POLITECNICO DI TORINO

Master's Degree in Engineering and Management

Master of Science Thesis

Industry 4.0 and Business Intelligence:

Business Plan development for a new software launch in the market

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Abstract

This thesis work concerns the development of the business plan of a business intelligence software for manufacturing companies' efficiency in a context of Industry 4.0. The idea on which the whole planning activity is based consists in a SaaS platform powered by a Cloud-based architecture aimed at turning industrial data into insightful decision making for companies, enabling predictive analytics with a consistent data driven approach. After a brief literature review aimed at introducing the Industry 4.0 paradigm the discussion dives into the topics more characteristics of a business plan. In fact, after the presentation of the company which powered the project (Guanxi s.r.l) the work deeply analyze: the market of reference in all its peculiarity from both an internal and external point of view, the current competition level and the strategic positioning options. After the market analysis the hypothesis made are validated with the results of a set of interviews conducted. It then follows the definition of the product with its marketing mix and detailed features, and after the presentation of an MVP and its testing phase results which led to a consistent market segmentation, the discussion dives into the redaction of an organizational, operational and financial plan, which results are then schedule and presented in a comprehensive project roadmap. The thesis is finally concluded by a lean business model canvas, which aims at being a final summary and overview of all the tasks performed along the discussion.

Acknowledgments

Before diving into the thesis' content there are some acknowledgments that needs to be done. Starting from the academic world, I would like to immensely thank Professor Paolo Landoni, my entrepreneurship professor and thesis supervisor, and Alberto Giusti, the founder of Guanxi s.r.l. and commissioner of this project, for giving me the opportunity of challenging myself with such an amazing topic and project.

After them I must spend some words to thank all my life long friends, for always supporting my life choices even when they brought me away from our amazing group, and the new ones I had the honor and the pleasure to meet here at Politecnico, without whom this journey would have not been the same.

Finally, the last and most important acknowledgement goes to my family, it is hard to find the words to properly thank them for all the opportunities they gave to me through all their sacrifices, I just hope that this final step in my academic journey will be a reason for them to be proud. This work is for them.

Summary

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1 Introduction

The exponential technological development which characterizes the industrial world nowadays is clearing the path for a digital revolution in every industry, and thousands of new businesses are growing every year leveraging this wave of transformation. The manufacturing industry is one where the capability of companies to keep the pass with the technological improvement is becoming a fundamental requisite to ensure competitiveness and grant a sustainable competitive advantage among competitors, for these kind of companies in fact missing the wave of the digital transformation would result in a fatality, especially when faced to compete with more technologically advanced competitors in a long-term view scenario. When associating the manufacturing world with the new internet-based technologies that are spreading nowadays, a new productive paradigm raises: the one of Industry 4.0. As it will be discussed in the relative chapter, one of the main aspects of the industry 4.0 paradigm is the data, and all the aspects that orbit around that. In a "smart factory" in fact, tons of bytes of sensitive data are supposed to be generated every day and correctively managing and leveraging the industrial data will constitute a major driver of success for the digitalized manufacturing companies. The predicted exponential raise in industrial data generation set the basis for the birth and growth of many new innovative businesses focused on the creation of ad hoc products for data extraction, management, processing and analytics in the manufacturing world. This condition represents ultimately the rationale of this thesis work, in fact the opportunities conferred by the undergoing digital transformation triggered the founder Guanxi s.r.l. to deepen the analysis of this market, with the players involved and the relative constraints and specificities, with the ultimate goal to come up with a structured business plan for the launch in the market of a new Business Intelligence software specialized in industrial manufacturing data. The thesis work concerns then the redaction of a business plan for a business intelligence software for manufacturing companies' efficiency in a context of Industry 4.0. The idea on which the whole planning activity is based consists in a SaaS (Software as a Service) platform powered by a Cloud-based architecture aimed at turning industrial data into insightful decision making for companies, enabling predictive analytics with a consistent data-driven approach.

The discussion starts with a literature review which defines the concept and the context of Industry 4.0. In this chapter the distinctive characteristics and the enabling technologies of the Industry 4.0 are presented to properly define the environment in which the product at the base of the business plan is intended to be positioned. Particularly the discussion touches the topics of: interconnectivity, virtualization, decentralization, remote interaction, real time elaboration, modularity, sustainability and interoperability (regarding the distinctive characteristics); and with respect of the enabling technologies the topics analyzed are: internet of things, big data analytics, cloud computing, cybersecurity, additive manufacturing, advanced robotics, artificial intelligence and machine learning. After the brief theoretical introduction the formal Business Plan redaction starts. In this executive summary all the chapters composing the plan will be listed and their content briefly summarized.

The company profile: Guanxi s.r.l.

The first chapter presents the company with which this thesis work was developed focusing on its competence areas and operations, its approach and the innovative methodologies which adopts. After the company introduction the project idea/rationale is presented, which consists in developing a tool to offer a valid and accessible solution to SMEs to leverage their industrial data generated in the manufacturing processes to enhance their productivity and operational efficiency.

Market Analysis

After analyzing the company, a detailed market analysis was conducted in order to assess the characteristics of the market and develop a consistent strategy for correctly positioning the product. At first the Industry 4.0 business trends and the Italian scenario were discussed. In this section the current situation of the industry 4.0 in Italy was discussed with a particular focus on the comparison of Italy with the other major European markets, the governmental incentives and laws that regulate the topic, and the major enabling technologies' adoption rates. After this general introduction of the market a more strategical perspective was adopted on approaching the market analysis. From an external point of view a market competitiveness assessment was conducted using the Porter's five forces model, the Key Success Factors have been identified, and a set of 10

heterogeneous competitors analyzed. From an internal perspective a SWOT analysis was redacted, with the aim of defining a correct entry strategy in the market.

The problem/need and market validation

After having discussed the idea and identified the market a validation study was conducted. At first a problem/solution canvas was developed in order to identify some of the key features necessary to grant a good problem/solution fit. In this phase several hypothesis were made and after having highlighted some of the key question to answer in order to verify the correctness of the assessments made a market validation exercise was conducted interviewing 12 manufacturing companies of various industries and sizes. The questionnaire proposed and the answers obtained are listed in the chapter, together with the conclusions obtained.

The first product definition and marketing mix

In this chapter, using the results of all the previous phases as a basis for the discussion, the product subject of the business plan was defined for the first time in its key features and aspects using the Kotler's 4Ps model to define the marketing mix. Hence, in this section, the product features and characteristics are defined, the pricing model proposed, and the promotion strategy and distribution defined.

The product: a deeper focus

In this chapter the product definition and analysis is performed on a deeper level defining some key aspects that have been introduced along the discussion but never properly presented in a formal and exhaustive way, but which represents some critical and peculiar characteristics of the product. At first the proposed Cloud architecture is presented and analyzed in detail, together with the proposed interface and its key aspects. After the discussion on the technical side, the user journey as it has been intended is presented by comparing an AS-IS and TO-BE scenario and summarizing the results in a pain/gain chart. Finally the business and revenue model adopted is formerly discussed.

Minimum Viable Product (MVP)

The next step of the business plan concerns the development and the testing of the project's MVP. The MVP developed, consisting in a landing page is presented and

commented to clarify all the sections that have been included in it. After the MVP development a testing phase followed, and was conducted by submitting the MVP to 61 manufacturing companies that may be identified as potential customers of the product's first release. The results of the MVP validation effort are here listed and analyzed.

Market segmentation and targeting

Starting from the results obtained during the previous validation phase, in this chapter the identified customer personas are here formalized and then the market segmented using the TAM, SAM, SOM model in order to define a reachable set of customers for the product's first release which will constitute the basis for the redaction of the financial projections.

Operational plan

In this chapter all the necessary resources necessary to perform the activities for the product development are listed and associated with their relative costs, and their availability assessed. All the project activity milestones are then listed and their priority and durations explained.

Organizational plan

In this chapter the team dedicated to the project development is presented, and roles, responsibilities and hierarchies defined and explained.

Financial plan

In this section, the financial plan for the project is redacted on the basis of all the information gathered in the previous steps. The financial plan is performed here on a 2 years-time horizon, and all the results and financial statements and projections presented.

Project roadmap

The chapter presents all the activities identified in the organizational plan scheduled over the project time horizon showing all the dependencies and the possible characteristics among activities.

Business model canvas

The final chapter of the business plan presents a lean business model canvas in which all the results obtained in the previous steps are gathered together and summarized.

2 Industry 4.0

The industry 4.0 is a concept related to a new stage of development of the manufacturing industry which comprehends the companies' organization in all the value chain's levels [1]. This disrupting concept is the basis of the fourth industrial revolution, which identifies a new productive paradigm with respect of the previous industrial revolutions that happened over the years. The concept of Industry 4.0 was originally born in Germany in 2011 during the infamous Hannover conference, where a specialized team introduced the concept in its project to deeply renew the German productive system in order to bring the country back sustainably to a leadership position worldwide with respect to the manufacturing capacity. This new paradigm is based on an individual and customized production, with the horizontal integration in collaborative networks and with the digital transformation of the supply chain. The biggest added value brought by the new paradigm is though related to a new concept of production and distribution of goods and to a new way of creating and distributing value for the companies. The products overcome in fact the limit of the physical dimension, enhancing their nature by being now strictly related to a technological environment, the products are now bearers of an enormous amount of data and information during their whole lifecycle. Leveraging these data, companies can now bundle their products with personalized services and enhance their productivity by deploying their industrial data using a data-driven approach in decision making. The concept as it is presented is quite broad, and many different definitions of it have been given; here the definition proposed by Hermann et al. (2015) will be given:

"*Industry 4.0 is a collective term for technologies and concepts of value chain organization. Within the modular structured Smart Factories of Industry 4.0, Cyber Physical Systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions. Over the Internet of Things, CPS communicate and*

cooperate with each other and humans in real time. Via the Internet of Services, both internal and cross-organizational services are offered and utilized by participants of the value chain." [2]

Starting from the point that a multitude of alternative definitions of the paradigm can be given, the proposed one and all its alternative share a common basis, with which it is possible to identify a common set of principles and enabling technologies shared by all the 4.0 solutions.

2.1 Distinctive characteristics

When talking about industry 4.0 it is necessary to assess the fact that the term has been deeply differentiated among the various contexts of application that is hardly definable in a univocal way, nevertheless there are some peculiar principles that set a guideline for the identification of a particular solution as a 4.0 one [2][3]:

- Interconnectivity: the ability of the various assets and resources of the company to exchange information and relevant data with internal and external systems throughout a dedicated network for data exchange. Moreover, this aspect must refer to a broader set than to the mere factory side, the interconnectivity and the ability to exchange data is crucial to all the actors and all the levels of the value chain.
- Virtualization: the possibility to digitally represent the enterprise, by means of utilization of dedicated sensors applied to the various components of the physical processes, which allows to define the "digital twin" of the company, whose combination with the physical assets generates the Cyber-Physical System which represents the foundation of the whole Industry 4.0 concept. The capacity of disposing of a virtual representation of the enterprise gives the chance to perform simulations aimed at predicting and managing hypothetical quick changes in the market conditions.

- Decentralization: the components of the CPS are able to recognize potential anomalies in the processes and to modify their behavior according to autonomous modules.
- Remote interaction: is the possibility to interact through remote access the processes so as to gather data which will allow to intervene proactively in case of malfunctioning.
- Real Time elaboration: the presence of tools which allow to gather information with samples big enough to follow the various processes dynamics in order to be able to perform real time actions and take strategical and operational decisions on real time quantitative data.
- Modularity: the ability to modify the mechanisms of production following possible variation in the demand exploiting an integrated value chain under the aspect of information sharing.
- Sustainability: the trend of pursuing an always greater efficiency energy-wise and resource-optimization-wise with the aim of reducing the impact of operations and enhancing the work conditions.
- Interoperability: the capacity of two or more distinct systems belonging to different enterprises to exchange data in order to create networks able to overcome regional/national borders so as to permit even to SME to improve their competitiveness.

The various possible combinations among these distinctive principles define the solutions that can be successfully considered as belonging to the Industry 4.0 paradigm. At this point, it is obvious how a critical role when pursuing these objectives is held by the enabling technologies. According to the literature [4] these technologies can be clustered into three main categories. The first one regards the elaboration and analysis of big quantities of data, which is becoming nowadays always more affordable by the accessibility to low cost sensors and to cloud computing models. The second concerns the whole man-machine interaction topic, made always more complex by collaborative robotics and advanced automation. Finally, the last one regards the concept of the value-chain interconnection realized by a smart sensor system, or Internet of Things (IoT).

Nevertheless, the digital transformation must not be associated to the mere adoption of the enabling technologies without considering that innovation 4.0 in its essence envisages

a deep interconnection of the technologies in order to integrate the whole production and supply chain in a network of people, machines and information systems and devices. It follows that it would be reductive to consider the undergoing industrial revolution only under the technological aspect without taking into account its dramatic impact on the corporate culture and the business behavior. The new paradigm needs new digital competencies, a reconversion of the workforce, new advanced infrastructures and a new investment behavior oriented to the very-short term so as to enhance flexibility, rather than being traditionally focused on the medium-long term; the "revolution" affects all the aspects and all the functions of the enterprise. Considering this, it is easy to understand how fundamental the role of the CEOs is, who must embrace the new challenge of the 4.0 context with a deep awareness and with the will of providing the enterprise with the conceptual, managerial and technological tools required by the new paradigm. To sum up, together with the adoption of the necessary enabling technologies, that will be discussed shortly, a necessary condition to cope with the 4.0 revolution is a clear and consistent vision of both the technological and the strategic and cultural aspects by the corporate managerial layer.

Figure 1: The Industry 4.0 enabling technologies. https://industry40marketresearch.com/wp-content/uploads/2019/02/Industry-4.0-Value-Chain.jpg

2.2 Enabling technologies

As it was stated previously, the industry 4.0 is usually associated with a set of enabling technologies: Internet of things (IoT), Cloud Computing, Big Data Analytics, Additive Manufacturing, Augmented Reality, Cybersecurity and Advanced Robotics. These technologies are already widespread among enterprises but currently their application is still sporadic and limited, being mostly focused on the control phase of the industrial processes. Hence, is possible to assess that the trend towards the digitalization of the enterprises, and of the manufacturing industry, is already consolidated in the enterprises universe, but underlines how the concept of industry 4.0 should not be intended only in terms of improved efficiency and productivity of manufacturing systems, in fact, the various opportunities generated by the technologies should be considered. The resource optimization, the rise of new business models, a better management of product life-cycle, the reduction of the time-to-market, the mass customization and the ability to know in real time the needs of the consumers are only a few of the variety of possibilities that the interconnection and the integration of the enterprise systems in a 4.0-way bear.

2.2.1 Internet of things

The IoT is intended as a framework of physical objects provided with specific technologies designated to data survey and transmission through an internet network. Adopting an adequate system of sensors, it is possible to link the virtual IT world with the real one, creating a brand-new ecosystem in which a product becomes able to communicate (for instance), everywhere and in every instant, information about its current state and the surrounding environment. Although the application possibilities of this technology are basically endless (i.e. smart homes) the focus in this work will be on its manufacturing application. The use of the IoT in a production environment (or Industrial Internet of Things, IIoT) holds multiple benefits: installing a set of sensors is possible to gather data about key parameters of any kind, which allow, for instance, to

intervene promptly in case of malfunctioning, performing a predictive maintenance and lowering set-up times and costs.

2.2.2 Big data analytics

Data and sensible information have a major role in the industry 4.0 scenario, in fact, the digitalization of the enterprises leads to the generation of an enormous amount of data, which then have to be gathered and analyzed in order to be used as a supportive tool to strategic and operational decisions. The potential of these business intelligence technologies lies in the fact that they allow for instance to foresee process failures ex-ante and to control, monitor and potentially measure in real time the performance of the production systems. Moreover, the Data Analytics activities arise the possibility of performing a better and deeper study of the companies' customers, allowing the company to identify the trends in the consumer's needs and behaviors, enhancing, if needed by the organization, the effectiveness of mass customization. To sum up, data represent the foundation of the whole industry 4.0 paradigm and a proper usage and analysis of them constitutes the fundamental prerequisite for implementing successfully the digital transformation in a company. Anyways, it must be stressed the concept that this technology represent as a big opportunity as a major criticality point: the enormous amount of data generated by the digitalization of the company would be useless and maybe dangerous for the performance of the operations without a proper and well-functioning infrastructure for the data gathering and analysis.

2.2.3 Cloud computing

The Cloud is commonly defined as an IT infrastructure which allows to store, withdraw and manage data with a platform shared among multiple users who have the necessary access references. Throughout this technology is hence possible to handle the huge amount of data generated by the IoT adoption. [5]

The Cloud Computing technology, on its side, is usually configured as a service provided by third parties according to the specific requirements of the users, discharging them from

any responsibility in terms of management and maintenance of the system. This technology, given that requires as the only adoption constraint the access to an internet connection, is therefore extremely flexible and allows to redefine the contractual conditions with the supplier in real time according to the current exigencies of the user. Nevertheless, the main threat in the adoption of this technology is the security of the data handled, it is in fact responsibility of the user to cope with the reliability of the provider so as to grant a proper treatment of the data shared in the digital platform.

The Cloud Computing technology can be discussed analyzing the three main categories of service that offers:

- Software as a Service (SaaS): grants access to the owned applications through a web interface which are fully managed on their side by the external provider.
- Platform as a Service (PaaS): grants a virtual environment dedicated to the implementation of software solutions and online services using the tools provided by the supplier. With this solution the user holds the responsibility of managing and updating its applications.
- Infrastructure as a Service (IaaS): is a Cloud service where the provider hosts the user's applications and data in its virtual infrastructure. This pay-per-use solution offers to the user the opportunity to pay only for the physical space used, allowing to reduce costs and improve efficiency, since the user is discharged from any reliability in maintaining and managing the Cloud platform.

2.2.4 Cybersecurity

In a context where huge data streams are generated, data which are often sensible and non-disclosable, it is easy to understand how the cybersecurity assumes a major role in the digitalization process of an enterprise. Sensible data generated by IoT technologies and shared through Cloud platforms might be accessible to third parties, like competitors, clients or suppliers, therefore, the warranty of a correct usage and treatment of data becomes undeniable.

Particularly, the concept of cybersecurity concerns all the routines, the technologies and the procedures aimed to defend data security and prevent informatic attacks of servers

and infrastructures, it follows that, in this context, particularly relevant is the topic of the accessibility to sensible data and the protection of strategic information of the company.

2.2.5 Additive manufacturing

The concept of additive manufacturing is usually related to the 3D printing technology, namely printers capable of creating a tridimensional object starting from a CAD project [3]. Nowadays the industrial materials supported by the 3D printing technologies range from polymers to ceramic materials, including metals as well. The increase of the materials supported, and the development of the technology allowed to deploy the additive manufacturing technologies for the realization of the final products, whereas in the beginning they were only used for the prototyping phase of the production. The advantages offered by additive manufacturing are significant, especially for products or components particularly complex, produced in small batches and reduced in dimensions. The 3D printing technology carries in fact:

- No complexity constraints, since the product does not need to be modified to be adapted to the traditional production process outcome.
- Unitary batch dimension, making the production cost independent from the batch size.
- No time or space constraints, since the products can be printed when needed and not necessarily in the producer's facilities.
- Waste reduction, being the production additive and not subtractive the cost of material is reduced almost to its minimum.

Therefore, the additive manufacturing brings many benefits in the manufacturing industry. First of all the reduction of time-to-market thanks to a rapid prototyping phase, but also an improvement in machinery maintenance, assembly times and tooling costs, as the necessary parts can be printed directly on site, and these benefits are directly observable considering the exponential increasing trends in this technology adoption in the manufacturing industry.

2.2.6 Advanced robotics

The use of robots in the modern manufacturing industry plays a fundamental role, the number of industrial robots has in fact more than doubled during the past few years, and the increase find its reasoning in the drop of prices together with the increase of the possible applications [5][6].

One of the founding characteristics of the 4.0 industry is in fact the autonomous production techniques made possible thanks to robotic units that guarantee the carrying out of the processes foreseen in an intelligent and integrated way with human operators. The possibility of integrating robots in spaces traditionally used for the work of operators gives production processes a substantial increase in the quality in terms of safety, flexibility and versatility so as to create possibilities for collaborative applications at all company levels, from production to logistics. The robotic units under analysis are precisely defined CoBots (Collaborative Robots), which are robots designed to share the workplaces collaboratively with the operators, guaranteeing safety thanks to sensor and camera systems that allow a continuous control of the surrounding environment reducing the risk of accidents. Another key feature of CoBots lies in the ease and speed with which they can be reprogrammed which ensures the flexibility required to be applied in numerous production areas significantly leaning and simplifying processes.
Finally, one of the most important characteristic of the CoBots is the integration possibilities of these units with other enabling technologies like IoT, big data and cloud computing which enable the machine learning, namely the capacity of the machines to learn autonomously while operating without the need to be reprogrammed.

2.2.7 Artificial intelligence and Machine learning

The term Artificial Intelligence describes the ability of a machine or a software system to emulate the cognitive abilities of the human mind [3]. The fundamental components to create an artificial intelligence are a machine or generally a robot; a software, essential for the learning process; the IoT, as the sensors interact with the system and the use of the cloud, indispensable for the amount of data to be exchanged.

The Machine Learning is a subset of Artificial Intelligence, this technology reproduces the functioning of the human mind which, to learn, first imitates, then tests and makes mistakes (heuristics) and finally repeats and memorizes. The strength of the Machine Learning is input, data-based analysis and informed decision-making. Unlike the classic instructions for computer use, the Machine Learning specializes in predictions in the field of computational statistics and probability.

In a smart factory where machines, components and interfaces communicate with each other, it is possible to collect valuable data to optimize the production process. This data facilitates process optimization thanks to artificial intelligence, for example by using image recognition algorithms to sort objects on conveyor belts, or by monitoring the energy consumption of machinery to assess the status and need for maintenance. Other applications concern the possibility of using robotic arms (CoBot) capable of collaborating with humans and carrying out heavy tasks, without ever putting people's lives at risk, because thanks to AI and ML they recognize certain situations and learn from events new, how to behave in the future.

Studies performed on the field showed that the use of AI can reduce the producers' conversion costs up to 20% and up to 70% reduction of costs resulting from higher labor productivity.

3 The company profile: Guanxi s.r.l.

Guanxi is a digital strategy consulting company based in Turin and founded in 2010 by Alberto Giusti [7]. The company operates to support other organizations by offering strategic advice so as to improve the potential of the clients' business models using the tools provided by the internet and the new digital revolution generating the most competitive advantage. The company's goal is to sustain the clients' growth and create new sources of value by generating tangible results to support the success achievement.

In the Italian competitive scenario many companies still have a vague idea of the huge possibilities offered by the digital world and given the situation, the future of many organizations will be strictly related to their ability to understand and adapt to the

challenges and the opportunities offered by the digital revolution, since the integration between the digital world and the real one is one of the macro trends that is impacting the world economy in an evident way. Guanxi's mission is then:

"to help entrepreneurs and managers to analyze the business model of the organization, considering opportunities and challenges, by implementing the digital strategy that will ensure durable, sustainable and incremental performance." [7]

To fulfill the established mission, Guanxi adopts an analytical, strategic and innovative approach which is goal-oriented to help organizations of all kind to achieve tangible, measurable and sustainable results using internet and the latest digital tools efficiently and strategically. Often the company's clients want to develop the idea of online businesses using the same processes and models used for offline ones, considering the online activities as an additional service not directly related to their core business strategy. With this traditional approach organizations risk losing opportunities and underestimating the primary objective of their companies since "being digital" does not only mean to use the internet or the latest digital technologies, but learn how to consistently earn from the undergoing digital revolution, structuring business models with the new emerging technologies. The digital must be strategically placed in the business plan of the companies, contextualized with the industry and the market, and integrated in the processes. With this lean and innovative approach, Guanxi aims at reaching the following goals when offering its services to a client to ultimately provide them with a consistent digital strategy:

- Understand and meet the challenges introduced by the advent of the digital revolution.
- Provide the means to understand and elaborate digital business models and to make the business flourish.
- Acquire the basic tools to trigger and support innovation in the organization.
- Define and implement digital strategies for success related to their businesses.
- Help establish a digital thinking culture in the organization.

As introduced before, the ultimate goal of Guanxi is to provide its clients with a consistent digital strategy (which fits in the fields of strategic management, marketing strategy and business strategy) in order to orient the actions of the management and the entire client

company by defining a vision, a mission and a value with the aim of transforming the business model. To achieve a complete and correct digital strategy is necessary to change the paradigm of the traditional business models, restructuring them by defining objectives, needs to be addressed, resources, challenges and opportunities while focusing on the customer, re-adapting then the processes of the organization. Guanxi uses a well-structured methodology to carry on with its peculiar and innovative approach:

1. **Identify opportunities and challenges of the business:** the customers approach Guanxi when they need to make strategic and operating decisions crucial to their business growth and sustainability. Guanxi offers on its hand consulting services to implement innovative business models within the digital or to support the traditional business with new tools and digital components. The first step of Guanxi's method consists then in analyzing all the business processes so as to deeply understand the company's structure and activities at all the levels of the value chain in order to define the potential of online activities or digital tools in the organization. Parallel to the analysis of the company a deep study of the strengths and weaknesses of the competitors is carried out to obtain a quantitative benchmark of their strategy, assets and potential. The analysis has also the purpose of evaluating some related activities and effects such as the online presence, the brand's influence and perception, the ability to get viral and the customer's reactions.

2. **Identify needs and expected results of clients:** after the preliminary phase of analysis the needs and the result expected are identified so that with a structured approach to problem solving all the significant variables and alternatives can be considered before designing a coherent solution to be proposed.

3. **Develop a range of solutions in distinct phases by priority:** the final step consists in proposing a business plan of operations, with a range of actions defined on the basis of the results of the previous phases. Together with the solution proposed are defined the required investment and the Key Performance Indicators to measure and evaluate the effectiveness of the solution. Finally, the solution is

delivered with a process and technical assessment, a structured business plan together with the skills necessary to understand, manage and control the new processes.

The lean approach and work method adopted, together with the skills of company's human resources allows Guanxi to successfully operate in a variety of industries: energy, automotive, telecommunications, insurance, financial, industrial, FMCG, non-profit, ICT, advertising and marketing, private equity and customer training.

3.1 The project rationale: the idea for a new product

The undergoing digital revolution is challenging organizations in every industry and business area, offering opportunities and threats to every company, moreover the advent of the new industry 4.0 paradigm is deeply transforming the manufacturing sector. The state of the manufacturing industry, in particular in Italy, and the current stage of the digital revolution related to it will be deeply discussed in the following chapter, however it represents the rationale of the project at the base of this thesis work: the idea for a new product. Guanxi's founders have recently decided to boost up their operations related to the manufacturing industries and have identified an opportunity to improve the company business leveraging one of the main aspects of the industry 4.0: the data generation. In a scenario where manufacturing plants are moving towards the idea of smart factory the correct use of the data generated by the production processes can lead organizations to better decision making, to reduce inefficiencies and to optimize the whole manufacturing line, in a few words, it can help manufacturers to reach the "perfect production", the idea is then to develop internally a Business Intelligence software to propose to the client companies bundled with the usual consultancy services offered by Guanxi to empower the clients' data and help them improve their operational efficiencies. In the following chapters the product idea will be described, and the market's state of the art and opportunities analyzed, in order to define a structured business plan for the product development and commercialization.

4 Market analysis

The always faster evolution of the new technologies is transforming deeply and irreversibly the manufacturing industry, with a rhythm never experienced before. Its impact is disruptive in all the economic sectors, it is the industry 4.0 revolution, which is questioning the strategies and the current business models of enterprises. The progresses in robotics, artificial intelligence and in the IoT market are in fact empowering a radical transformation of digital and physical systems, making them always more interconnected. It follows that the organizational structures and the operations of enterprises will have to change accordingly in order to adapt to a more flexible and mutable economic environment based on a close cooperation among people, robotic units and digital environments.

In this chapter the state of the art of the Italian scenario will be analyzed, with the aim to perform an external market analysis that will be the founding pillar for the development of the strategy to be adopted in the business plan that is the core of this thesis work: **the plan for the launch of a BI software for 4.0 manufacturing data**.

Firstly, the state of the Italian scenario will be analyzed, even in comparison with the situation in the other top manufacturing countries, in order to assess whether there is potential for a project like this one to be successful given the state of the art.

Secondly, a more traditional analysis of the industry will be performed using the classical tools of strategic analysis so as to assess the competitivity of the industry, its potential, its threats and opportunities, its players and the key features necessary to be sustainably profitable.

4.1 Industry 4.0 business trends and the Italian scenario

Italy is confirming itself as a country rich in resources and potential in terms of advanced technologies and the investments performed by the Public Administration created a favorable environment for the development and the digitalization of enterprises. Despite the economic recovery is emerging way less in Italy than in other European countries like Spain, Germany and UK, the latest data from the authorities on the state of adoption and

application of the industry 4.0 technologies are showing an encouraging and favorable picture for the development of the industry 4.0 and reveal that Italy is maintain a strong and leading position in Europe and in the world.

With more than 5400 hi-tech manufacturing enterprises [8], Italy is among the first four players in Europe (together with Germany, UK and Poland), where there are overall around 46000 companies of this kind. Italy is above the European average even in terms of production and application of industrial robots and adoption of 4.0 technologies like cloud, IoT and Machine To Machine communication (M2M) [9], moreover, according to the European Commission data, the investment in R&D in this sector from the top spenders in Italy (185,4 M€) is above the EU average (165,8 M€), at least if considered in absolute value. These premises outline the profile of a Country rich in resources and potential, which must be fully exploited through collaborative strategies among enterprises, institutions and public and private bodies. With this purpose, the Italian government moved an important step for the technological evolution of the national industrial framework implementing a number of significant measures with the national plan for industry 4.0 (*Piano nazionale "Impresa 4.0"*). The fiscal incentives and the other initiatives of the plan led to positive results, as it is demonstrated by the increase in the investments in digital technologies and new industrial equipment [10]. The governmental plan comprehends a series of measures aimed at developing the enabling technological infrastructures for industry 4.0, with an allocation of funds of 3,5 Billion of euro. These complementary measures regard for instance the enhancement of the ultra-wideband (with the aim to cover 100% of the national territory by 2020), the definition of open-source standards for M2M communication in the IoT scope, the development of high-speed digital networks. Currently one of the main weaknesses of the Italian technological profile lies in the backwardness of the infrastructures and of the data transmission velocity, anyways, European programs like Horizon 2020 and FP7 aim to offer a valuable contribute to the modernization of the internet connectivity of the Italian enterprises, of which only the 7% presents a 100 Mbps connection [11], far below the EU average of 16% (figure 2). The European projects allocated significant funds to support research activities and start-ups dedicated to technological solutions for manufacturing and data management for Italian enterprises (figure 3).

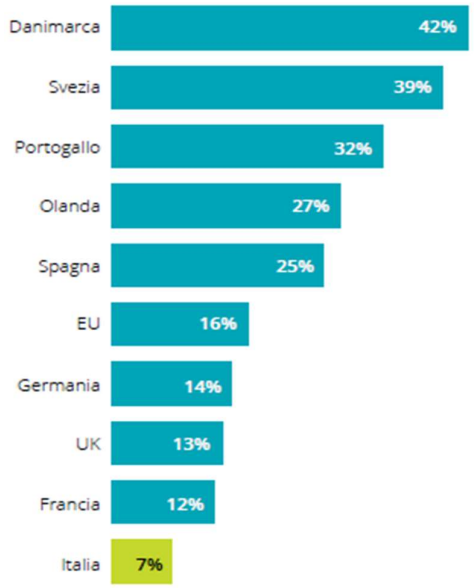

Figure 2: Enterprises with at least 100 Mbs internet connection speed. https://www2.deloitte.com/content/dam/Deloitte/it/Documents/process-and-operations/Report%20Italia%204.0%20siamo%20pronti_Deloitte%20Italy.pdf

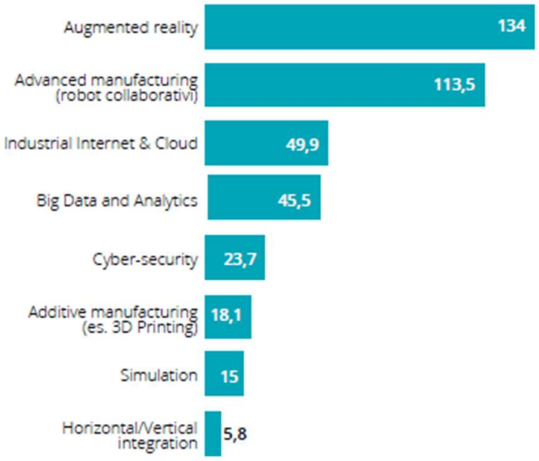

Figure 3: Resources from EU programs for 4.0 technology development in Italy. https://www2.deloitte.com/content/dam/Deloitte/it/Documents/process-and-operations/Report%20Italia%204.0%20siamo%20pronti_Deloitte%20Italy.pdf

THE NATIONAL PLAN "I*MPRESA 4.0*"

The national plan "*Impresa 4.0"* represents an important starting point for the development of the industry 4.0 in Italy especially under the aspect of cooperation between public institutions and private enterprises. The Government allocated significant resources, particularly in terms of tax incentives, but a proper development is not possible without an aligned effort by the enterprises. Within the main objectives of the plan there is the growth of private's investments in R&D (estimated in 11.3 Billion € in the three-year period 2017-2020) [12] with a specific focus on digital technologies. The enterprises must be able to foresee the undergoing revolution throughout a consistent process of technological innovation which would grant competitive advantage conferring a cutting-edge positioning in the market; obviously the R&D efforts are fundamental for the innovation of both products and productive processes. The plan *"Impresa 4.0"* allocated funds for over 18 Billion euro for the three-year period 2017-2020, and its measures are based on nine fundamental points:

1. Iper/Super amortization: A super-deduction of 250% for investments in new industry 4.0 equipment and of 130% for other new equipment.
2. "*Nuova Sabatini"*: A governmental incentive aimed at covering partially the interests payable from bank loans for the purchase of new industrial equipment and digital assets for SMEs.
3. Development Contracts: Preferential financing and outright grants for a total of 850 Mln €, aimed at supporting big investments for technological development.
4. Innovation agreements: An allocation of 200 Mln € for investments in experimental R&D for product and process innovation throughout the utilization of specific technologies.
5. R&D tax credit: A tax credit of 50% on R&D expenditures exceeding the amount spent in the years 2012-2014.
6. 4.0 education tax credit: A fiscal incentive of 40% of the costs faced to enhance the development of technological competences and encourage the 4.0 education of the personnel.
7. Patent Box: A reduction of 50% on IRES and IRAP on revenue streams from intellectual property rights.
8. Innovative startups and SMEs: A number of incentives and tax detractions to support entrepreneurial initiatives and encourage startup incubations.
9. Guarantee Fund for SMEs: The government is accountable for financings requested by SMEs for investments in innovative digital technologies up to the 80%.

The annual report of ISTAT [13] confirms that the fiscal incentives led around the 67% of the manufacturing enterprises to invest in new technologies and/or machineries during 2017, although there is a significant gap on the dimensional aspect of the enterprises, in fact, the amount rises to 96.7% if considering big enterprises, while lowers to 42% with respect to SMEs. Hence, the bigger companies are leading the industry 4.0 development in Italy, despite the SMEs maintain an essential role in the composition of the Italian manufacturing environment, anyways, the incentives offered were designed with a particular attention to the SMEs and overall were largely appreciated by the enterprises, as it is shown in (figure 4), in fact, the ministry of economy and finance elaborated that

the incentives stimulated the purchase of new tangible assets like machineries (+13%) and electronical appliances (+7%) [14].

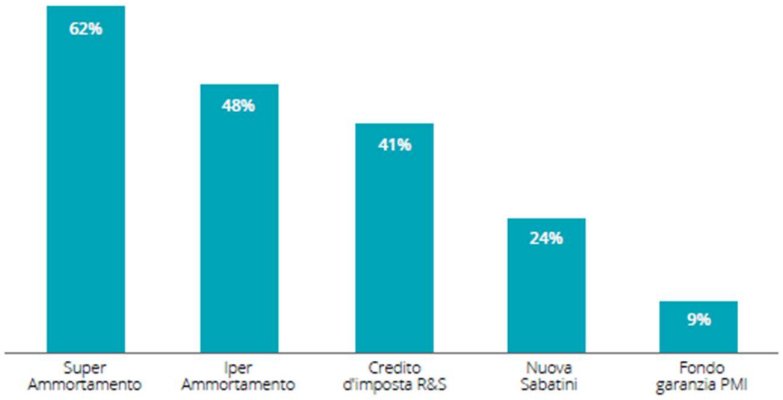

Figure 4: Impact of incentives on investment decisions of enterprises. https://www2.deloitte.com/content/dam/Deloitte/it/Documents/process-and-operations/Report%20Italia%204.0%20siamo%20pronti_Deloitte%20Italy.pdf

It is important to underline as well that, according to the institutional reports, in 2017 there was an increase of early stage investments in startups (+16,5%, for an overall amount of 141 Million €) on behalf of venture capital companies and business angels (figure 5), although the percentage of this sort of investments with respect to the GDP is still far below the EU average in Italy (figure 6).

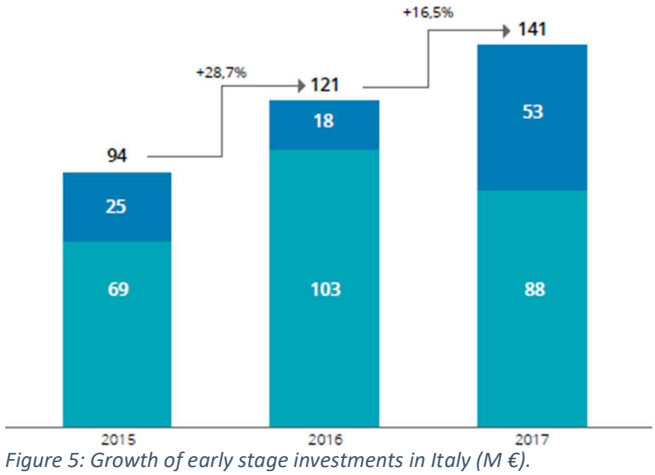

Figure 5: Growth of early stage investments in Italy (M €). https://www2.deloitte.com/content/dam/Deloitte/it/Documents/process-and-operations/Report%20Italia%204.0%20siamo%20pronti_Deloitte%20Italy.pdf

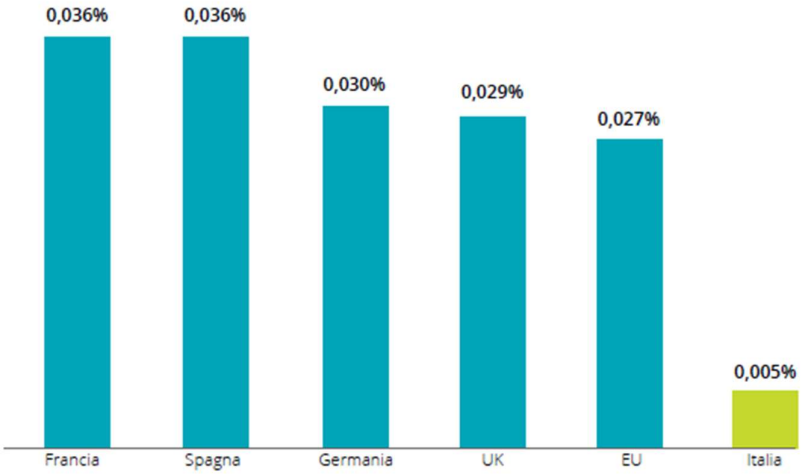

Figure 6: Early stage investments to GDP ratio. https://www2.deloitte.com/content/dam/Deloitte/it/Documents/process-and-operations/Report%20Italia%204.0%20siamo%20pronti_Deloitte%20Italy.pdf

4.1.1 Focus on technology adoption

Italy is well positioned in the global top 10 in terms of adoption of the main enabling technologies of the industry 4.0, confirming the potential of the Country's manufacturing framework. In this paragraph the adoption trends of some of the most important technologies are analyzed and compared with the data from the other top manufacturing countries.

Industrial robotics: It is a highly concentrated industry, dominated by four leading countries: China, South Korea, Japan and USA. Nevertheless, Italy ranks at the seventh place with a yearly production of 6500 units (figure 7 a), and the estimations suggest that the production might rise at 8500 units by 2020 [15], remaining strongly above the EU average. Moreover, according to the International Federation of Robotics [16], Italy is among the leading countries even in terms of intensity of industrial robotics, which defines the ratio between the number of industrial robots and the dimensions of the workforce (figure 7 b).

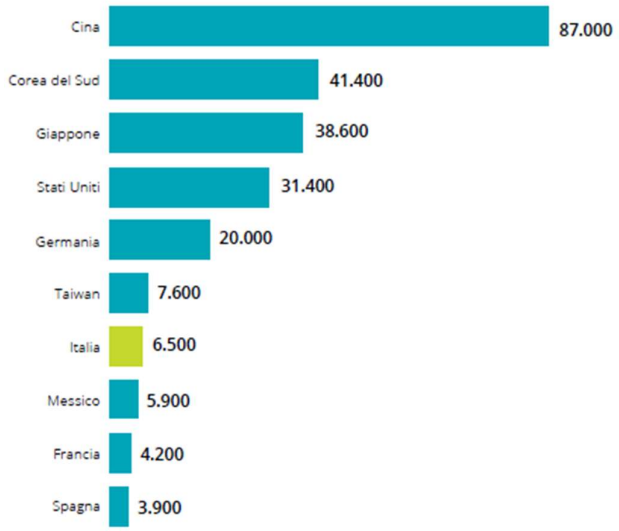

Figure 7: Above,Yearly offer of industrial robots (units). Below, number of industrial robots every 10k employees in manufacturing.

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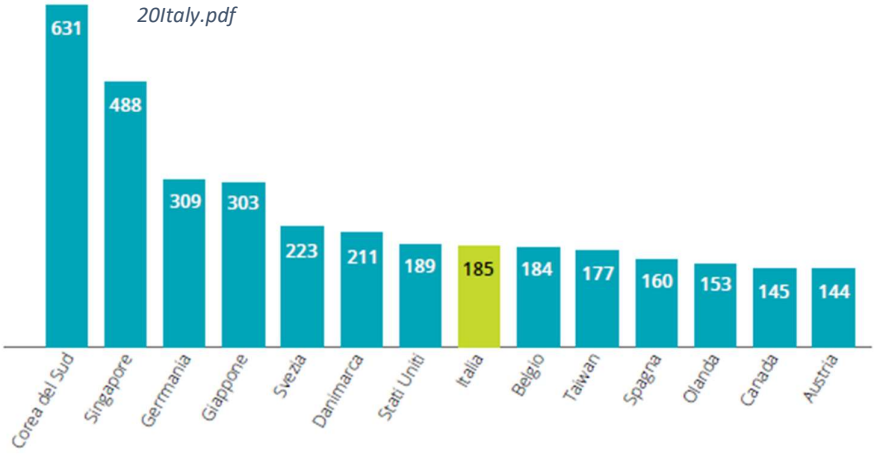


Internet of Things: In 2017 the Italian IoT market reached a value of over 3,5 Billion €, with a growth of 32% with respect to the previous year and of 139% with respect to 2014, confirming the exponential development trend of the market in all its applications [17].

Machine-to-Machine communication: According to the OECD [18], Italy is among the leading countries, ranking at the sixth place worldwide, in terms of interconnection among industrial machineries (M2M communication). This technology allows for an automated and real-time exchange of data within a network of plants, machineries, sensors and industrial robots, it follows that M2M represents one of the most critical

elements of the industry 4.0 and constitutes the funding technological infrastructure of the Industrial Internet of Things (IIoT). In Italy the adoption of sensors and SIM cards installed in the machineries (necessary to enable the M2M data transmission) is of 16,4 every 100 inhabitants, a data which matches the level of countries like China and Germany and surpasses Japan and South Korea (figure 8).

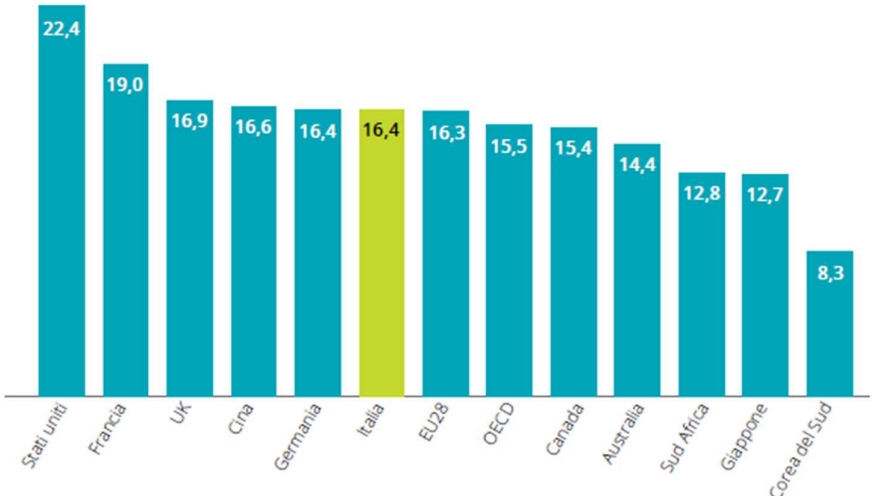


Figure 8: Number of sim cards for M2M communication every 100 inhabitants. https://www2.deloitte.com/content/dam/Deloitte/it/Documents/process-and-operations/Report%20Italia%204.0%20siamo%20pronti_Deloitte%20Italy.pdf

Cloud: According to a study carried out by the Polytechnic of Milan [19], the Italian market for cloud technologies is in continuous expansion: in 2017 it reached a value of 2 Billion €. All the main industrial sectors are involved in this trend, but the manufacturing one holds a leading role in driving the evolution of this technology, confirming itself as one of the most dynamic industries in Italy as well. The technologies related to the cloud represent a crucial factor for the development of the industry 4.0 and of the digital innovation, since they allow to implement other innovative solutions like the information management from big data and cognitive analytics, the creation of predictive models for manufacturing and the adoption of artificial intelligence and machine learning tools. One of the latest studies from EUROSTAT [20] estimates that cloud technologies are implemented in the 22% of the Italian enterprises, a level which results in line with the EU average and another time among the most relevant worldwide (figure 9).

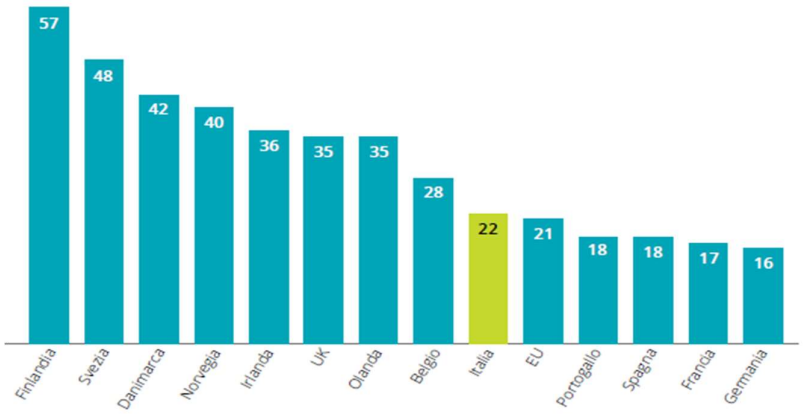


Figure 9: Percentage of companies which adopted Cloud technologies (%). https://www2.deloitte.com/content/dam/Deloitte/it/Documents/process-and-operations/Report%20Italia%204.0%20siamo%20pronti_Deloitte%20Italy.pdf

4.2 External analysis

4.2.1 Porter's 5 forces model

The Industry 4.0 and the Industrial Internet of Things markets are extremely wide and comprehend a variety of different products and applications. For the seek of specificity, in this section the market analysis will be carried out with respect to the business intelligence software market, with a focus on the application in a manufacturing 4.0 scenario. The model of Porter's Five Forces is a framework for the industry analysis and business strategy that determines the competition intensity and may suggest therefore how to attack the market in order to obtain a profitable and sustainable position over time [21].

THREAT TO ENTRY: HIGH

Capital requirements: The software market is generally not highly capital-intensive to access, since there are not particular requirements in terms of hard assets in order to compete in this industry. The main variable to be considered in an innovative and quickly evolving environment like the industry 4.0 one is the effort and the resources to be invested in R&D activities, to maintain technological excellence and prevent obsolescence of the BI product offered.

Economies of scale: In a market like this there might be significant economies of scale. In fact, a company could virtually serve the whole market with a single customizable product, which could be empowered by each user's feedback in a way of sustained and incremental improvement. Anyways the benefits gained by a consistent market share deployment are extremely volatile and could be lost if the market comes up with a better product.

Product Differentiation: The product differentiation results critical in this market. A huge variety of products concerning Business Intelligence are already existing and with the rise of the industry 4.0 and the industrial internet of things the possibilities of new product development are basically endless. Even if the ultimate task of BI software may be hard to differentiate, a variety of complementary characteristics are customizable, and represent the main driver for value generation on the user's side.

Government policies: Governmental policies are basically absent when dealing with software development and Business Intelligence, despite of the cybersecurity topic. Anyways, they must be considered when approaching an industry 4.0 scenario, in fact, they play a critical role with respect of the complementary assets needed to implement a 4.0 manufacturing environment. The criticality of the complementary assets in this market will be discussed later, by now it is enough to consider that governments in the most developed and industrialized countries are offering incentives to help manufacturing companies through their digitalization, and the presence of a smart infrastructure represent the base for the adoption of a dedicated business intelligence software, therefore the increasing trend in the digitalization of companies offers an opportunity to enter the market of BI software for industry 4.0 data management.

Access to distribution channels: In this industry the retailing side of the business is basically absent. Usually the companies designing BI solutions for smart manufacturing hold a close relationship with their clients, since the solutions must be engineered according to the clients' specific requirements. It follows that the well-established companies might benefit of a better reputation and hence of a higher demand, leveraging on their field expertise, anyways, the distribution channels don't represent a major barrier to entry for new firms and startups.

To sum up, it is possible to conclude that given the state of the art, the environment does not present any major barrier to entry, therefore the market is likely to expand both in terms of players involved and, given the increasing digitalization trends, in terms of demand.

THREAT OF SUBSTITUTES: LOW

When analyzing the BI software market, especially in relation to the industry 4.0 scenario, it is quite hard to find substitutive solutions. The whole environment is characterized by the adoption of innovative technologies, it follows that the main substitutes to the considered BI solutions are traditional tools for manufacturing data gathering and management. Nevertheless, it is quite improper to consider the traditional tools as direct substitutes, especially if considering the growing trends for the whole industry 4.0 scenario, which suggest that in the short-medium run the routines and the tools considered here as substitutes will become obsolete and their adoption might represent a driver for competitive disadvantage.

BARGAINING POWER OF SUPPLIERS: LOW

The profitability of a software developing company is slightly affected by the nature of its relationships with suppliers. Being the core business related to the digital world, a software developing company does not need significant investments in terms of machineries and equipment. Therefore, the profitability of a firm operating in this business is much more driven by the internal resources and capabilities rather than by the access to superior resources from external supply. The bargaining power of suppliers in this market is hence low, and its impact on the industry profitability very restricted.

BARGAINING POWER OF BUYERS: MEDIUM/HIGH

Unlikely than what happens with suppliers, customers might present a medium bargaining power in this industry. Especially in this early stage of the industry lifecycle the demand for BI tools embedded in an IIoT framework is limited, and only early adopters in the manufacturing scenario are willing to invest in order to start the journey of the digital revolution. The companies which possess the assets to implement solutions as the proposed one might present a significant price sensitivity and, moreover, might not have clearly defined which are their needs and requirements and therefore might be difficult to

be locked-in, since the features that they perceive as value generating could change along with the process of digitalization.

RIVALRY WITHIN THE INDUSTRY: HIGH

According to the forces analyzed so far it is clear that the market considered present a fierce competition, which will increase with the industry development. The fast-growing environment presents expansive trends on both the demand and supply side, and the lack of barriers to entry and substitutes' threat confer a consistent attractiveness to the market. Another time it is critical to consider that the industry lifecycle is still at an early stage, and hence lacks of the presence of a dominant design of the products offered and of a leading incumbent role, in fact, even if all the major software companies worldwide are moving their first steps into developing BI solutions for the industry 4.0 scenario, a major part of the potential economic value of the market still has to be claimed. To conclude, the market analyzed presents a huge innovation potential and a lot of players, if well positioned and able to develop a competitive product, can outline the trends and the dominant designs of the undergoing industrial revolution.

ROLE OF THE COMPLEMENTARY ASSETS: CRUCIAL

When analyzing any market related with the IIoT scenario, it is critical to underline the importance of the complementary assets. With respect to the case analyzed in this project, it is clear how the adoption and implementation of a smart manufacturing environment is fundamental for empowering a related BI solution. Hence the accessibility to Cyber-Physical Production Systems, Cloud Computing and all the other enabling technologies of the smart factory is a key aspect to be considered, and the overall adoption of the 4.0 solutions in the manufacturing scenarios is what determines the phase and the maturity of the digitalization process in the manufacturing environment. As it was discussed in the previous paragraphs, the industry is still undergoing a preliminary stage and especially if referring to the Italian market and to SMEs, not many firms possess the right infrastructures to properly start their digital revolution process, anyways, considering the expansive trends and the governmental aids for the purchase of 4.0 machineries with special amortization procedures is reasonable to think that in the close future a lot of new firms and SMEs will start their digitalization process.

4.2.2 Key Success Factors

The key success factors refer to those crucial factors upon which the competitive future of the business holds. These factors could range in a wide spectrum that includes product attributes, competencies, resources, market achievements, competitive capabilities etc. It's important to understand the landscape of the industry in order to identify the most critical competitive factors and apply appropriate strategies to address the driving forces and competitive conditions in the industry. Several Key Success Factors can be identified in the BI for industry 4.0 market. In this paragraph some of the key aspects that both the product to be launched and the company developing it should possess to obtain a sustainable profitability are listed and briefly discussed.

On the company's side, which in this thesis work will be addressed as a digital strategic consultancy company, the key success factors are:

- **Strategic management expertise:** The digitalization journey is a process that affects all the layers of the organization and requires investments and dedication to be performed. When referring to a manufacturing company undergoing this process it is easy to understand how the disruptive changes in the production routines must be aligned with a consistent management and strategic vision in order to enhance the possibility of extracting most of the economic value from the digitalization process. Considering this fact, it is clear how the companies providing digital solutions to manufacturing enterprises must possess a deep and accurate strategical expertise, in order to provide solutions which are able to grant long-term value generation in an uncertain environment like the one under analysis.
- **Technical expertise:** Of course, after designing innovative solutions that perfectly fit the customer's strategy, the company providing digital solution must have valuable internal resources to develop the solutions to be implemented in order to obtain a superior product that can face the competition of all the other players in the market.
- **Customer-oriented operations:** A particular attention to the customers' needs and requirements results critical in this market. The company providing BI solutions for manufacturing 4.0 should design its products closely with its

customers, and even involving them in the innovation process, in order to implement solutions that present all the key features that are perceived as valuable and fundamental by the end-users and can grant profitability to both them and the company.

- **Cutting edge cross-functional teams:** In order to provide the key features just discussed, it is crucial that the product development process is carried out by cutting edge cross-functional teams where business analysts, technical developers, project management experts and some representatives of the client work closely so as to implement a solution that fits at best the needs, the resources and the capabilities of all the parties involved.

On the product side some key features essential for surviving the competition are identifiable. Let's recall for a moment that the product kind analyzed in this work is a BI software for industry 4.0 data. The most relevant characteristics are:

- **Interoperability:** The software must be able to work solely with the supportive technical infrastructure and all the manufacturing equipment to be managed. In order to ensure competitivity the software must create with all the related hardware machineries an effective environment, where the enabling technologies of the industry 4.0 scenario can communicate and work at their best, fully exploiting the potential of the client enterprise's manufacturing infrastructure. Any communication issue among hardware equipment and with software at the communication protocols level must be solved to fully empower the solution to be implemented.
- **Real-time effectiveness:** The power of a 4.0 BI solution lies in the fact that, contrarily from the traditional tools, it can ensure real-time effectiveness, it follows that this is probably the most critical feature that a software of this kind must possess. The capacity of gathering data from the production equipment, analyzing and showing them both to the shop floor operators and the production managers in real-time is the feature that mostly empowers a solution of the kind and represent its fundamental characteristic together with the capacity of taking predictive actions on the productive processes starting from the data provided by the software and acting on the machines through it, exploiting the interoperability features embedded in the system.

- **Interface "end-user friendly":** While the back-end section of the software and the infrastructure can be quite complex, it is crucial to think that the end-users that will be handling the final product are shop floor operators and/or managers, it is hence critical for the interface proposed for the dashboard to be easy-to-use and relatively intuitive, since a product that works well but is hardly utilizable by the users might be perceived as not valuable and hence lead to failure.
- ***Ad-hoc* customization:** In order to grant the most of the flexibility to the client companies a key feature that the software should present is the opportunity for the users to customize the final product according to their changing needs and requirements. The product should possess different templates for the data visualization and should be customizable by the user according to the specific machineries and processes to be utilized in their manufacturing routines. An open and customizable product could allow the developing company to benefit of the different experiences of the various clients, providing hence insights on how to enhance the product making it suitable for a variety of manufacturing scenarios, while involving directly the customer in the innovation process and therefore ensuring the customer satisfaction.

4.3 Competitors analysis

The market is filled with a variety of companies widespread all over the world offering software solutions for smart manufacturing and in general to drive factories towards the industry 4.0 paradigm. For the sake of simplicity in this paragraph only the companies developing and selling dashboards for KPI analytics will be taken into account, even though software solutions can vary significantly in terms of features and complexity, starting from tools for mere graphic representations of data to fully integrated Manufacturing Execution Systems.

In order to identify the potential and the opportunities of the project developed a brief analysis on some of the competitor companies was conducted, especially in order to establish the price trends and identify the most important features to be included in the

software to gain competitive advantage and to penetrate the market effectively. Prices and features outlined by competitors in this project case were supposed critical even because they could provide insights and inspiration for the development of the software to be launched, especially because most of the companies analyzed refer to foreign markets and hence, even if the may operate globally, some of their strength points might be adopted to attack the Italian market from a privileged position by Guanxi.

SimpleKPI

SimpleKPI is a company based in the UK with under 50 employees which provides an online KPI software tool that is easy to setup, simple to use and affordable for all sizes of business [22]. The tool comes complete with all the functionality needed to create, manage and monitor all the Key Performance Indicators and Business Metrics, with the ultimate aim of helping organizations of all sizes track and propel their performance against strategic goals and make insightful decisions using KPI Dashboards, Reports and Analytics features.

In detail, the tool is intended as a SaaS system capable of report, track and analyze KPIs to simplify the process of managing data. It reduces the time taken to merge numerous data sources like spreadsheets into meaningful real time information through an exhaustive array of features:

- **KPI reporting:** The tool offers a range of multidimensional reports that relieve the burden of KPI reporting collation and distribution as well as providing detailed analysis of statistical data. It comes loaded with a set of predefined reports to be used as examples and users can customize any aspect of the reports that can later be saved, shared with other users or published publicly.
- **KPI analytics:** The tool provides and intuitive environment to start investigating sensible data, comparing KPIs or even date ranges across data is as simple as selecting and viewing, the interactive charts also provides filter options to enable drilling down into data, select different departments and even users. Listing KPI data allows to see exactly those entries that are causing concern and then to save

any of the analytics views for reference and even export the data via Excel or PDFs.

- **KPI dashboard:** The software allows to create dashboards in order to help the user monitor and analyze all the KPI information in one place. It allows to monitor individuals, departments, teams or the company as a whole, through the utilization of graphs, league tables and widgets. The dashboard is designed to be fully customizable so it can be chosen the best way of displaying the KPIs, and it allows to setup multiple dashboard to present different areas of KPIs to be visualized and each dashboard can be shared with other users or even shared publicly. The numerous charts available on the dashboard are designed to provide a near infinite way of representing KPI data, from simple line graphs to multiple KPI visualizations and even gauges that display RAG and goals.
- **KPI data entry:** The system offers a simple and intuitive 'one point' of entry for KPI figures, teams and individuals no longer have to juggle with spreadsheets to submit their KPI figures. It's all controlled conveniently in one place. KPIs are divided into their different frequencies for ease of entry and a calendar control allows users to either toggle through previous periods or select an historic date. Managers and Directors can use the data entry screen to access their user's entry sheets, make corrections or change targets. As well as manual entry, users can also upload their data using spreadsheets - and for ease of reporting both a PDF and excel export feature are available.

To sum up, the tool is cloud-based and offered to clients through the internet, it has a single pricing model of 99€ per month for the full deployment of the application. The strength of this software, together with the competitive price, is the flexibility of its features, in fact, SimpleKPI is not focused on a particular business application, but instead offers solutions for all the industries that might need to analyze data to get meaningful insights, from e-commerce to smart manufacturing.

Klipfolio

Klipfolio is a Canadian company based in Ottawa, which provides a real-time dashboard that is cloud-hosted, web and mobile accessible [23]. Klipfolio helps increase the

visibility of real-time business information, resulting in faster, more informed decision-making that improves performance and profitability. The company currently has 135 employees, with an estimated annual revenue stream of 13.5 Million USD and raised funding over the years for more than 16.8 Million USD.

Klipfolio is a cloud app for creating dashboards, reports and performing visual analysis. The application is compatible with virtually any source of data on premise or in the cloud, from web services (Facebook, Twitter, Moz, Pingdom, Salesforce, Marketo, Google Analytics, Google Adwords, Xero, HubSpot and more) to files stored in computers, servers (Excel, CSV and XML files from computer, and FTP and SFTP files from server) or data warehouses (MSSQL, MySQL, Oracle Thin, Oracle OCI, Sybase SQL Anywhere, PostgreSQL, Firebird and DB2). The various types of data can be accessed in several ways: from traditional uploading to dedicated server connectors and database queries, the system is capable of interact as well with web services which lack a pre-built connector through an open web services connector and to email attachments as well. The data endpoints live outside of the application, in which connections can be created to define which slides of data and how often are to be pulled in the application. Once the connections are defined, the data queries are temporarily stored in the app's library until it is time for the data to be refreshed; in the application data sets can be transformed and combined with excel like functions and formulas. When it is time for a data source to be refreshed, the latest data will be pulled into the Klipfolio data library from the original data source, ensuring that the data visualizations and dashboards always reflect current data. All the data pulled into Klipfolio can then be used to build flexible and fully customizable reports and dashboards, throughout the utilization of a user-friendly interface with built templates and methods. Once the dashboards and the reports are ready, they can be easily shared with enabled users or via publishable links in form of PDFs, mails and wallboards. Finally, in terms of security, all the data transmitted to Klipfolio is encrypted via HTTPS and stored in the company's servers hosted by AMS (Amazon Web Services).

The app is designed to satisfy the needs of several industries and type of companies: startups, non-profit, healthcare, manufacturing, insurance, airlines, professional services, eCommerce and hotels; and it is distributed worldwide, penetrating mostly the North

American market, but significant utilization is reported in countries such as Brazil, Germany and UK.

The software's pricing varies according to the number of enabled users, the number of dashboards editable, the features upgrade and the nature and size of the client company, starting from 29 USD per month for the most basic solution and reaching 549 USD per month for the top solution.

Datumize

Datumize is a Spanish company based in Barcelona, which develops software solutions to acquire and manage dark data to provide powerful and compelling insights to enhance efficiency of day to day operations [24]. The company has currently 50 employees, with an estimated yearly revenue of 4 Million € and raised funding over the years for more than 2 Million €.

Datumize produces several software solutions for different industries (travel, hospitality, warehousing, industry 4.0, retail) and purposes. For the sake of this project only the solution for industry 4.0, the "Datumize Machine Data" will be taken into consideration in this analysis.

The company's solution for industry 4.0 aims at unlocking and empowering the industrial data collection from any device, overcoming the barrier posed by legacy systems or complex industrial protocols in the extraction of captive information and integrate it with other systems, without requiring any hardware investment or any infrastructure change. The innovative solution is powered by an Intel architecture based IoT gateway, and it is designed to recover dark data and transform it into relevant information that supports better manufacturing and logistics decisions, providing them with advanced metrics, dashboards, and alerts based on dark data that could not previously be accessed.

Datumize is active mostly in the Spanish market, but there is a significant level of adoption in India, France and Switzerland.

Oden technologies

Oden Technologies is a company based in the United States, providing hardware and software solutions to help manufacturers achieving "perfect production" by increasing operational efficiency by exploiting to the fullest the digital potential of any factory [25]. The company currently has less than 50 employees and an estimated yearly revenue of around 1 Million USD and received funds for more than 15 Million USD.

Oden's solutions provide complete visibility into all the production processes in real-time, connecting wirelessly data from any device and integrating it with third party systems in order to deliver instantaneous insights leading to effective quality control, timely maintenance and lower machine downtimes, optimizing operations and increasing the customer satisfaction. The platform was designed using best practices and the most advance big data technologies by cooperating with engineers from top companies such as Google IBM and Philips. The platform aims at providing manufacturers with a better access to data by unifying data acquisition and analytics into one single place, empowering companies to continuously improve and gain competitive advantage.

The platform is integrated with a hardware solution consisting in a small device to be plugged into any sort of machine or PLC to retrieve and collect data, streaming them in a secure network so as to be then processed by the software. The software solution by Oden technologies on its hand gives manufacturers cutting-edge analytics that are easy to use and customizable for any need of any operational level, from shop floor to top management decision making.

Oden's platform pricing model is divided in two parts: the hardware side has a fixed cost dependent on the units to be installed (usually in the order of thousands of USD), while the software solution is sold as a service and priced with a yearly subscription fee which varies according to the size of the operations to be analyzed.

Oden technologies is mostly active in the United States market, but with significant adoption in Germany and in the UK as well.

iDashboards

iDashboards is an American company providing software solutions for data visualization which enable users to create easy-to-build and dynamic dashboards in order to draw real meaning from the data [26]. The company has currently 62 employees and an estimated yearly revenue of 12 Million USD.

iDashboard core product is a software which allows users to easily build, edit, use and share dashboards to analyze any sort of data and make informed decisions. The software is accessible from any mobile device on provides on-demand access to all the connected business metrics. Some of the most powerful features of the application are the user-friendly interface and the real time updating of charts and graphs from the most recent data points, in fact the platform comes with embedded tools to sync and automatically update data sources at fixed time intervals as quick as up to 60 seconds. iDashboards presents some remarkable data connection capabilities as well which enabling to link all sorts of data sources including SQL, Excel spreadsheets and a multitude of cloud application, allowing to build charts using a mix of data sources in a single dashboard. Finally, the customizable dashboards offered by iDashboards are designed for any kind of business and type of data to be analyzed.

iDashboard solutions are mostly adopted in the US market, but with significant usage in India, UK and Australia as well.

Geckoboard

Geckoboard is an English company based in London which provides a software for developing live TV dashboards to share KPI analysis and improving the utilization of the key metrics [27]. The company has currently 37 employees, a yearly estimated revenue of 1 Million € and received funding for around 1,8 Million €.

Geckoboard solutions are sold as a SaaS devoted to pull metrics together from different tools bringing them together on a single dashboard. Geckoboard comes with over sixty pre-built integration tools which enable to pull live metrics to any data source without

any technical know-how, moreover, the dashboards refresh automatically o show the most recent data available from the relative data sources. Some interesting features on which Geckoboard is focusing is the live shareability of its dashboards. Geckoboard allows in fact to instantly display, swap and manage dashboards from the app account, with the possibility of cycling between several dashboards in only one screen, these features are supported by virtually any device which can run and display a web browser.

Geckoboard's pricing model varies according to the number of dashboards buildable and the numbers of devices enabled for the display and account for 49 USD per month for the 2 dashboards 1 TV version, 159 USD per month for the 10 dashboards unlimited TVs version and 699 USD per month for the fully unlimited version.

Geckonoard is mostly used in the United States, but with significant adoption as well in the UK and Germany.

Mnubo

Mnubo is a Canadian company based in Montreal specialized in Internet of Things, which provides data analytics solutions for connected product manufacturing and service providers [28]. Mnubo currently has 66 employees, an estimated yearly revenue of 5 Million USD and received funding over the years for more than 20 Million USD.

Mnubo solution equips manufacturers with insights that allow them to improve usage, increase customer engagement, reduce customer churn and lower the cost of operations. Their products allow to facilitate the exploration and the analysis of sensor time series and events so as to obtain insightful and actionable information about connected product, enabling connected objects to properly become smart objects.

Mnubo SmartObjects platform is a cloud-based, comprehensive, full-stack IoT data platform designed to transform industrial data into insights, available as a SaaS. The platform enables the ingestion IoT data at high velocity from sensors, devices, machines and equipment, applying heuristics and algorithms in order to enrich, clean and process the data streams, organizing them in a proper way. Through the utilization of the multiple

built-in features users can explore, manipulate and analyze their IoT data to build insights. The product features enable the full IoT data stack in one SaaS solution providing big data storage and archival, data cleanup and enrichment through build-in models and algorithms, high connectivity with rich and flexible APIs and data visualization and reporting through the pre-built dashboards.

In spite of being the selling price undisclosed, the platform comes with three different pricing levels which vary according to the features enabled. Mnubo is mostly active in the Canadian market, but with significant adoption in the UK and in the United States as well.

Incorta

Incorta is an IT company specialized in business intelligence based in California, US, which provides solutions to aggregate complex business data in real-time eliminating the need to reorganize them embedded with analytics and reporting tools. The company has currently 119 employees, a yearly estimated revenue of 7,5 Million USD and received funding for more than 42 Million USD [29].

Incorta's product, the Direct Data Mapping engine, aims at overcoming the need for a complex data warehouse which is usually required when analyzing large volumes of data spanning ERP, cloud applications and other business systems. Incorta's solution provides real time aggregation of this kind of data bypassing the need for a traditional data model design, running multiple direct data loaders in parallel to enjoy full and incremental updates in real-time and autonomously, with the possibility to connect virtually any new source of data through the flexible APIs. The platform ensures sub-second query response time independently of the number of joins among data and deliver the results on the analysis with responsive dashboards.

The pricing model is undisclosed due to its customized nature. The company is mostly active in the United States market with significant adoptions in India and in the Asian market as well.

Chartio

Chartio is a business intelligence company based in California, US, which develops solutions to help businesses analyze and track through an intuitive interface [30]. The company has currently 36 employees, a yearly estimated revenue of 5,6 Million USD and received funding for 6,8 Million USD over the years.

Chartio has developed a simple yet intuitive cloud-based data exploration solution that makes easy to connect all the data sources of an enterprise to build powerful dashboards without any technical knowledge required. With a drag and drop user interface and powerful data pipeline, Chartio helps businesses intuitively query, analyze and track key metrics in real-time to quickly identify trends, patterns and outliers. Another time the power of the tool lies in its interoperability with virtually any data source, in its ease of usage and in the real-time responsiveness which allows to extract powerful insights from big amounts of complex time with no particular knowledge and quickly, enhancing operational efficiency and lowering costs by empowering the value of data.

The company is mostly active in the United States but has considerable adoption rates in the UK, Canada and India as well. Chartio comes with two different pricing models: a version designed for teams (up to six users) which starts at 249 USD per month, and an enterprise version, which is custom designed and varies in amount according to the size of the company and the amount of data to be managed.

…And many more

The competitors analyzed in this section are obviously not all the ones operating in this industry, they were in fact chosen to be discussed since they represent all innovative companies and with a product offer that covers quite well the possibilities for data empowering solutions currently available. In any case all the major software houses (like Microsoft, Oracle, Sap, Tibco, etc.) still held the majority of the market share and are often unbeatable in the market, however the analysis of these smaller but still successful and profitable companies underline how the huge dimension of this market allows to a

variety of players to survive proficiently in the market on the condition that they have a sustainable business model and a product perceived as valuable by the targeted customer segments.

4.4 Internal Analysis: SWOT

The SWOT Analysis allows to map out the potential Strengths, Weaknesses, Opportunities and Threats of the business, highlighting the positive and negative aspects and helping to understand where to focus in order to improve the business and how to properly prepare to handle threats [21]. The four points of the SWOT describe the internal and external factors that affect the company decisions.

STRENGTHS

- High expertise in digital consulting: the solution designed can be bundled with the traditional consultancy service in order to come up with the best possible product customization for each client, generating a sustainable advantage for both the parties.
- Customer oriented method: the usual work method adopted by the company based on designing any solution starting from the actual needs and problems of the clients instead of pushing the product towards them can differentiate the company from the competition in a positive way.
- Product characteristics: intuitive interface, customizable modules, wide data sources connection opportunities grant the product the necessary characteristics to compete with any other similar product in the market.
- Business and revenue model: the lean revenue model (SaaS with a monthly subscription fee) grant accessibility to the product to companies of all size and in particular to SMEs without obliging them to face an onerous investment.
- Partnerships: the company's partnerships with Google and Hubspot could provide the product to be developed with unique and valuable characteristics unmatched by its competitors.

WEAKNESSES

- Poor brand recognition: the company is still small and not yet well recognized in the market, especially if referring it with a proprietary software product.
- Low software development expertise: developing a new tool from scratch is out of the company's usual business activities.
- Lack of necessary human resources: in spite of having Business Intelligence and digital strategy experts in the company, Guanxi lacks a software development team, that would probably have to be hired.

OPPORTUNITIES

- Market size and growth: the exponential growth in the industry of industry 4.0 and in particular in its applications in industrial internet of things and data analytics (as analyzed in the previous chapter) grant an unrepeatable opportunity for profitability by entering the market in this period of digital transformation of companies.
- Brand reinforcement: the company could reinforce its brand recognition in the market and strengthen its position towards competitors, with the opportunity of establishing a long and profitable relationship with the clients, locking them in by offering a customized bundle of product and consultancy services.
- Product portfolio and revenues enlargement: towards the development of a new product the company could increase its product portfolio and revenues, given that the usual consultancy services would reinforce and be reinforced by being bundled with the sale of a software for business intelligence and data analytics.

THREATS

- Fierce competition: the peculiar attractiveness of the market and the lack of major barriers to entry will contribute to the formation of a high rivalry among

competitors in the market; if on one side there are major opportunities of succeeding this market condition carries an equal threat of failure.

- Lack of product/market fit or problem/solution fit: a major threat to the success of this project lies in a hypothetical misinterpretation of the market need and of the actual requirements of the clients, which would lead to the development of a product that would confer no profitability at all for the company.
- Late timing: in spite of this being the right time to attack and invest in this market, during the time period that the product development will require some competitors might come up with a superior product establishing a dominant design.
- Big competitors: some of the actors in this market are huge software and IT companies (like Microsoft, Oracle, etc.) against which is impossible to compete in terms of resources availability and network of clients.

5 The problem/need and market validation

The lean methodology for new business and product development [31] assesses that in order to be successful an new project must find its foundation in an existing and unmatched market need, to be satisfied trough the development of the project under discussion, instead of the traditional way of creating a new product and then pushing it in the market.

This project of developing the business plan for a new business intelligence tool to be implemented in an industry 4.0 scenario starts from the needs that companies might face deducted from the analysis of the market and the current situation in Italy. The rate of digitalization of Italian companies in lower than the European average, and this suggest how there is a huge opportunity for improvement, especially in the manufacturing sector.

In the manufacturing industry the main need of companies is to optimize production in order to move towards the concept of perfect production, applying the need to the case of this project, the main problem consists then in the fact that data and information generated during the production processes and necessary to properly manage them are not exploited

to the fullest and can be empowered to consistently improve the efficiency of factories, in particular, due to the adoption of always more advanced machineries and equipment, the data generation during the manufacturing processes has exponentially increased and the correct exploitation of this often underrated resource could make a substantial difference for efficiently carrying out the day-to-day operations and the strategic decision making.

The problems described in (table 1) in a very simple canvas outline the struggles that a poorly digitalized manufacturing company might face in correctly using their data to improve the decision making and the overall plant efficiency, together with the characteristics of a solution to solve those problems. In a hypothetical AS-IS situation the process of turning data into insightful decision making would start from the data gathering from machineries, production lines and other company's operations. This process could be extremely costly in terms of time and effort for the dedicated personnel, shifting their focus from activities that would result more critical for the company's operations. Once the data necessary to make a proper performance analysis, they would have to be processed in order to turn them into KPIs and then displayed through a dashboard or a report to be submitted to the judgement of the higher management level. In this phase might occur a tremendous amount of inefficiencies: from human error to compatibility issues with the software utilized and any sort of delays. Another, and probably the most impactful, problem intrinsic in the process as is intended is that the reporting activities are performed on fixed time intervals (usually monthly or quarterly), so the production lines are programmed and optimized on not updated data and the only decisions that could be taken from the performance reports are corrective measures.

In order to solve these problems the idea of Guanxi is to develop a tool to help the reporting and dashboard creation phases of performance analysis empowering the data generated during the production processes, offering a solutions that facilitates the data gathering process fully automating it and enables an almost real-time analysis of the line state by extracting continuously data from the data sources updating the sensible ones, everything supported by an intuitive interface which comes with customizable modules to efficiently create reports and dashboards, lowering the time cost and increasing the efficiency of the performance reporting process and decision making, enabling the

management to take predictive measures before a major issue is likely to occur rather than reacting after its occurrence.

Table 1: Problem-Solution canvas.

Problem	Solution
● Data collection is time demanding and represents a relevant agency cost. ● Gathering and processing data from different data sources is costly in terms of time and effort and compatibility issues may arise when shifting the data to the tools used for the reporting activities. ● Reporting and data analytics activities are usually performed at fixed time intervals, periodically and not continuously. ● After the analytics phase the data must be turned into meaningful Key Performance Indicators, the process is usually performed by dedicated personnel. ● The reporting phase and the creation of KPI dashboards can take a lot of time and effort when some proper tools are not used. ● The production lines organization and the output levels to be produced are determined on the	Create a Business Intelligence tool for KPI analytics and reporting which: ● Exploits a connected environment and gathers data in real time from machineries (when possible) and supports any data source. ● Extracts and updates data from databases at fixed time intervals. ● Presents an intuitive and easy to use interface. ● Allows access from multiple devices and at any time. ● Supports customizable modules for graphing KPIs to create dashboards in a glance. ● Allows to obtain reports on the production activities almost in real time. ● Allows for fast and consistent decision making enabling predictive measures.

basis of previous performance analysis. ● The decision-making process is performed in a sub-optimal way and allows only for corrective actions when a problem is manifested after the periodical performance reports.	

5.1 Market Validation

The best practices for new business and product development suggest that when implementing a new project, the starting point must be an existing and serious problem/need that is fully or partially unmeet in the market. After the problem to be addressed is identified the following step is to validate the hypothesis made directly involving the end users of the product to be developed, so as to make sure that the hypothesis made are consistent and represent a strong and valid foundation on which structuring all the following steps of the business plan. The market validation phase is then critical, since it represents the occasion to verify whether the path chosen is the right one and if the hypothesized need is not validated by the end users, gives a chance to pivot on the initial idea/project before wasting a pointless effort developing it, given that without validation by the end users the product would inevitably be unsuccessful after its launch.

For the sake of this project there are many variables that need to be verified and validated in terms of actual market needs, industry specificity and operational habits of potential customers:

- **Do companies use data to create and analyze KPIs for performance evaluation?** First of all, is fundamental to validate the hypothesis that manufacturing companies rely on performance evaluation to optimize and

program their operations, without a strong reliance of companies on performance analytics, the project for a new software tool would fall apart.

- **How is the adoption rate for software tools aimed at improving performance and KPI analytics?** The current adoption rate of potentially substitute or competitor technologies must be verified in order to assess whether the industry carries a real opportunity for profitability.
- **Which kinds of technologies and tools are mostly used in the market for data acquisition and processing?** In an ideal scenario, the tool to be developed subject of this work would have to be interfaced with other software and technologies currently used by the potential customers, understanding which technologies are currently adopted by manufacturing companies is then fundamental to confer to the product to be developed the right characteristics in terms of features and compatibility with complementary assets.
- **Which KPIs are mostly analyzed in the manufacturing industry?** The KPIs that a generic manufacturing company could track are virtually endless, is then important to verify if there are some common trends among companies and mostly to assess which are the most important ones for the companies' efficiency and if it would be helpful to provide a tool to help tracking and displaying them.
- **Is the manufacturing industry homogeneous in the routines adopted for KPI and performance analytics?** The manufacturing industry as a whole can be divided in a multitude of sub-industries characterized by the typology of product produced and technology adopted. Given that the sub-industries can be extremely different among each other is necessary to verify whether the product to be developed could be adopted by all of them or if there is some intrinsic specificity to take into account in order to perform a proper market segmentation and focus on the segments which are more likely to be profitable.
- **How and by which players are the KPIs are used during the performance evaluation of manufacturing processes?** To properly define the product features and customize ad hoc the interface it is necessary to understand how and when the KPIs are used during the performance evaluation and in which way they impact on the decision-making process. Moreover, to correctly satisfy

the needs of the actual end-users, the actors involved in this process must be identified, and their user journey unraveled.

- **Are companies adverse to outsource the handling of sensible data to third parties, even when the security is granted?** Finally, given the possibility of the product to be developed to rely on architectures owned by partner third parties, it must be understood whether the client companies would be adverse on adopting a solution of this kind.

To answer the questions necessary to perform the market validation a short survey was developed by the candidate and directly submitted to some manufacturing companies. The approach in this interviewing phase was based on trying to submit the survey to a wide variety of companies both in terms of role of actors interviewed and industry of competence. The survey was submitted using LinkedIn and direct phone or mail interviews as channels.

5.1.1 Survey script and Interviews results

1. Do you currently use any software for monitoring and controlling production processes (MES, dashboards or similar) in your company? If yes, which ones?
2. Which performance indicators (KPIs) are particularly relevant and are analyzed in your company?
3. What methods and technologies are used to collect production data, to create databases and to analyze KPIs?
4. How are KPIs used in the different hierarchical levels of the company (line operators, production managers, top management) and what impact do they have?
5. Would you be averse to using a software based on the use of a Cloud for data management managed by third parties?

PLANT MANAGER @SKF INDUSTRIE SPA

1. SI - Infor suite (ERP)
2. S-safety – number of injuries; Q- quality - n ° complaints and n ° supplier complaints and non-quality costs; C- cost - variance standard production cost; D- delivery - delivery on time and broken promises; E - environment - ton CO2, total energy, value added energy.
3. SQL databases and computers for data collection.
4. A daily review is carried out on a single department level and then monthly on a single line level. The data has a target set at the Budget stage.
5. Yes, where possible we opt for resident solutions.

QUALITY MANAGER @TOWER AUTOMOTIVE ITALY SRL

1. We have internally developed software.
2. The KPIs are the usual ones: Customer complaints, Ppm, COPQ, OEE, SCARTI, Absenteeism, Productivity, Ebitda.
3. Data analysis software and shared collection files.
4. Daily analysis in the plant, weekly analysis with European management, monthly with operators.
5. Data sharing with third parties is not permitted by the company security policy.

PRODUCTION TEAM LEADER @GIACOMINI SPA

1. For monitoring and control of production processes we use Nicim monitor.
2. The most relevant KPIs at our company at the production level are: OEE QHP Effectiveness index productivity index waste index set-up time.
3. For data collection we use production extractions from Sap and Nicim to then process them and calculate them on excel (pivot; pareto etc).
4. Operators compile KPI boards (5s, kaizen), middle management processes and reports to top managers who in turn will decide on new goals to be achieved.
5. I don't think there would be problems

PRODUCTION PLANNER @PAINI SPA RUBINETTERIE

1. We currently use only one ERP. Concerning MES or similar, we are really interested in this period. Today, for example, I attended a meeting where we discussed qualities and defects of Sedapta and Kompass for our turning department. For our packaging department we are discussing the possibility of introducing kanbanbox, a software for using the e-kanban tool and heijunka leveling.
2. Efficiency, rejects, set-up times, supplier delays, returns, delays, warehouse levels, turnover / hours ratio, absenteeism, accident hours, orders sent on time.
3. The collection of production data is mostly paper. We have an old version of Kompass that as I said above we are trying to update or replace. We mainly use excel and our ERP for creating databases and processing them. For the methods of analysis above all tools coming from lean manufacturing like the Deming cycle or PDCA (if that's what you meant as methods).
4. Yes try to reduce costs and improve customer satisfaction.
5. It depends on the type of application. In one of our departments we already have a third party management regarding the continuous monitoring of the plant.

RESPONSABILE SVILUPPO TECNOLOGIA DI PRODOTTO @FAGGIOLATI PUMPS SPA

1. We use company management software for components and order management, but not for the management of production processes.
2. Currently, we do not use performance indicators when working on very different orders from each other and on order.
3. In general, company data is manipulated with Excel and Access database.
4. \
5. Company policy would be adverse to the use of external platforms in the management of potentially sensitive data.

TECHNICAL SERVICE MANAGER & ENERGY MANAGER @ESSEX SPA ITALY

1. No longer, Selesta had been installed, but it was not followed properly.
2. Many. On energy the main one is KWh / Kg produced, on maintenance the € / kg (costs).
3. Erp, manually, excel sheets.
4. Line operators: 0; manager owners of KPIs in part use them, partly suffer them, Top live on those... (Their usefulness is doubtful, both that of many KPIs and of many of the TOP managers arrived after the restructuring).
5. Personally no, the IT responsible either, the TOPs would struggle to understand the difference.

PRODUCTION SUPERVISOR @VALEO MONDOVì

1. In our company there is a system called fram which allows us to observe shift by shift performances. On this system it is possible to observe any type of event that occurs during a shift on a specific line. The system is an MES.
2. The first KPI on which each performance is evaluated by me and by the top management is the TRP which is the total of the pieces actually produced on the total of the pieces that could be produced (capacity / shift). This indicator refers to the performance of the machines in particular refers to the cycle time measured by the PVD.
3. The data is collected through a Cloud system that runs on a VPN. You can see all the data on a QCD platform (quality-cost-delivery).
4. Through the platform it is possible to extract data on Excel that allows us to analyze any losses in production efficiency such as breaks, breakdowns, new personnel training, etc. In addition, there are other KPIs that allow us to evaluate the performance based on the production of the line based on staff training and not just on machine capacity. Furthermore, there is an indicator that indicates the performance closely related to the workforce.

5. The system is already managed by an external company but we have an IT department that allows us to manage the system internally. Furthermore in valeo Mondovì we are already following the path of industry 4.0 as the system was previously compiled by the line leader team, today instead it is directly related to the line computer manager that allows to automatically update the performance of the line in real time.

JUNIOR MANUFACTURING ENGINEER @LEAR CORPORATION

1. MES.
2. OEE (Overall Equipment Efficiency).
3. Data collection from PLC.
4. The efficiency indicators are aimed at personnel management (the company is highly manufacturing) and at the right trade-off between technological innovation / training / labor
5. We already use it.

LEGALE @S.C.M. ITALY SRL

1. No. We do not have software for monitoring and controlling production processes.
2. Currently, working on orders that are very different from each other, we do not use performance indicators.
3. \
4. \
5. No, we wouldn't be adverse

PRODUCTION MANAGER @HUHTAMAKI FLEXIBLES ITALY Srl

The company has a MES to collect and feed the main management from which the KPIs are then processed. For reasons of confidentiality and compliance with the policies I cannot give information on what software is used.

The KPIs used for process monitoring start from the OEE and then descend on the detailed assessments which are used for continuous monitoring and improvement.

At the moment I do not believe that the company is inclined towards third-party cloud management but this is not decided in the Italian site but is delegated to the German headquarters and head quarter in Finland

PROCESS TECHNOLOGY MANAGER @VERSALIS SPA (ENI GROUP)

1. Different software is used for monitoring and controlling the active and passive cycles relating to production. The common basis is SAP, which is then integrated with other complementary structures dedicated to specific activities (order management, quality, raw materials, etc.). There are also process simulators and control systems integrated with PI software.
2. As this is a chemical company dealing with substances with a strong environmental impact, analyzes are performed mainly on indicators relating to technical process parameters. However, indicators relating to costs, production efficiency, environmental impact and energy consumption for end-of-period analyzes are analyzed.
3. Extraction from SAP and excel processing.
4. The management uses the KPIs in the period-end analyzes to assess the achievement of the set objectives.
5. Given that strategic data are processed, the data management system is closed, the use of cloud managed by third parties is excluded.

5.2 Conclusions

The results of the interviews are quite exhaustive by themselves, however it is helpful to formally summarize the conclusions deducted by the answers obtained. Firstly, an important insight obtained is the fact that companies actually invest a lot of time and resources into systems to empower their data in order to make more precise and efficient performance analysis and many of the companies which do not currently use a state of

the art software for this matter are considering to invest to improve their current situation. Concerning the KPIs analyzed, it is quite hard to generalize a common trend since they can be very industry specific, however the results of the interviews show how a particular attention is put into the monitoring of indicators concerning the overall efficiency of the plants (OEE), costs of production and wastes, therefore it can be assumed that a software tool working on those kind of KPIs could be appreciated by customers. Finally, probably the most insightful result that can be evinced from the interviews concerns the nature of the companies that could constitute the customer base of the product to be developed. The interviews show in fact that the most attractive segment in this scenario is represented by manufacturing SMEs, especially the ones operating in sectors characterized by standardized and homogeneous productive outputs. The interviews highlight in fact how the bigger players in the market already moved to fully operating Manufacturing Execution Systems (MES) or to Cloud-based technologies to solve the needs identified in this chapter, moreover, the companies operating in industries characterized by high-quality and high-complexity products and with a quite heterogeneous product portfolio result more reluctant to the routine of performance analysis, and hence cannot represent a solid customer base for this project.

6 The first product definition and marketing mix

After the validation on the hypothesis made on the market and the analysis of the results of the interviews to get some meaningful insights, the following step was to design the product with its features and characteristics, the desired channels of distribution and promotion through an accurate marketing strategy, the identified customer personas and their user journey and experience in order to define in every aspect the solution to be proposed and successively create a simple Minimum Viable Product (MVP) to test and assess the actual reaction of the market with respect of the product designed. In order to discuss the product to be developed in all its aspects and with the complementary activities necessary to its commercialization the conceptual framework of the “Kotler’s 4 Ps” was adopted.

6.1 Product

Product refers to what the business offers for sale and may include products or services. Product decisions include the "quality, features, benefits, style, design, branding, packaging, services, warranties, guarantees, life cycles, investments and returns." [32] The software tool to be developed has been called "xiKPI", the name is a quite immediate mashup between the company's name Guanxi and KPI, giving at first sight an idea of the fact that the software aims at working with data to create and analyze KPIs so as to enhance the efficiency of the clients' processes. The product xiKPI is intended to be a software platform designed to turn industrial data into insightful decisions to empower the manufacturing processes of the user company. The main value proposition of the product is then to empower the data generated during the manufacturing processes to enhance the operational efficiency. In the current manufacturing scenario with its practices moving towards the 4.0 paradigm using metrics and KPIs to track manufacturing processes and business objectives is fundamental for the enterprises which want to ensure their competitiveness, but with big amounts of data generated every day the processes of storage and analysis the data and then elaborating them to make them visualizable and communicable results and KPIs can be significantly impactful on operational costs. The smart manufacturing approach requires data connection and integration in manufacturing plants in order to generate compelling insights regarding operations. Having data locked into control systems and production line machines limits the operational intelligence and inhibits continuous process improvement. The proposed solution aims at enabling the users to take full advantage of the potential of the generated industrial data by producing a variety of multi-dimensional KPI reports and dashboards, allowing the real-time tracking of the most important metrics, the continuous comparison of the results with the pre-fixed targets and reference periods' performances, the real-time distribution of reports to the key decision makers in the company with the ultimate goal of spending less time dealing with data sources, spreadsheets and databases and more in analysis and strategic decision making. As introduced previously, the final purpose of the software is intended to be the creation of dashboards of KPI and performance reports, throughout a set of pre-built and customizable templates presented in a user-friendly interface which facilitates the connectivity of a variety of different data sources in a quick

and easy way. Moreover, xiKPI unlocks and empowers industrial data collecting them from any industrial device and/or data source. The platform, using the Google Cloud Architecture, allows to exploit fully the Industrial Internet of Things capacity of your plant, overcoming any system legacy or complex industrial protocol barrier.

Overall, the main desired features for xiKPI can be summarized as follows:

- Connectivity among data sources: The platform should support virtually any data source enabling the creation of links among the different types of data generated. The data should be pushed to the platform both manually linking the source and by autonomously extraction from any company's asset (from direct extraction from the IIoT enabled machineries to the traditional tools for data management like Excel spreadsheets or on-premise ERPs).
- Accessibility: xiKPI should be accessible anytime from any enabled device by all the users authorized to utilize the platform.
- Cloud-based architecture: xiKPI is intended to be a Software as a Service (SaaS) platform accessible by users via subscription and fully handled remotely by the provider. The Cloud based architecture powered by Google (with which Guanxi has an established partnership) would ensure real time updates of sensible data, quick accessibility and high-speed analytics features.
- Customizable modules: xiKPI would come with a library of pre-developed dashboarding templates and KPI samples fully deployable by the end users and completely customizable to better match the specific requirements of the single client company.
- User-friendly interface: The platform is intended to come with an easy and intuitive interface to facilitate its utilization by actors at any level of the company.
- Connectivity among users: After deploying the application to create compelling dashboards and reports, the platform empowers the communication among all stakeholders by allowing multi-access and shareability features.

6.2 Price

Price refers to decisions surrounding "list pricing, discount pricing, special offer pricing, credit payment or credit terms". Price refers to the total cost to customer to acquire the product, and may involve both monetary and psychological costs such as the time and effort spent in acquisition [32]. The platform xiKPI is intended to be developed and commercialized as a SaaS (Software as a Service). Typically, a SaaS solution is constituted by two main parts: the user interface platform and the back-end architecture, being the both linked by a cloud infrastructure. Particularly xiKPI represents a user interface platform for manufacturing data analytics and performance reporting, for its correct functioning the platform relies then on a cloud architecture powered by Google, with which the company Guanxi has an established partnership. The platform will be designed with modular and standardized blocks that will carry the possibility of being customized during the implementation phase by the client with the help of Guanxi's consultants. The product, as it usually happens with SaaS solutions, will be licensed to clients for its usage with a monthly subscription fee. For what concerns the subscription price there are some considerations to discuss. The first release of the platform will carry a limited number of features compared to the full possibilities and set of extended features that the ideal product would carry. The meaning behind this choice is to optimize the initial investment developing a product that can be deployed effectively by the customers even with minimum viability features, so that the actual reaction of the market can be validated before allocating a greater amount of resources in research and development to bring xiKPI to the next level. The first release of the product is intended to be then a simple dashboarding and reporting tool for KPI and data analytics, where the sensible data set will have to be manually uploaded to the system. Once the product kicks off in the market and the adoption and the brand recognition start to scale up then another and major investment will be made in order to develop all the missing characteristics concerning the autonomous data extraction from the manufacturing systems together with other extra features that might be identified by the early adopters as highly desirable to improve the product's value. The business model will then obviously be B2B and the revenue model based on the monthly subscription fee, established for xiKPI's first release at 69,99 € per month with unlimited users (with a month free trial) to be enabled to access

the platform, plus an extra fee for the hypothetical consultancy service during the implementation (which value would have to be established on the basis of the entity of the service itself, with the usual rates adopted by Guanxi). Of course, the price will have to be re-discussed after the second release on the based of the investment faced and the value offered and actually perceived by the customers.

6.3 Place

Place is defined as the "direct or indirect channels to market, geographical distribution, territorial coverage, retail outlet, market location, catalogues, inventory, logistics and order fulfilment". Place refers either to the physical location where a business carries out business or the distribution channels used to reach markets. Place may refer to a retail outlet, but increasingly refers to virtual stores such as "a mail order catalogue, a telephone call centre or a website" [32]. Being the product a SaaS solution, the concerns that usually come from the supply chain management and the logistics are basically null. The platform will be accessible on the cloud via subscription by the enabled users.

6.4 Promotion

Promotion refers to "the marketing communication used to make the offer known to potential customers and persuade them to investigate it further" [32]. Promotion elements include "advertising, public relations, direct selling and sales promotions. The promotion of xiKPI will at first take place with a LinkedIn lead generation campaign aimed at targeting SMEs in the identified industries of interest. Using the social media to push the product by redirecting the audience to the dedicated landing page will guarantee both the optimization of the marketing effort in terms of resources while granting the reach of a solid customer base, enhancing the brand recognition among potential client companies.

7 The product: a deeper focus

The platform xiKPI has already been discussed in the previous chapters on a quite general level, however in this section of the report the product will be analyzed on a deeper level in order to clarify exhaustively some core aspects related to it and in particular what concerns the product's architecture, the platform's user interface and the intended user journey and experience comparing the AS-IS and TO-BE scenarios, as it was hypothesized in designing this project.

As it was already repeated many times, the product will be commercialized as a SaaS, hence it will have all the common characteristics of this kind of products. In particular xiKPI will constitute the web accessible interface, ad-hoc customized on the basis of the customer needs that will be backed by the "hard" cloud architecture powered by Google. The choice of using the Google's cloud environment lies in the fact that, other than granting maximum reliability and performance being one of the undiscussed leaders in the industry, as it was said before, Guanxi is a certified business partner of Google, and hence there was absolutely no reason for choosing a different supplier for the Cloud architecture. From this starting point, the supporting Cloud architecture chosen must be analyzed and discussed. First of all, Google's Cloud environment carries a multitude of different modules which enable for a variety of different processes covering basically any conceivable scenario, to support the development of xiKPI the module chosen was Google Cloud Dataflow, which will be presented in the following paragraph.

7.1 Cloud architecture

Google Cloud Dataflow is one of the various Cloud solutions powered by Google [33], particularly, this module enables a simplified stream and batch data processing while granting reliability and expressiveness. The module is a fully-managed service for transforming, enriching and analyzing data in stream (real time) and batch (historical) modes which comes with a serverless approach to the hardware resource provisioning and management, which grants to the client access to a virtually limitless capacity do fully satisfy all its data processing needs, allowing to pay only for what has been used. In

this particular case, the Dataflow model is particularly suitable since it empowers the IoT analytics in a manufacturing scenario. The module supports fast and simplified pipeline development via SQL, Java and Python APIs in the Apache Beam SDK, a tool which provides a wide range of windowing and session analysis primitives together with a rich ecosystem of source and sink connectors. Moreover, the unified development model peculiar to Beam, allows for reusing more code across different streaming and batching pipelines. The peculiar Software Development Kit allows Dataflow to seamlessly integrate with all the services available in the Google Cloud Platform but most importantly the Beam-based SDK lets developers build custom extensions, and here lies the justification for choosing Dataflow as the reference architecture for xiKPI, in fact the platform to be developed would constitute an extension of the reference Cloud environment. Other than the integrability features, another advantage brought by the Dataflow module is as anticipated the serverless approach. This feature removes the operational overhead with performance, scaling, availability, security and compliance, which are handled automatically, focus on programming instead of managing server clusters.

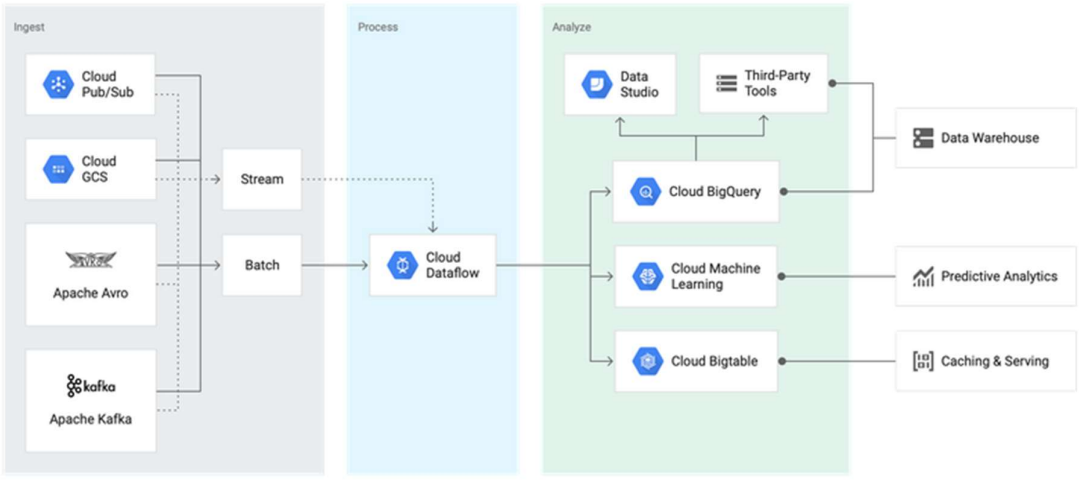


Figure 10: Google Cloud Dataflow architecture. https://cloud.google.com/dataflow/

Having discussed the main characteristics of Dataflow that constitute the foundation for choosing it as the reference architecture for xiKPI, now the main features of the cloud features will be presented exhaustively.

- Automated resource management: minimize latency and maximize utilization automating provisioning and management of processing resources.
- Dynamic work rebalancing: the automated work partitioning rebalances the lagging work in a dynamic way without the need to pre-process the input data.
- Reliable and consistent processing: the Cloud module provides a built-in support for fault-tolerant execution which is correct and consistent in any case, no matter which are the data size, cluster size, processing pattern or pipeline complexity of the specific case.
- Horizontal auto-scaling: this organization of worker resources ensure optimum throughput results in better overall price-to-performance.
- Unified programming model: Apache Beam SDK enables rich operations, powerful, data windowing and grained correctness for both streaming and batch data; enabling the integration with custom extensions granting the same efficiency.
- Flexible resource scheduling pricing for batch processing: For processing with flexibility in job scheduling time flexible resource scheduling offers a lower price for batch processing. These flexible jobs are placed into a queue with a guarantee that they will be retrieved for execution within a six-hour window.

Another relevant feature to discuss concerning the Google Cloud Dataflow module is the pricing model adopted. The Dataflow jobs are billed in per second increments, based on the actual use of batch or streaming workers, with an extremely user-friendly approach. In (figure 11) the pricing model as presented by Google is showed, however is important to clarify that any complementary service used, as for example the modules for data ingestion are billed separately per that service price. For the sake of clarity, the default configuration for each type of worker as presented by the provider are reported (Note that the FlexRS worker type is not relevant in this project, but reported for a matter of completeness):

- Batch worker default: 1 vCPU, 3.75 GB memory, 250 GB Persistent Disk.
- FlexRS worker default: 2 vCPU, 7.50 GB memory, 25 GB Persistent Disk per worker, with a minimum of two workers.
- Streaming worker default: 4 vCPU, 15 GB memory, 420 GB Persistent Disk.

Cloud Dataflow Worker Type	vCPU $/hr	Memory $ GB/hr	Storage - Standard Persistent Disk $ GB/hr	Storage - SSD Persistent Disk $ GB/hr	Data Processed[4,5] $ GB[6]
Batch [1]	$0.0616000	$0.0042684	$0.0000648	$0.0003576	$0.0121
FlexRS [2]	N/A	N/A	N/A	N/A	N/A
Streaming [3]	$0.0759000	$0.0042684	$0.0000648	$0.0003576	$0.0198

Figure 11: Google Cloud Dataflow pricing list. https://cloud.google.com/dataflow/

To conclude this paragraph on the Cloud architecture there are some considerations to make. First of all, the module chosen for data processing (Dataflow) is the one absolutely required for xiKPI's development at minimum viability, the data ingestion block of the architecture will in fact be handled using the open source tool Apache Kafka at first. It is however necessary to clarify that for the second and improved release even the reference architecture will have to be improved, in fact the solution's architecture (in this case the Dataflow) module will have to be complemented by other modules to create an appropriate environment for the correct functioning of a more complex version of xiKPI. Particularly the necessary additional services to implement to define a correct architecture to perform a state-of-the-art stream analytics in an industrial IoT environment are:

- Google Cloud Pub/Sub: for data ingest connection and management.
- Google Cloud IoT Core: for device connection and management.
- Google Cloud BigQuery: for data warehouse and fast querying.

The discussion of these modules is not strictly necessary for the completeness of this Business Plan, at least in this phase and for this product version, and hence will not be performed, however further informations about the solution are publicly available in Google Cloud's official website.

7.2 Interface

Moving forward from the architecture the next topic that needs to be discussed is the platform interface, which basically constitutes the core of xiKPI. The characteristics of usability that the interface should carry have already been discussed, however in this section the structure and the technical features of the user interface will be further analyzed.

The interface is intended to be as a simple and intuitive environment where the data streams uploaded can be managed and analyzed in order to obtain reports and graphical representations of these data streams and combined and processed to obtain structured KPIs relevant for the company operational efficiency and decision making. The interface will present to the users a list of task which will explicate the possibility of:

- Manage the data streams present in the system: uploading, updating and deleting data, together with the possibility of navigating through the data already present in the system.
- Create KPIs from the inserted data by choosing among a pre-compiled library of KPIs: accessing a library which includes some common and widely used KPIs such as OEE, throughput, set up average time, waste ratio, reject ratio, takt time, production uptime, etc.
- Combine data streams to create custom KPIs: in the case that some KPIs absent in the library need to be created, different data streams can be combined to create custom indicators.
- Generate graphical representations, dashboards and reports: as represented in the example in (figure 13).

Figure 12: Desired Interface example.

7.3 User Journey

To continue the analysis of the product, having touched all the topics related to its technical aspects, the actual usage and hence the user journey related to the product must be discussed. To do so in the most meaningful way, an AS-IS and a TO-BE scenarios have been identified and discussed in order to explicate the actual benefits that can be obtained in the day-to-day operations and the increments in efficiency obtainable using xiKPI, in particular referring to the planning and decision making-process related to the reporting activities from a traditional approach to a strictly data-driven one.

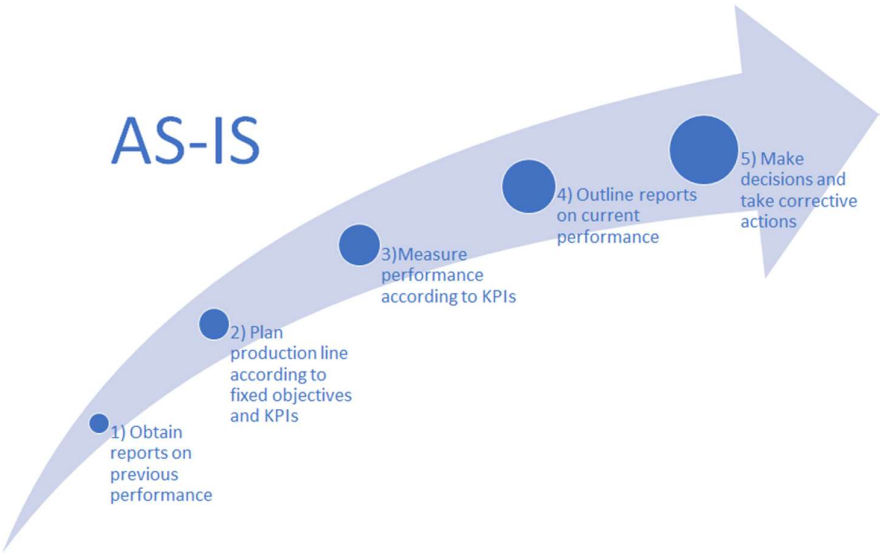


Figure 13: AS-IS User Journey

The AS-IS situation (figure 13) is characterized by the fact that the performance analysis must be handled directly by some dedicated personnel and, other than being subject to the occurrence of errors in the process, allow only for corrective decision making. The TO-BE on its hand (figure 14) is centered on the utilization of xiKPI for this process and is now intended to be fully automated, increasing the accuracy and the efficiency and mostly allowing to make decisions in a predictive way with a solid data-driven approach.

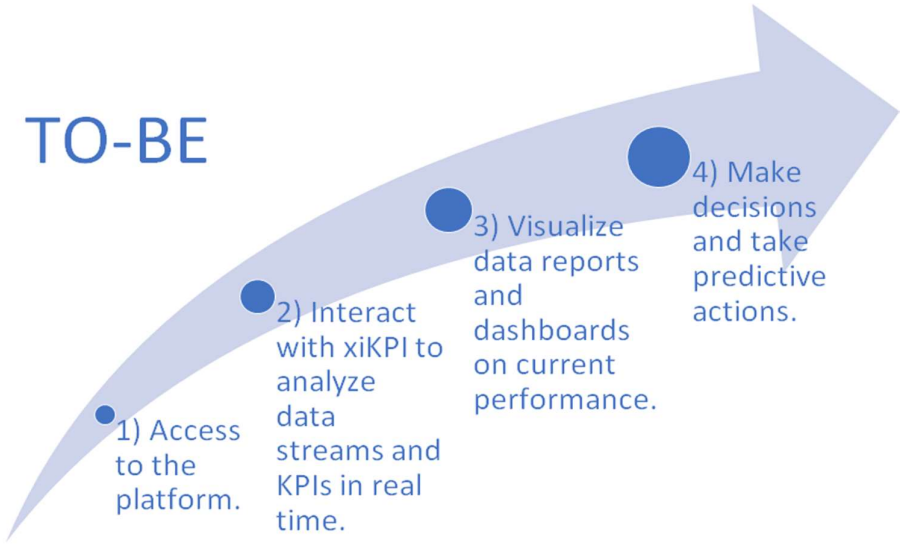


Figure 14: TO-BE User Journey.

For the sake of completeness, the various steps of the process under discussion are listed in (figure 15) and analyzed in a pain/gain chart in order to directly compare the issues and the risks of the AS-IS scenario with the respective solutions/benefits obtainable with the proposed TO-BE scenario.

PAIN	ACTION	GAIN
Reports might be ready late	**Obtain reports on previous production performance**	Reports are generated in real time and always accessible
Planning actions might be based on inaccurate reports and performed in a sub-optimal way	**Plan production line according to fixed objectives and KPI**	Automatically generated reports ensure accuracy and optimality of the outcome
The data gathering and analysis can be costly, time demanding and sub-optimal	**Measure performance according to KPI**	A cloud based and automated data analysis process cuts costs empowering efficiency and accuracy
Reports can be costly and time demanding to outline and can be performed only when the production processes are finished	**Outline reports on current performance**	Reports are generated automatically and continuously updated in real time with the production process
Ex-post produced reports only allow for corrective actions and might be misleading if inaccurate	**Make decision and take actions**	Reports generated with 4.0 technologies allow for predictive actions and ensure quality

Figure 15: Pain-Gain chart.

7.4 Business and revenue model

Since in this section all the points touched but never discussed in detail are being analyzed, the business and revenue models adopted will be here formalized to avoid any misunderstanding.

The business model is obviously B2B, since the product is designed to serve and improve the operations of manufacturing SMEs.

The revenue model is based on a mix of two major revenue streams: firstly, a monthly subscription fee of 69,99€ to be paid by the customer to obtain and maintain the authorization to access the platform and its services, moreover, it is intended to provide a depowered demo of the product for one month (not embedded in the cloud architecture) to give the chance to the customers to familiarize with the product trying it. The second revenue stream consists comes from the consultancy and implementation service bundled with the product and delivered by Guanxi, which as a first estimation was fixed at 1000 €/user, but may vary according to the specific situations.

8 Minimum Viable Product (MVP)

The main directive of a Minimum Viable Product is to create a simple and fast way to deliver on customer value and actually test whether the value delivered is perceived by the customers in the expected way. The concept of MVP was first formalized by Eric Ries, author of *The Lean Startup*, defined it as:

A Minimum Viable Product is that version of a new product which allows a team to collect the maximum amount of validated learning about customers with the least effort [31].

Given that one of the riskiest phases of developing a business plan is designing a consistent revenue model, the MVP represent a very powerful tool to validate with a minimum effort of resources the hypothesis made and to assess whether the revenue and business model designed is supported by a solid customer base and therefore if it is

sustainable over time and justifies the necessary investment. With respect to the original definition, the concept of MVP got simplified over time to: “the smallest thing you can build that lets you quickly make it around the build/measure/learn loop”. The build/learn loop represented in (figure 16) quickly sums up the overall purpose of the whole MVP building and testing process. In the beginning a new product idea is developed into a product, in this case at a minimum viability level with only the necessary features to satisfy early adopters and test their reaction to the product. After its realization, the MVP is released to the customers in the validation phase. This particular process aims at measuring the sensible variables for the product success and at gathering insightful data to analyze the overall MVP performance, the actual reaction of the market and mostly whether the value intended to be delivered to the customers is actually perceived by them and hence monetizable. The last point of the loop is the one that could either constitute an exit point, if the products features and characteristics are perceived positively, and the beginning of the product development at its full potential, or an iteration point in the case the product needs to be pivoted after a negative feedback from the market.

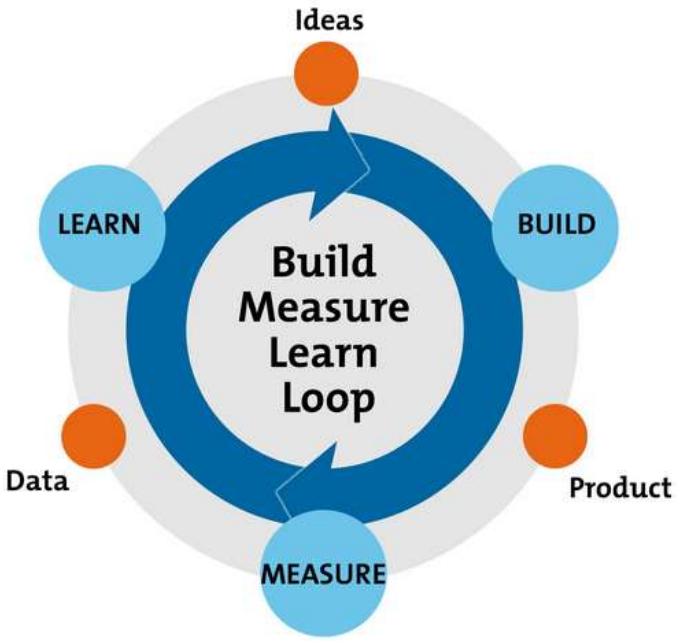


Figure 16: Build-Measure-Learn loop.
https://www.mindtools.com/media/Diagrams/BML-Loop.jpg

The effectiveness of this procedure made the lean approach a pillar in new product development and entrepreneurship and the MVP development and testing represents now a common practice in this world. For the sake of this project a landing page was developed as the first MVP to obtain from a targeted audience (the one identified in the market validation phase) a consolidated feedback on the all the aspects of the platform xiKPI before carrying on the development of the first version of the platform. The landing page was developed using a template available on Hubspot [34] and it was submitted to the potential client companies via Linkedin [35] and direct contact via mail and/or phone.

8.1 Landing page

As introduced in the previous paragraph, the first MVP developed for testing the feasibility of xiKPI's first release consisted in a landing page reporting, in a simple but detailed way, all the main product features and characteristics carried by the product and needed to be known by the potential customers to whom the landing page was submitted in order to provide the company with a consistent feedback that could constitute a valuable lead. In this paragraph all the sections of the landing page will be presented and explained in detail.

The first section, showed in (figure 17), other than the navbar presents clearly the name of the product together with an immediate and concise description of what xiKPI consists in. Moreover there is a call-to-action button which directly leads to a "contact us" form, where an enquiry on the product can be made.

The second section, showed in (figure 18), discusses a bit further the main scope of the product: the empowerment of misused data to increase the operational efficiency of the user. Other than showing a demo example of a dashboard generated with the platform, in this section is discussed the rationale of the product and the main outputs that can be generated with the platform (and in particular granted in the first product release as well) and that should be perceived as highly value adding by the potential customers.

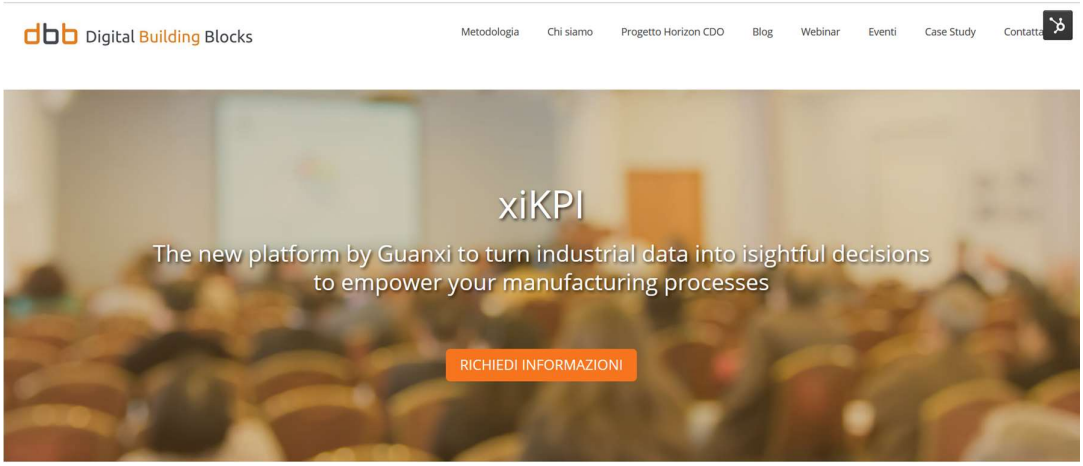


Figure 17: Landing Page section 1.

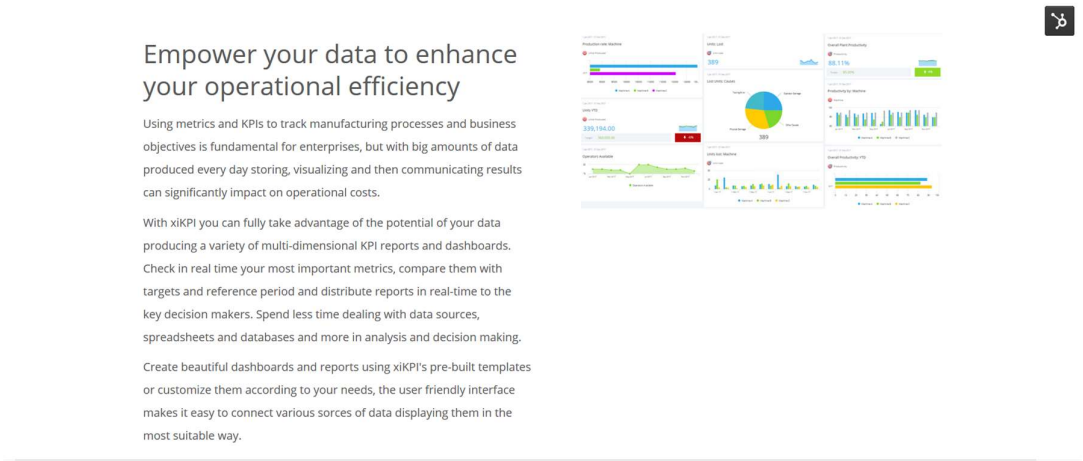


Figure 18: Landing Page section 2

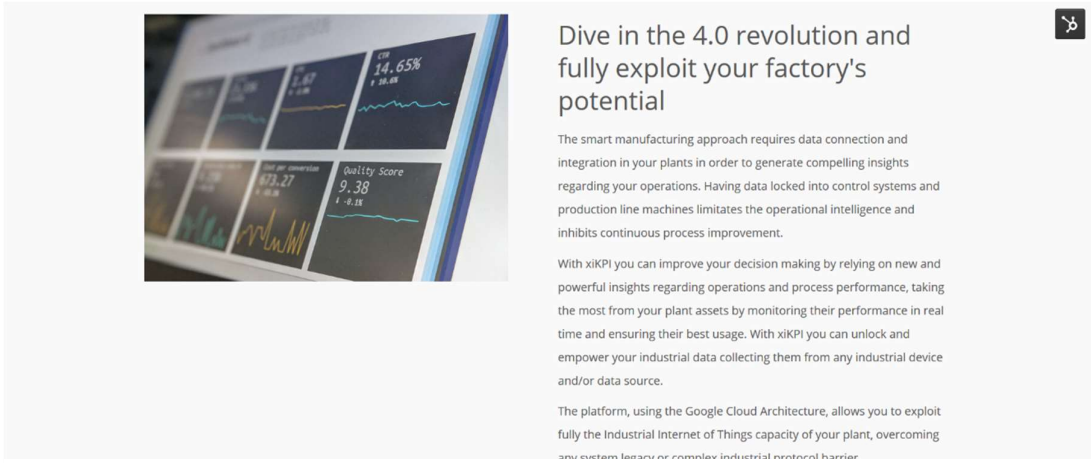


Figure 19: Landing Page section 3.

The third section of the landing page presented in (figure 19) describes a little bit further which is the potential of xiKPI, this time with a deeper focus on its application in a manufacturing 4.0 scenario, so it deepens the characteristics of the product and its potential referring to the second and final release of the product. In this section is particularly described how the utilization of xiKPI in a connected and smart manufacturing environment could drive the production process towards a more efficient production, adopting the paradigms of the industry 4.0 revolution.

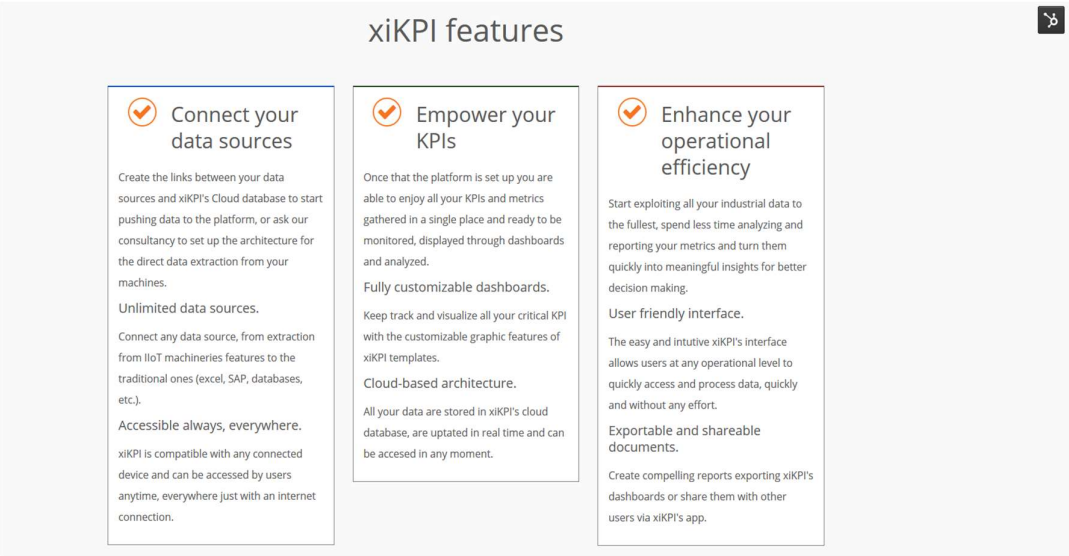


Figure 20: Landing Page section 4.

The main features of the platform are then discussed in the fourth section of the landing page (showed in (figure 20)). In this section all the relevant and value generating characteristics of the product are presented to the potential customer. In particular, the topics touched in the section concern: data sources and connectivity, accessibility, customization, product architecture, shareability, user interface and outputs obtainable.

In the fifth section of the landing page (figure 21) the pricing model is finally presented. In this paragraph is explained the 69.99 € per month subscription fee and the presence of a free trial period of one month. Furthermore in this section is anticipated that xiKPI will come with a PRO version (otherwise the second release version of the product) for which there is not a price available yet, but the potential customer are here invited to enquiry about it if interested.

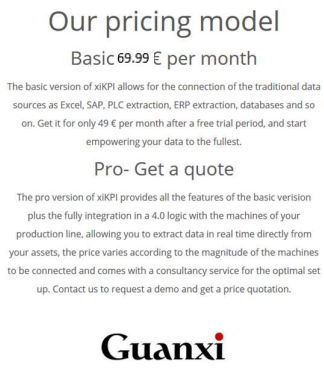
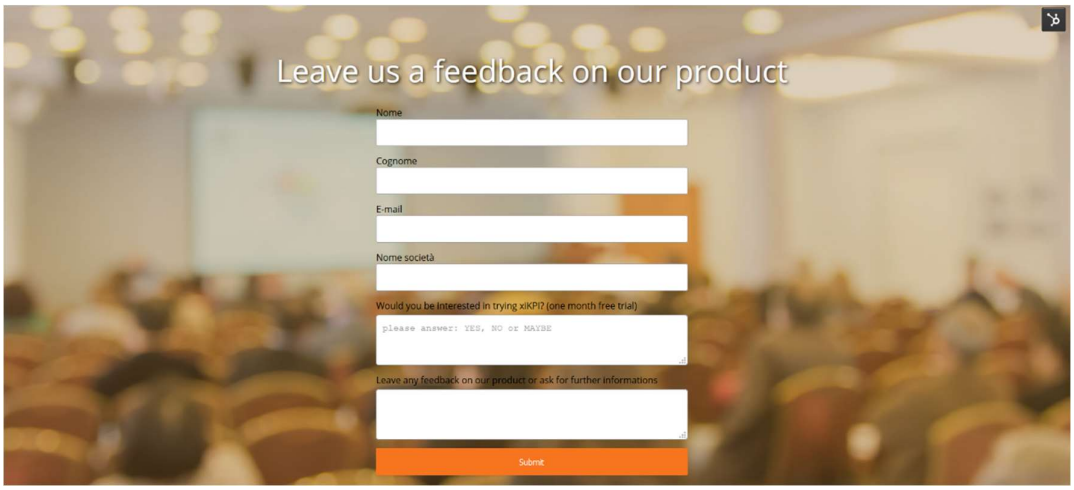


Figure 21: Landing Page section 5 and 6.



The last section of the landing page is probably the most relevant for the sake of the testing phase of this MVP. It presents in fact the form to obtain the feedback from the interviewed audience and the call to action for the submission of the form. It is significant to specify that even if the form presents different input areas, the ones required for the form to be successfully submitted are the email field and the one concerning the interest in trying the product.

As introduced previously this landing page was the MVP utilized in this project for testing the real needs and interests of the potential customers identified in the market validation phase, the results obtained after the MVP testing phase will be presented in the following paragraph.

8.2 Validation and results

The ultimate goal when building the landing page as an MVP was, as it has been said before, to test whether there was an actual interest and traction in the market with respect to the product to be developed by submitting the landing page to potential customers and obtaining a specific feedback from them. The MVP was submitted to the analyzed audience in various ways (mostly getting in contact with the specific company via LinkedIn, phone and email), and the whole process of obtaining a consistent amount of feedbacks represented probably one of the most challenging parts of the business planning activity. The MVP was submitted to hundreds of companies until a total of 61 feedbacks was obtained (the response ratio was extremely low). A specimen size of 61 was not chosen randomly, in fact it represent the necessary dimension to make a statistical estimation over a total population of 1 Million units with a confidence interval of 90% and an error margin of 10%. Of course a bigger specimen size would have led to a more accurate estimation, but given the high uncertainty typical of this kind of data and the high risk level which is peculiar of every entrepreneurial activity, the confidence interval adopted was sufficient to obtain highly valuable insights and make the necessary projections to obtain a first estimation on target market size and desired traction of the product. For the sake of obtaining a heterogeneous but still focused set of feedbacks, starting from the insights obtained in the market validation phase, the companies interviewed varied in both terms of size and industry of reference. In terms of company size the interviews were conducted on:

- 10 large enterprises (more than 50M € in yearly gross revenues), of which only 2 very large (more than 1B € in yearly revenues).
- 18 medium enterprises (yearly gross revenues between 10M € and 50M €).
- 33 small enterprises (yearly gross revenues lower than 10M €).

The focus on SMEs lies in the fact that the product was conceived for satisfying that market, while some larger companies were interviewed as well in order to assess whether there could be traction in that market segment as well, anyways the main focus and target remains the SMEs environment. In terms of industry of reference, as said before, the foundation of the approach used lies in the insight taken from the market validation phase. After that first round of interviews it was deducted that a product like the one proposed

seemed to be more suitable in the manufacturing environment for those companies operating in industries which carried a high level of standardization in the production processes, being them the sectors where an optimized production planning through a proper empowerment of production data can constitute a major driver for competitive advantage. To classify the various companies by industry and even to identify them in the first place by filtering the dedicated databases [36], the convention of the ATECO [37] codes was adopted, and in particular the codes relative to the reference industries taken into consideration in the validation phase were:

- 25.94: Manufacture of fasteners
- 25.11: Manufacture of metal structures and parts of structures
- 25.00: Manufacture of metal products (excluding machinery and equipment)
- 28.15: Manufacture of bearings, gears and transmission components (excluding hydraulic ones)
- 25.50: Forging, pressing, stamping and profiling of metals; powder metallurgy
- 28.14: Manufacture of other taps and valves
- 28.13: Manufacture of other pumps and compressors
- 27.32: Manufacture of other electric and electronic wires and cables
- 29.32: Manufacture of other parts and accessories for motor vehicles and their engines
- 28.49: Manufacture of other machine tools
- 20.10: Manufacture of basic chemicals, fertilizers and nitrogen compounds, plastic materials and synthetic rubber in primary forms
- 22.21: Manufacture of plastic plates, sheets, tubes and profiles
- 20.16: Manufacture of plastics in primary forms
- 20.17: Manufacture of synthetic rubber in primary forms
- 22.22: Manufacture of plastic packaging
- 22.11: Manufacture of tires and inner tubes; tire regeneration and reconstruction
- 22.19: Manufacture of other rubber products
- 27.11: Manufacture of motors, generators and electrical transformers

The complete list of companies interviewed, with the respective characteristics and results obtained are listed below in (table 2).

Table 2: MVP interviews and results.

Company	Industry (ATECO CODE)	Yearly Gross Revenues (M €)	feedback to xiKPI MVP (Y/N/M)
INOXDADI S.R.L.	25,94	8,83	Y
TREDINOX S.R.L.	25,11	10,2	M
METALARREDINOX S.R.L.	25,00	6,37	N
LAMFER S.R.L.	25,00	24,77	N
SKF INDUSTRIE S.P.A.	28,15	1050	N
TOWER AUTOMOTIVE ITALY SRL	25,50	123,21	N
GIACOMINI SPA	28,14	162,59	N
FAGGIOLATI PUMPS SPA	28,13	10,46	N
ESSEX SPA ITALY	27,32	142,6	N
VALEO SPA	29,32	227,08	N
LEAR CORPORATION	29,32	644,66	N
SCM ITALY SRL	28,49	428,44	N
VERSALIS SPA	20,10	4110	N
HUHTAMAKI FLEXIBLES ITALY SRL	22,21	71,65	N
PAINI SPA RUBINETTERIE	28,14	87,87	N
AZ PNEUMATICA SRL	28,14	9,79	M
BS SYSTEM SRL	28,14	8,46	Y
D.M.P. ELECTRONICS SRL	28,14	5,13	Y
ERREESSE SRL	28,14	16,42	M
JOINTEK SRL	28,14	8,42	N
NICOLAZZI SPA	28,14	11,2	N
ZANELLATO SRL	28,14	5,73	Y
BORGHI ASSALI SRL	28,15	6,8	M
COBRA SRL	28,15	11,84	M
DZ TRASMISSIONI SRL	28,15	5,98	Y
FLUITER ITALIA SPA	28,15	18,16	N
GFM MECCANICA SRL	28,15	6,84	N
ITALGEAR SRL	28,15	11,85	N
MEI ECOGROUP SRL	28,15	6,7	N
UFLEX SRL	28,15	7,55	Y

AIPOL SPA	20.16	13,5	Y
BAZZICA SRL	20.16	11,05	M
COMEF SRL	20.16	7,79	M
TECHPARTNER SRL	20.16	6,18	N
GOA GOMMA SRL	20,17	6,23	N
TAGOS SRL	20,17	9,77	N
AKRAPLAST SRL	22,21	7,77	Y
BOGOPHANE SRL	22,21	14,15	N
CELBO SPA	22,21	15,08	N
FIBER PLAST SRL	22,21	5,51	M
FLEXTECH SRL	22,21	24,59	M
KEMICA SRL	22,21	13,02	N
POLICART SRL	22,21	6,76	Y
FABRIS SRL	22,22	6,68	N
CELIPLAST SRL	22,22	6,78	Y
PIESSECI SRL	22,22	7,64	M
CORGOM SRL	22,11	5,11	N
PE. SA. GOMME SRL	22,11	9,63	M
AGAV SRL	22,19	5,89	N
BIASIN SRL	22,19	8,74	N
CARCO SRL	22,19	12,08	M
CENTER GOMMA SRL	22,19	11,51	N
EMMEBLAST SRL	22,19	7,04	N
G.B. SRL	22,19	14,47	N
PASELL SRL	22,19	5,33	Y
CIMA SRL	27,11	13,2	N
DAGU SRL	27,11	7,68	N
ICME SPA	27,11	19,21	N
MARGEN SPA	27,11	9,87	M
TEKNOMOTOR SRL	27,11	7,72	N
WARIS SRL	27,11	7,86	Y

The table below (table 3) shows the key of lecture of the previous one, for the sake of clarity; in picture (figure 22) is displayed the graphic representation of the feedbacks obtained. As the best practices for business planning suggest, the results of this testing phase represented the foundation for the market segmentation activity, which will be discussed in the following chapter, and indirectly the basis of the sales projections necessary to define a structure financial plan.

Table 3: MVP interviews and results table key of lecture.

KEY	
	Small enterprise (<10M €)
	Medium enterprise (10M €<x<50M €)
	Large enterprise (>50M €)
Validation question	Would you be interested in trying xiKPI's first release?
Y	Yes
N	No
M	Maybe
Results	
Y	12/61 (18,3%)
N	36/61 (60%)
M	13/61 (21,7%)

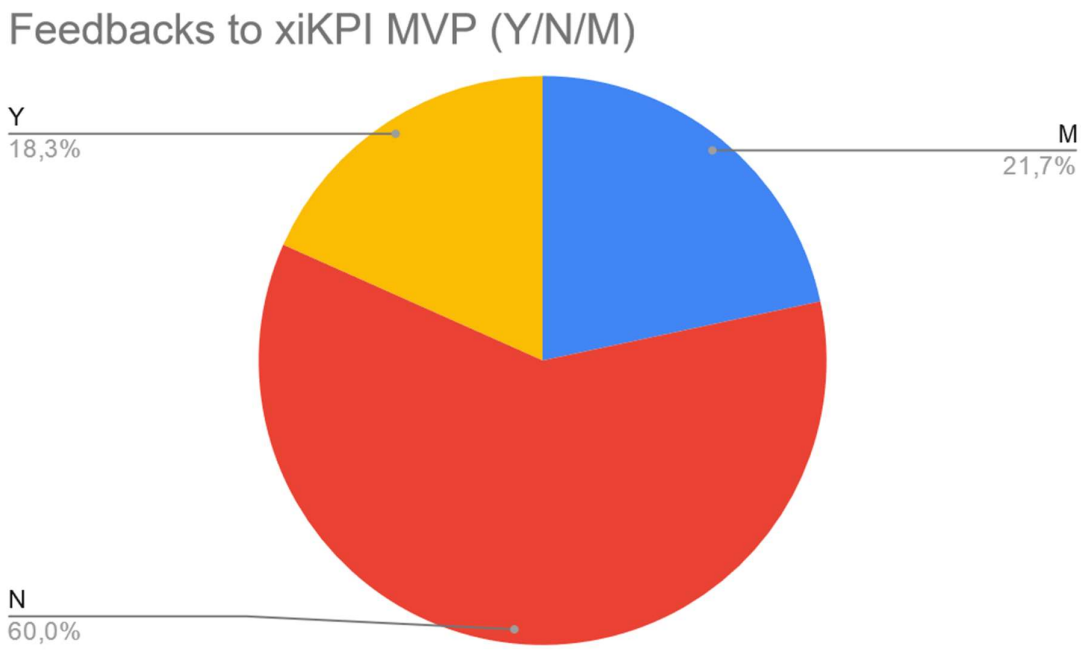


Figure 22: MVP Validation results.

9 Market segmentation and targeting

In this chapter the market segmentation effort, which constitutes the basis for the estimation of the obtainable sales of the product, will be discussed, together with the identified customer personas. The hypothesis made on the actual available market were all made using the latest reports available from the related governmental authority, while the assumptions on the reachable customers and the personas were here made starting from the results obtained with the market and MVP validations.

9.1 Customer Personas

The nature of the identified customer personas was anticipated in different phases of this business plan, it will however be properly explicated in this section. Given the nature of the product which constitutes the subject matter of this business plan, the personas

identified remains at a quite general level, however there are some fundamental characteristics that a company must comply with so as to be a targeted potential customer of xiKPI. The characteristics, and their reasoning, are listed below:

1. **Be a Small or Medium Enterprise (SME):** it has been assumed that a product that wants to attack the market differentiating itself from competition leveraging on affordability and ease of usage, and which will operate at a suboptimal level at least in its first release would be perceived as valuable most likely from those companies which cannot afford the product offered by the more structured competitors, but which still want to improve their performance through digitalizing their processes.
2. **Be a manufacturing company operating in an industry characterized by a relatively standardized output:** as it has emerged in the market validation phase, the product is most suitable for companies which manufacture goods in a quite standardized way since they are the ones which can improve the most their production processes with xiKPI as it is intended to be. For some concrete examples of reference industry see the ATECO codes [37] taken into consideration in the MVP validation chapter.
3. **Operate in Italy:** the product launch is intended to be circumscribed to Italy at first.
4. **Do not use a competitor or substitute product already.**
5. **Be willing and committed to start a digital transformation process.**

9.2 TAM, SAM and SOM

The most relevant part of this chapter is the one concerning the market segmentation process. To filter the market from its totality to only the portion addressable with xiKPI the TAM-SAM-SOM model has been used. The model, widely used for market segmentation activities, starts from the Total Available Market and then incrementally discounts it defining the Service Available Market and finally the Service Obtainable Market (figure 23).

- **TAM:** The total available market represents the totality of the market that can be addressed and was estimated starting from the report on Italian enterprises redacted by ISTAT [38] and accounts for a total of 401.164 SMEs of which: 340.570 enterprises with 1-9 employees, 40.900 enterprises with 10-19 employees and 19.694 enterprises with 20-49 employees.
- **SAM:** The service available market represent the portion of the TAM that can be served considering the constraints on geography, industry specificity issues and product features. In this analysis it was estimated to be the 30% of the TAM, wanting to delimit the segmentation to the northern part of the country and overestimating the sectors which are not compatible with the product features and usage proposed. The SAM accounts then for a total of 120.350 enterprises.
- **SOM:** The service obtainable market represents that portion of the SAM that can be properly targeted and reached with the product proposed. The estimation here is made considering the results of the MVP validation phase, since the statistical specimen of testing was large enough to project the results on the SAM with a confidence interval of 95% and an error of 10%. The SOM is hence deducted applying the percentage of positive results on the SAM (18.3%) which leads to a total of 22.024 enterprises. Now, the obtained results represents more a long term objective rather than a milestone to reach before the end of the time interval allocated for this project (which is of 24 months), hence the actual target market can be utterly discounted to a fixed objective of 500 customers to be obtained during the following 8 months after the product launch, representing a humble fraction of the total identified SOM.

The results obtained in this phase, together with the ones related to the operational plan, will constitute the foundation for developing a structured and coherent financial plan for the project.

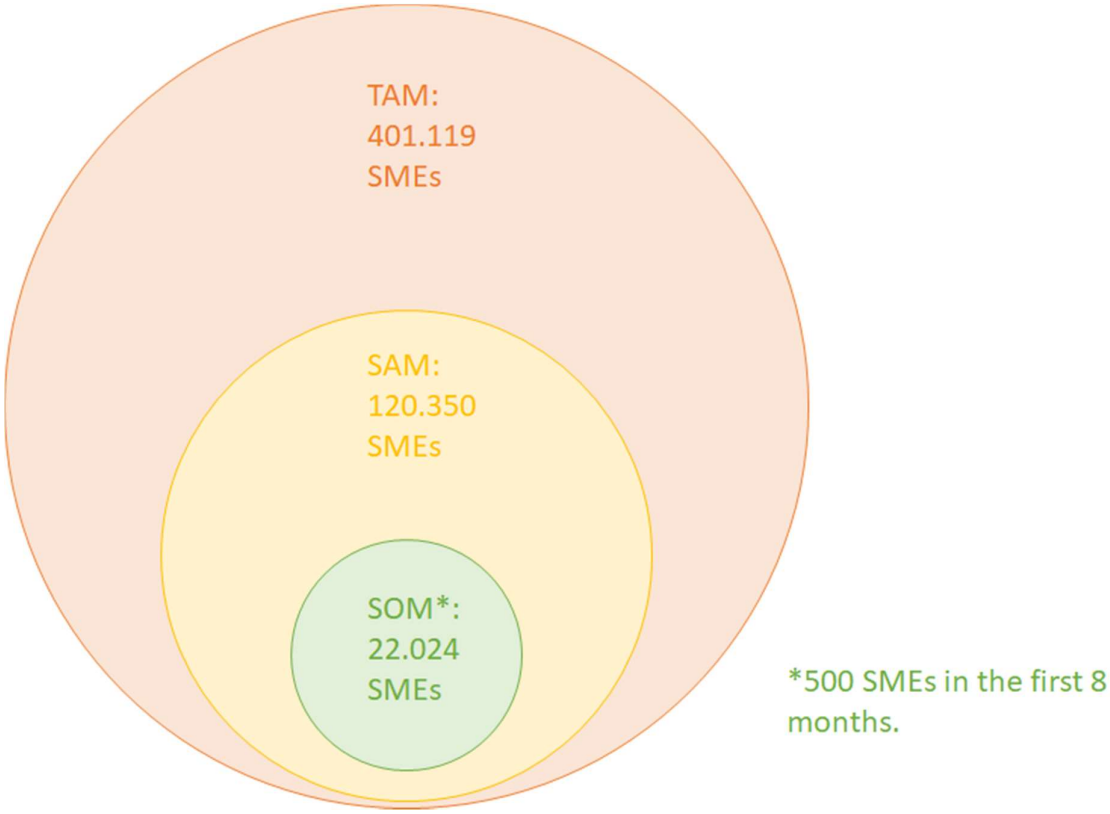


Figure 23: TAM-SAM-SOM.

10 Operational plan

In this chapter the operational plan for the development of xiKPI will be discussed. The aim of this phase of the business planning activity is to identify all the activities and the milestones necessary to carry out the project from start to completion while associating them to the resources (tangibles and human capital related) necessary to perform them. Once activities and resources have been identified the results obtained must be used to recognize all the costs that must be faced during the product development journey, in order to structure the cost side of the financial plan and to define a precise project roadmap. The first table (table 4) lists the main resources necessary for the project development (which in this business plan will have a duration of 24 months). Concerning the list of resources there are some key points to clarify. Firstly, being this project a spin-

off of an existing and structured company, it will here be considered as a cost center only the resources which are currently unavailable in the organization, in other words, basically only the resources related to the technical aspects of the project will constitute a cost to consider when elaborating the financial projections. The resources related to the business analytics, marketing and strategic sides of the xiKPI project are considered as already available and allocable to the project since they represent the core business of Guanxi. The same logic has been applied to all the basic resources necessary to carry out a business (i.e. office, office equipment, facilities, etc.) since the team dedicated to the development of xiKPI can work both remotely and using the facilities disposed by Guanxi. After listing the resources each of them among the currently not available has been linked to an estimated cost, established on the basis of the current market average value related to the respective resources. Finally, concerning the human resources, the team organization and hierarchies will be further discussed in the organizational plan chapter.

Table 4: Necessary Resources.

NECESSARY RESOURCE/ACTIVITY	CURRENT AVAILABILITY	ESTIMATED COST
HUMAN RESOURCES		
MOBILE INTERFACE DEVELOPER	not available	5K
SENIOR BACK END DEVELOPER	not available	70K
JUNIOR BACK END DEVELOPER (X2)	not available	80K
SENIOR FRONT END DEVELOPER	not available	60K
JUNIOR FRONT END DEVELOPER	not available	40K
UI/UX DESIGN SPECIALIST	not available	5K
MARKETING SPECIALIST	available	-
BUSINESS ANALYST	available	-
PRODUCT/PROJECT MANAGER	available	-
TECHNICAL RESOURCES		
CODE REPOSITORY	not available	1K
CICD	not available	Pay-per-use (ca. 50 € per user per month with standard batch configuration)
DATA INGESTION CLOUD (MODULE 1)	not available	

DATA PROCESSING CLOUD (MODULE 2)	not available	
DATA VISUALIZATION CLOUD (MODULE 3)	not available	
DATA RETENTION CLOUD (MODULE 4)	not available	
LICENSES FOR CODING ENVIRONMENT	not available	1K
OTHER		
OFFICE	available	-
OFFICE EQUIPMENT	available	-
COMPLEMENTARY ASSETS	available	-

The second table in this section (table 5) lists all the primary activities that will be carried out during the 24 months of the project duration. All the activities reported, which represent the milestones of the project itself, were sequenced using a priority order, which was established separately for the technical activities concerning the coding and development part and for the business planning and marketing related ones. The detailed project roadmap will be discussed in the dedicated following chapter, however in this section the division by pertinence areas was utilized since in each area most of the activities are connected with the followings in the priority sequence by a finish to start relation. Moreover, in this section is important to clarify that in spite the overall project duration was established to be 24 months, the total time allocated to carry out the identified key activities ranges from 10 months (in the best case scenario) to 12 months (in the worst case scenario, considering some time delays that might occur). This difference finds its reasoning in the fact that the listed activities concern mostly the first part of xiKPI's project, in other words, the phase where the product will be transformed from an idea to fully functioning platform. The remaining time allocated to the project will be used for the after launch activities of sales and continuous marketing and it represents the time interval in which the realized platform will be directly tested in the market, and in which decision concerning the hypothetical re-development for the second and improved released will be made on the basis of the actual traction experienced in the

market. Finally, concerning the activities identified, they do not need much further explanation since they represent the quite standard activities to be performed in a product development project for a SaaS software solution, the only thing that is necessary to clarify is the fact that the technical activities described as "MODULE" refer to the Cloud modules of the Google Dataflow Cloud solution explicated already in the previous table.

Table 5: Primary Activities.

PERTINENCE AREA	ACTIVITY	PRIORITY	DURATION	TOTAL DURATION
TECH (BACK END)	FIRST WIREFRAME SETUP	1	2 WEEKS	10 MONTHS (BEST CASE) 12 MONTHS (WORST CASE)
TECH (BACK END)	CLOUD ARCHITECTURE STUDY	2	2 WEEKS	
TECH (BACK END + FRONT END)	DESIGN ARCHITECTURE PROPOSAL	3	2 WEEKS	
TECH (BACK END)	FINAL WIREFRAME SETUP	4	1 WEEK	
TECH (BACK END)	CODING ENVIRONMENT PREPARATION	5	1 WEEK	
TECH (BACK END)	AUTHENTICATION AND SECURITY SYSTEM DESIGN	6	2 WEEKS	
TECH (FRONT END +UI/UX+ MOB.DEV.)	DESIGN SYSTEM DEVELOPMENT	7	1 MONTH	
TECH (BACK END)	MODULE 1 DEVELOPMENT	8	7 MONTHS	
TECH (BACK END)	MODULE 2 DEVELOPMENT	9		
TECH (BACK END)	MODULE 3 DEVELOPMENT	10		
TECH (BACK END)	MODULE 4 DEVELOPMENT	11		
TECH (BACK END)	MODULE 1 DEVELOPMENT (second iteration)	12		
TECH (BACK END)	MODULE 2 DEVELOPMENT (second iteration)	13		
TECH (BACK END)	MODULE 3 DEVELOPMENT (second iteration)	14		
TECH (BACK END)	MODULE 4 DEVELOPMENT (second iteration)	15		

TECH (FRONT END +UI/UX+ MOB.DEV.)	INTERFACE FINAL CONFIGURATION	16	1 MONTH	
TECH (ALL)	FINAL SYSTEM-INTERFACE INTEGRATION	17	2 WEEKS	
TECH (ALL)	BETA VERSION RELEASE	18	-	
BUSINESS	IDEA VALIDATION	1	1 WEEK	
BUSINESS	MARKET NEED ASSESSMENT	2	1 WEEK	
BUSINESS	PRODUCT/MARKET/NEED FIT	3	1 WEEK	
BUSINESS	COMPETITION ANALYSIS	4	1 WEEK	
BUSINESS	STRATEGIC POSITIONING	5	1 WEEK	
BUSINESS	MARKET VALIDATION	6	2 WEEKS	
BUSINESS	CUSTOMER PERSONAS	7	1 WEEK	
BUSINESS	USER JOURNEY/EXPERIENCE	8	1 WEEK	
BUSINESS	PRODUCT FEATURES DESIGN	9	1 WEEK	
BUSINESS	MVP DESIGN	10	1 WEEK	
BUSINESS	MVP TESTING	11	2 MONTHS	
MARKETING	MARKETING CAMPAIGN DESIGN	12	1 WEEK	
MARKETING	LEAD GENERATION CAMPAIGN	13	CONTIN UOUS	
BUSINESS	FINANCIAL PROJECTIONS	14	2 WEEKS	
ALL	PRODUCT LAUNCH	15	-	

11 Organizational plan

In this chapter, the organizational structure of the team dedicated to project will be briefly discussed. In (figure 24) it is represented the hierarchical structure of the team with the relative roles involved and the current availability of each resource in the current company organic.

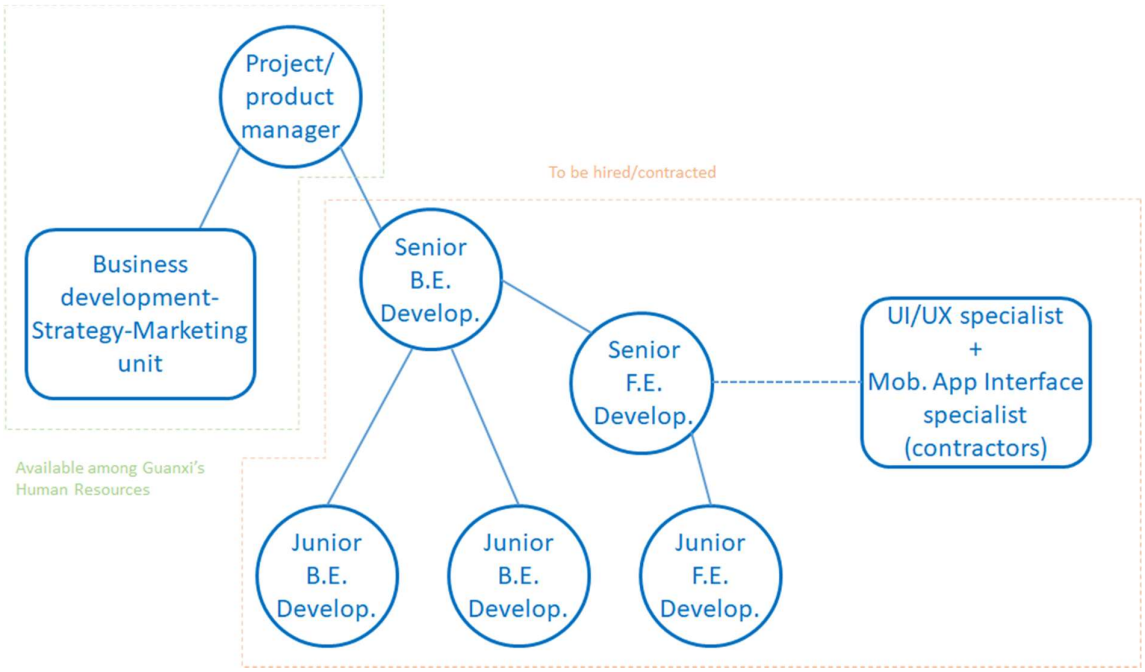


Figure 24: Organizational Structure.

The highest hierarchical level will be held by the project manager that will cover at the same time the role of product manager. The head of the team figure will have the fundamental role of coordinating the team's activities, making sure that the milestones are reached in the planned time and guaranteeing the alignment among the technical team and the one dedicated to business development and marketing. This figure will be identified inside the company's current organic. The same logic will be applied to the business development, marketing and strategy unit, which is left generic in terms of amount of dedicated people given the fact that the team will be formed with people already hired by Guanxi, hence the precise allocation will be handled by the project manager according to the contingencies and the actual requirements of each of the activities to be performed. On the other hand, the situation will be more structured on the

technical side of the team. The tech unit will in fact be managed by the senior back end developer, who will cover the data architect position as well and will report directly to the project manager. The senior back end developer will coordinate the work of his direct subordinates and supervise the activities of the senior front end developer, who on its side will coordinate his subordinate and manage the relationship with the UI/UX and mobile app interface specialists. Finally, the whole technical team will have to be hired but different strategies will be adopted for the various positions: the developers will be formerly hired by the company while the two specialists will be contracted as consultants, since in spite of the fundamental relevance of their duties, their involvement is necessary on a minor set of activities which will require less resources and time allocation to be performed, and hence this strategy represent an occasion to cut some of the costs while ensuring the maximum quality of performance. Of course this proposed organizational structure will be effective for the duration of the project related to the first product release, in case of success of this preliminary phase and if a second and improved version will be financed, the team will be most likely expanded and roles and responsibilities discussed again.

12 Financial plan

The financial plan for the xiKPI project was redacted on the basis of the results and the assumptions of the previous phases of the business plan and developed using iPlan [39], a tool for estimating market demand, financial and impact indicators developed by Giorgio Di Maio and Paolo Landoni for SIT-Social Innovation Teams and PoliTo.

12.1 Financial assumptions

xiKPI's financial plan was developed over a 2 years' time horizon hypothesizing a fixed tax rate of 40% on the yearly gross revenues. The company's team plans on financing its activity with a mix of bank overdraft and equity capital contribution. The bank overdraft

will be disbursed at the beginning of operations in January 2020 and will account for a total of 78.000 €, with a fixed interest rate of 3%.

12.2 Revenues

xiKPI plans on obtaining its revenues from two main streams. The first one consists in the monthly subscription fee of 69,99 € for the license of the product, the second one comes instead from the consultancy service for product training and implementation assistance, fixed at 1000 € per client. Both the revenue streams are discounted of the related operating costs in this financial analysis, in fact the subscription fee carries an intrinsic cost of 50 € per month, which is an estimation of the cost to be faced to deploy Google's Cloud architecture with a standard configuration (see (figure 11) for the actual pricing list). The consultancy revenue on its hand is discounted of a cost of 200 € which represents a rough estimation of the agency costs to be faced to deliver the service. The net revenues as estimated are then projected over the two years horizon basing the hypothesis on the assumptions made and the results obtained in the market segmentation phase.

Item 1	xiKPI subscription fees	1/2020	2/2020	3/2020	4/2020	5/2020	6/2020	7/2020	8/2020	9/2020	10/2020	11/2020	12/2020
Sales per month (units)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Selling Currency	EUR												
Revenues per unit (EUR per unit)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Revenues per month (EUR)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exchange rate	EUR/EUR												
Revenues per month (EUR)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Purchases per month (units)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Purchases Currency	EUR												
Purchases price (EUR per unit)		50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
Purchases per month (EUR)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exchange rate	EUR/EUR												
Purchases per month (EUR)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Margin (EUR)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

1/2021	2/2021	3/2021	4/2021	5/2021	6/2021	7/2021	8/2021	9/2021	10/2021	11/2021	12/2021
5,00	10,00	20,00	50,00	120,00	200,00	250,00	300,00	350,00	400,00	450,00	600,00
69,99	69,99	69,99	69,99	69,99	69,99	69,99	69,99	69,99	69,99	69,99	69,99
349,95	699,90	1.399,80	3.499,50	8.398,80	13.998,00	17.497,50	20.997,00	24.496,50	27.996,00	31.495,50	41.994,00
349,95	699,90	1.399,80	3.499,50	8.398,80	13.998,00	17.497,50	20.997,00	24.496,50	27.996,00	31.495,50	41.994,00
5,00	10,00	20,00	50,00	120,00	200,00	250,00	300,00	350,00	400,00	450,00	500,00
50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00	50,00
250,00	500,00	1.000,00	2.500,00	6.000,00	10.000,00	12.500,00	15.000,00	17.500,00	20.000,00	22.500,00	25.000,00
250,00	500,00	1.000,00	2.500,00	6.000,00	10.000,00	12.500,00	15.000,00	17.500,00	20.000,00	22.500,00	25.000,00
99,95	199,90	399,80	999,50	2.398,80	3.998,00	4.997,50	5.997,00	6.996,50	7.996,00	8.995,50	16.994,00

Item 2	implementation consultancy	1/2020	2/2020	3/2020	4/2020	5/2020	6/2020	7/2020	8/2020	9/2020	10/2020	11/2020	12/2020
Sales per month (units)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Selling Currency	EUR												
Revenues per unit (EUR per unit)		1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00
Revenues per month (EUR)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exchange rate	EUR/EUR												
Revenues per month (EUR)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Purchases per month (units)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Purchases Currency	EUR												
Purchases price (EUR per unit)		200,00	200,00	200,00	200,00	200,00	200,00	200,00	200,00	200,00	200,00	200,00	200,00
Purchases per month (EUR)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Exchange rate	EUR/EUR												
Purchases per month (EUR)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Margin (EUR)		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00

1/2021	2/2021	3/2021	4/2021	5/2021	6/2021	7/2021	8/2021	9/2021	10/2021	11/2021	12/2021
5,00	5,00	10,00	30,00	70,00	80,00	50,00	50,00	50,00	50,00	50,00	150,00
1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00	1.000,00
5.000,00	5.000,00	10.000,00	30.000,00	70.000,00	80.000,00	50.000,00	50.000,00	50.000,00	50.000,00	50.000,00	150.000,00
5.000,00	5.000,00	10.000,00	30.000,00	70.000,00	80.000,00	50.000,00	50.000,00	50.000,00	50.000,00	50.000,00	150.000,00
5,00	5,00	10,00	30,00	70,00	80,00	50,00	50,00	50,00	50,00	50,00	50,00
200,00	200,00	200,00	200,00	200,00	200,00	200,00	200,00	200,00	200,00	200,00	200,00
1.000,00	1.000,00	2.000,00	6.000,00	14.000,00	16.000,00	10.000,00	10.000,00	10.000,00	10.000,00	10.000,00	10.000,00
1.000,00	1.000,00	2.000,00	6.000,00	14.000,00	16.000,00	10.000,00	10.000,00	10.000,00	10.000,00	10.000,00	10.000,00
4.000,00	4.000,00	8.000,00	24.000,00	56.000,00	64.000,00	40.000,00	40.000,00	40.000,00	40.000,00	40.000,00	140.000,00

Figure 25: Revenues.

12.3 Costs

As anticipated in the operational plan the company foresees the major fixed costs to be related to development and marketing expenses (respectively for a total of 260.000 € and 40.000 €). On top of those major drivers a monthly cost of 1000 € for unforeseen overheads was involved in the analysis.

12.4 Terminal value

At the end of the second year, xiKPI will continue operating for at least two more years with an estimated growth on revenues of at least 100% per year. This assumption may result bold but is justified by the fact that xiKPI is intended to relaunch an improved version of the product in those years and that the customers obtained in the period analyzed are still an extremely small portion of the total SOM identified. Considering the trends on net earnings, the company should evaluate to cease the operations and sell for

a value not inferior than the value of the cash balance of the last year considered (2023): 1.210.000 €.

Business operations beyond the Business Plan's time horizon and final selling or liquidation of the business activity		
Last year in the business plan's time horizon	2021	
Terminal year (at the end of this year, the business activity is sold or liquidated)	2023	It should be between 2021 and 2034
Number of years between the last year of the business plan's time horizon and the terminal year	2	
Net earnings in the last year of the business plan's time horizon, 2021	302.299	Euro
Constant annual growth rate of the net earnings in the period 2022-2023	100%	%
Selling price or liquidation value of the business activity at the end of 2023	1.210.000	Euro

Figure 26: Terminal Value.

12.5 Financial need

Using the data estimated so far, the net cumulated cash flows were calculated over the business plan years. The analysis showed a financial need (i.e. the minimum of the monthly cumulated NCF) of 260.680 € and the reach of the break-even point in September 2021.

Operating Cash Flows

Period	1	2	3	4	5	6	7	8	9	10	11	12
Month	1	2	3	4	5	6	7	8	9	10	11	12
Year	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020	2020
Month/Year	1/2020	2/2020	3/2020	4/2020	5/2020	6/2020	7/2020	8/2020	9/2020	10/2020	11/2020	12/2020
Not Taxable Revenues	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Taxable Revenues	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Inflows (Ingoing Cash Flows)	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Investments	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Variable costs	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Fixed costs	22.830,00	22.830,00	22.830,00	22.830,00	22.830,00	22.830,00	22.830,00	22.830,00	22.830,00	25.680,00	25.680,00	3.850,00
DIY - Operating Costs	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Taxes	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Outflows (Outgoing Cash Flows)	22.830,00	22.830,00	22.830,00	22.830,00	22.830,00	22.830,00	22.830,00	22.830,00	22.830,00	25.680,00	25.680,00	3.850,00
Net Cash Flows	-22.830,00	-22.830,00	-22.830,00	-22.830,00	-22.830,00	-22.830,00	-22.830,00	-22.830,00	-22.830,00	-25.680,00	-25.680,00	-3.850,00
Cumulated Net Cash Flows	-22.830,00	-45.660,00	-68.490,00	-91.320,00	-114.150,00	-136.980,00	-159.810,00	-182.640,00	-205.470,00	-231.150,00	-256.830,00	-260.680,00
Financial Need (Minimum Cumulated Net Cash Flows)	-260.680,00											

13	14	15	16	17	18	19	20	21	22	23	24
1	2	3	4	5	6	7	8	9	10	11	12
2021	2021	2021	2021	2021	2021	2021	2021	2021	2021	2021	2021
1/2021	2/2021	3/2021	4/2021	5/2021	6/2021	7/2021	8/2021	9/2021	10/2021	11/2021	12/2021
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
5.349,95	5.699,90	11.399,80	33.499,50	78.398,80	93.998,00	67.497,50	70.997,00	74.496,50	77.996,00	81.495,50	191.994,00
5.349,95	5.699,90	11.399,80	33.499,50	78.398,80	93.998,00	67.497,50	70.997,00	74.496,50	77.996,00	81.495,50	191.994,00
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
1.250,00	1.500,00	3.000,00	8.500,00	20.000,00	26.000,00	22.500,00	25.000,00	27.500,00	30.000,00	32.500,00	35.000,00
3.850,00	3.850,00	3.850,00	3.850,00	3.850,00	3.850,00	3.850,00	3.850,00	3.850,00	3.850,00	3.850,00	0,00
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	207.088,98
5.100,00	5.350,00	6.850,00	12.350,00	23.850,00	29.850,00	26.350,00	28.850,00	31.350,00	33.850,00	36.350,00	242.088,98
249,95	349,90	4.549,80	21.149,50	54.548,80	64.148,00	41.147,50	42.147,00	43.146,50	44.146,00	45.145,50	-50.094,98
-260.430,05	-260.080,15	-255.530,35	-234.380,85	-179.832,05	-115.684,05	-74.536,55	-32.389,55	10.756,95	54.902,95	100.048,45	49.953,47

Figure 27: Operating Cash Flows.

To face the financial need, xiKPI will adopt a financing strategy of 70% equity and 30% debt. The capital contributions, for a total of 190.000 € will need to be raised during the first months of operations, while the debt part of the capital structure will consist in a bank overdraft as anticipated before.

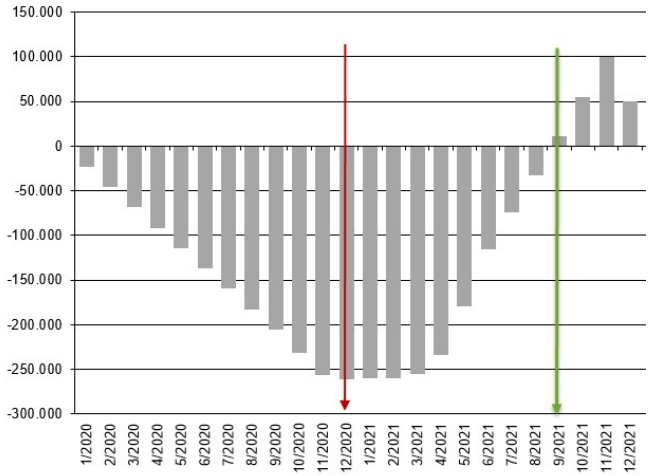


Figure 28: Cumulated Operating Net Cash Flows.

12.6 Cash balance

The cash balance chart shows the cash availability over the time horizon analyzed. Is important here to specify how the presence of several months with a negative cash balance are index of high impacting short-term expenses necessary to fuel the scale up of the operations and sustain the long-term oriented profitability.

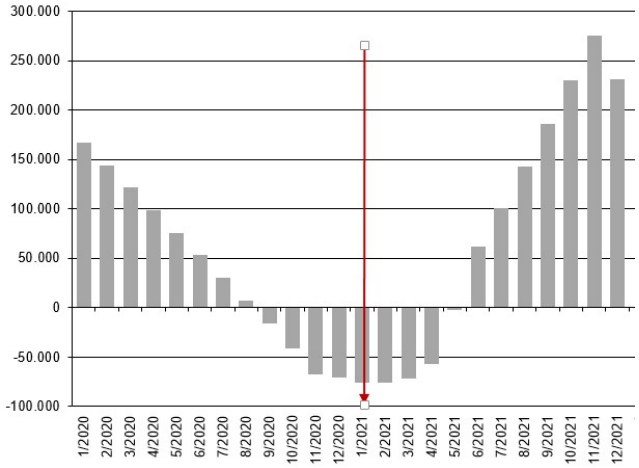


Figure 29: Cash Balance.

12.7 Net earnings

Based on the data estimated, the tool utilized calculated the net earnings for the 2 years period in considerations. As the graphs show, the company will start having positive earnings in the second year of operations, after which the profit is expected to grow exponentially.

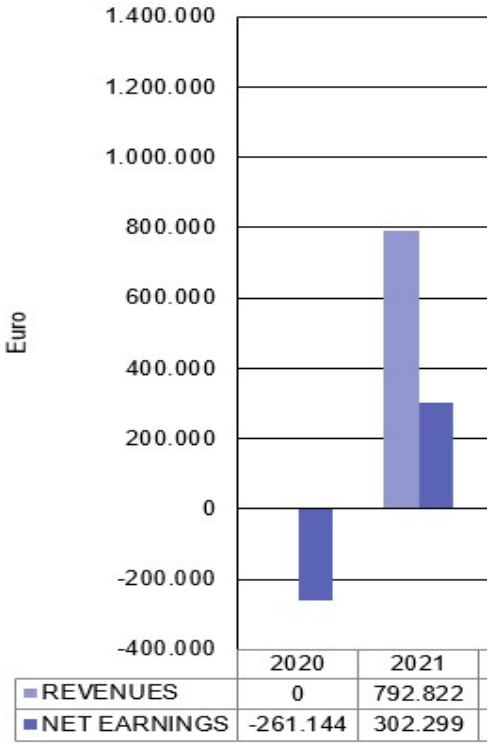


Figure 30: Net Earnings.

12.8 Financial statements and indicators

The financial statements of xiKPI for the two years analyzed are here reported together with the calculated indicators.

Balance Sheet

	2020	2021
LIABILITIES		
Capital	190.000	190.000
Retained Earnings	-261.144	41.154
Equity	-71.144	231.154
Bank Overdraft	71.144	0
Mortgage	0	0
Debt	71.144	0
TOTAL LIABILITIES	0	231.154
ASSETS		
Gross Fixed Assets (Plant & Equipment)	0	0
Accumulated Depreciation	0	0
Net Fixed Assets	0	0
Bank & Cash	0	231.154
TOTAL ASSETS	0	231.154

Figure 31: Balance Sheet.

Income Statement

	2020	2021
Taxable Revenues	0	792.822
Not Taxable Revenues	0	0
REVENUES	0	792.822
Costs and Expenses	-260.680	-275.100
EBITDA	-260.680	517.722
Depreciations & Amortizations	0	0
EBIT	-260.680	517.722
Interests	-464	-13.892
EARNINGS BEFORE TAXES	-261.144	503.831
Taxes	0	-201.532
NET EARNINGS	-261.144	302.299

Figure 32: Income Statement.

Cash Flow Statement

	2020	2021
CASH FLOWS FROM OPERATING ACTIVITIES		
Net Earnings	-261.144	302.299
Depreciations & Amortizations	0	0
Net cash provided by operating activities	-261.144	302.299
CASH FLOWS FROM INVESTING ACTIVITIES		
Investments (Plant & Equipment)	0	0
Net cash provided by investing activities	0	0
CASH FLOWS FROM FINANCING ACTIVITIES		
Capital contributions	190.000	0
Dividends	0	0
Bank Overdraft	71.144	-71.144
Mortgage		
Net cash provided by financing activities	261.144	-71.144
NET INCREASE IN CASH IN THE YEAR	0	231.154
CASH AT THE END OF THE YEAR	0	231.154

Figure 33: Cash Flow Statement.

Calculated indicators: ROE: 131 % in 2021, ROI: 137%.

13 Project roadmap

One of the last steps of the business plan, once the roles and activities have been identified, the financials projections estimated and the product idea validated, is to structure a consistent project plan to schedule in a detailed way all the steps required to transform the idea into a tangible product. To do so the various activities identified in the organizational plan where scheduled in a Gantt chart to show the time requirements necessary to perform them, together with the dependencies among each other and the possible parallelisms that can be put in place to optimize the project development. It is important to specify in this section that in spite of being the project duration fixed at 24 months the scheduling covers roughly only the first year of operations, which is the one characterized by the performance of all the tasks related directly or indirectly to the product development activity. The various tasks were grouped in the scheduling by pertinence areas in order to obtain a cleaner and leaner representation and reflecting the fact that some of the activities are carried out by different work teams.

Before presenting the chart the lecture key should be defined: firstly, to each number corresponding to a column in the chart represent a week, where the first one is the week starting on 01/10/2019. Secondly each color in the Gantt schedule blocks represent a work team assigned to the task:

- Red (R): Business.
- Yellow (Y): Marketing.
- Blue (B): Back end development.
- Orange (O): Front end development.
- Green (G): Full tech team.
- Purple (P): Streamline overall duration.
- Black (X): Product launch.

Stream 1: Business.

TASK DESCRIPTION	PLAN START	PLAN END	TYPE
Business development	01/10/2019	10/03/2020	P
Idea validation	01/10/2019	07/10/2019	R
Market need assesment	08/10/2019	14/10/2019	R
Product/market/need fit	15/10/2019	21/10/2019	R
Compatition analysis	22/10/2019	28/10/2019	R
Strategic positioning	29/10/2019	04/11/2019	R
Market validtaion	05/11/2019	18/11/2019	R
Customer personas	19/11/2019	25/11/2019	R
User Journey/experience	26/11/2019	02/12/2019	R
Product features design	03/12/2019	09/12/2019	R
MVP design	10/12/2019	16/12/2019	R
MVP testing	17/12/2019	17/02/2020	R
Market segmentations	18/02/2020	24/02/2020	R
Financial projections	25/02/2020	09/03/2020	R

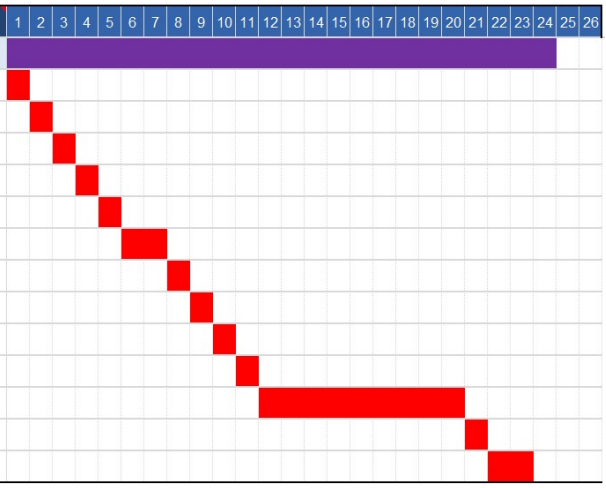


Figure 34: Project Plan for Business Stream.

Stream 2: Product Development.

TASK DESCRIPTION	PLAN START	PLAN END	TYPE
Product development	01/01/2020	01/01/2021	P
First wireframe setup	15/01/2020	27/01/2020	B
Cloud architecture study	28/01/2020	10/02/2020	B
Design architecture proposal	11/02/2020	24/02/2020	G
Final wireframe setup	25/02/2020	02/03/2020	B
Coding environment preparation	03/03/2020	09/03/2020	B
Authentication and security syster	10/03/2020	26/03/2020	B
Design system development	04/03/2020	07/04/2020	O
Cloud modules dev. (4x2rounds)	01/04/2020	26/10/2020	G
Interface final configuration	27/10/2020	30/11/2020	O
Final system-interface integration	01/12/2020	21/12/2020	G
Beta version release	22/12/2020	28/12/2020	X

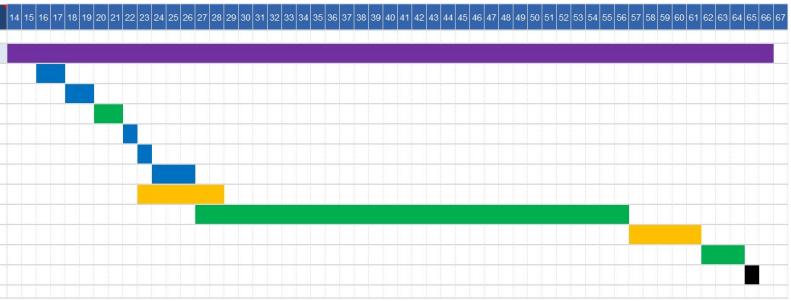


Figure 35: Project Plan for Product Development Stream

Stream 3: Marketing and launch

TASK DESCRIPTION	PLAN START	PLAN END	TYPE
Marketing	18/02/2020	12/01/2021	P
Marketing campaign design	18/02/2020	24/02/2020	Y
Marketing campaign design	25/02/2020	12/01/2021	Y
Lead generation campaign	22/12/2020	12/01/2021	Y
Product launch	29/12/2020	12/01/2021	X

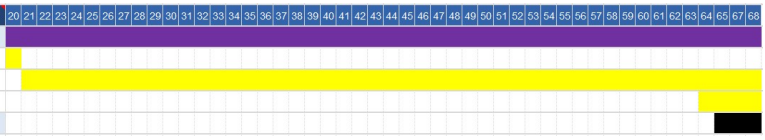


Figure 36: Project Plan for Business Stream.

After the product release the main activities of the organization will concern the lead generation for fueling the sales activities, the sales activities themselves, a continuous marketing campaign and the maintenance of the platform developed, with the goal of obtaining as many customers as possible before diving in the redevelopment project.

14 Business model canvas

The lean business model canvas is a 1-page business plan template ideated by Ash Maurya [40] aimed at deconstructing the idea on which a new business is intended to be built on into its key assumptions. It is an adaptation of the canonic business model canvas created by Alex Osterwalder optimized for lean startups, it is hence a powerful tool to be used by new innovative businesses which are technology driven. The lean canvass is a template mostly utilized for presenting the idea to third parties and in particular when pitching for obtaining funds.

In this business plan project the lean canvas is presented as the final results of all the effort and all the analysis and validations performed, since it was redacted with the key insights and assumptions developed in all the previous phases of this thesis work. The reason behind presenting the canvas as the conclusive chapter is not casual, but finds its reasoning in well-established best practice in business planning according to which the executive summary of a report should be redacted at last, when all the necessary information have been discussed and consolidated.

Hence, the lean canvas presented in (figure 37) is the final deliverable of this project and summarizes the mission and the vision that constitute the backbone of this project and its major rationale, and it is intended to be the tool with which investors, manufacturers, technology enthusiasts and exponents of the academic world can get passionate about the idea and start believing in it; constituting the fuse that can bring the project to a long and sustainable success. All the contents reported in the canvass will not be furtherly explained in these section, since they have been widely discussed in each relative chapter of reference.

Lean Canvas

Problem	Solution	Unique Value Proposition	Unfair Advantage	Customer Segments
SMEs in the manufacturing industry operate at a sub-optimal level, they do not leverage the industrial data to enhance efficiency and cannot hence compete with bigger players. Saas cloud-based solutions are often too expensive to be implemented by SMEs.	Accessible platform, user friendly, easy to implement. Enables real-time stream analytics for data-driven decision making and business intelligence. **Key Metrics** Feedbacks to MVP Subscriptions Retention Churn Ratio	xiKPI is a Saas cloud-based platform to turn industrial data into insightful decisions to empower the manufacturing processes of SMEs.	The project is developed as a spin off of an established digital strategy consultancy company. **Channels** Digital marketing campaign (core competence) mostly via LinkedIn and HubSpot.	Manufacturing SMEs which: - Have a standardized output. - Operate in italy. - Don't use already smart solutions. SOM: 22K enterprises in italy Target: 600 in the first year.

Cost Structure	Revenue Streams
Marketing costs 40K € Development costs 260K € Cloud architecture cost 50 €/user/month	69,99 €/month subscription fee 1000 € one time training and implementation consultancy service fee. EBITDA 517K € one year after launch.

PRODUCT MARKET

Figure 37: Lean Business Model Canvas.

15 Conclusion

To try to sum up the conclusion of a project like this is quite hard, and can only be made trying to briefly retrace the journey that has been working on it. The first consideration that needs to be made is that getting involved in a business planning activity for a new innovative product development effort driven by state of the art technologies is a tremendous opportunity to acknowledge the huge amount of work that is necessary to bring an idea to fruition, at first, and eventually to success. Every single step to take carries in fact an intrinsic risk and any misunderstanding with respect to the positioning, in any aspect of the business, which is intended to confer to the idea in the project's early stage and then to the product could have an enormous impact to the future of the project. The second consideration necessary to be made regards the critical relevance of the teamwork. When dealing with a project like this one which carries an enormous amount of complexity, touching topics so different and so specific, from the more business related to the marketing and technical ones, the greatness of having the pleasure of working with a team of dedicated, passionate and competent team emerges. Only with a team which puts to each member's fruition the competences and capabilities of the single a situation with this high rank of complexity and cross-functional aspects can be faced up and managed properly. Finally, it is important to consider that in this kind of operations, in spite of all the best practices that can be adopted some external contingencies that cannot really properly be managed like timing and luck play an important role, and that is what confer to this kind of entrepreneurial activities an artistic side on top of the scientific one. In this very moment it is still uncertain whether the project of xiKPI will have a concrete future or not, but this thesis work aims at constituting the spark that might ignite the great success or the undeniable failure of what it seems to be a great idea placed rightly in the undergoing time. Being the analyzable part of the project finished, what is left is just to face up the risk and start this journey aiming for a long term success, of course the risk-taking part is the most onerous one but is not entrepreneurship all about having the foresight to take risks?

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