INTRODUCTION

Nowadays, concepts like "Smart Society", "Community Digitalisation", "e-Governance", "Industry 4.0", "Internet of Things", "Big Data" are on everyone's lips and these are just few of the many terms that can be associated with the wider concept of "Smart City", a city that exploits technology and digital tools for the benefit of its own territory and citizens.

In the last few years, politicians, city leaders and managers all around the world have begun to embrace those concepts and to develop plans which foresee the introduction of digital tools in public administrations, in business processes or even in day-to-day activities, with the aim to transform traditional cities in modern, innovative, smart ones.

The growing degree of urbanisation that the entire world is facing, has demanded cities to come up with innovative solutions to deal with the socio-economic problems that a huge concentration of people in urban areas causes. These include environmental issues, overcrowding, unemployment, public services request, infrastructural needs and resources exploitation, among others.

This is the 21st Century's context that allowed the Smart City concept to take hold as an effective approach that exploits technology to face those growing urban challenges with the aim to improve the quality of life and foster economic growth.

However, when talking about smart cities several questions arise, mainly concerning the aspects that make a city smart, how can be different cities compared in terms of smartness, which are the actors that needs to be involved and which are the actions that must be taken in order to exploit all the opportunities that ICT (Information and Communication Technology) offers to citizens and businesses and to minimise the risks of an inaccurate planning.

The aim of this thesis is to provide an answer to those questions, paying particular attention to how companies can benefit from the innovative environment that smart cities create and to which is the impact that the introduction of digital tools has in industrial processes.

In the first chapter a general overview about Smart City is provided, including the definition and characteristics, its origins, the subjects that need to be involved, and the impact of smart initiatives and projects on the overall society.

In the second chapter the Smart City's role as innovation driver is presented. In particular, the technologies adopted in the smart city framework are discussed and the impact that these, the Internet of Things (IoT) above all, can have on business processes and products are examined. Finally, an overview about global IoT adoption is provided.

In the third chapter a real business case concerning the entrance in the European IoT market is analysed. Invisiblefarm, an Italian IT company operating in the Smart City field from a few years has developed an IoT sensor, eStopper, able to measure the level of content in a tank, and it is seeking for market opportunities in the international landscape. For this purpose, following a market research, an internationalisation strategy has been developed and the results are presented in chapter three.

Even if the first examples of smart communities date back to the XX Century, in the last few years urbanisation and digitalisation pushed the diffusion of the smart city as an innovative model that employs ICT to deal with the growing urban challenges: data collected and analysed through digital tools allow city leaders to take conscious decisions and improve the quality of life. If less than a decade ago only few big cities had embraced this concept, today more and more cities around the world are making significant efforts to become smart and are competing with each other to attract investments, innovative enterprises and qualified workers.

When talking about smart cities, one refers to the organisation of many different aspects of the life in a community and may involve initiatives in six different dimensions, namely: Smart Economy, Smart Mobility, Smart Environment, Smart People, Smart Living and Smart Governance. All these dimensions are associated with the use of digital tools in the various social domains: smart economy is associated with the presence of IT companies or enterprises using digital tools in their processes; smart mobility relates to the use of ICT in the transport system; smart environment refers to the employment of sensors which monitor the environmental quality; smart governance means using digitalisation to improve city management; smart living and smart people are related to the improvement of social inclusion and liveability through digital means.

However, as it will be explained in chapter one, developing intelligent cities is not only a matter of applying technology to manage and control cities; it is a wider concept which involves the reorganisation and the improvement of services offered to citizens and to businesses. It consists of the creation of a new vision of the community, inclusive of all the stakeholders, which favours individual growth, business innovation and collective

wellbeing. Technology, institutions and people, key components of a Smart City, must be interconnected to make a city truly efficient. Furthermore, several actors must be involved and must be able to interact with each other in order to identify problems and develop innovative solutions to solve them. These subjects include not only public administrations and IT companies, but also urban services providers, citizens and research centres, among others.

As it will be highlighted at the end of chapter one, if well managed, smart cities can generate various benefits for citizens, including higher safety, better environmental quality, reduced cost of living, but also huge possibilities for companies in terms of business opportunities, higher competitiveness and enhanced innovation.

In this regard, smart cities will be the mean to achieve the ideal, futuristic vision of society, defined by the Government of Japan as Society 5.0, which is able to use technology, data sharing and knowledge to empower itself and be more successful, and which follows the basic ideas behind Industry 4.0, as to say integrating ICT tools in business processes and activities to make them more efficient, foster innovation and improve competitiveness.

Smart cities are increasingly playing a crucial role as innovation drivers for companies operating in several fields, not only in those related to public services, such health, environment, utilities or in the ICT sector, but also for industrial firms.

By creating Open Innovation (OI) ecosystems, where boundaries across the various stakeholders are minimised, smart cities not only improve the quality of life and services offered to citizens, but also enhance companies' innovativeness and competitiveness even in the international landscape. Living Labs, innovation hubs and clusters are spreading all around the world as OI systems where government, businesses, universities and people cooperate, share knowledge, combine skills and develop cutting-edge solutions.

In this sense, a Smart City lays the foundations for the rise of the Smart Industry, or Industry 4.0: thanks to the opportunities coming from the employment of new digital tools in urban settings, like the Internet of Things, many firms are exploiting smart cities as testbeds for new, innovative technologies, products, but also for new business models. Indeed, along with the rise of smart cities, a new, innovative manufacturing framework has emerged and businesses must adapt to it in order to remain competitive. The Smart City manufacturing framework outlined in chapter two is based on three crucial elements,

namely, Big Data, Industrial IoT and Additive Manufacturing, which allow production systems to be flexible but, at the same time, efficient.

However, digitalisation impacts not only on the production procedures; instead it affects also products innovation, human resources management, decision making processes, companies' philosophy and especially the supply chain design, mainly concerning the relationships with clients and suppliers.

In chapter two, Internet of Things is identified as one of the key pillars of the modern ICT, given interconnected devices allow a huge amount of information to be collected and analysed. IoT played and is playing a crucial role in the development of smart cities; but, in the meanwhile, if applied to industrial processes, it helps to increase efficiency and effectiveness of business operations.

As the snapshot at the end of chapter two highlights, IoT adoption is exponentially increasing: today the number of connected devices amounts to more than 9 billion and they are expected to reach at least 25 billion by 2025, being manufacturing sector the major adopter. In this field, IoT can be employed to achieve overall business optimisation through production monitoring, processes automation, maintenance scheduling, replenishment policies definition, and so on. For this reason, IIoT (Industrial Internet of Things) adoption is driven by the world-leading manufacturing economies, like US, China, Germany and the other Western European countries. In particular, the new business models, which foresee the introduction of IIoT in companies' processes, may be the turning point for the European economies which, in the last decade, struggled to improve productivity and lost international competitive advantage.

These considerations have been used as starting point for the international analysis developed in chapter three, which assesses the opportunities in western European Markets for Invisiblefarm's IIoT sensor: eStopper.

Invisiblefarm Srl is an Italian company, based in Brescia, which offers IT solutions and services in several fields including computer programming, training and education, healthcare and Smart City, among others. Since its foundation, in 2004, Invisiblefarm has expanded its fields of operation; this allowed the company not only to enlarge its organisational structure, but also its set of clients and consequently the revenues, which have increased with an average annual rate of 18% and overcame, in 2017, € 1 million.

While operating in the smart city sector, Invisiblefarm developed eStopper, an innovative IIoT sensor able to remotely monitor the level of content in a tank, in a digital and

automatic manner. The fields of application of eStopper are various, as it can be programmed to calculate the volume in bins or tanks of different dimensions and shapes, and it is able to indicate the level of various typologies of content, liquid or not. However, the main addressees of eStopper are lubricants distributors which need to monitor their clients oil consumption and plan effective distribution strategies.

In order to commercialise eStopper, Invisiblefarm is looking with particular interest at the international market, more mature and prepared to embrace IoT solutions than the Italian one.

The aim of the analysis developed in chapter three is to identify the European Country with the highest potential for eStopper commercialisation. For this purpose three levels of screening have been performed. In the first screening, a PESTEL analysis has been used to evaluate the 13 countries selected from a macroeconomic point of view, taking into account Political, Economic, Social, Technological, Environmental and Legal factors. After having reduced the number of countries to 6, in the second screening the McKinsey/GE matrix has been employed to compare them in terms of market attractiveness and Invisiblefarm competitive strength. The results show that Germany, the Netherlands and Finland are the most attractive, therefore, in the third screening, the market potential in these countries has been estimated to identify the best one.

From the analysis has emerged that the German market has the highest potential for eStopper introduction in terms of economic and industrial development, attitude towards innovation and market demand. Following these considerations, at the end of chapter three a general marketing strategy for Invisiblefarm entry in this market is suggested. In particular, the company should first enter the market through direct export and adopt a penetration pricing approach while investing resources in eStopper promotion, for instance through the participation to industrial fairs to get directly in touch with potential customers. Even if following this strategy Invisiblefarm may initially face some losses, it will benefit from increased market share and profits in the long run.