. Figure 4 represents the steps of a card payment, which are detailed below.

Figure 4: Processes of a card transaction



Source: developed by the author

A card transaction starts after a merchant, who has a card payment machine, sells an arbitrary good/service to a customer, who is a cardholder.

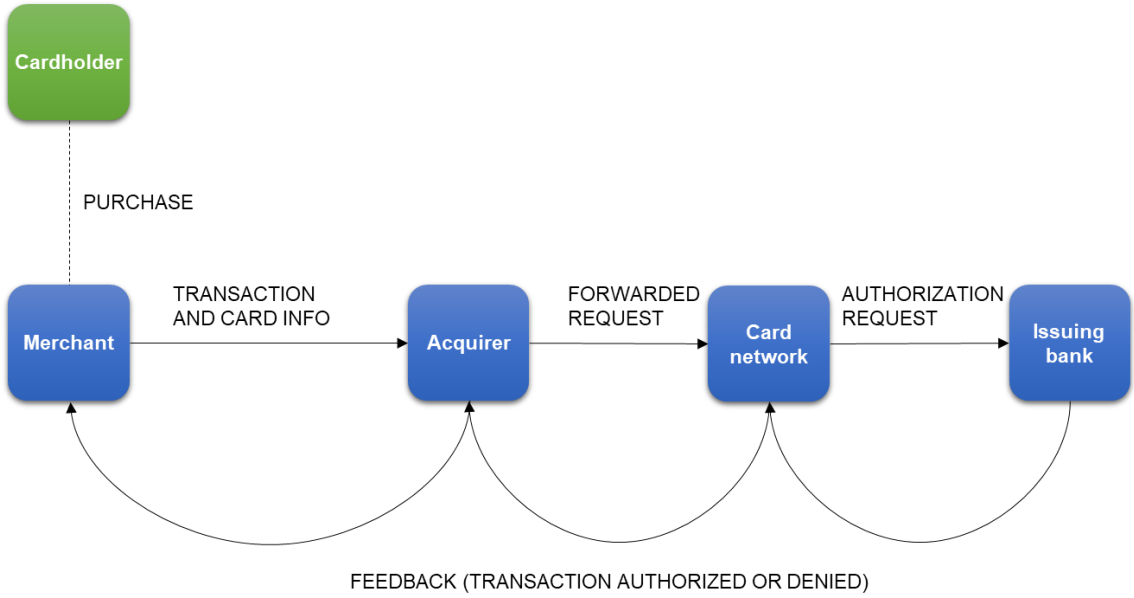
Merchants that take card payments are often served directly by an acquirer, which usually also supplies them with the necessary equipment (the card payment machine). Alternatively, the merchant might own a card terminal operated by a different software that, in turn, connects to the acquirer's payment system through a standardized interface. In both cases, the acquirer is providing a payment service.

The following step, transaction authorization, involves processing by a sequence of different companies (a diagram is presented in Figure 5). The simplest structure has the following parts:

- **Merchant**: after selling something, can take a card payment from the cardholder, swiping or inserting the credit or debit card in the machine (which, depending on the technology, is called pinpad, POS or payment terminal, more generally), inputting the transaction value and asking the customer to type a password (PIN or Personal Identification Number), if required
- **Acquirer**: receives the transaction data and forwards it to the credit/debit card network, requesting an authorization.
- **Card network (or schema or brand)**: a huge network, often international, connecting acquirers and issuing banks. For each transaction requested by an acquirer, it will contact the issuing bank to verify if there are enough funds or credit limit for the purchase and if the buyer identification is valid. According to the feedback received, the card network will authorize or deny the transaction
- **Issuing bank**: a bank at which the cardholder has an account. This institution is the one that issued the credit card to the buyer and, after receiving a transaction authorization request, will check the cardholder funds or credit position and deny or authorize the transaction. In case of authorization, the exact amount will then be deducted from the

cardholder credit limit (in credit mode transactions), from the cardholder checking account (in debit mode transactions) or from the card's funds (in the case of prepaid cards)

Figure 5: Flow of a transaction authorization



Source: developed by the author

After that, the authorization follows the reverse flow, from the issuing bank to the merchant, and this part of the process is completed. Though no money has been really transferred between accounts at this point, the authorization means that the authorized amount is already being held by the issuer bank. The merchant then receives the message through the system, notifies the consumer that the authorization was successful and the cardholder can take his/her card back.

Then, after the authorization, a receivable is created from this transaction, in favour of the merchant who sold the product.

Several days later, which is usually the time this process takes, money flows from the issuing bank to the merchant, who receives its share of the transaction value, in what is called settlement. In general, those times vary from a few days, for debit and prepaid modes, to approximately one month, for credit card payments. If a credit card purchase is paid in installments, the settlement might be divided over months as well.

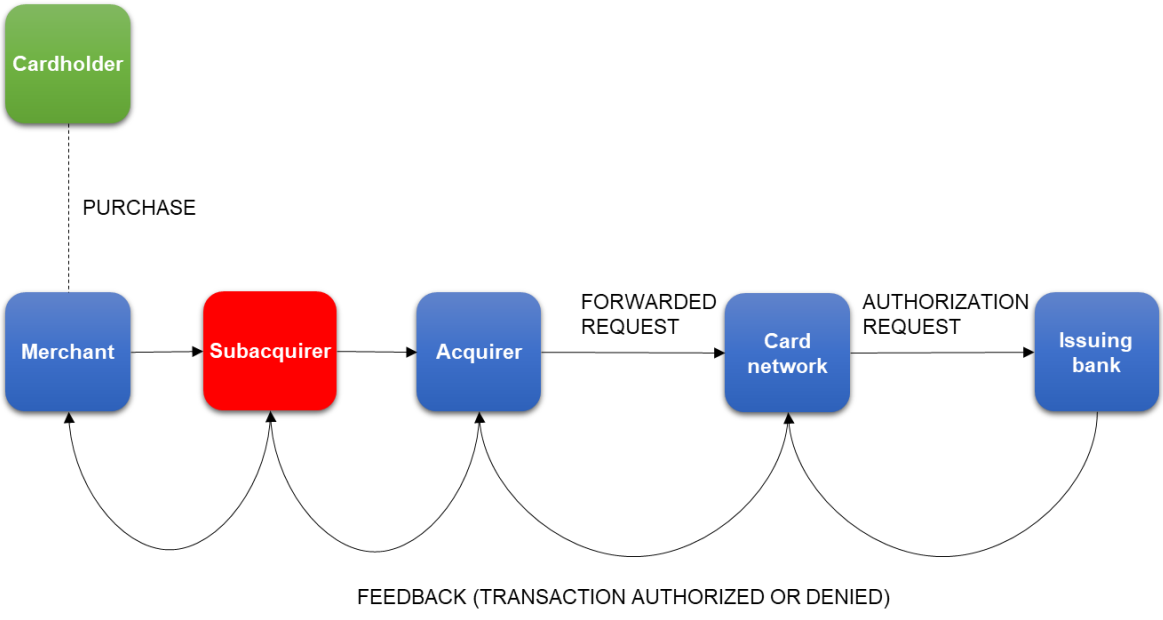
Each intermediator (bank, card network and acquirer) also receives its fee for its service. In this market, the total percentage discounted from total transaction value before the cash payment to a merchant is called MDR (Merchant Discount Rate). This rate is usually a minor percentage of the purchase value and represents a stream of revenue for the intermediators and is distributed among them, at pre-defined proportions.

After the settlement, a cardholder can still question a transaction that has been charged to his/her card, and a chargeback is done in case of proven fraud, a faulty product or an unsatisfactory service.

Additionally, there might be another service provider between merchants and acquirers – a subacquirer – acting as a payment intermediator that facilitates the use of payment systems by the former and aggregates additional services, offering complementary solutions like fraud prevention (in the event of fraud, a merchant might face losses and end up without receiving any payment). These intermediators also charge fees for their service, either fixed (e.g. a monthly price for the card machine rent or leasing) or variable (e.g. percentage rates and costs per transaction).

In this case, when a merchant has a contract with a subacquirer rather than with an acquirer, the transaction authorization flow slightly changes at the merchant end, changing the information flow as shown below in Figure 6.

Figure 6: Flow of a transacion authorization, with a subacquirer



Source: developed by the author

As it can be noted from the diagram, the authorization arrives in the end at the subacquirer system, through which merchants are notified whether the transaction has been authorized or not. The subacquirer becomes then the point of contact with the merchant, which will no longer communicate directly with an acquirer. Like acquirers, subacquirers will be paid their fees later on, after settlements.

In Brazil, the market has also seen its two major acquirers lose share, from 90% in 2010 to 73% nowadays (BRONZATI, 2018). Parallel to that, the product offering sharply increased – there are more than 200 companies competing now.

This movement has been possible thanks to recent changes in the regulation, made to reduce market concentration and stimulate competition. According to Chacon (2018), the last years have concentrated a more intense modernization in the country, with several important adjustments directly or indirectly related to this sector. Brazilian authorities started passing new rules and laws in the beginning of this decade. In 2010, after years of discussions on the subject, pressure from government agencies and an agreement signed by companies, the last exclusivity clause between each of the two major card networks and its exclusive acquirer expired –- until then, there was essentially a duopoly.

In 2013 and 2015, other laws and rules became effective, introducing compulsory registering and submission of certain information about institutions and centralization of some processes, under the national payments system.

Many other decrees and norms came into force, affecting taxes, credit cards installments and interest, banking service fees, etc.

The opening process of the acquiring market was gradual and initially based on a VAN (Value Added Network) solution. In this system, an acquirer's card machine could read and accept card brands with which the acquirer had an agreement and also accept other brands, by forwarding the data to another acquirer, which effectively processed and settled the transaction. The latter acquirer kept a higher percentage of the fees, while the former acquirer, that started the transaction, was usually paid a fixed fee per transaction. This model allowed merchants to reduce even more the number of POS they had to operate, making it possible to have only one machine, in theory.

Until 2017, more companies reached the status of full acquirers, leaving the VAN and connecting directly to more card networks, this time including the smaller ones. Full acquirers execute the whole cycle of a transaction, as opposed to the VAN model.

The offering in this market has also been evolving to a higher variety of integrated products, representing a new way to improve revenues or profits. Both fintechs and incumbents brought various new products to businesses and entrepreneurs, among physical or virtual services, for example:

- POS and card swipe machines, customized for small businesses (differences in hardware, compact or more sophisticated devices, among others)
- Gateways for the e-commerce: Internet-based payment platforms comprising in a single system many payment methods such as cards, electronic transfers, “boleto” bank payment slips, etc.
- Softwares integrated to the payment solution: functionalities such as sales management, dashboards and reports, access through mobile applications, cloud based systems and features alike
- Digital banking accounts: simplified accounts that could replace some services traditionally offered with saving and checking accounts by retail banks.
- Pre-paid cards: they are a form through which merchants can receive their share of transactions values after a settlement. The merchant owns a card and the acquirer or subacquirer recharges it with the payment amount. It might be an alternative to entrepreneurs that cannot afford business credit cards
- Split payments: business owners, instead of receiving money from a card transaction and distributing commissions and tips to employees afterwards, can opt for splitting a payment directly into many banking accounts (belonging to different people). It might be interesting for hair salons and restaurants and similar services, for instance. A two-step payment is taxed twice because there are two transfers, while a direct split is taxed just once.

With such transformations, the payment industry is certainly increasing in complexity, a phenomenon that poses new challenges to its players. Nevertheless, this change also represents an unprecedented opportunity to develop more tailored products designed for a big number of customers with particular needs.

1.1. ABOUT THE INTERNSHIP

The present work was written in parallel to an internship at Perfe (fictitious name used to keep its real name secret), a subacquirer whose main product is a physical card payment system (using a pinpad).

The author of the present work is an intern at the company, working in the competitive intelligence area.

A more detailed description of the company and its business is provided in a later section.

2. THE PROBLEM

2.1. DEFINITION OF THE PROBLEM

The competitive characteristics of the industry and its current situation of intense growth suggest that subacquirers should be aware of their market dynamics and able to detect trends and opportunities inside it. Thus, the challenge is a competitive intelligence question: how to monitor an environment with so many players (among direct competitors, new entrants, incumbent banks, technology companies that began offering financial products and others) and a complex, heterogeneous market of customers, especially when it is all under rapid transformation.

The objective of the present work is to propose a competitive intelligence solution to be applied to a subacquirer and to analyze some aspects of its operation and related concepts from a critical point of view.

2.2. PERTINENCE AND RELEVANCE OF THE PROBLEM

From a macro perspective, major changes are expected to impact the financial sector in the next years, driven by the development and application of new technologies and the revision of regulations by national governments and authorities on the financial industry. This sector, other than having an important size on its own, lives with the interest of big non-financial stakeholders (e.g. “tech giants”), attracted by multiple business opportunities and possible partnerships with the financial industry. As a result, understanding this particular market requires a dedicated effort, since it is complex with many players, from many fields, and there is the possibility of any of those players becoming a fierce competitor in a relatively short time – either through vertical expansion or new ventures, for instance.

It is also expected that the current landscape, with hundreds of subacquirers and many more lateral competitors, is not sustainable in the long run and will eventually shrink, when the majority of those companies shut down or leave the market. In this context, staying competitive demands adequate strategies and a vision of where to compete, at the right time.

This study will also discuss various consolidated theories and frameworks, applying each one of them to solve a specific part of the central problem, and identify how the relate to each other and what issues emerge from their combinations.

3. LITERATURE REVIEW

This section will present theories and concepts that are useful for analyzing strategic issues and developing intelligence solutions.

3.1. STRATEGY

According to Carvalho and Laurindo (2012), one of the main points about strategy is being able to choose what to do or not to do. This choice should be understood as an open question and each aspect of it is wide – "how will the company compete?", "what should be the targets in this process?", "what policies are necessary to the achievement of each target?"

Along this decision-making, there are two groups of factors that serve as inputs to be considered before the final choice:

- the (external) competitive environment in which the company is (or intends to enter)
- the company's own internal characteristics

Several frameworks have been proposed for analyzing such factors (external/internal) and some of the classical ones are detailed below

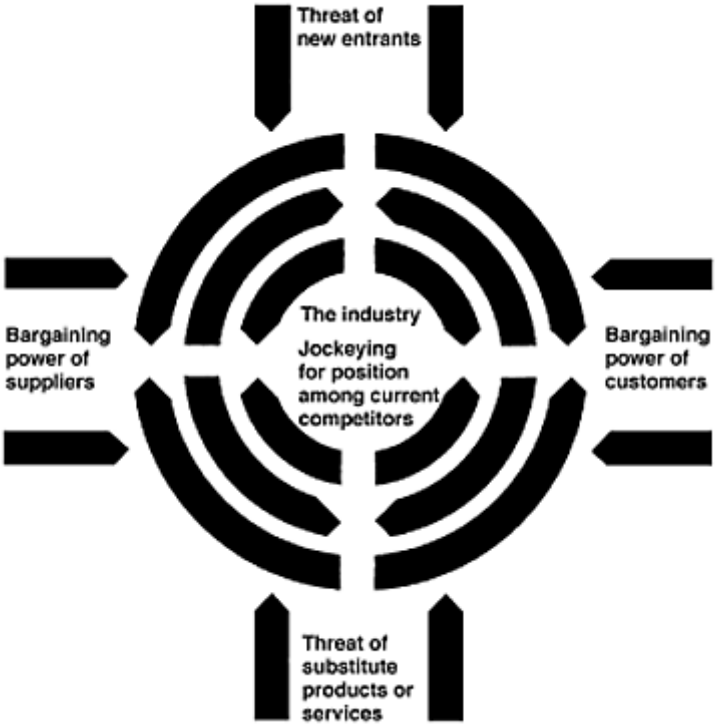
3.1.1. Porter's Five Forces

This model relates to the external factors of strategy and is a perspective of a given competitive environment. Porter (1979) listed five possible sources of competition and bargaining within an industry, as shown in Figure 7.

- Rivalry among existing competitors: represents all the direct competitors of the industry – for example, companies that already offer the typical product (intended as good or service) of that industry
- New entrants: the set of all companies that are not part of the industry in question but may enter it in the future. An entrant either comes from another sector or is a new venture
- Substitute products: behind this force are companies offering products that might be sold in the market as substitutes for the current products marketed by the industry under consideration. Such substitutes are not identical to those products, rather they have some common functionalities or satisfy similar customer needs

- Bargaining power of customers: are imperfections caused by economies of scale, market concentration, etc.
- Bargaining power of suppliers: an analogous situation applied to the industry and its suppliers

Figure 7: Porter's Five Forces Elements



Source: Porter (1979)

This analysis can work as a guide to the company, indicating what kind of competition (including competition among suppliers or buyers) it should be aware of.

3.1.2. PESTEL Analysis

Richardson (2017) tells the history behind the PESTEL framework:

> Originally conceived as ETPS (a mnemonic for the four sectors of his taxonomy of the environment: economic, technical, political, and social) by Francis J. Aguilar (see his 1965 Harvard dissertation entitled "Formulating Company Strategy: Scanning the Environment" which was later published as Scanning the Business Environment in New York by Macmillan, 1967).

> A little later in the 1960s, Arnold Brown for the Institute of Life Insurance reorganized it as STEP (or strategic trend evaluation process) as a way to organize the results of his environmental scanning. See his Supermanaging: How to Harness Change for Personal and Organizational Success with Edith Weiner (New York: McGraw Hill, 1984).
>
> Thereafter, this macro external environment analysis, or environmental scanning for change model, was modified yet again to become the so-called STEPE analysis (i.e., the social, technical, economic, political, and ecological taxonomy). Note that the final E has been a grab bag of strategy, politics, behavior/culture, staff, processes, and architecture (see, for example, Thomas H. Davenport and Laurence Prusak's Information Ecology: Mastering the Information and Knowledge Environment (New York: Oxford University Press, 1997).
>
> […]
>
> Even more recently, the L for legislative or legal concerns has also been added, [...]

This framework enumerates six categories of external factors that shape environmental and local conditions relevant to the particular market. Its first version was created in 1967 and originally named "ETPS". Later, the acronym has been expanded to PESTEL, including the following clusters of factors:

- **Political**: any political orientation or policy that the government follows and may impact business
- **Economic**: a wide range of circumstances related to the local or global economy – for instance, production costs, family income trends, economic stability in the country, crises, interest rates and international trade
- **Social**: changes in the population and aspects that drive individual or collective behavior, including cultural characteristics. Examples are social habits, preferences, mass effects and trends. It is important to note that not all of such behaviors are always rational
- **Technological**: involves the scientific development of new technologies that may be applied to the product or the production process, the adoption and diffusion of basic technologies by stakeholders (from suppliers to customers) and any limitations due to those factors
- **Ecological**: standards, best practices and restrictions that must be observed (or should be observed, in case the company wants to brand itself as "green"). Frequently, not only

does this question concern a company's internal processes, but it also involves the whole supply chain (e.g. suppliers complying with environmental standards or not)

- **Legal**: laws might represent constraints to a company's operations, imposing what is prohibited or mandatory, or what its rights are. Doing something illegal puts companies at a high risk (in several cases, resulting in heavy penalties)

Unlike Porter's Five Forces model, it takes into account factors that are more distant from a company's supply chain and competitor products, but still relevant to its environment. In other words, it shifts focus from supply chain and competition aspects to questions that are more inherent to the society and more external to businesses.

In the end, a complete PESTEL analysis help the company define what it can or cannot do, given its present and expected future environments.

3.1.3. Core competencies

Moving on to internal strategic factors (on a company level), it is necessary to have a perspective on the characteristics that determine competitive advantage. It is essential for organizations to identify the most important competencies that are needed for building a sustainable advantage over time (RABECHINI JR.; CARVALHO, 2003[2] apud CARVALHO; LAURINDO, 2012)

Prahalad and Hamel (1990) introduced the concept of core competencies. They start their reasoning with a proposition: that the concept of corporation should be rethought. Even big companies that did not do so could risk losing their leadership to rivals taking a new approach, not strictly focused on totally independent and decentralized business units anymore.

The problem with the old vision is that it is no longer enough to simply choose one isolated business unit at a time and conquer its end product market. This method became almost impossible (or, at least, unsustainable), given that market boundaries are changing more quickly, new markets are invented or transformed, new entrants emerge quickly and customers choices/preferences constantly evolve (and are influenced by what the market introduces).

[2] RABECHINI JR., R.; CARVALHO, M. M. O perfil das competências em equipes de projeto. **Revista de Administração de Empresas – RAE Eletrônica – FGV**, São Paulo, v.2, n.1, 2003.

Hence, a company's management should create an organization that is capable of react to those dynamics and be flexible to innovate when needed.

A better view should cut across many different business units, finding core competencies and core products that are common to more than one area of the corporation. Core competencies should be jointly developed by these departments, or acquired through collaborative arrangements (strategic alliances for technology access, as an example). In the end of the process, there must be a consolidation of technologies and skills across the corporation divisions. More than that, "it is also about the organization of work and the delivery of value" – this integrated understanding should belong not only to managers, but also to employees at all hierarchical levels, again to allow quick responses and innovation.

One of the possible related questions is understanding how different businesses may overlap in the future, and what possibilities will be opened for those able to combine multiple core competencies.

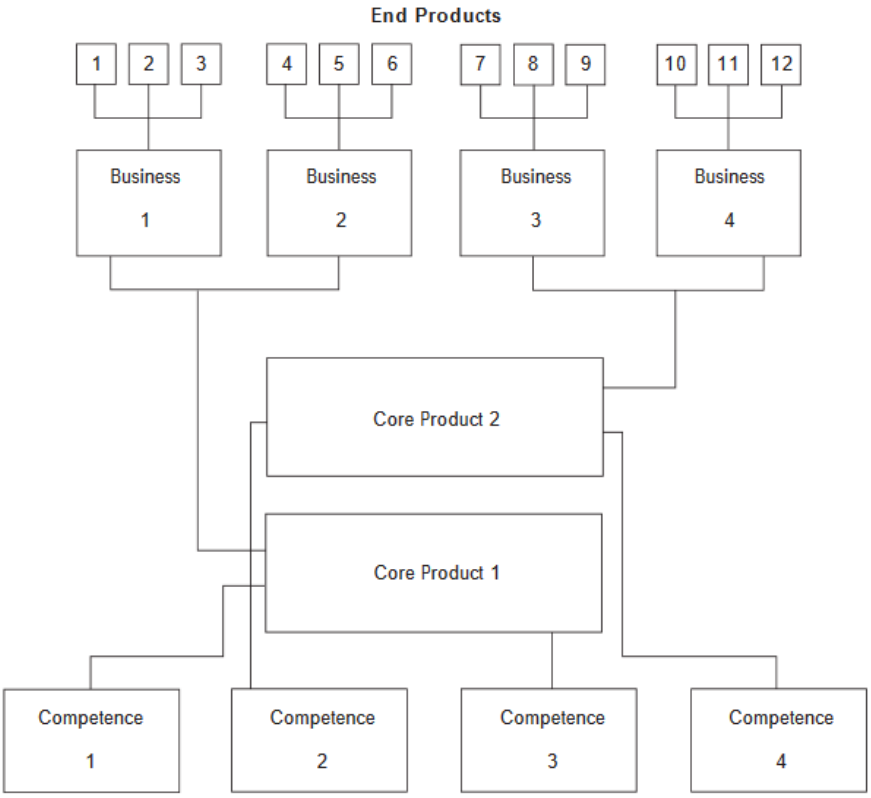
According to these authors, a company must identify, develop and explore such competencies (that will "spawn unanticipated products"), ideally in a more cost-efficient and speedily way than its competitors, in order to sustain long-term advantage.

In short, the idea is to leverage on abilities, technologies and know-how that will allow synergies and lower costs in the overall production flow. Core competencies support the creation and making of core products, which are then either marketed or used internally as components/inputs/resources for end products (in the context of a big corporation, this also happens across different business units). A company should concern about keeping a good portfolio of competencies, not a portfolio of businesses.

The authors also compared the core competencies theory to the structure of a tree, represented in Figure 8:

> The diversified corporation is a large tree. The trunk and major limbs are core products, the smaller branches are business units; the leaves, flowers, and fruit are end products. The root system that provides nourishment, sustenance, and stability is the core competence. You can miss the strength of competitors by looking only at their end products, in the same way you miss the strength of a tree if you look only at its leaves.

Figure 8: The tree view of core competencies



Source: Prahalad and Hamel (1990)

Corporations that do not grasp the idea of core competencies and have a limited view of business units may sell one of its divisions, ignoring the fact that such a decision might result in losing an important competence or opportunity. Similarly, if a company sees competitiveness as a mere function of price and performance, it is missing the core competence point – and outsourcing or external suppliers will not solve their problem in the future. As already mentioned before, a player without core competencies will have nothing more than a weak competitive advantage. Another downside of the SBU (Strategic Business Unit) approach is that, in this scenario, competencies are only developed internally to business units and stay imprisoned there forever, not reaching nor helping other business units from the same company.

Even when a corporation decides to leave an industry, it does not necessarily have to kill and abandon all the related core competencies, as it could ultimately mean giving up on future business opportunities emerging from new applications and further improvements of the same competencies.

It should be noted that “products” may refer to tangible goods or services, so this concept applies to any kind of economic activity in which there is competition.

Regarding the selection of core competencies by an organization, the authors suggest that it must end up with around five or six competencies at most – if more has been identified, it is probable that some of them should be crossed out. A test for checking appropriateness and relevance of a candidate is simultaneously satisfying the three conditions below:

- The competence provides the company with access to a wide variety of markets
- The competence effectively contributes to an end product’s value, from the customer benefits point of view
- It is difficult enough for competitors to reproduce the competence

After being properly identified, each core competence should, if it already exists, be maintained and updated (e.g. through better practices, improvement or adoption of new technologies) or, if it doesn’t exist yet, be developed, in order to sustain long-term competitive advantage.

3.1.4. SWOT

Subsequently to the analyses of external and internal strategic factors, all points raised should be synthesized into an integrated model to establish connections among them and understand what they mean to the business.

Each of those points (and their implications) has two main characteristics. First, it is either positive (“good”) or negative (“bad”) to the company. Second, it is related to either the external environment or the internal aspects of the organization in question.

This leads to four possible buckets into which an element may fall. They are known as SWOT, standing for Strengths, Weaknesses, Opportunities and Threats. Figure 9 shows the structure of a SWOT analysis and each bucket is detailed below:

- **Strengths**: internal characteristics of a company that are favorable to it, against its competitors. Examples are distinctive competencies, position in the market and tangible/intangible assets.

- **Weaknesses**: internal characteristics that have a negative impact on the company's competitive advantage. Examples are lacks, absences or inefficiencies of some competence or asset.
- **Opportunities**: possibilities, dictated by environmental contexts, that the company may pursue and explore to grow or improve its business. For example, new segments or geographical markets, new deals within the supply chain, following recent social/technological/ecological trends and exploring new possibilities created by changes in regulation.
- **Threats**: any external agent or move that might harm the company in the future. They can be derived from Porter's Five Forces, for example, or involve any other stakeholder related to the industry.

Figure 9: SWOT analysis structure

	POSITIVE	NEGATIVE
INTERNAL	Strengths	Weaknesses
EXTERNAL	Opportunities	Threats

Source: developed by the author

This analysis gives the organization some directions. Some of the actions that can be taken following a SWOT are: leveraging on strenghts, keeping them updated, working on weaknesses and overcoming them, evaluating opportunities and develop ideas, defending against identified threats.

3.1.5. Other topics on strategy

Following the discussion on the definition of strategy, Henderson (1989) identified basic elements of a competitive strategy:

- The ability to understand competitive behavior as a system in which competitors, customers, money, people, and resources continually interact
- The ability to use this understanding to predict how a given strategic move will rebalance the competitive equilibrium
- Resources that can be permanently committed to new uses, even if they do not bring immediate returns
- The ability to predict risk and return with enough accuracy to justify those new uses of resources
- Willingness to take action

The concepts above depict what kinds of questions should be answered in a strategic analysis. It also highlights that specific resources and investments are needed in the process and focuses on the predictive ability of the strategy function.

Still on the theme of business strategy aspects, Mintzberg and colleagues (2000) identified the common characteristics below:

- Strategy concerns both organization and environment – inseparability of organization and environment, the former uses strategy to deal with changing environments
- The substance of strategy is complex, because change brings novel combinations of circumstances to the organization. It remains unstructured, unprogrammed, nonroutine, and non-repetitive
- Strategy affects overall welfare of the organization
- Strategy involves issues of both content and process, i.e., the actions taken and
- the processes by which actions are decided and implemented
- Strategies are not purely deliberate – intended, emergent, and realized strategies may differ from one another."
- Strategies exist on different levels: corporate strategy (What businesses shall we be in?) and business strategy (How shall we compete in each business?)
- Strategy involves various thought processes, conceptual and analytical exercises.

Some of the concepts above can be extended as well. The notion that strategies exist on different levels, for instance, applies not only to big corporations, across their business lines and under the corporate umbrella, but also to smaller companies, in which product lines strategies should be aligned with the higher level company strategy.

3.1.6. Dimensions of competitive strategy and strategic groups

In a more detailed view, a company's strategy has multiple dimensions. A strategy is made of choices and postures that involve several areas and these areas are the origins of the company's advantage. Porter (1980) listed the dimensions that characterize the many existing options for a company competing in a given industry:

- **Specialization**: a strategy may determine that a company will offer a wide line of products or a limited selection of them, or even specialize in certain customer segments or geographic markets.
- **Brand identification**: this dimension relates to the decision about whether the company will seek to build a strong brand or compete based on other characteristics (for example, price). Those pursuing brand identification need to dedicate efforts in advertising, sales, marketing, etc.
- **Push versus pull**: sales to end customers may be driven by the brand identification that a company builds or by the support of distribution channels.
- **Channel selection**: distribution channels can be company-owned or third-party outlets, specialized or not.
- **Product quality**: to position itself, a company must decide what the quality of its products will be and choose adequate raw materials, technical specifications, tolerances, features, and so on.
- **Technological leadership**: defines whether a company will seek technological leadership and the role of introducing technological innovations, or will be mainly a follower and imitator. Technology and quality are not directly correlated, thus it is possible to combine technological leadership and lower quality, if a company wants to do so.
- **Vertical integration**: a company may be more or less integrated in the production chain. Forward (distribution and outlets) and backward (suppliers of materials and services) integration increases the capture of value by the firm.
- **Cost position**: a company may choose to seek a low-cost position, which requires investment in facilities and specific equipment.
- **Service**: the firm can offer ancillary services, such as assistance and customer service.

- **Price policy**: the profitable range of price positions for a product has a lower limit defined by costs, which are affected by product quality, even though, a company can manage price and adjust it to different levels.
- **Leverage**: related to financial and operating leverage.
- **Relationship with parent company**: if the firm has a parent company, it will be subject to external commands and decisions. It could be a unit of a diversified conglomerate, a unit of a vertical business, a part of a cluster or a subsidiary of a foreign group. This relationship will influence the objectives of the management, the resources that are made available to the company, what functions must be shared with other units and what the firm must supply to other units.
- **Relationship to home and host government**: governments can provide resources to firms or assist them, as well as impose regulations and restrictions. Multinational companies can be affected in their home country and by local governments in countries where they are present.

The strategic dimensions mentioned above can describe, in general terms, the strategy of a firm, highlighting most of its aspects. There might be also other relevant dimensions that were not presented here.

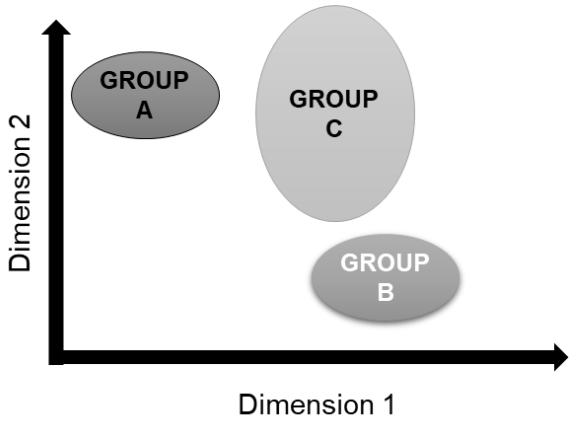
Some of the dimensions can be related – for instance, price policy and cost position. Moreover, a company must choose its positions for each strategic dimensions such that their entire set is internally consistent, meaning that all the dimensions must be compatible among them.

Because of the existing relationship among strategic dimensions, as explained previously, it is natural that, in a given industry, the positions of all companies will be concentrated in few clusters, which represent the most viable and consistent strategies.

It is common to observe that, in a industry, competitors are grouped in such clusters, that are called strategic groups. They are also result of the internal characteristics that each firm has, as well as influenced by history and backgrounds.

This concept can be illustrated with a map, as shown in Figure 10. In this chart, called strategic group map, each axis represents a strategic dimension, and the companies or groups are plotted as points according to their strategy.

Figure 10: A strategic group map



Source: developed by the author

It is expected that companies from the same strategic group will react similarly to a given external phenomenon, because their similar strategic positions should require the same sort of response.

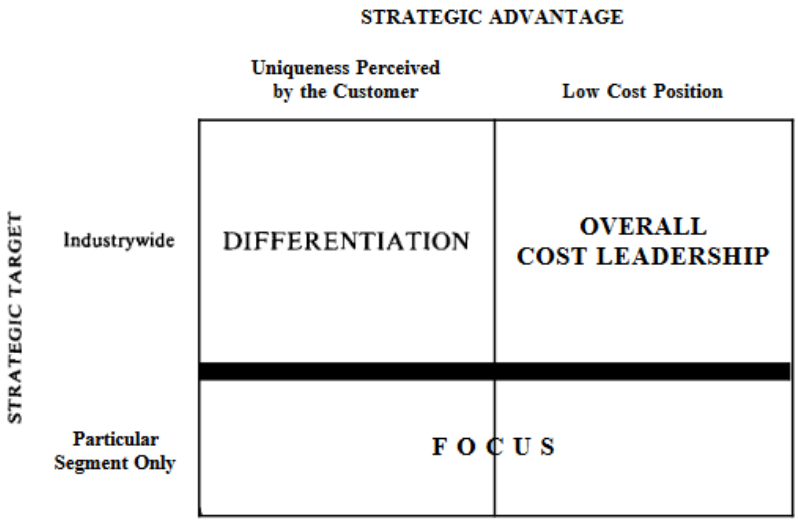
Strategic groups also differ when it comes to entry barriers (barriers to new entrants in the industry). More generally, there are also mobility barriers for companies that are inside the industry and tries to change its strategic position, moving along the dimensions. All these barriers can vary from group to group, implying that some strategic groups can be more protected from competition than others. This difference influences profitability, in the end, and is a persistent advantage for firms benefited by the barrier. In some cases, mobility barriers can be built through investments with a long-term return and a high associated risk of unsuccess.

Another difference among groups are that their exposure to the industry's competitive forces may vary as well. Different groups can be more or less vulnerable to the bargaining power of customers and suppliers, the threat of substitutes, or even the rivalry among existing competitors in the industry.

3.1.7. Porter's generic strategies

Porter (1980) defined "three internally consistent generic strategies (which can be used singly or in combination) for creating […] a defendable position in the long run and outperforming competitors", as illustrated in Figure 11.

Figure 11: Three generic strategies



Source: Porter (1980)

Each of the three strategies is a combination of two options: first, if the target is the whole industry or a particular segment (or a subset of the industry with more than one segment); second, if the strategic advantage stems from a unique characteristic of the offering or from a lower cost relatively to competitors.

3.1.7.1. Overall cost leadership

This position is achieved through the implementation of specific functional policies, making use of efficient-scale facilities, cost reduction enabled by accumulation of experience, financial control, for instance. In spite of such orientation, there are minimum standards regarding quality and service level that always must be observed.

One upside of this strategy is being a way to maximize profits and returns. According to the microeconomics theory, companies capable of keeping the lowest costs are the fittest to survive in competition. Low cost structures are also a defense against all the five Porter's competitive forces.

Some of its downsides is that it often requires overcoming a scale barrier, having a high market share, forcedly building volume, a more complex design of products and production systems, heavy capital investments, facing significant start-up financial losses and/or aggressive pricing.

3.1.7.2. Differentiation

As shown in Figure 11, differentiation is marked by a uniqueness of products and services that is perceived as such industrywide and not only by part of the market.

The differential may be in a good design, a distinctive brand image, a technology, a special feature, a better customer service, a dealer network, etc. A single product can have more than one unique characteristic.

Usually, the process of designing, producing and distributing a differentiated product implies higher costs and, as a result, cost minimization cannot be a primary objective in a differentiation strategy.

From an economical perspective, the uniqueness of a product justifies a higher price that, in turn results in increased profit margins. This fact by itself may preclude the need for having a high market share to be profitable. Furthermore, in some cases, a differentiated product must be seen as something exclusive, a status that is incompatible with a mass product with a huge market share.

3.1.7.3. Focus

This generic strategy's main point is focusing on a particular segment, be it in terms of product line, geography or other characteristics of buyers. The idea is to tailor the company's activities and offering to serve the targeted customers in a manner that competitors serving the whole industry cannot.

However, the possible strategic advantages remain the same: cost leadership and differentiation, no more at the whole industry level, but within a narrow part of it. Sometimes the target is a segment that is less vulnerable to substitute products, or a specific group in which competitors are not so present and strong.

Focus strategies have an intrinsic limitation in terms of sales volume, that will be, at most, only a fraction of the entire industry.

In order to stay competitive, it is important for a company to successfully adopt at least one of the three generic strategies. If none of them is achieved, the firm is "stuck in the middle", as the author writes, because this position is a poor and risky situation and lacks a solid competitive advantage.

As a result, the company's fate is low profitability and it may lose ground in the future, eventually being pushed out of the market.

Not all the generic strategies are always viable in every market, for several reasons. For example, a particular industry might have no opportunities for differentiation.

Last, each of the strategies are associated to its own risks, caused by internal failures or changes in competition and in the market. These issues are described below.

The risks of overall cost leadership are: technological changes that make past capital investments or past learning useless, low-cost model imitation by rivals, competitors developing low-cost models quickly by acquiring technology, inflation in costs caused by external economic conditions that threat the company's low-cost model and ignoring important market signals/demands because of an excessive attention placed on cost.

A differentiation strategy involves the following risks: a sharp increase in the cost differential between low-cost competitors and the unique product that becomes too expensive and loses appeal, a change in buyers' needs for differentiation and an introduction of sophisticated imitations by competitors.

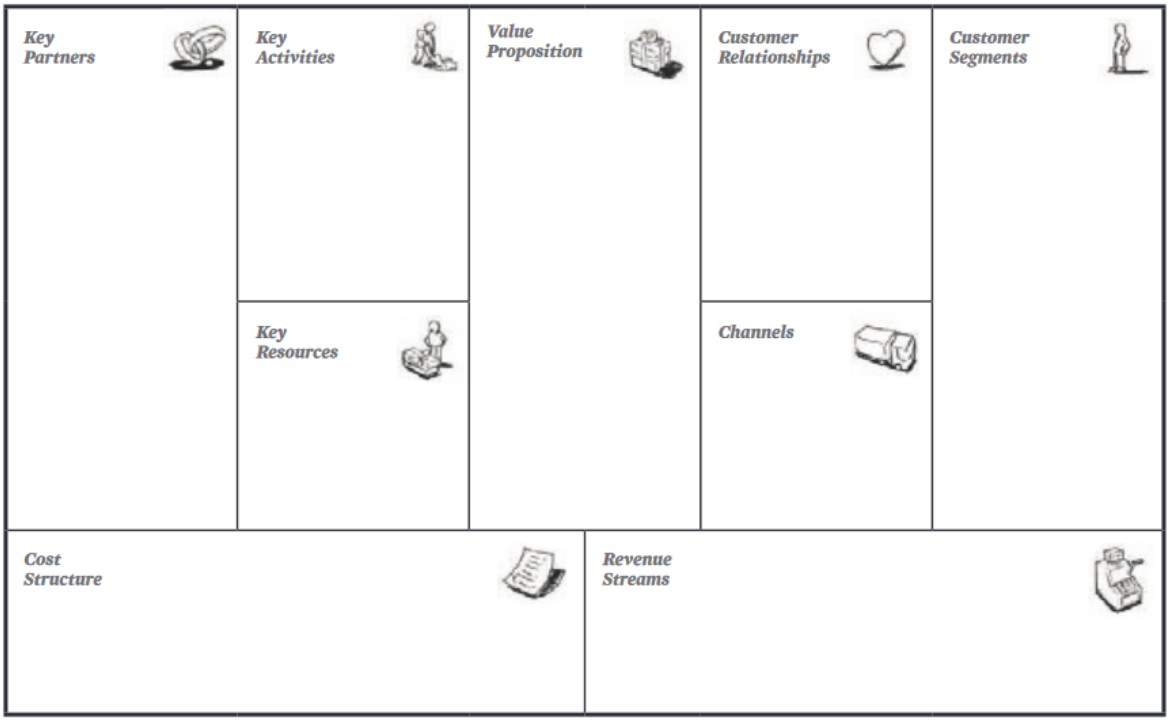
The risks related to a focus strategy are: the cost for the focused firm increases and becomes much higher than broad-range competitors, nullifying focus advantages; the desires of the targeted segment and the whole market get closer to each other, with no reason to maintain the focus; the possibility of a competitor finding a submarket within the company's targeted segment.

3.2. BUSINESS MODEL CANVAS

According to Osterwalder and Pigneur (2010), "a business model describes the rationale of how an organization creates, delivers, and captures value". They use nine building blocks to describe this logic, covering four bigger areas: customers, offer, infrastructure and financial viability.

All those blocks are put together in a diagram, the Business Model Canvas, as shown in Figure 12. Each of its parts is explained in more details below.

Figure 12: A blank Business Model Canvas



Source: Osterwalder and Pigneur (2010)

The nine building blocks and their contents are:

- **Key Partners**: suppliers and other partners of the business. Especially important in outsourcing cases, partnerships can be as complex as networks or multicompany alliances. There are four examples of relationships: strategic alliances, *coopetition*, joint ventures and buyer-supplier partnering. Depending on the business model, partners may be suppliers of Key Resources or responsible for performing Key Activities. Some of the reasons why partnerships are optimizing production and achieving economies of scale, minimizing risk and uncertainty (e.g. companies developing together standards or technologies in an industry) and acquiring resources that are essential for a given product.
- **Key Activities**: "the most important things a company must do" in order to deliver its Value Proposition, reach its customers, create and nourish relationships with them and

generate revenues. Three categories are identified: production activities (from design to manufacturing and delivery), problem solving activities (for solving customers' problems) and platform/network activities (such as softwares, systems and web services).

- **Key Resources**: the main assets required by the business model. According to the authors, these resources can be physical (e.g. "manufacturing facilities, buildings, vehicles, machines, systems, point-of-sales systems, and distribution networks"), financial (e.g. cash and credit), intellectual (e.g. "brands, proprietary knowledge, patents and copyrights, partnerships, and customer databases") or human (mainly in industries that are knowledge-intensive or creative, for example) – in other words, any kind of tangible or intangible asset. Such resources can also be owned by the company, leased or acquired from a third party.
- **Value Proposition**: describes the products and services offered and their value to customers. This block explains what a customer gets and gains when acquiring the product, and why he/she chooses this company over other competitors (differentiation). Value can be defined in terms of what customer problems are solved and what customer needs are satisfied. Proposed values can be related to newness, improved performance, customization, design, brand status, price, cost efficiency, risk reduction, accessibility, convenience or usability, for instance.
- **Customer Relationships**: they must be established and maintained, contributing to customer acquisition, retention and boost sales. Relationships can be personal or automated (or even hybrid, omnichannel). Sometimes, they involve giving customers a promotional benefit. Examples of categories are: personal assistance, dedicated individual advisory, self-service, automated services, user communities on the Internet and co-creation.
- **Channels**: this building block describes how a company reaches its customers. Essentially, there are communication, distribution and sales channels, covering all the phases in which there is contact with buyers: brand and product awareness, offering evaluation, purchase, delivery and after sales. They heavily influence customer experience and should be well designed to ensure customer satisfaction. Examples of channels are physical own stores, wholesalers, retailers, online stores and sales representatives.

- **Customer Segments**: they represent the target chosen by the company. Segments have common traits, such as needs and behaviors. Among segments, differences lie in which offering is more suitable, diverse distribution channels, types of relationships, profitability levels and willingness to pay. A company can address the mass market, focus on one or more niches/segments or even serve a multi-sided market (in which multiple players and parts are customers, in a way).
- **Revenue Streams**: revenues originate from the right side of the canvas, where the customers are. This block comprises the core gross revenues, obtained through different pricing strategies – flat or variable, with or without bargaining, dynamic or not. The authors identify two basic types of Revenue Streams: one-time customer payments and recurring payments. There are many forms of them, among which physical goods sales, usage fees, subscription fees, renting/leasing, content/technology licensing, brokerage fees and advertising.
- **Cost Structure**: costs are incurred in the operation of a business and are consequences of all the previous building blocks of the canvas, particularly on the left side (Key Partners, Key Resources and Key Activities). Costs are divided into fixed and variable and, depending on the opportunities, can be reduced through economies of scale or scope.

The Business Model Canvas is proposed as a tool for planning a new company or reformulating an existing business, but it is also useful for representing the business model of any organization.

3.3. BUSINESS INTELLIGENCE

Vercellis (2009) explores the subject of business intelligence, or BI. He defines it as “a set of mathematical models and analysis methodologies that exploit the available data to generate information and knowledge useful for complex decision-making processes”.

The “available data”, nowadays, exist in large amounts and may have different origins, contents and representation. Some examples are commercial transactions, financial records, e-mails, texts and other documents. Their availability and accessibility is possible thanks to low-cost data storage technologies and widespread communication technologies such as the Internet.

Their content is valuable, in the sense that it can be converted into useful information and knowledge, through methods and models and using technological tools, ultimately guiding choices and decisions made by managers or authorities.

The ability to make decisions is of great importance for the performance and the competitive strength of organizations. In spite of that, it is historically known that most decisions are made using easy and intuitive methodologies, primarily based on experience and personal knowledge. These approaches are inappropriate in an economic environment marked by unstable conditions and rapid changes. Other than that, processes are also too complex. For these reasons, a more analytical and rigorous approach is required.

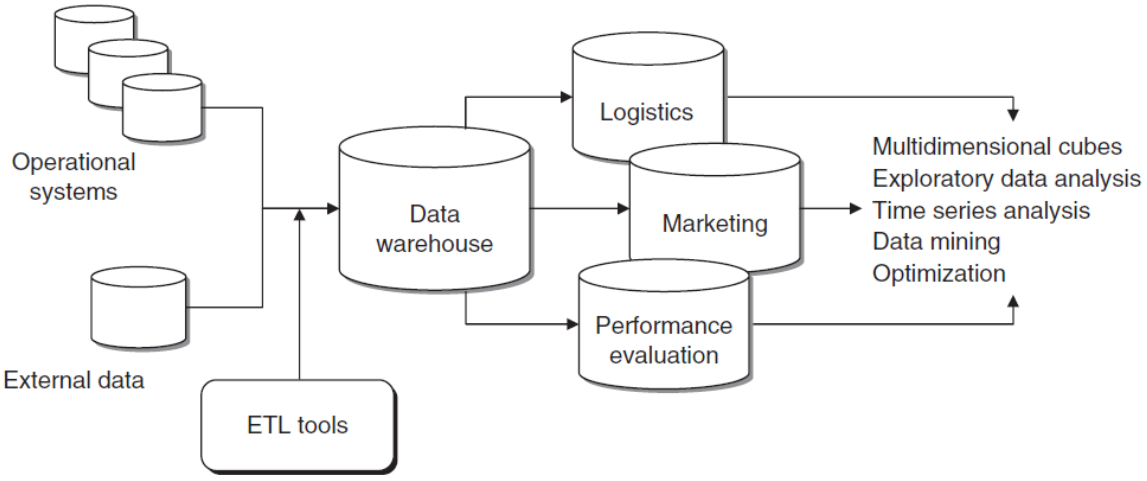
BI systems are a solution to that. One of their purposes is “to provide knowledge workers with tools and methodologies that allow them to make effective and timely decisions”. The effectiveness results from rigorous analytical methods, which generate dependable knowledge and allow deeper comprehension of the applied logic, higher accuracy and the analysis of a large number of alternatives. The timeliness is achieved through computing or automation and is a critical factor for the success of a company in a market.

In business intelligence systems, there is the transformation of data in information and, finally, in knowledge. Data can be understood as a codification of entities or facts that are originally stored within information systems kept by organizations, in a form that cannot be used directly in a decision-making without prior processing. Information is obtained after extracting and processing data, being more meaningful (at least for people in a specific domain or context). Knowledge is information “put to work”, used to make decisions and develop actions along with other inputs such as the experience and competence of a decision maker.

In this process, BI makes use of mathematical models and concepts, from the mere calculation of totals and percentages to optimization and learning algorithms. It is, in general terms, a scientific and rational approach to decision-making.

A BI system typical architecture is represented in Figure 13 and is composed of data sources, data warehouses/data marts and business intelligence methodologies, which are explained in more detail below.

Figure 13: The architecture of a BI system



Source: Vercellis (2009)

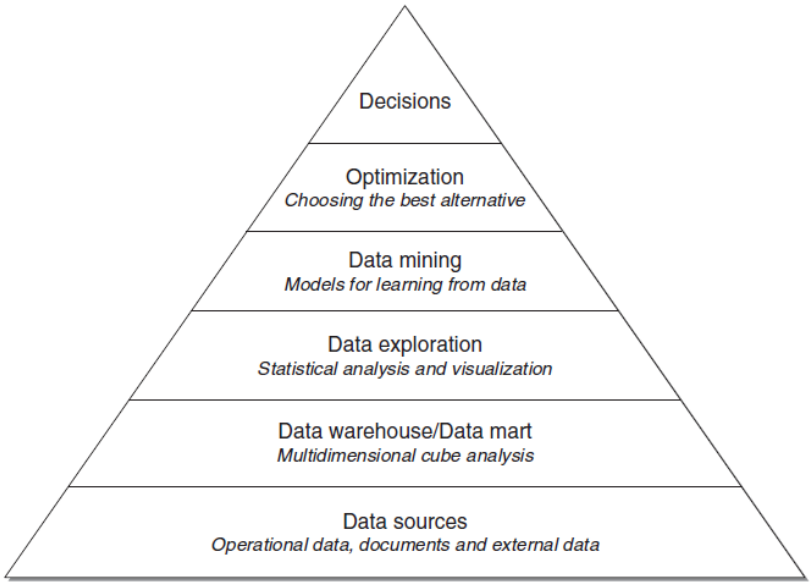
Data sources are the first elements, from which data is gathered and integrated. Sources can be either primary or secondary, contain structured data retrieved from operating systems or unstructured data such as generic documents, and their origins and types are often heterogeneous. All the data coming from multiple data sources must be unified and integrated later.

Data warehouses (DW) and data marts (DM) are bigger databases that are specifically set up for the BI system. As input, they receive data that are extracted from sources, transformed and loaded into the database, through a process or tool knows as ETL (Extract, Transform and Load).

Business intelligence methodologies are the end components of a BI architecture. These methodologies are implemented as decision support applications that consume data extracted from data warehouses and/or data marts. Examples of mathematical models and kinds of analysis that belong to this group are: multidimensional cubes, exploratory data analysis, time series analysis, inductive learning models for data mining and optimization techniques.

The parts of a BI architecture have been presented above, but a whole BI system is not just made of its architecture. Actually, the latter corresponds to the two basic building blocks of a complete business intelligence system and there are more components, as depicted in Figure 14.

Figure 14: All the components of a BI system



Source: Vercellis (2009)

Data exploration comprises statistical, visualization and reporting tools used for passive business intelligence analyses, i.e., in which decision makers design the analysis and define the criteria manually.

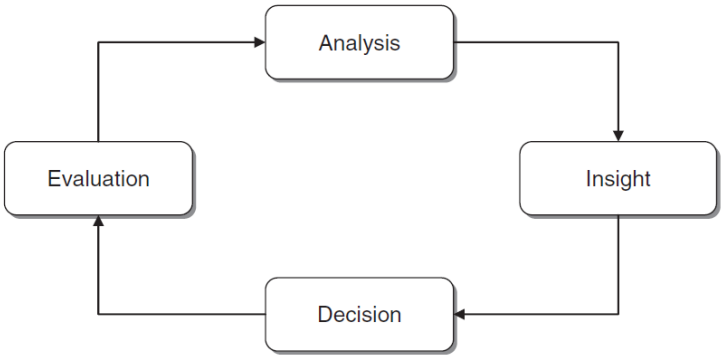
Data mining consists in active business intelligence methodologies for extracting information and knowledge from data. It may involve mathematical models for pattern recognition and machine learning. Analyses are run without the intervention of decision makers, who just use the outputs later to decide.

Optimization is helpful when it is necessary to determine the best solution out of a huge set of alternatives, during a decision-making process. Some categories of this problem can be solved with the application of mathematical techniques, or a heuristic approach can be possible in other cases.

Decisions are the last step of the BI system. They are ultimately influenced by all the BI-generated information and knowledge and by additional informal or unstructured information received by a decision maker.

Regarding the process of a business intelligence analysis, now from a point of view of the analyst (decision maker) who is carrying it out, there is a usual cycle, represented in Figure 15 and described in the following paragraphs.

Figure 15: Cycle of a BI analysis



Source: Vercellis (2009)

The first phase is an analysis, in which the problem to be solved is recognized and spelled out, to be clearly stated. After this definition, it is necessary to think of a mental representation of the phenomenon related to the problem and choose the most relevant factors that are involved with it. Some business intelligence methodologies can be used to help decision makers formulate a hypothesis, interpret parts of the phenomena and develop paths of investigation, through efficient and interactive exploration of data. At the end of this phase, the BI analyst translated the problem into several questions to be deepened and answered in the following steps.

With the relevant questions defined, the decision maker proceeds to insights generation. This phase involves investigations of those questions and of possible causal relationships, consuming the information obtained during the analysis phase and transforming it into knowledge.

The next phase is the decision itself, when the BI analyst puts together all the insights that were obtained, uses them to answer the initial questions and proposes action plans to solve the problem.

The last phase is the evaluation of the impact caused by any changes made. It can be done through a comparative performance measurement. This evaluation will trigger, if still necessary, a new cycle of the BI analysis, whose starting point will be a more refined view and understanding of the problems.

All the activities related to BI projects discussed so far depend on three enabling factors, basically: technologies, analytics and human resources. Technologies comprise hardware and software that are the means through which a BI solution can be implemented, from the data storage to the visualization of graphs. Analytics comprise all mathematical models and analytical methodologies used to enhance information and extract knowledge from data. Last, human resources are all the employees and owners of an organization that contribute to the business intelligence system, directly or indirectly, through their roles, experience, knowledge, collection of data, decision-making, interpretation, analyses, planning, among many other activities.

3.3.1. Data warehousing

Vercellis (2009) discusses this topic, covering a number of concepts and their features. He defines a data warehouse (DW) as "the foremost repository for the data available for developing business intelligence architectures and decision support systems". In this sense, data warehousing means the design, implementation and usage of a DW.

A first discussion in about what categories of data are stored in a data warehouse. Three main types can be distinguished and they are defined below:

- **Internal data**: data that is internal to the organization's boundaries, originally stored in one of the company's own databases (also called transactional systems or operational systems), which are part of an enterprise information system. These data can originate from corporate departments, such as accounting, production, logistics and operations, that use a centralized application (e.g. an ERP, or Enterprise Resource Planning) or many different systems.
- **External data**: an organization may want to use data collected and stored by external institutions or companies. As an example, some agencies make available economic, financial and market indicators for selected business industries, future projections on sales and consumption, or the results of specific surveys. Another source of external data are the stakeholders of a company, such as its suppliers or buyers, which may exchange business data.
- **Personal data**: most decision makers keep personal assessments and information stored in less structured formats such as worksheets and other files. This accumulated

information frequently needs to be integrated with more structured databases, when performing an analysis.

Data warehouses are the base for OLAP (on-line analytical processing) tools, in contrast to OLTP (on-line transaction processing) applications, which include traditional operational systems of a company, for instance. The distinction between OLTP and OLAP is presented in Table 1.

It is important to note that the characteristics from Table 1 are only the typical aspects of the two systems and, in reality, an OLAP/OLTP system may be slightly different from its theoretical model. For example, an OLTP system may well record not only the current data, but also all the historical data, provided that there is enough disk space. An OLAP system can store atomic, detailed data if they are relevant to BI analyses, rather than storing only aggregated data. Last, query performance depends much on the query clauses and whether the desired data is in the "native" format of the database – a query in OLTP or OLAP can be very fast or slow, depending on these two factors.

Table 1: Differences between OLTP and OLAP

Characteristic	OLTP	OLAP
volatility	dynamic data	static data
timeliness	current data only	current and historical data
time dimension	implicit and current	explicit and variant
granularity	detailed data	aggregated and consolidated data
updating	continuous and irregular	periodic and regular
activities	repetitive	unpredictable
flexibility	low	high
performance	high, few seconds per query	may be low for complex queries
users	employees	knowledge workers
functions	operational	analytical
purpose of use	transactions	complex queries and decision support
priority	high performance	high flexibility
metrics	transaction rate	effective response
size	megabytes to gigabytes	gigabytes to terabytes

Source: Vercellis (2009)

Knowing the differences between OLTP and OLAP, it becomes clearer why a data warehouse and a database supporting OLTP systems are implemented separately – their applications have distinct requirements, as exemplified below.

Decision support systems that use data from DWs need access to integrated data (combining content from multiple sources), high quality data (free of errors and noise, after a process of data preparation) and fast querying, therefore OLAP is necessary. Database supporting OLTP systems, however, are focused on the recording and processing of transactions and avoid any redundancies, thus, they are not compatible with OLAP.

Still on the topic of data warehouses, the author identifies some of their common characteristics: they are entity-oriented, integrated, time-variant, persistent, consolidated and denormalized. "Entity-oriented" means that a DW modeling is concerned with the entities that will be analyzed by decision makers, and data will be structured in terms of these entities. "Integrated" means that all the data are homogenized and harmonized before they are loaded into a DW (this is necessary because different sources may have different measure units and encodings, for instance). "Time-variant" means that a DW stores data as "snapshot pictures", that refer to single time periods. "Pesistent" means that, once loaded, data in a DW are not modified further and users do not edit or overwrite them. "Consolidated" means that a DW usually stores summarized data, not at the most granular[3] level. Finally, "denormalized" means that, intentionally, data in a DW is not in normal form – rather, it contains redundancies that allow shorter processing times to some queries.

Data marts, mentioned earlier, are simply the functional or departmental counterparts of a data warehouse. They are smaller and more specific versions of a DW and include other data that are relevant only to that specific department.

3.3.1.1. Data quality

Another important and frequent issue in data warehousing is the quality of data. It should be always verified, preserved and improved, in order to avoid problems with data validity and integrity. Data quality is composed of several factors, among which are:

- **Accuracy**: inaccurate data can be useless for further analyses
- **Completeness**: it is desirable that the least possible amount of missing values exist in the dataset. Incomplete data is a common situation, but it can be remedied through learning, data mining or estimations

[3] Granularity is "the highest level of detail" of the stored data (VERCELLIS, 2009)

- **Consistency**: there must be form and content consistency across all the data that comes from different sources, after an adequate integration procedure. Examples are currencies and measurement units, that need to be converted before any comparison or calculation
- **Timeliness**: each type of analysis requires a different update schedule for the data. Usually, a DW is updated daily or weekly
- **Non-redundancy**: as a general rule, data repetition and redundancy should be avoided to prevent waste of storage memory and the risk of inconsistencies. However, in practice, redundancies are used intentionally in a DW to speed up processing and querying
- **Relevance**: high quality data must be relevant to the needs of the BI system and add real value to analyses
- **Interpretability**: data should be structured and described in a way that BI analysts understand and interpret it correctly. It might be useful to follow best practices and create documentation about the system
- **Accessibility**: accesses by analysts and other applications

Such quality factors presented above are addressed at various phases of a business intelligence analysis.

3.3.1.2. ETL tools

Referring back to the architecture of a BI system from Figure 13 and following the discussion about data warehouses, the next component to be presented are the ETL tools. ETL stands for Extraction, Transformation and Loading of data, from data sources to a DW. Each of these three concepts is explained in the following paragraphs.

Extraction from internal and/or external data sources is the first step. This extraction can be either complete, in which all the available past data is fed into the empty DW, or incremental, in which a data warehouse keeps its older data and is only updated with the latest values extracted from the source. The extraction occurs as it was defined during the design of the DW system.

Transformation of data takes place after the extraction phase. It involves cleaning the data and improving its quality, through the correction or elimination of inconsistencies, inaccuracies and missing values. There might be duplicated data or inadmissible values, for example. This

cleaning can be made through preset automatic rules, which are capable of correcting most common imperfections. It is also during the transformation phase that the system converts data to a single unit or scale, if necessary, and guarantees homogeneity and effective integration among all the data. Data can also be aggregated, summarized and consolidated in this step.

Loading is the final part of ETL. After transformation, data is ready to be loaded into the data warehouse, where it will become available to decision makers and other applications.

3.3.1.3. Cubes and multidimensional analysis

A data warehouse that has been successfully filled with data after the ETL process can be used for its first analyses.

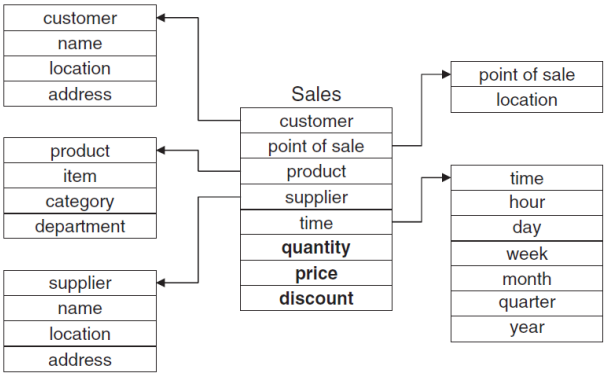
The multidimensional analysis is an analytical method that is useful when dealing with data warehouses. It is a paradigm for structuring data and linking them through relationships. A multidimensional model can be built from the data tables belonging to a given DW, and is represented by a diagram called star schema (Figure 16). In this model, two types of data tables exist: dimension tables and fact tables.

Dimension tables contain data relative to entities of an organization and its business. For a company, entities can be its customers, products, locations, time, etc. Some dimension tables have an internal hierarchy in their structure. For instance, the dimension “time” has different levels such as day, month and year. As another example, the dimension “location” may have a geographical hierarchy.

Fact tables, in turn, contain transactions, quantities and data alike. Each row or record in a fact table must refer to at least one record in a dimension table. Fact tables store measures or numerical values of an attribute characterizing a transaction or of a quantity.

In Figure 16, each table represents an existing table in a hypothetical DW. The one in the center is the fact table, which stores facts or measures that refer to a combination of dimensions (e.g. the sale at a certain price, referring to a product, to a customer that bought it, to the point of sale where it happened, to a time when it occurred).

Figure 16: Example of a star schema



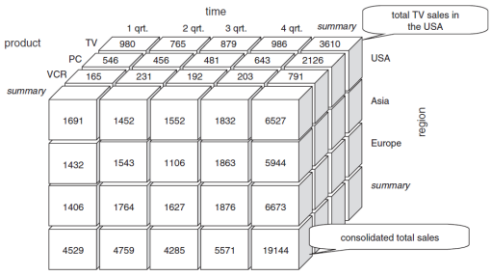
Source: Vercellis (2009)

The star schema concept may be further extended. If the dimension tables in a star schema are standardized to a normal form, it becomes a snowflake schema. In this arrangement, a central fact table is still connected to dimension tables, but the latter can also refer to other dimension tables (in the case there is a hierarchy, for example).

A different case occurs if the schema includes not one fact table, but many of them instead – then, the model is called galaxy schema. In this situation, some dimension tables can be connected to multiple fact tables.

The data of a fact table that is directly linked with n dimension tables can also be viewed as a data cube of dimension n. An example of a three-dimensional data cube is shown in Figure 17.

Figure 17: A three-dimensional data cube



Source: Vercellis (2009)

Three-dimensional data cubes are an extension of two-dimensional matrices and spreadsheets. Each cell contains data relative to specific points in each dimension. Likewise, these cubes can be extended to higher dimensions.

3.3.1.4. Hierarchies and OLAP operations

In many situations, the structure of a data warehouse contains hierarchies of concepts that apply to certain dimensions. Considering the dimension “location” as an example, a possible hierarchy is the sequence street-city-province-country.

With hierarchies of concepts, it is possible to perform OLAP operations in a data cube, navigating across various levels of visualization.

The first of these operations is the roll-up, also known as drill-up. It consists of an aggregation of data and can be done in two different ways: going to a higher level of a dimension hierarchy (e.g. aggregating data of all cities of a province) or eliminating one dimension from the analysis (resulting in totals aggregated along the whole dimension that was eliminated).

The second operation is the roll-down or drill-down. It is the opposite of a roll-up operation, hence leading to more detailed information. The operation consists in either going to a lower level of a dimension hierarchy (e.g. drilling down to detailed data about each street of a city) or adding one dimension to the analysis.

The third and fourth operations are slice and dice. Slice limits the analysis to only one value of an attribute along a given dimension (e.g. analyzing only the data of one city, excluding all the other cities). Dice, in turn, means picking a smaller cube that is a piece of the whole cube, by selecting values for several dimensions simultaneously.

The fifth and last operation is pivot or rotation. It can be viewed as a swapping of the dimensions axes, resulting in a modified view of the data cube.

Each of these OLAP operations can be used during data exploration and analysis by decision makers.

This subsection introduced the main concepts on business intelligence, as well as related processes, components and techniques.

4. STRATEGIC ANALYSIS OF THE COMPANY

This section will describe the company under consideration in the present work, where the author is an intern working with the competitive intelligence team.

Subsequently to this description, a strategic analysis of the company is conducted, to understand what factors and variables a competitive intelligence solution should take into consideration.

4.1. DETAILED DESCRIPTION OF THE BUSINESS

Perfe (fictitious name used to keep its real name secret) is a subacquirer founded a few years ago and it can be described as a technology service provider focused on micro and small businesses, offering a solution for operations and financial management.

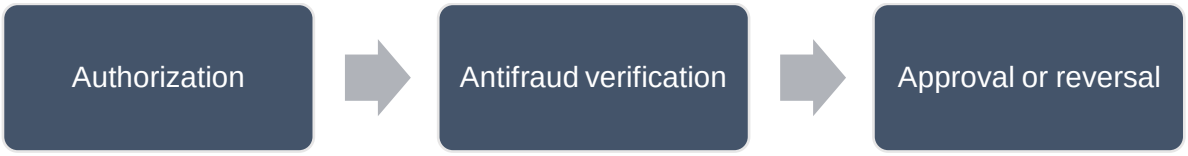
Its product is a card payment system consisting of a pinpad, a PC software and a web site. Merchants (here intended as any customer, not strictly a store owner) can either be actively prospected by a sales representative or contact Perfe first via site or phone. Its profile will be then analyzed and, if it is considered appropriate (i.e., without presenting abnormal risks of fraud or low profitability), the merchant is registered, offered a contract and activated, when he/she finally receives both the pinpad and the software to be installed on the connected computer. Then, the system is ready to operate. All this registration and activation process has been designed to be streamlined and can be completed in a single day.

In Perfe's current business model, customers are neither charged for the credit card machine rental nor do they have to buy it. The whole system is, in fact, free of fixed costs. This strategy is also adopted by other competitors and makes it easier to convince business owners to install the product.

A transaction is started when a merchant enters its data, essentially value and additional information if necessary. For payments in monthly installments (up to twelve), there is a calculator to compute the variation of fees, whose values can either be incorporated to the final price charged from the consumer or deducted from the original price of the sold product (i.e., changing who "pays" the fee in practice, the cardholder or the merchant). After that, the software connects to the pinpad, in which the buyer's card should be swiped or inserted. The

pinpad asks the cardholder's password and initiates the processing of the transaction, through the software installed in the PC, as shown in Figure 18.

Figure 18: Processing of a transaction by the subacquirer



Source: developed by the author

Through their partner acquirers, the company is able to process cards of the leading networks in Brazil. Its system also complies with international information security standards, created by relevant entities in this sector.

Immediately after the card is inserted and the buyer types the PIN, a transaction authorization is requested to the acquirer. Given that negotiated prices vary between the two possible acquirers, Perfe's gateway chooses the most convenient option for each transaction, depending on the merchant category, the card brand, the card type (debit or credit) and the number of installments. After a few seconds, the acquirer sends a response with an authorization or denial feedback.

Transactions are also subject to antifraud verification by the subacquirer. A predefined set of rules can block and reject transactions with typical characteristics of a fraud, based on the value and merchant category, for example. When the transaction is authorized as normal, it can still be left pending to a more detailed analysis if its characteristics are suspect. In this case, the system will automatically notify an analyst, who will later check each possibly fraudulent transaction and contact the merchant, if necessary.

At this point, the transaction has already been authorized by an acquirer and by the issuing bank, and the corresponding value is being held in the cardholder's account, but if Perfe flags it as a fraud, it may opt not to finalize the processing and no settlement will be done. This step represents the approval or the reversal of a transaction by the subacquirer.

Following the payment process, the receivables in favor of the merchant are settled after the transaction is authorized and approved. While the standard practice in the acquiring market is paying the seller days later, Perfe offers advance payments on "D0", or day zero, which means

that entrepreneurs receive their money on the same day the transaction is approved (or on the following business day, if a transaction occurs after business hours). These transfers are batched twice a day, just at the end of morning and at the end of the afternoon. Suspect transactions are not settled until they are analyzed and declared approved or not, but they represent only a small portion of all transactions, so that the majority of payments are concluded in less than one working day.

The entrepreneur can access a personal page on Perfe's website and retrieve a history of all transactions made and their statuses.

Perfe is present in many Brazilian States and has dozens of thousands registered customers. The company grew organically without heavy initial investments, which means the absence of important liabilities in its balance.

It serves mainly micro and small businesses, and is mostly successful in the automotive niche, which comprises car and motorcycle stores, repairers, and other related businesses such as "despachantes". Vehicle "despachantes" in Brazil are motor-vehicle expediting agents that handle bureaucratic issues by filling out forms and conducting complicated processes in the name of their clients. They often have government contacts and can facilitate tasks such as renewing a driver's license, paying taxes on automobiles, paying traffic tickets (fines) and licensing/registering a vehicle.

Its value proposition includes fast settlements, the possibility to take card payments in installments, a free and easy to install solution and an alternative to non-payment problems with consumers (that might happen in the case of other payment methods).

In order to advance receivables to merchants before bills are actually paid by cardholders and the issuer bank transfers any money, Perfe practices what is called credit card receivables financing. It is a form of factoring in which merchants sell their receivables in exchange of an advanced value paid by the subacquirer. The rights are then transferred to Perfe, which will receive the money from issuing banks on the due date. An important part of this operation is the funding solution – the FIDC. Through this fund, Perfe gets cash that is used to advance payments to merchants.

It should be noted that this business model is particularly attractive and sustainable because of high interest rates in Brazil, a condition that creates a high margin between the values advanced to merchants (which mathematically corresponds to the transaction value minus a discount) and

the values paid by cardholders and issuing banks in later installments. In the end, this margin is turned into profits that are split into income for Perfe and remuneration to FIDC investors.

More recently, Perfe has been developing and designing new complementary products, such as the virtual account – an account that is a digital alternative to a true savings or checking banking account managed by a real bank, but is, instead, a simplified product that emulates some services that are typical of traditional accounts, such as transfers and prepaid cards.

Other product under development is a payroll solution – which will allow direct payments to the merchant's employees, upon settlement of receivables from transactions.

4.2. CANVAS

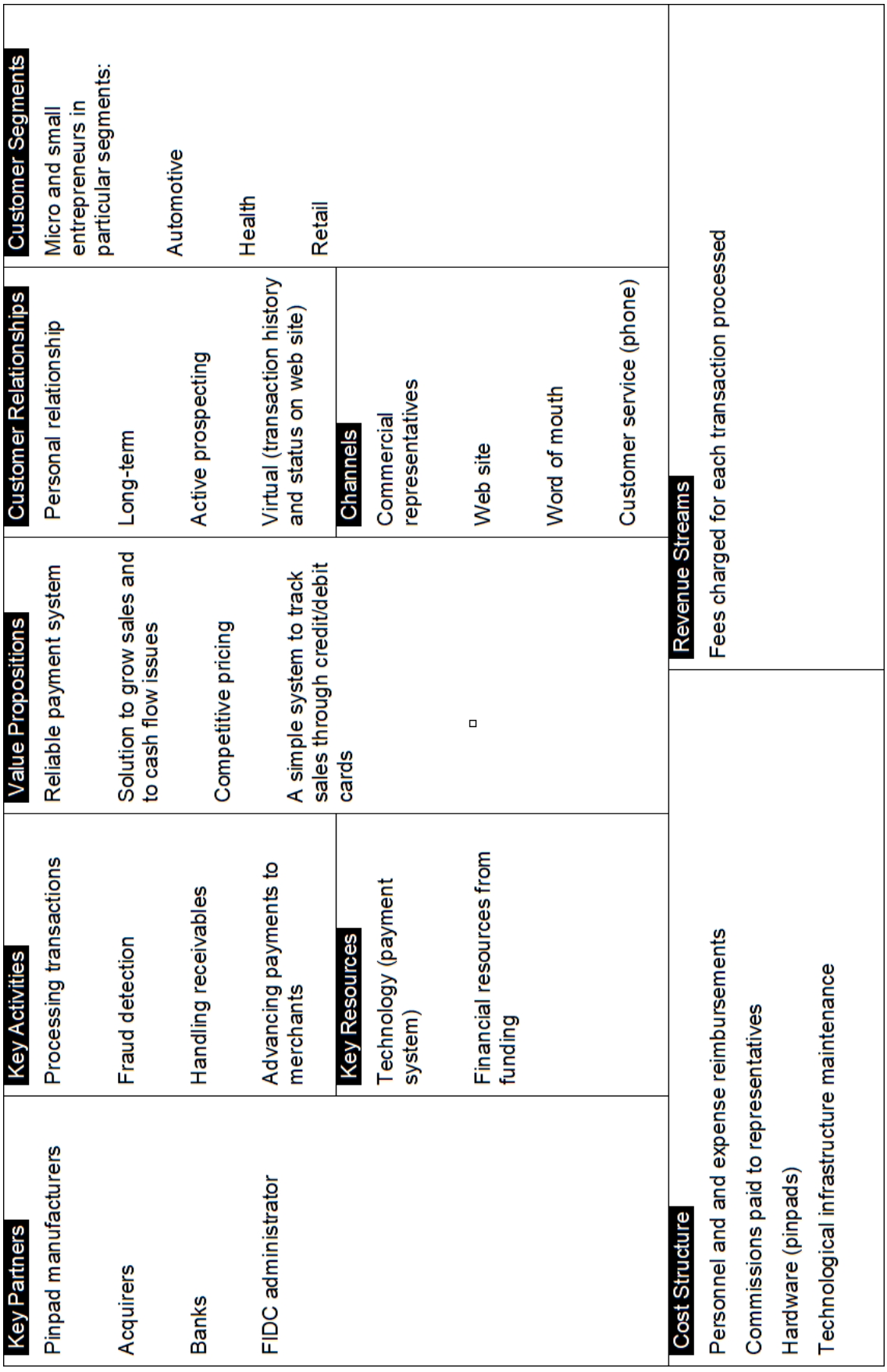
In order to illustrate how Perfe operates and what it offers, a Business Model Canvas was used to summarize some of the main points. It is presented in *Figure 19*.

4.3. PORTER'S FIVE FORCES ANALYSIS

Proceeding to the environmental analysis, the forces acting on Perfe's industry are as follows:

- **Rivalry among existing competitors**: direct competitors are concentrated in two groups. The first of them includes big incumbents, such as acquirers that were once the only few players in the market. Over the time, they also introduced new diversified products to increase their businesses. The second group contains newer competitors, which are mainly subacquirers or acquirers. They have smaller market shares than those older counterparts, but grew at high rates in the last years during the sector expansion.
- **New entrants**: banks of many sizes that are not in the acquiring market and do not offer this type of payment processing products can enter to compete in the industry, especially motivated by the opportunities created with new regulations and attracted by the growth achieved by acquirers and subacquirers in general. Non-financial corporations (e.g. technology companies or players from industries that also serve micro and small enterprises) may also become new entrants.

Figure 19: Business Model Canvas of the company

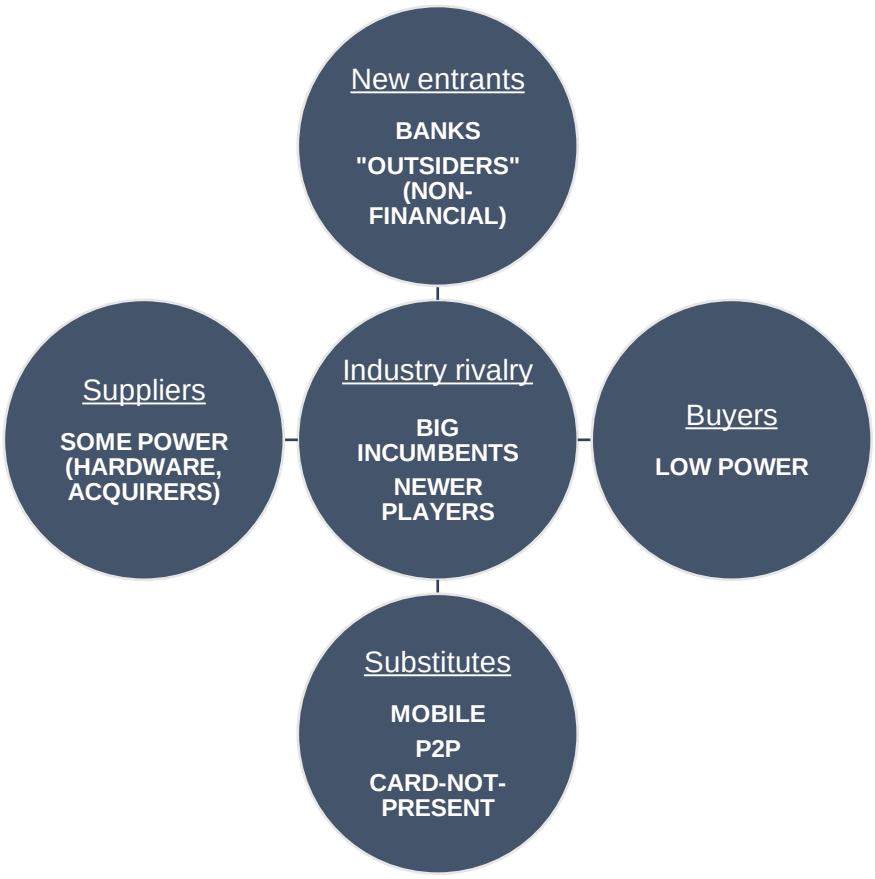


Source: developed by the author

- **Substitute products**: there are alternative payment solutions such as e-commerce gateways, payment mobile apps, and P2P (peer-to-peer) payment platforms that might compete against Perfe's solutions. Moreover, it is believed that other innovative products will be developed and launched in the near future, also incorporating the latest technologies.
- **Bargaining power of customers**: small entrepreneurs have low bargaining power in their negotiation with the payment industry, due to their limited scale.
- **Bargaining power of suppliers**: pinpads and POS machines are standardized hardware products, for which there is some variety of suppliers. If acquirers are considered to be subacquirers' service suppliers and card networks are considered to be as suppliers for acquirers, it should be noted that both are more concentrated and bargaining, in this case, requires some scale. Lower fees and better conditions are usually offered only when transaction volumes are higher.

Figure 20 represents the output of this analysis.

Figure 20: Porter's Five Forces analysis of the company



Source: developed by the author

4.4. PESTEL

The next step of the environmental analysis was the characterization of each factor from the PESTEL framework, detailed below.

- **Political**: fintechs are a new subject for politics and, in many countries, regulation is still a pending issue. In Brazil, the Central Bank (BACEN) has been updating rules and establishing new ones in an effort to foster competition and create viable ways for those new players to operate in different financial sectors. At the same time, BACEN declares that verticalization in the payments industry is unwanted[4] – which implies two important trends. First, it means that any Payment Service Provider might find difficulties when expanding in a vertical integration process. Second, it also protects smaller competitors as it is less likely that a big player (which could be the main target of such measures) will become excessively dominant under BACEN rules.
- **Economic**: performance of a company in payments industry depend on several economic factors, such as economic stability and crises (affecting consumption and expenditures), evolution of the family disposable income and interest rates (affecting credit card interests and usage).
- **Social**: credit card is a promising payment method in Brazil. Despite having high interest rates, it is widely used by people as a credit solution, while part of Brazilians do not save money and must get credit from family, friends or financial institutions when needed. The adoption of digital or electronic payment methods is also growing, with cash payments and representing a high share of all transactions.
- **Technological**: electronic and/or digital financial services depend on an existing technological infrastructure. For the information flow, there must be a functioning telecommunications network connecting merchants and acquirers/subacquirers/payment providers. On the client side, there must be a technological device such as a POS machine, a smartphone or a PC. Moreover, the client (merchant) must be capable of using this form of technology. Financial products are also limited by available technologies, in the sense that their features often depend on what is technologically possible to implement. Companies operating in this market should also be alert to the rise of new technologies that could be applied to new products,

[4] As declared by the Central Bank, according to the news.
https://economia.uol.com.br/noticias/redacao/2018/06/25/interoperabilidade-meios-de-pagamento.htm

such as contactless cards, NFC (Near Field Communication) wearables and tags and P2P virtual transactions

- **Ecological**: while ecological and environmental concerns are very relevant to some industries, they are not major issues for every financial company and, specifically, for the payment industry – mainly because its product is an intangible service with few tangible goods involved. Possible generic topics that might apply are: using eco-friendly materials, choosing responsible suppliers, imposing internal green policies in the office (e.g. avoiding waste of paper, recycling)
- **Legal**: given that companies in this market process sensitive financial and personal data, some legal risks exist. Information stored or exchanged between systems must be kept safe and privacy must be protected. A company should address such questions in order to not only avoid sues in case of data leaks, but also comply with security standards required by some stakeholders in the industry. Serving illegal businesses or informal entrepreneurs is sometimes prohibited by law or difficult, as registering transactions into a payment system would unveil and expose these informal activities. In the future, a Brazilian version of GDPR (the General Data Protection Regulation from European Union) might create new restrictions on personal data collection and handling, possibly data about customers, business owners, etc.

4.5. CORE COMPETENCIES

From the description of Perfe's business and its business model canvas (particularly, sections Key Partners, Key Activities, Key Resources, Customer Relationships and Channels), its current core competencies have been identified and they are described below.

Strong relationship abilities with customers:

Salespeople and their close relationship with customers give Perfe a competitive advantage because both their capillary distribution – there are agents for each city or zone – and their face-to-face approach guarantee that the company's offer will effectively reach a great number of potential customers. In fact, these commercial representatives are sometimes the first people to introduce the payments industry to small entrepreneurs, who have always been neglected by the old market, and explain them details about the product. Furthermore, they act as a channel

that forwards complaints and suggestions made by merchants, redirecting such issues to management.

This is an important competence: as it was observed, many competitors do not have a sales team making similar efforts – in some cases, there is no face-to-face, in others, the relationships are not so strong.

Efficiency in processing transactions:

Each transaction started from a pinpad is automatically processed by a software system, called gateway at Perfe. It receives a set of data (e.g. credit card number, payment value, merchant identification, payment mode i.e. debit or credit, quantity of installments) and, after processing it, sends the output to an acquirer, which continues the processing in turn.

As a subacquirer, Perfe has agreements with two acquirers. The gateway automatically chooses the one offering the best fees for each transaction and this decision depends on the card schema, the merchant category (described by a Merchant Category Code or MCC) and payment conditions. This flexibility contributes to competitive advantage by minimizing transaction costs for Perfe.

It is also a core component of the payment processing system, and may be updated or adapted to work with other card payment methods in the future (for instance, virtual one-time cards and "card not present" transactions – such as e-commerce solutions).

Effective fraud prevention routines:

As explained previously, Perfe pays receivables in advance to merchants, at a pre-established discount rate. Similarly to credit concession, this activity involves financial risks and, as a consequence, maintaining an effective fraud detection and prevention system minimizes losses and sustains competitive advantage. Considering that the majority of transactions are paid through this advanced mode, it is a core competence for the company.

Their fraud prevention system consists of not only algorithms, but also human agents who are responsible for manually verifying some transactions. Rules implemented in the software evaluate each requested transaction and, based on information such as value, merchant profile and patterns, can either approve and send it forward to the gateway or mark it as suspect and leave the data to be analyzed by a human operator. This agent can finally decide to approve or reject the transaction, after checking its genuinity. Both components – algorithms and staff – are part of the competence, along with the know-how and tools used in the task.

4.6. SWOT

Basically, the SWOT content may be derived from Porter's Five Forces, PESTEL and core competencies analyses. Figure 21 presents selected factors and their details are explained below.

Figure 21: SWOT analysis of the company

Source: developed by the author

Strengths:

- A first aspect, related to the sales representatives team, is their presence in a vast area and the fact that they reach a great number of potential customers individually and personally.
- A second aspect is that many representatives are experienced professionals in the commercial field, having worked at banks as salespeople, and have long experience in covering a geographic area, serving a certain local customer base (possibly their old customers) and/or selling financial products (as they know what competitors have been offering in the market for a long time, they are able to compare Perfe's product and stress its unique benefits).

- Brand trust among customers, thanks to high reliability of the product (any technical difficulty is solved in short times), available customer service (active also during extended hours) and fast service (merchants receive payments from a transaction within a few hours or on the next working day).
- A stable funding structure, based on FIDC, which is attractive to many investors and sustains the company's operations by providing cash inflows needed to advance payments to customers
- Because of its financial structure, having developed without major investments from third parties, Perfe has never been under pressure to reach a breakeven point and become profitable, unlike many fintechs that are built from heavy funding resources that must be "repaid" after a few years

Weaknesses:

- Limited product and low diversification (at present), which is centered at the pinpad solution, and are a constraint – for example, this configuration is not appropriate for every type of merchant, given that some of them need mobile devices
- Unknown brand, especially in comparison with the bigger competitors that have been in the market for decades. It is an important issue, depending on the perception and preferences of each potential customer in the market
- Because of its business model, which makes profit from advancing credit card receivables by using resources from a FIDC, Perfe has a low profitability from debit transactions. This fact is amplified by the current price war that exists in the payment industry
- Other than funding from FIDC, Perfe has a low availability of financial resources to be invested or spent in capital. Some competitor startups may have more cash to burn and expand in new markets. As noted before, this is a dual factor – from another point of view, this structure may be a strength as well.
- Some functions are not well defined internally. This organizational condition may harm the company's operations and delay processes such as the development of new products.
- The current model is dependent on external acquirers. The fees that must be paid lower the overall profitability and the acquirer's system functioning may impact Perfe's

services, a question of reliability. The lack of acquiring functions and capabilities is a weakness, in this case.

- Many services offered by Perfe depend on external banking services – each money transfer, for example, is done through a partner bank, as the subacquirer is not allowed to perform such activities. Not having an official banking license represents a limitation.

Opportunities:

- Become an acquirer (and open new business possibilities, such as offering acquiring services to other subacquirers) – with the advantage of eliminating the intermediary and raising profitability
- Adapt to changing regulation – new rules established by authorities will possibly allow Perfe to compete in new fields, like in credit concession, for example
- Current economic cycle – following the growth of Brazilian economy, there might be stronger micro and small businesses, increase of family income and purchases in general, while access to credit card by consumers is expected to increase
- Diffusion of technology (for instance, telecom access points and coverage) in remote areas of the country, opening the doors to new financial-technological products in those smaller markets – an opportunity of expansion, considering these regions are plenty of micro and small businesses.
- Developing a complete and integrated financial product for businesses, given that there is not an ideal payment solution for micro and small businesses yet – customer experience is often unsatisfactory, fees are considered high, etc.

Threats:

- Loss of market share against competitors - especially incumbents with a huge customer base or new heavily funded startups, some of which have also international expertise and can set aggressive strategies
- New entrants, coming from other industries, who could eventually offer new payment and/or financial services (from technology giants like Google, to apparently unrelated players, such as online marketplaces)

- Economic instability – the payment industry is heavily dependent on purchases by consumers, which is in turn affected by economic stability. There is some uncertainty about the future scenarios in Brazil, thus there is the need of a risk mitigating plan (e.g. expanding to new regions or focusing on more resilient markets e.g. cities with a better performance)
- "Takeover" in payments industry, as happened in China – where there is the supremacy of Ant (owned by the Alibaba group) and mobile solutions, kicking off and replacing traditional banking (and plastic cards) from the market. This movement happened in China because of circumstances such as an underserved population that was until then excluded from banking solutions. It is not clear if the same can happen in Brazil, considering that there are similar conditions.
- Data protection issues – features such as storing information about consumers and sales (for CRM purposes, for example) might become inviable or complicated with new passed laws on GDPR or, in the future, with similar laws and rules in Brazil.

This section presented a strategic analysis of the company with the use of conceptual models. The next section will start the discussion of the solution.

5. OVERVIEW OF THE SOLUTION

This section starts with the answer to one of the questions posed in the problem definition, presenting a discussion about what should be monitored by the competitive intelligence system, among all the elements analyzed so far.

From the previous analyses, essentially Porter's Five Forces, PESTEL and the external components of SWOT, it is possible to identify several stakeholders, related to the market dynamics and possibilities, that could exert pressures on Perfe or impact the company's activities. Those stakeholders can be categorized into three groups and its details are explained below.

Competitors: as discussed before, competition in this field occurs at different levels – from the closest and immediate companies offering the same product (a payment system with a card terminal), to fintechs and incumbent banks offering a wide variety of financial services, to technology giants developing new solutions related to finance. The reason why they should be monitored is particularly important at the moment: the market is moving at a fast pace, with accelerated growth players. This could lead to fierce competition and a more hostile environment.

Customers: Perfe is a B2B (Business-to-Business) company and its customers are either micro/small businesses or self-employed individuals. In this market, there is a number of different characteristics and needs, and also the customers distribution over the cities varies. This means that one-size-fits-all products and marketing strategies are not suitable anymore. Another fact about these customers is that part of them is still underserved or has limited access to payment products and financial services, in general.

Regulatory authorities: public entities and agencies that define rules and norms which impose limits to what Perfe can or cannot do. Moreover, these stakeholders may change such rules and, by doing so, they set new boundaries to the company's operation – many times, changes are positive and open up new opportunities, for example, when BACEN (the Brazilian Central Bank) modernizes regulations as discussed previously. Other related authorities for this sector are those responsible for telecommunications (because POS machines, for instance, can use cellular networks, thus depending on telecom operators) and personal data protection (as

payment solutions do process personal data from transactions and might manage additional information on consumers through their software).

Given that the factors discussed above are important and should be taken into consideration before any strategic level decision, it is relevant to track the mentioned groups in a systematic way.

The next question to be answered is what data should be collected about them. In order to answer it, one can define what is relevant, specifically for each of the groups, from Perfe's perspective

Table 2 exemplifies what variables and information could be monitored about each of the three stakeholders above.

Table 2: Stakeholders to be monitored

Competitors	**Customers**	**Regulatory authorities**
Geographical presence	Addressable market size (quantity of customers, revenues, quantity of sales and transactions)	Competent agencies (Interviews, declarations and statements)
Price point/Pricing		
Targets	Profile	New regulations issued
Differentiation	Needs	Trends (from other countries)
Financial performance	Pains, problems and complaints	
	Geographical distribution	

Source: developed by the author

For organizational reasons, those fronts can be assigned to different people or functions in a work team. At Perfe, the author of the present work has been mainly responsible for the customer and regulation parts. Meanwhile, two other members – an analyst and an intern – have been responsible for collecting and analyzing data on competitors, whose details are described later in this paper.

Combining the above information on all three stakeholders allows a company to understand competition and aspects relate to its market potential. Together, that data determines facts vital to subsequent decision making.

Regulations established by authorities define what a company subject to them can legally do or not. Furthermore, as they change over time, new opportunities arise or more constraints are created.

Characteristics and behavior of competitors can tell what they offer, where they are present, how they compete, how they are performing and what is different between their products and Perfe's.

Last, by monitoring data about potential customers, a company can have insights on what it should offer and how it can reach them.

In other words, regulations represent limits or possibilities, while competitors and customers represent market demands and conditions.

This approach will later support strategic decisions and plans made by the company management, on a regular basis.

5.1. COMPETITOR MONITORING

Again, this task can be divided among several functions or roles for organizational purposes. At Perfe, the two people leading this workstream cover basically:

- Person 1: Financial indicators, presence and strategies of competitors – through analysis of financial statements such as balance sheets and income statements, which are either obtained from annual reports or publicly disclosed information that companies (especially the bigger ones) must provide, obligated by law. Variations in these statements may suggest strategic moves and reveal areas of growth, expansion or divestment. The same reports can reveal strategies and future plans adopted by the company.
- Person 2: Information on the product offering made by each competitor – what the differentiation aspects are, who their target is, what the price point is. Price, in the form of monthly charges and fees per transaction, is a relevant factor in this market and

customers are considered to be sensitive to it. Pricing is sometimes publicly available on competitors' websites.

After those roles and responsibilities have been divided between the two members, it is necessary to define in more detail an exhaustive list of what specific data should be sought by the team.

Regarding the first part – competitors' financial indicators, presence and strategies – the relevant indicators may be determined from financial concepts (related to profits or the balance sheet) and from metrics that quantify a company's size, in terms of volume or presence. As a result, some of the specific variables to be monitored are:

- TPV (Total Payments Volume) that a company processes through its payment system, in a given period
- Number of merchants served by the company. It represents the size of its company base
- Revenues, that may be from fees, sales of hardware and terminals or any other sources, depending on the business model
- Costs incurred in operations and other activities
- Profits
- Assets and their variation over time
- Liabilities, such as loans and issued bonds
- Equity and changes in the ownership structure – for example, if a company raises capital through equity funding and new investors

Regarding the second part, the approach is quite different. Components of the competitors' product offering and pricing, for instance, may be inferred from the previous analyses about the industry, presented and discussed in earlier sections of the present work. Thus, it is reasonable to say that a complete view of competitors' offering include, specifically, the following product characteristics:

- Fees charged on transactions, and how they vary according to the monthly transactions volume of a merchant – usually, lower fees are offered to merchants with higher sales
- Prices of POS machines and card terminals, that merchants must purchase or rent monthly
- Types and technologies of the payment terminals
- Lead times for transaction settlements

- Possibility to take payments in installments from consumers
- Policies on advance payments
- Card brands compatible with the system
- Main value propositions
- Partnerships with banks or other companies offering additional services

It is desirable to know all the information above about every competitor in the market. Obviously, this is not possible in practice for a couple of reasons.

One of the reasons is that, generally, the availability of this kind of information is limited. Data found on competitors, especially the smaller, non listed companies, is often insufficient to completely profile them.

Hence, given that such data is sometimes treated as confidential and kept secret by companies, a more qualitative approach is suitable in this case.

The sources used at Perfe include contacting competitors and making requests for quotation, Perfe's customers who have been recently approached by competitors and know their offering, field research to interview merchants and insights from sales representatives, who hear on the streets about what competitors are selling in their zones.

The team prepared questionnaires for some researches on this topic and has already gathered data about competition (more specifically, what fees and prices were offered by competitors) in cities where Perfe is present.

Regarding the possible data sources, information on competitor's offering and price point can be found:

- On the own competitor's website
- Through competitors' contact channels, such as phone or e-mails
- On news or articles posted online, about the competitors
- Through merchants, which may reveal their negotiated fees with competitors. This includes both merchants that are currently served by Perfe and merchants that are not, such as prospective customers
- Through sales representatives, who know what competitors are offering locally

Data about competitors' strategies and financial performance can be retrieved:

- From online content on the competitor's website

- From articles and news
- From annual reports, balance sheets and income statements
- From other reports that companies must make public, according to current regulation in Brazil or the country where its stocks are publicly traded
- From market analyses made by specialized consultancies or associations

As a whole, it is possible to have an overview of competitor's situations and positions by collecting the different types of data combined from the multiple origins. In the present case, the information that could be found at each source is presented in the next tables. Table 3 describes the findings for financial indicators, presence and strategies.

Table 3: Availability of financial, presence and strategy data about competitors, according to the data source

	Website	Articles/news	Annual reports, balance sheets, income statements	Public information (regulators)	Consultancies
TPV	◐	-	◐	◐	-
# of merchants	◐	◐	-	◐	◐
Revenues	-	-	◐	◐	◐
Costs	-	-	◐	-	-
Profits	-	-	◐	-	-
Assets	-	-	◐	-	-
Liabilities	-	-	◐	-	-
Equity and ownership	-	◐	◐	-	-

Legend: - not available or too few ◐ partially available ● mostly available

Source: developed by the author

As it can be observed, these data are almost always limited and only partially available, because they are missing for some competitors and incomplete, in many cases. For example, a company may reveal on its website what its TPV is or how many customers it serves, but not in enough details. The same might happen to public information provided by regulators and government agencies – only a few numbers are available without a breakdown or explanation. Annual or quarterly reports containing balance sheets and income statements are a good source of information, but most of the times these documents can only be found for the bigger firms, excluding the numerous smaller competitors. News, articles and other specialized materials, such as studies by consultancies and associations, can be very complete but are released only sporadically.

The same analysis has been reproduced for the other workstream of competitive monitoring, regarding competitors' offering and pricing. The results are shown in Table 4, indicating what data about competitors were found at each identified source.

As it can be noted, no source provides all the information about product offering and pricing. Competitors' websites, on which the main product features are presented to potential customers, contain a huge variety of data, but are often unclear about details related to fees discrimination and restrictions on advance payments. By using contact channels, one can ask for more information about those unclear points. However, variables such as fees and prices ultimately depend on negotiation and cannot be figured out. Articles and news can bring basic information about the features of products. Merchants and sales representatives have more data on the detailed product offering from competitors, but they know only a fraction of the companies in the market. Merchants can tell details of the fees they pay and the services provided by other subacquirers, while commercial representatives centralize general information about some competitors.

It is true, however, that this approach has some limitations and disadvantages when compared to quantitative techniques. For example, biased information has a stronger effect in a qualitative research, as the sample is usually smaller. It might be also difficult to process all the collected information. That said, it is important to acknowledge what the limitations are when using the qualitative data. In spite of its weaknesses, this approach can at least lead to some notions about what is happening in the environment of competitors and how they are acting.

Table 4: Availability of pricing and offering data about competitors, according to the data source

	Competitors' websites	Competitors' contact channels	Articles/news	Merchants	Sales rep.
Fees	◐	◐	-	◐	◐
Prices of POS/terminals	●	●	-	◐	◐
Types/technologies of card terminals	●	●	◐	◐	◐
Settlement lead time	●	●	-	◐	-
Installments and advance payments	◐	●	-	●	-
Card brands	●	◐	-	-	-
Value proposition	●	-	◐	◐	◐
Partnerships	●	◐	-	◐	-

Legend: - not available or too few ◐ partially available ● mostly available

Source: developed by the author

Another difficulty is comparing data that was obtained at different moments. Some variables, such as prices, promotional offers and presence over the territories are volatile and oscillate constantly, often on a daily basis. When analyzing price dynamics, for example, it is important to have data on every competitor referring to the same point in time, otherwise results are going to be less precise (evaluating how companies react to a change in competitors' prices is more difficult when these information is not synchronized and each piece was collected at a different moment).

The above data, collected and researched by the team, are used for several analyses. In one of the examples, the fees and price ranges of competitors were all plotted in graphs (price versus merchant transactions volume) and the results were compared to Perfe's pricing. This study

allowed a few interesting analyses. First, to see how prices and fees decrease with merchants' sales volume across the whole market. Second, to show which competitors have flatter prices and which ones have more variable prices. Third, to identify the points where the company's fees are higher or lower than competitors'.

In other case, after analyzing a competitor's balance sheet from its annual report, it was found that this company was holding a high amount of liquid assets. This fact suggested that the competitor possibly wanted to have cash available for a heavy investment in the near future and, thus, an aggressive strategic move by the competitor was imminent – it could be entering a new market, launching a new product line, start a massive promotional campaign, trigger a price war, and so on.

One of the difficulties in tracking the competitors' offering is related to its complexity, given that there are too many variations and details about the product, making it difficult to have a totally comprehensive view of what competitors are selling in the market.

All findings are collected and systematically stored as documents, reports and spreadsheets on a permanent rolling basis. These researches are not only carried out with some frequency, but also continually improved.

In fact, the researches that were described in this section are initiatives recently established at the company under consideration and have been conducted as preliminary versions. They can certainly be further improved and some possibilities have already been proposed, and examples are provided in the following paragraphs.

A more sophisticated solution, to be implemented in the future, could be one based on a permanent kind of call center, in which operators would contact interviewees and conduct the research, collecting the desired information from a wider sample of the market. This would be especially useful for tracking in more detail the characteristics of competitors' product offering that were discussed earlier in this section.

The other part of the competitor monitoring, that comprises the financial aspects, presence and overall strategy, can also be improved in the future. A possible approach would be automating the extraction of these data from the various sources that have been identified. Given the diversity of such materials – that range from spreadsheets available online to website pages to other files and formats, released by dozens of different organizations – it is naturally complicated to implement this type of solution. It is not possible to develop a universal tool that

works with all those documents, but one can try to automate at least part of these data extractions.

Another suggestion of improvement to be made is related to the research activities. Competitor monitoring consists of a permanent search for data on internet about a big number of firms, which is a time-consuming task. It would be interesting, then, to look for ways to run more search queries on news websites and search engines, by using programming, for instance. The processing of search results could also be improved, maybe with the use of intelligent applications.

The last subsections illustrated the aspects of competitor monitoring in Perfe's case, featuring what is analyzed about those rival companies, by which means and what were the difficulties faced so far. Because competitor monitoring, at the company, is not among the main responsibilities of the author of the present work, the discussion on this part will not be continued.

6. CUSTOMERS AND REGULATORS MONITORING

Moving on to the next groups of business stakeholders to be monitored, the analysis will now focus on customers market and regulation monitoring. The customers part will be presented first and, at the end of this section, the regulators monitoring topic will be briefly explored along with some notes and ideas.

6.1. POTENTIAL CUSTOMERS MONITORING

An important part of strategic studies is devoted to the understanding of customers and their several characteristics. Indeed, customers have many dimensions to be considered. Therefore, the first step must be a definition of a methodology to guide the construction of a customer monitoring system.

6.1.1. Methodology

First, it will be determined what kinds of customers should be monitored, based on the theoretical discussions presented in previous sections. This definition will delimit Perfe's addressable market to be considered within the competitive intelligence development in course.

Afterwards, the variables to be monitored about potential customers are defined, based again on analyses made in other sections of the present work.

Next, possible solutions to operationalize the data gathering and consolidation will be searched and compared, considering their own pros and cons and choosing the most adequate one. Each category of variables can have a different solution.

The following step is making sure that the proposed solutions fit all the desired requirements. If they do not, a secondary solution should be proposed as a way to solve the deficiency of the original setting. Problems may occur with either the data content or the method used for collecting it.

The general idea is to confront theory (that defines what is needed, what should be monitored) and implementation (how those needs can be satisfied using tools such as BI), identifying any possible gaps that might emerge from this.

In this way, a customized and viable Competitive Intelligence solution is proposed in the end.

6.1.2. Development of the solution

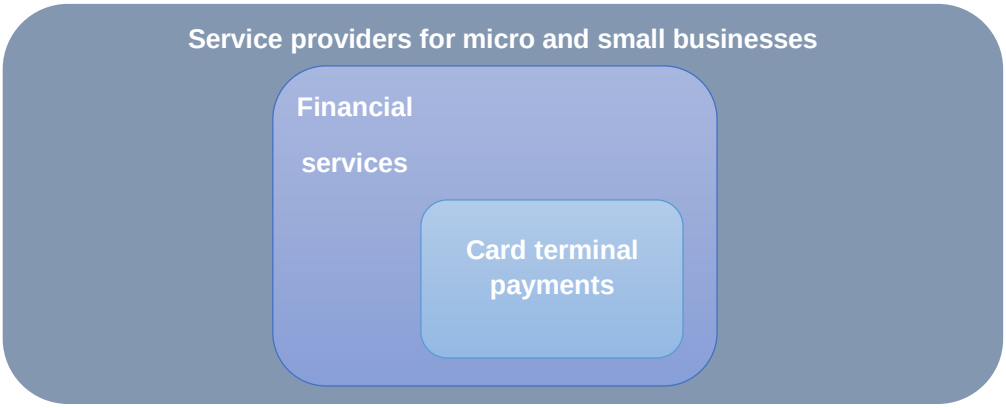
As discussed previously, during the strategic analysis, there are multiple levels of competition in the payment industry, which can be divided in three groups, as described below, varying in proximity and complexity (in the sense that a wide view on the competitive landscape leads to a more complex analysis, involving more companies and their related markets):

- Terminal-based payments industry: includes competitors whose core product is a payment solution that consists of a pinpad, POS or similar device operated by a payment processing system. They are mainly acquirers or subacquirers, newer or older in the market, and have merchants as their customers.
- Financial institutions in general, including incumbents, banks and fintechs: this group extends to providers of alternative payment solutions, banks offering card swipe machines or not and fintechs selling any type of product (e.g. lending, financial planning apps, digital banking). They have more categories of customers – from individuals to government entities, on which their overall performance and profitability depend. Players in this group can compete directly against the payment industry: some banks, for example, sell a POS along with banking services and an account for businesses, all in one integrated product.
- All sectors that serve the same market as Perfe – i.e., micro and small businesses – and are potential competitors (including, for instance, technology companies with a diversified portfolio that are developing and introducing new financial products): many other companies consider entering the financial solutions market. For example, Google, Apple and Samsung have developed mobile payment solutions based on smartphones. As another example in Brazil, iFood, a food delivery marketplace, declared its intention of providing customers with supplementary financial products – during an event promoted by a university, an executive from the company said: “Our specialization is

microbusiness. We know what entrepreneurs need, also regarding the financial aspect". (UOL, 2018). Even if these companies might someday offer products that are different from POS machines, it is important to watch them as their solutions and technologies can potentially become substitutes for what Perfe offers. A strength of these companies is that they have famous brands and huge customer bases.

These three levels are depicted in Figure 22.

Figure 22: Levels of competition faced by a subacquirer



Source: developed by the author

It should be noted that a single financial problem can be solved by many financial solutions, provided by companies that belong to any of those three levels. For instance, Perfe helped small car stores increase their revenues. These stores are, in fact, banking correspondents which act as a channel between consumers and banks (with the former getting a car loan from the latter). In the past, this segment was underserved – these local stores had no access to credit card terminals – and their customers (car buyers) did not manage to get a loan for the full value of the vehicle they wanted to acquire. So, after car stores were equipped with payment terminals, individuals became able to finance part of the cost through their credit card limit and the remaining part through loans. In the end, a credit-related issue has been solved by a payment solution, stimulating sales growth. This is a problem that could have been solved not only by the payment industry, but also by financial institutions that offer loans.

Another example of interaction between financial products is the case of the payment industry and issuing banks. Performance of acquirers and card networks, measured by the volume of transactions in a given period, can be affected by moves from the issuers side (e.g. fintechs or

digital banks issuing thousands of new credit cards are promoting the use of this payment method by individuals). This is another reason why an integrated analysis is indispensable in this industry.

Still regarding the multiple competition levels, on the one hand, the three levels of competition explained previously demand each a different scope of analysis. Hence, they could be treated separately and with different urgencies, dictated by their proximity to Perfe business. The highest priority is for the terminal-based payments industry, in which the most direct competitors are, followed by financial institutions in general and, last, by the widest market with all potential competitors. At each level of analysis, different decisions on market targeting and future product development should be made.

On the other hand, in spite of that difference, competition in this market happens across various categories of solution providers, with very diverse products, as discussed before. As a consequence of that, it is reasonable to adopt a more comprehensive vision – understanding the market as the whole universe of micro and small businesses.

Such extended view has also the benefit of revealing new business opportunities. The current product, a pinpad-based card payment system, is not suitable for all kinds of micro and small businesses. In fact, street vendors would prefer a POS that does not require a PC to work – and they are served, indeed, by competitors like PagSeguro, which offer simplified devices. The company can encounter new markets for its current product or discover a segment of customers that needs a new product.

For the reasons above, it can be concluded that the issues raised by broader concepts of customers and the market are too important to be neglected. Consequently, the function of monitoring potential customers cannot be limited to analyzing exclusively the level of terminal-based payments industry and its characteristic variable – card transactions. Instead, many other variables should be considered as well – the volume of other payment methods, further financial products, any supplementary service acquired a business pays for – they all are related to the higher levels of competition that go well beyond card payments.

This orientation does not mean that the subsets cannot be analyzed in detail. It is possible to do so – as an example, one may be interested in studying the usage of POS by entrepreneurs in different regions of the country – and such analyses can be relevant and convenient, in some contexts. However, the focus of the monitoring developed in the present work will be the broader perspective on the potential customers.

It is still necessary to precise what information and data should be monitored from the group of customers defined above.

In order to determine what the relevant variables about customers are, it is possible to refer back to the description of Perfe's business and the strategic analyses, presented earlier in this work.

One of the main variables is the quantity of potential customers. It should express how many they are, as well as their distribution in various aspects – geographically and according to different categories or characteristics. As mentioned in the business analysis and defined earlier in this section, Perfe's customers are the micro and small businesses in Brazil. Therefore, the number to be sought is the amount of those businesses.

Another important variable is the "worth" of those potential customers, in financial terms. In the present case, considering Perfe's revenue stream from its business model and given that its customers are entrepreneurs and merchants, a good measure is the revenue of those micro and small businesses. This variable is a good choice for two main reasons. First, because Perfe is a subacquirer and its income stems from a percentage of merchant sales. Second, recalling the concept of a broader level of competition, Perfe competes in an industry that goes beyond card payments and its real market encompasses many other sorts of services that entrepreneurs acquire for their businesses. In other words, Perfe can sell them supplementary products (cross-selling) in the future, capturing a higher portion of their revenues (which is the idea of "share of wallet").

The two variables described above are fundamental to size the market – one, in terms of quantity of customers; the other, in terms of financial value.

Some other variables that characterize customers are important as well. In the PESTEL analysis, it was underscored that there is an important technological factor related to the customer: because Perfe's product is digital, an internet connection must be available to merchants using the system. Consequently, it is important to know the internet coverage in different cities and if potential customers have access to the web.

Finally, with respect to the value proposition, further variables are also relevant to understand customers: their needs, pains, problems and complaints about the existent products in the market. These variables are purely qualitative.

There might be more important variables to be included in this monitoring, but for the time being, only the above ones are considered.

Table 5 shows a summary of those variables and what they represent.

Table 5: Variables about customers to be monitored and their meanings

Variable	**Meaning**
Quantity of micro and small businesses	Market size (amount)
Revenues of micro and small businesses	Market size (value)
Internet coverage and access	Underlying conditions
Needs (qualitative)	Matching value proposition
Pains, problems and complaints (qualitative)	Matching value propostiion

Source: developed by the author

Because of their qualitative nature, potential customers' needs, pains, problems and complaints are variables that are best treated and organized like the qualitative data from the previous section of this work, involving methods such as field research and interviews. To avoid repetition, they will not be the focus of the current section.

For the other variables, data can be obtained in different ways. Due to the fact that this monitoring is complex, involving dimensions of space (geographical distribution details) and time (for some variables, it is important to keep track of historical time series to allow trend analyses), using primary sources is not an ideal option. Primary sources require the setup of ad hoc surveys and, in order to obtain a complete dataset, intensive efforts and labor are required and it would be a very costly activity.

As a result, the remaining alternative is using secondary sources. Secondary sources encompass any data that is already available and was collected by someone in the past for other purposes than the specific analysis being conducted.

Possible secondary sources that have been considered by the author of the present work are enumerated below:

- Central bank
- Regulatory agencies
- Confederations of industries
- Associations from specific sectors
- Statistics bureau (IBGE, the Brazilian Institute of Geography and Statistics)
- Market intelligence companies
- Consultancies
- Organizations that support small businesses
- Federal revenue agency
- Ministries
- Local chambers of commerce
- Professional associations

Each of the secondary sources above, in some extent, may provide data related to those variables about customers specified earlier.

As it can be seen, a variety of possible data sources exists for each variable to be studied. Nonetheless, part of them are not appropriate for specific use in the field of Competitive Intelligence. Then, it is necessary to define what requirements are sought among the alternatives, before selecting the most adequate one. Characteristics of an ideal data source are discussed below.

- **Trustworthiness**: The values and statistics must be reliable and depict reality. One way to guarantee such characteristics is preferring credible sources that use proved methodologies in their researches, such as statistics institutes, government agencies and trusted private organizations or companies.
- **Continuity**: A good data source should be permanent over time, supplying a long time series, otherwise it is not possible to analyze and spot trends. Discontinued surveys, old

registers and data with many missing time periods are not as useful in this situation and cannot be used to evaluate the evolution of a variable.

- **Methodology consistency**: All aspects of methodology – statistical calculations, sampling, classification and readings, for instance – should remain the same over time, to make data comparable between different periods. This is why occasional, sporadic researches released by consultancies or academic institutions, for example, cannot always be compared and combined to complement each other. If distinct methodologies have been applied to each one of the works, distortions may be created when combining and linking their numbers. In extreme cases, the result can even be an impossible quantity or value. This is also true for other types of data sources. Any two researches using methodologies that are not the same will not relate directly to each other. To connect them, approximations or simplifications are needed. That represents one of the biggest difficulties when using secondary sources.
- **Up-to-date data**: Especially for recurring analyses, it is important to have always updated information and the latest monthly or yearly numbers. This feature is fundamental if the data must be used to make quick decisions and react to the very latest signals.
- **Granularity**: Ideally, data must be as detailed as possible – for example, it should be possible to pick the specific value of a variable referring to a month, a city and a particular category of customer.

Other than the data sources, it is also necessary to define a structure to store and organize all the data that will be collected. Three options have been considered: a normalized relational database, an unstructured/semi-structured database (which stores data in variable formats) and a multidimensional model. They are compared in Table 6.

There are two requisites for the monitoring system in question. First, the final database containing the integrated information must be standardized, in the sense that all the data must share a common base to allow comparisons among them. Second, efficiency and high speed are needed when analyzing data at different levels of detail and performing operations (e.g. drill-downs and roll-ups).

As a consequence, the most suitable structure is the multidimensional model.

With that defined, it is possible to proceed to the implementation of the solution, for each of the variables chosen earlier. The following parts of this paper describe how the customer market monitoring system was implemented by the author of the present work.

Table 6: Comparison of structures for databases

Feature	**Normalized relational databases**	**Unstructured/ semi-structured databases**	**Multidimensional modelling**
Redundancy	No (by definition)	Possible	Yes
Complex operations and queries speed	Low	Low	High
Establishing relationships between data	Difficult, requires assumptions	Not necessary at first	Difficult, requires assumptions
Standardization required	High	Inexistent, depends on the data sources	High

Source: developed by the author

6.1.3. Quantity of potential customers

The first step is enumerating the possible sources of this data. After an extensive search, several options have been identified. They are listed below:

- Confederations of industries
- Associations from specific sectors
- Statistics bureau (IBGE)
- Market intelligence companies
- Consultancies
- Organizations that support small businesses
- Federal revenue agency

- Ministries
- Local chambers of commerce
- Professional associations

In order to select the sources to be used in the system, the alternatives have been evaluated according to the desirable characteristics mentioned before. The evaluation is presented in Table *7*.

Table 7: Evaluation of data sources - quantity of potential customers

	Trustworthiness	Continuity	Methodology consistency	Up-to-date	Granularity
Confederations of industries	✔				
Associations from specific sectors	✔				
Statistics bureau (IBGE) *CEMPRE*	✔	✔	✔	✔	✔
Market intelligence companies	✔		✔		
Consultancies	✔		✔		
Organizations that support small businesses	✔				
Federal revenue agency *MEIs*	✔			✔	✔
Ministries *e.g. Economy*	✔				
Local chambers of commerce					
Professional associations	✔				

Source: developed by the author

As it can be seen, the most complete data source for the variable in question is the statistics bureau (IBGE), which maintains a database called CEMPRE (*Cadastro Central de Empresas*, or Central Register of Enterprises). It contains registers about the existing formal companies in the country, updated once a year. The solution for this part – monitoring the quantity of potential customers – will be built upon this data source.

The volume of data contained in this register is huge, because of its detail level. Geographically, it provides information about each the 5,570 Brazilian cities. Enterprises are also divided in hundreds of different economic activities, according to their CNAE (*Classificação Nacional de Atividades Econômicas*, or National Classification of Economic Activities). It is available online through an API.

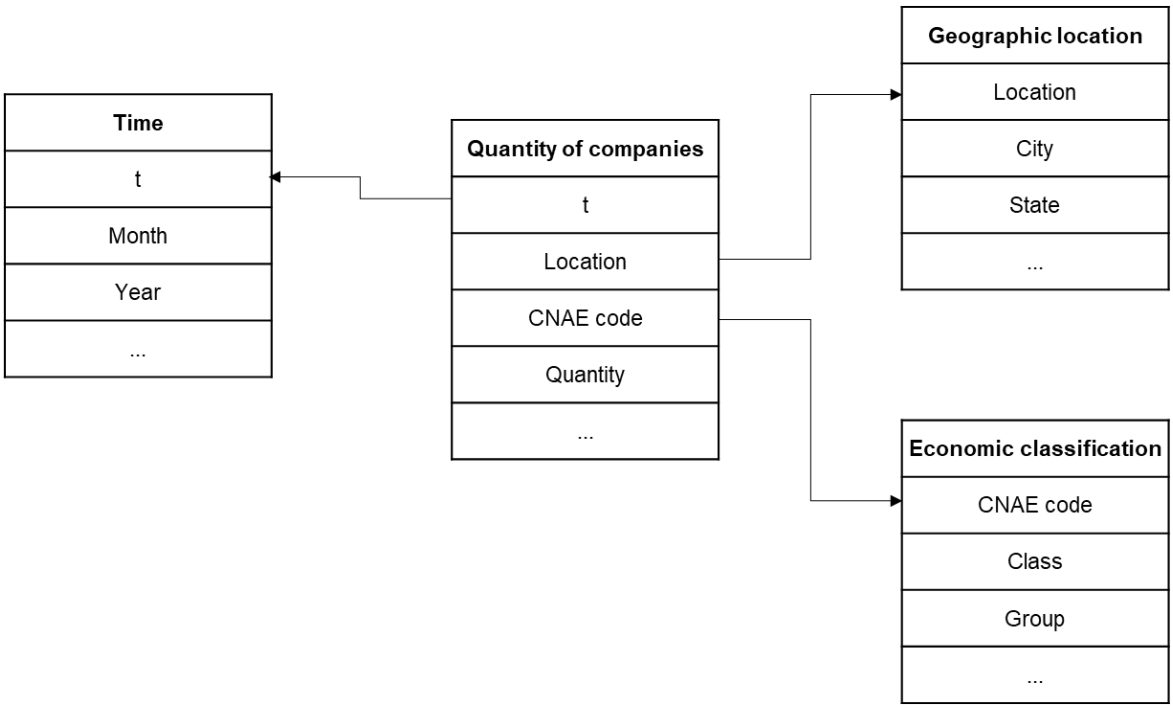
If all those gigabytes of data were to be extracted with the use of common programming methods, the process could take more than one day. In order to reduce times, a Python application was developed using asynchronous programming techniques, which allow the download of many pieces of data in parallel. In short, this program combines multiple API parameters, extracts the data from the server in the JSON file format and saves them all in a folder of a cloud server.

Then, a stored procedure programmed in a database management system (SQL Server) reads the extracted files and convert the data to a structured format that is inserted into a database table. At this point, data is already in a relational model. The database in the server also has other tables – for instance, a table of geographic locations containing a list of cities, states and regions and their hierarchy.

This data – the number of companies according to the location and economic activity – is the core of the data cube (made with SQL Server Data Tools, in an Analysis Services project) created to monitor the quantity of Perfe's potential customers and their distribution, as shown in Figure 23.

At that stage, the cube essentially had data copied from CEMPRE. The following step was refining the solution, after checking if that initial implementation had all the desired characteristics and features. This analysis is described below.

Figure 23: Star schema - quantity of potential customers



Source: developed by the author

The first verification was whether the cube contained the same data as had been planned. Considering that the objective was to collect information on micro and small businesses, it was questioned if the data encompassed this whole category. To answer to this question, technical notes and documentation about the methodology of CEMPRE were reviewed. It was found that this register in fact included micro and small businesses (as well as medium and large ones, irrelevant to this context), but excluded a smaller category: MEIs (*microempreendedores individuais*, individual micro-entrepreneurs, literally), a type of business similar to sole traders. They are excluded because CEMPRE is fed by a database from the Ministry of Labor, which exempts MEIs from registration.

It became necessary, then, to find a new data source with information about MEIs. An alternative was found: a webpage hosted by the federal revenue agency, with statistics on this group of entrepreneurs. This page has data in a detail level that is very similar to the CEMPRE database, i.e., according to geographic location and hundreds of economic activities (CNAE). To extract this data, a different technology was implemented, because there was not any API available on the website. The solution combined browser automation and web scraping – a Python script was programmed to access the webpage (using a browser automation tool called

Selenium), automatically loop through dropdown menus, click buttons and read the tables generated, inserting the data into the SQL Server database after being they are properly transformed to a compatible format.

With these two collections of data (CEMPRE and MEIs), the data warehouse and the cube have sufficient information regarding the quantity and distribution of potential customers. The only types that are excluded from the current version of this data cube are self-employed people and informal businesses. As a result, some categories of entrepreneurs are missing from the dataset. However, the major part of the market is well-represented.

About the granularity of the data, three aspects were considered: time, geography and economic classification.

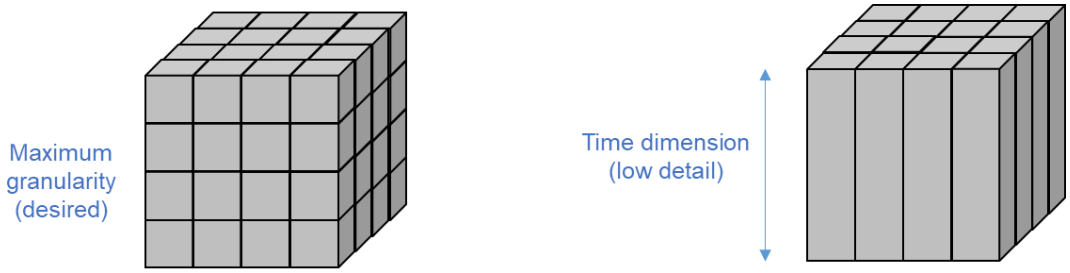
With respect to granularity in time, the drawback is that the basic data extracted from CEMPRE has only annual values, lacking monthly information. The website about MEIs presents only current statistics, lacking their history. Unfortunately, no solution for these issues were found, but they are not a huge limitation. They only mean that detecting temporal trends of this variable is harder, but other types of analyses are not affected.

The geographic level of detail in the data cube is as high as it was planned, comprising statistics at city level.

Last, the economic classification granularity is also the same as expected, presenting detailed information for each of the hundreds of CNAE classes. The only drawback is that some economic activities are not isolated – for example, driving schools are a subclass within a class and there is not a specific value for them in the statistics. However, this problem only occurs in a few cases and, in general, CNAE classes provide a level of detail that is enough.

Figure 24 illustrates the situations described above.

Figure 24: Representation of data - quantity of potential customers



Source: developed by the author

6.1.4. Businesses' revenues

Possible sources of this data were prospected. The options found are enumerated below:

- Confederations of industries
- Associations from specific sectors
- Statistics bureau (IBGE)
- Market intelligence companies
- Consultancies
- Organizations that support small businesses
- Federal revenue agency
- Ministries
- Local chambers of commerce
- Professional associations

The sources analyzed are the same as those considered for the previous variable, quantity of potential customers. However, being a different variable, the data made available by each of the sources also differ in their quality. The evaluation of the data sources, regarding the variable in question – revenues of businesses and entrepreneurs - is presented in Table 8.

Again, the most complete data source in this case is the statistics bureau (IBGE), which conducts several surveys about the industry, service and commerce sectors. The database tables containing revenue statistics will be primarily based on this source.

The IBGE runs two types of surveys on this topic. The first is released annually, with absolute revenue estimates and several other data about businesses. Examples are the PAC (*Pesquisa Anual de Comércio*, translated as Annual Survey of Trade) and the PAS (*Pesquisa Anual de Serviços*, translated as Annual Survey of Services). The second genre of surveys are the monthly editions, which are simplified and do not present absolute values, just month-to-month variation indices and equivalent statistics. Some examples are the PMC (*Pesquisa Mensal de Comércio*, translated as Monthly Survey of Trade) and the PMS (*Pesquisa Mensal de Serviços*, translated as Monthly Survey of Services).

They are available online and can be downloaded via the IBGE API. Tables for each of the surveys have been set up in the SQL Server cloud database and stored procedures have been developed to automate the extraction of these data, from the download of JSON files to their conversion into structured data.

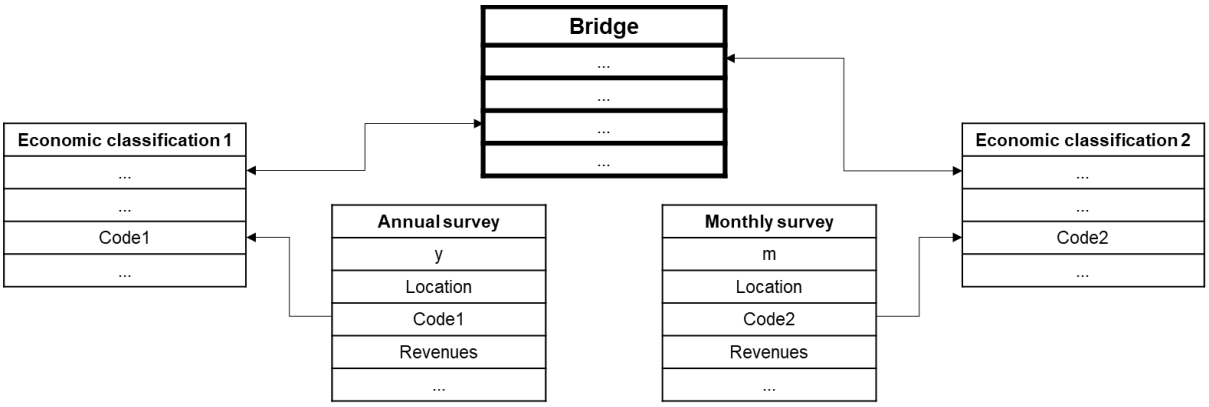
Table 8: Evaluation of data sources - businesses' revenues

	Trustworthiness	Continuity	Methodology consistency	Up-to-date	Granularity
Confederations of industries	✔				
Associations from specific sectors	✔				
Statistics bureau (IBGE)	✔	✔	✔	✔	✔
Market intelligence companies	✔		✔		
Consultancies	✔		✔		
Organizations that support small businesses	✔				
Federal revenue agency	✔				
Ministries *e.g. Health (healthcare sector)*	✔			✔	
Local chambers of commerce	✔				
Professional associations					

Source: developed by the author

To obtain monthly revenue statistics, it was necessary to combine the absolute annual data from PAC/PAS and the monthly variation indices from PMC/PMS. However, these surveys contain data that is aggregated by geography at state level and by groups of economic activities. The problem is that annual and monthly surveys follow distinct economic classifications, whose hierarchies are different from each other and are not exactly the CNAE either. Therefore, a bridge table is necessary to connect these parts. The relationships among these surveys are illustrated in Figure 25. Bridge tables match each category from a given annual survey with the closest category available in monthly surveys.

Figure 25: Bridge tables - businesses' revenues



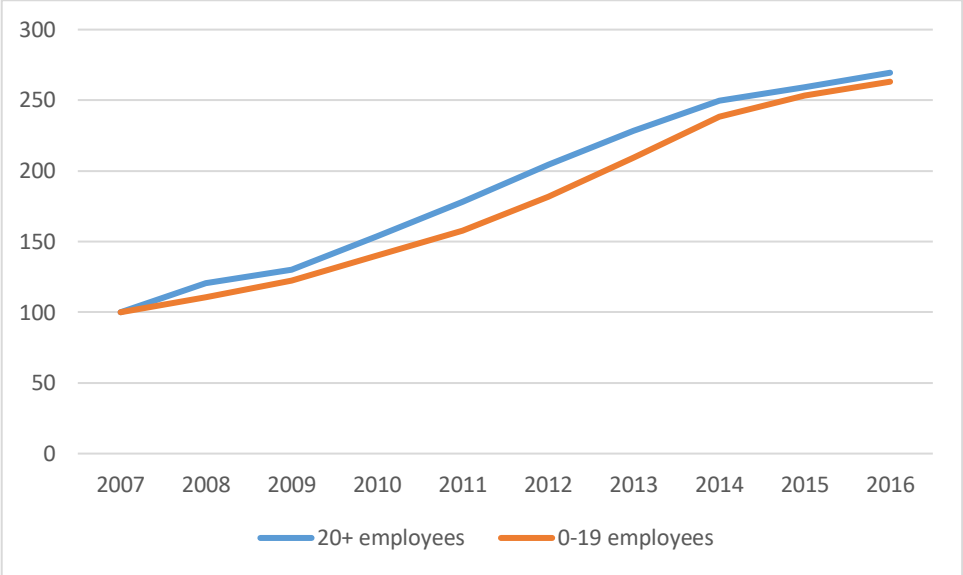
Source: developed by the author

The following step was the analysis of the data model, to check if it was complete and met all the requirements.

The methodology and technical notes about the surveys were investigated, in order to better understand details of the data. The first finding was that the monthly surveys, PMC and PMS, do not cover all the Brazilian states, only 12 of the bigger ones. As a result, values for some regions had to be estimated using variation indices at national level.

The second finding was that indices presented in the monthly surveys are calculated from a sample of companies with 20 or more people employed. This fact raised a concern about whether these statistics are applicable to the whole universe of businesses, including the smaller ones. In order to answer to that question, an analysis was carried out comparing the evolution of revenues of different-sized businesses in the commerce sector, as presented in Graph 1.

Graph 1: Evolution of revenues in commerce, according to the business size (2007=100)



Source: developed by the author, using data from the PAC/IBGE

The results show that the growth rates are similar. Therefore, variation indices from the monthly surveys may be used in general.

With respect to the granularity of the data, the detail levels of geography and economic activity are lower than what was originally planned. To address that issue, if a more detailed view is desired, it is possible to split the aggregate values relative to a state into values for each city. This breakdown can be done proportionally to another variable, such as the quantity of businesses, under the assumption that revenues are uniform within a given group of economic activity and geography. This is a strong hypothesis, though.

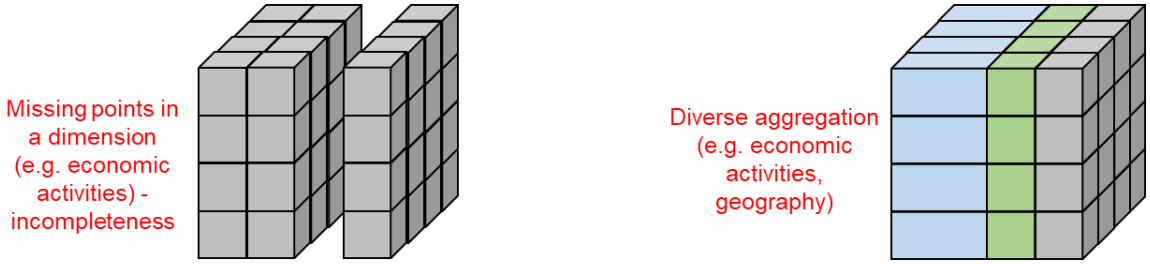
Concerning the time dimension, data is as granular enough, since they are detailed at month level.

Furthermore, it should be observed that the surveys under consideration do not cover all the existing economic activities. Additional sources of data can be used to complement the data warehouse. For instance, the Ministry of Health releases information about professionals and healthcare institutions, containing some data on services delivered by them and prices charged, which could be useful for estimating their revenues. Improvements such as this example will feed the system with CNAE classes that are missing from IBGE economic surveys on

businesses' revenues, resulting in a higher compatibility with the other data cube, which covers the full CNAE classification.

Figure 26 illustrates the peculiarities described above.

Figure 26: Representation of data - businesses' revenues



Source: developed by the author.

6.1.5. Internet coverage and access

This information has fewer options of source, as listed below:

- Regulatory agencies
- Statistics bureau (IBGE, the Brazilian Institute of Geography and Statistics)
- Consultancies
- Organizations that support small businesses

The alternatives were evaluated with regard to their qualities, as presented in Table 9.

As it can be seen, the best choice in this case is the data released by the regulatory authority, represented by ANATEL (*Agência Nacional de Telecomunicações*, or the National Telecommunications Agency).

ANATEL publishes detailed data regarding internet/cellular coverage and the number of access points by city or phone area code. It is available on their website in CSV files that are regularly updated with monthly statistics. A stored procedure was created to automatically extract them and load the data into the SQL Server database.

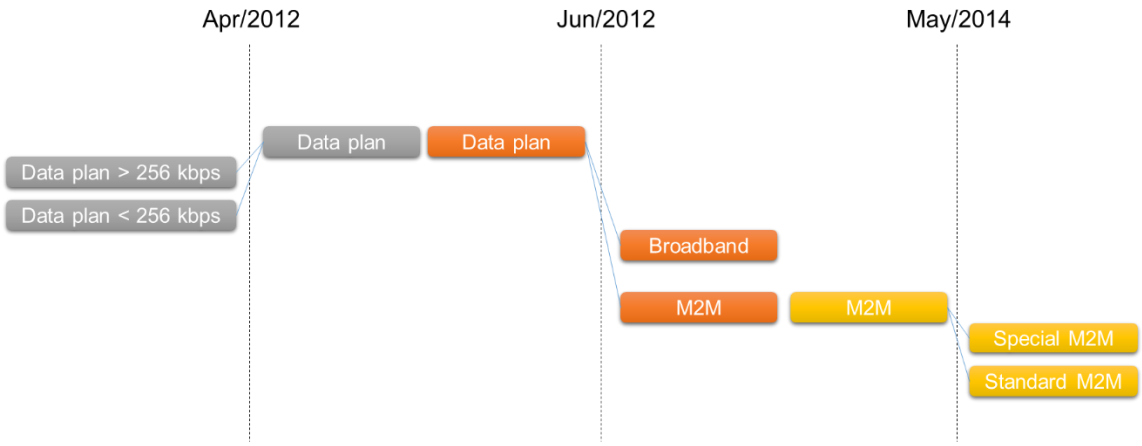
Table 9: Evaluation of data sources - Internet coverage and access

	Trustworthiness	Continuity	Methodology consistency	Up-to-date	Granularity
Regulatory agencies	✔	✔		✔	✔
Statistics bureau (IBGE) *Surveys about the population*	✔	✔	✔		
Consultancies *Specialized telecom consultancies*	✔	✔		✔	
Organizations that support small businesses					

Source: developed by the author

Two drawbacks have been identified. The first is that the classification of mobile internet technologies changed a few times, as seen in Figure 27. While this change is not a major issue in the present case, it represents an example of the difficulties related to classifications that differ from each other and are an obstacle to data integration.

Figure 27: Classifications that changed over time



Source: developed by the author

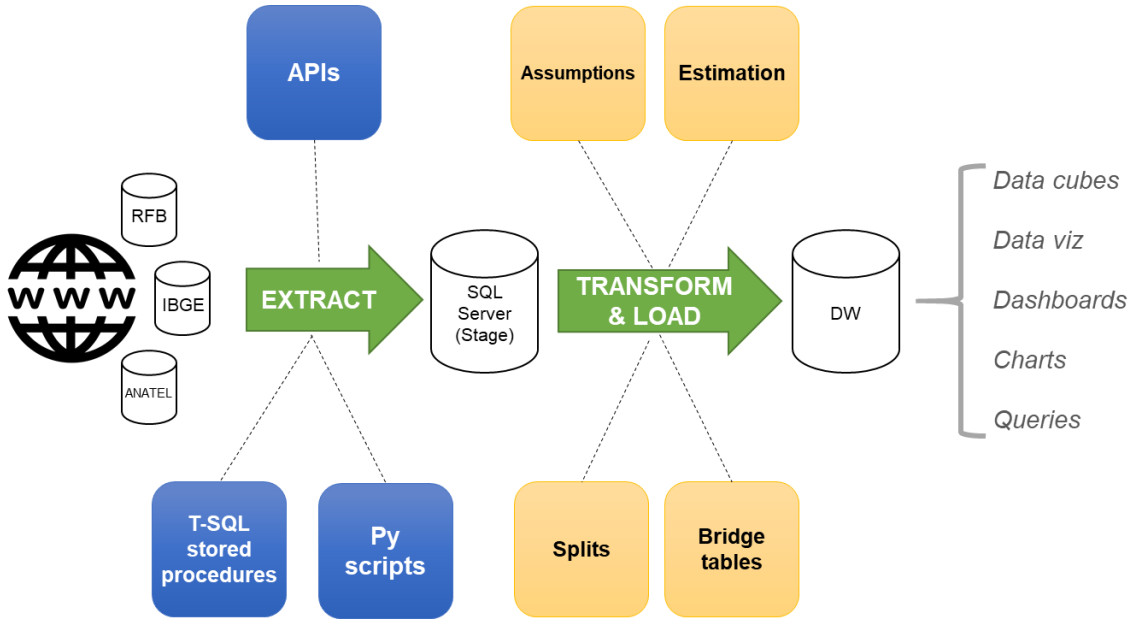
The second drawback is that part of the past numbers about cellular access points are not so detailed, as in the first years of the series, the country was divided in only three big zones for regulation purposes. Again, this is a minor issue that compromises only a detailed comprehension about old periods.

Unlike the two previous variables, the data in question does not relate to the dimension of economic activities, and such granularity is neither available, nor relevant to the case.

6.1.6. ETL diagram

The competitive intelligence solution implemented, for monitoring Perfe's customer market, is summarized in Figure 28. The diagram represents the extraction, transformation and loading, as well as the data sources, technologies and infrastructure involved.

Figure 28: The ETL implemented



Source: developed by the author

This subsection presented the development of the potential customers monitoring solution and the reasoning behind it, from the definition of what to monitor, to the analysis of problems and

difficulties that emerged due to the gaps between the theoretical plan and the practical implementation.

6.2. REGULATORS MONITORING

Following the same logic applied to the discussion about competitors and customers monitoring, it is first necessary to define what must be monitored with respect to regulation and authorities. Two questions must be answered – what entities are going to be monitored and what type of information is wanted. Then, a practical solution can be proposed, with the explanation of how the monitoring process should work.

Who should be monitored?

As explained in previous parts of this work, there are certain regulatory authorities that have a higher relevance for Perfe. These entities should be monitored but they are not the only source of news and information about regulation issues. The media can also be a source of articles and other content on this subject.

Hence, two categories of entities to be monitored can be identified:

- Regulatory authorities, comprising many government agencies and competent authorities. In the case of Perfe, as it has already been mentioned, two relevant authorities are the BACEN (Brazilian Central Bank), which regulates the financial system and its institutions on a variety of matters, and ANATEL (the national authority for telecommunications), which oversees the communication networks (that, in turn, are used by payment systems)
- Other organizations than regulatory authorities. Among them, the most relevant category is the media – specialized in business and economy or journalism from mainstream media – because they can occasionally report what is happening abroad in terms of regulation or interview officers from regulatory authorities, and this information can anticipate decisions by regulators and reveal trends

What type of information is searched?

The entities above provide information in different formats, and important changes or facts regarding regulation can be contained in:

- Official documents issued by authorities and agencies, containing new norms and standards that have been approved and established
- Announcements communicating changes or imminent changes in regulation
- News that bring information about regulation in foreign markets (that can be considered models or references) or about the opinion and intentions of regulatory authorities

Other types of information not listed above may be relevant as well.

How the monitoring process should work?

After determining who and what information is going to be monitored, the question lies in the channels through which information can be accessed. The possibilities are simple:

- Regularly checking the regulatory authorities websites, on which virtually every information about regulation will be found
- Following the news and articles that are related to regulation, in general
- Contacting the office of the regulatory agency

At Perfe, the online sources mentioned above are constantly checked, at least once a week, in search of news on regulation. If any are found, they are reported to the company's management. Nevertheless, it is uncommon that regulators make major changes – most part of the articles found are discussions about the subject or explore the situation in other countries that are modernizing rules.

This section presented details of a system for competitors monitoring and regulators monitoring. It also described how it was implemented at Perfe, showing the tools and concepts used in the process. The difficulties and gaps were identified and discussed as well, and several solutions were proposed.

With all the parts of the system detailed, the description of the solution to the Competitive Intelligence question posed earlier in this work comes to an end.

7. RESULTS AND CONCLUSIONS

For a company's strategist or decision maker, it is important to know the competitive environment – the market, customers, competitors and other stakeholders. Moreover, it is important to have objective information about all these elements. Porter (1980) had already presented this idea, defending an intelligence system that could assist managers in industry forecasting, interpreting market signals from history and spotting competitive moves.

A competitive intelligence solution in even more important nowadays, when expressions like "data-driven" are in vogue. While some difficulties related to obtaining data that are "kept secret" remain the same, the advent of the internet, huge databases, complete information systems and other technologies created a new opportunity – now, there are a lot of data stored everywhere. At the same time, new difficulties emerged: incompatibility of formats, heterogeneous data are some of the problems when gathering and processing information from many sources.

The present work developed a competitive intelligence solution for a subacquirer. The starting point was a strategic analysis of the company. From the strategic perspectives on competition and market, it was possible to determine what elements should be monitored by the competitive intelligence.

Thereafter, using concepts such as Business Intelligence, practical solutions were proposed for implementing the competitive intelligence system, from collecting the data to structuring it. It was also described how the author of the present work designed and implemented the part under his responsibility at the company.

However, there are gaps between what is desired to be monitored (according to a theoretical, strategic approach) and what can be put into practice (the solutions proposed, each one satisfying part of the demand). Some examples of the difficulties faced were:

- Conflicting classifications and data aggregated in different ways
- Data structured in different hierarchies
- Incomplete data
- Lack of surveys and statistics about certain sectors of the economy and informal businesses
- Differences in methodology among data sources

- Low availability of up-to-date information and of sources that are updated frequently
- Unstandardized files (especially true for data released in formats such as CSV and spreadsheets)
- Lack of granular data

As always, the answer is a hybrid approach – automate tasks when possible, use qualitative methods if there is no choice, estimating missing values, etc. In the case of estimates and proxies, the important thing is to have clear what were the assumptions made, to know where the error might be during an analysis. Some data can be used to analyze month-to-month trends, others are only useful to view a photograph of the geographic distribution of a variable.

This competitive intelligence project can be developed further. Having a rich database is only a prerequisite to more advanced methods – data mining, econometric analyses of trends and correlations, microeconomic models and many others.

So far, the competitive intelligence solution that was implemented at Perfe has already been useful in some situations and strategic activities. In a recent market segmentation analysis, the data warehouse containing the distribution of potential customers by city and economic classification was used to determine the size of various possible segments, for each geographic market in the country – an analysis with a detail level that would not be possible without the DW.

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