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The Influence of Artificial Intelligence on The Consulting Industry

Study of six consulting firms to understand the way they implement AI both in their internal processes and their clients' offer.

Authors: Charline Alexandre & Lucie Blanckaert

Supervisor: Paul Belleflamme

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ABSTRACT

This paper aims at understanding the link between Artificial Intelligence and the Consulting sector. We study two complementary views: The way consulting firms are using AI in their internal processes and the way they are implementing AI in their clients' companies.

To conduct this study, we first theoretically define the two concepts, AI and Consulting. We describe their history, their definition, their advantages and negative points. Then, we make a study following an exploration method. We use qualitative data collected through seven interviews. We conducted one in an AI specialized firm and the others in consulting companies from different sizes. For the analysis, we divide consulting companies in three groups depending on their size. We deeply detail the major outcomes of the interviews before going to the conclusion.

We come to the conclusion that AI is already used in consulting companies but less than expected. It means that, for large companies, AI is omnipresent in their solutions and starts to be internally developed. However, for smaller firms, it is still an unreachable concept that is not the focus, at least for now. Indeed, Artificial Intelligence does not bring a sufficient ROI for them.

We also discover that AI will not destroy jobs but, instead, create new ones asking for a complementarity between the human and the machine.

Finally, we highlight some challenges consulting firms need to face while implementing AI. These are, for instance, the resistance and reluctance to change or the legislation.

Along the paper, the reader needs to keep in mind that the vision adopted is broad, as it is one of the first studies on the subject, and that the scope of our research is, inevitably, limited. We propose avenues for further researches at the end of the paper.

We would like to thank all the people who contributed, directly or indirectly, to the elaboration of our thesis. We would like to express our gratitude for all the enriching discussions, comments and advices we received.

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We would also like to thank all the experts that we interviewed. They managed to dedicate us a little bit of their time to answer our questions. This valuable information allowed us to have a better understanding of the AI implementation in their company.

Also, and more broadly, we would like to thank our families and friends who helped us along the work to keep up with motivation and also gave us their own point of view on the subject to help us draw our conclusion.

TABLE OF CONTENT

INTRODUCTION

Fifty years ago, AI technologies and the consulting service market were running independently from each other. Consultants were working thanks to the human resource they were representing while AI was still an unknown and feared concept. People started to be familiar with the "Artificial Intelligence" concept in 1956, when this word was used for the first time. From this time until the technologies currently available such as Machine Learning, Deep Learning or Robots, the improvements are huge. In less than a century, innovation has become a major area of focus for organizations in order to stay competitive. These new technologies induce changes both in the private and the public sectors. It brings massive improvements in terms of quality, time and resources management. On the other side, Artificial Intelligence is also raising many questions as it is new and unexplored. What about the economic impacts of automating some tasks? How could it change the way people are working and interacting with each other? But also, how to make sure these improvements are staying ethical and that each human is respected? How will AI be accepted in people's minds as some change resistance could appear?

All these interrogations are hard to answer as AI is still at an early stage of development and improves fast. Organizations are starting to be aware that these technologies could increase their performance. Those changes are time and budget demanding. It requires huge investments in people to find the right expertise. The consulting service market does not deviate from the rule. Indeed, as this industry is providing advices to its clients, firms have to stay up to date regarding new technologies that will allow consultants to provide the best solution. These last years, the consulting sector has started its transition by developing technology departments. They aim at improving existing solutions and deploying new ones. These technologies can appear under multiple forms: Machine Learning, Deep Learning, Natural Language Processing, etc. Such processes started to be implemented in the biggest companies around ten years ago. It is the example of multinational players such as the Big Four. Smaller organizations are also following the pace. This development has brought new competitors on the market such as start-ups and scale-ups that are proposing innovative and agile processes. This increased competition has led to the development of new partnerships and a disruption of the initial business model of consulting companies.

Nevertheless, although there is a clear interest from consulting organizations to improve their processes with augmented technologies' solutions, it also raises many challenges. Understanding the stakes of using Artificial Intelligence, investing the right amount of time and money and finding the best expertise are the questions that are faced. Moreover, it can generate some change resistance and reluctance from customers or employees. The implementation of Artificial Intelligence in consulting companies is thus not an easy task and induces economic and organizational impacts.

Therefore, we asked ourselves: What is the real impact that AI has on the consulting sector both in the way consultants interact with their clients and in their internal processes?

The objective of our analysis is, hence, to understand the challenges that consulting companies are currently facing in the development of new technologies. We analyze the economic and the organizational impacts that the implementation of AI has on consulting firms and the way they are dealing with it. We also make the distinction between the internal implementation of those new technologies and their external development in the way consultants are advising their clients. The goal of our research is to detect the gap that exists between the theory and what is actually implemented in those consulting firms.

To do so, we base our analysis on multiple interviews conducted in seven companies. One of those is a Belgian start-up specialized in the development of Artificial Intelligence programs. The six others are firms working on the Belgian consulting service market. Our scope of consulting companies is very broad and covers multinationals players as well as smaller structures such as SMEs or start-ups. We, thus, conduct a qualitative research that allows us to better catch all the stakes of this implementation.

We divide the research into several chapters. We start with a theoretical definition of the two main concepts: Artificial Intelligence and the Consulting sector. Based on that theory, we raise the problematic and multiple research propositions. Then, we develop the practical analysis thanks to the interviews that we conducted. It provides us a practical view on what is happening on the field compared to the potential idealization made in the theory. Finally, we make a comparison between the literature and the practice. We discuss the potential gap that can occur and draw the final conclusion to the research question by exploring all the research propositions that we raise in the methodology part. We also expose the limitations faced and further questions it raises.

CHAPTER 1 – LITERATURE REVIEW

Currently, Artificial Intelligence is a fashionable topic raising many questions both in the private and the public sectors. Its applications and consequences are considerable for the daily life. Many manual tasks will be replaced by machines equipped with augmented intelligence.

In this first chapter, we detail the two major concepts of the paper: "Artificial Intelligence" and "Consulting". It helps to better understand the notions to, afterwards, draw the research question, the research propositions and the questions asked during the interviews.

1.1. Artificial Intelligence

To define AI, we start by a short summary about its history. It helps to understand where it comes from and its overall evolution. This summary makes the reader understand that AI, although it is currently a hot topic, has a long story behind it. Then, we provide a detailed definition including the existing AI types, its characteristics and the range of technologies it includes. It helps us to understand the extent to which augmented technologies appear and thus, the complexity of the concept. To end up, we explain the advantages and disadvantages of these augmented intelligences. Indeed, although AI needs to be considered by companies, there are some risks that need to be studied.

All along the paper, we will use the abbreviation "AI" to define Artificial Intelligence. It helps to avoid complexity during the analysis.

1.1.1. History of AI (see complete AI History Appendix 1)

Although the first signs of AI appeared around 384 BC, many historians consider that this concept only emerged in 1950 when Alan Turing published an article named "Computing Machinery and Intelligence" detailing the Turing test (Blanchot V., 2018). It was working based on a conversation between a human and a machine. Then, the discussion was evaluated by an external supervisor who had to differentiate the machine from the human. If the distinction could not be made, the test was succeeded (Petropoulos G., 2017). This test was aiming at demonstrating the possibility of a machine to think as a human.

The following significant turning point occurred in 1956, when the term "Artificial Intelligence" was used for the first time by John McCarthy, computer and cognitive scientist,

at the first academic conference on the subject in Darmouth. He defined it as *"the science and engineering of making intelligent machines"* (Blanchot V., 2018).

In 1970, the first anthropomorphic robot in the world, called WABOT-1, was built at Waseda University, in Japan. It was able to see, move and converse (Reynoso R., 2019). It was improved in 1980 to become WABOT-2. Its purpose was to demonstrate that robots could be able of reflection. It requires to provide them with human-like intelligence and dexterity (Reynoso R., 2019; Waseda University, n.d.). In the following years, many improvements were made: the first self-driving car by Mercedes-Benz, the first chatbot, a chess-playing computer able to win against a world champion deployed by IBM, etc. (Reynoso R., 2019).

After all these discoveries, the 21st century arose with many innovations. Moreover, many movies were made based on science fiction. The pace of innovation, at that time, was really high. We only enumerate the major changes here after.

In 2006, the term of "machine reading" went out for the first time in order to define a machine able to autonomously read and understand a text. In 2010, ImageNet launched the first software able of visual recognition. The same year, Microsoft created Kinect for Xbox 360. It was the first device able to recognize humans' movements and reproduce them in a virtual game (Reynoso R., 2019). The following year, two other creations appeared. IBM developed a machine able to answer some questions that was more powerful than the two champions in the domain. Also, Apple launched Siri, the first speaking assistant (BootStrapLab, 2017). This technical improvement gave to the user the opportunity to ask questions to his phone by only using his voice and a wake-up word (Reynoso R., 2019).

In 2013, researchers from Carnegie Mellon University released the Never Ending Image Learner (NEIL), a semantic machine learning system able to compare and analyze relationships between pictures (Reynoso R., 2019). In 2016, the first artificial citizen, Sophia, was released by Hanson Robotics. It was the first robot capable to act nearly like humans: able of image recognition, making facial expressions and communicating with other people thanks to an AI software (Reynoso R., 2019). The same year, Google released its home assistant called Google Home. It was able to remember the tasks that the owner had to do but also answer to many questions (Reynoso R., 2019). In 2017, Facebook tried to launch Chatbots able to communicate with each other to learn a way of negotiation. In 2018, the language processing tool created by Alibaba scored 82.44 out of 100 questions (Reynoso R., 2019). In 2018, Samsung introduced

its virtual assistant, Bixby. This device was not only able to speak and answer questions but also to see and to be a home assistant (Reynoso R., 2019).

From this period, many scientists tried to create AI prototypes. At that time, the AI approach was not about the technologies currently existing such as machine learning. It was more to specify rules of logical reasoning and real-world conditions that machines could be programmed to follow and react according to those. It has, hence, known a huge evolution and will, in the future, evolve even more.

1.1.2. Definition of AI

AI is broad. It can be defined in many ways. The first idea is to divide the concept into its two terms. “Artificial” explains that the technology is human made. It means it could not exist independently. “Intelligence” refers to efficient and capable devices. AI is combining these two characteristics to improve machines’ autonomy and learning (Future of tech, n.d.).

More deeply, AI, part of computer science, is defined as the intelligence demonstrated by machines. It is the computer systems’ ability to perform human-like tasks in the same or better way than humans do (Petropoulos G., 2017). It gathers all technologies allowing machines to think independently by understanding what is happening in the external environment and reacting according to it. Hence, it is able to perceive, reason, discover, generalize and take actions according to human beings in complex and non-complex environments (Copeland B.J., 2019; Robin, 2010). To achieve such performances, it needs to get provided with huge amounts of data (Nilsson N., 2009). Naturally, the dataset needs to be high-grade to enable machines to conduct performant analysis.

This explanation seems simple, but the definition of AI is not that easy to catch. Some precisions must be made. First, it is essential to differentiate the traditional computer programs, running according to fixed algorithms, and AI devices, equipped with cognitive abilities. Also, it is important to understand that AI can appear both under software and hardware forms.

Looking at the definition presented, it is obvious that AI is hard to define because it has many applications domains: biology, statistics, healthcare, industry, etc. Hence, in this paper, we explain it according to its range of technologies and characteristics.

1.1.2.1. Two types of AI

The first type is called "***weak AI"*** or ***"narrow AI"***. It considers expert systems as a simulation of cognitive functions running on computers only able to perform a specific task. These devices have no conscious function and are unable to go beyond their defined abilities. They cannot solve a problem out of their delimited scope. It is consequently called "weak" AI because it cannot be compared to human intelligence (Technopedia, 2020). It is the example of Siri, Apple's software voice recognition system, working with the Google internet database. It is only able to catch the human voice, translate it into words and then look on the Internet to answer. If the question asked cannot be answered on the Internet, the voice recognition software is unable to response. This type aims to be used in important areas such as the energy consumption.

The second type, ***"strong AI", "Artificial General Intelligence"*** or ***"full AI"***, is represented by systems able to go beyond their own limits. They can find solutions to unknown situations. This type follows the main AI goals considering that it is equipped with many cognitive functions similar to humans allowing to have perceptions, beliefs, etc. (Frankenfield J., 2019; Future of tech, n.d.; Rouse M., 2019; Technopedia, 2020). However, full AI only exists in movies so far. Some people have long argued that building it was easy, that it could be done by putting all the weak AI together. Nevertheless, this belief has quickly been demonstrated wrong, seeing that intelligence is not about combining some narrow AI but about thinking in a new way with new configurations (Future of tech, n.d.).

While the narrow AI is the most used and known these days, the main goal of researchers is to develop the second type. They know that it could bring intelligent systems to outperform human tasks and revolutionize the industry in many domains (Tegmark M., n.d.).

In complement with these two types, there is also the "***Artificial Superintelligence***", referring to devices able to overpass human capacities. Scientists argue that, once the strong AI will be discovered and managed, there will only be few steps left to reach the Artificial Superintelligence (Future of tech, n.d.).

1.1.2.2. AI vs. Machine Learning vs. Deep Learning

Another precision that we make is the difference between Artificial Intelligence (AI), Machine Learning (ML) and Deep Learning (DL). Overall, they are subfields of each other: Deep Learning is a subfield of Machine Learning that is a subfield of AI (See Figure 1). They are all managing some numeric (regression) and non-numeric (classification) problems by testing data and struggling to make decisions.

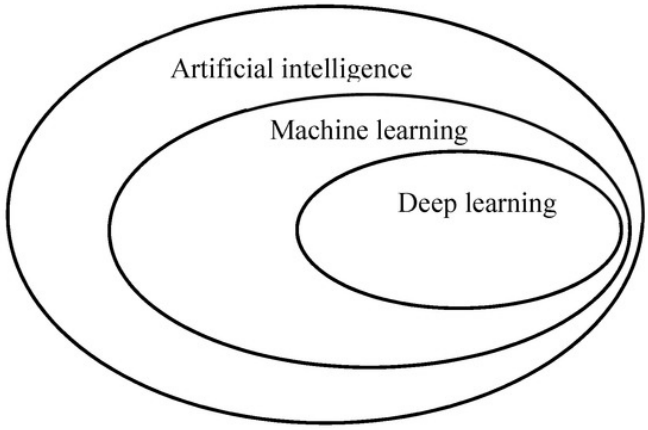

Figure [1]: Venn- diagram of AI: Link between AI, Machine Learning and Deep Learning (Melit A. & al., 2020)

Machine Learning (ML) is defined as the computer's ability to act without programming (Rouse M., 2019). It has been created in the late eighties, early nineties (Edureka, 2018). It helps machines to acquire knowledge and skills through analysis, self-training, observation and experience (Petropoulos G., 2017; Technopedia, 2020). The machine is learning and improving over time thanks to self-correction mechanisms. It is working based on a learning life cycle: ask a question, collect data, train the algorithm, try it out, collect feedback and use the feedback to improve. The device is able to act and make data-driven decisions (Edureka, 2018).

Then, ***Deep Learning (DL)*** is inspired by huge neural networks (See Section 1.1.2.3.) that are processing through many layers (Edureka, 2018). It is used to detect patterns in a large amount of unstructured data (SAS insights, n.d.). Currently, the most famous examples are Siri and Alexa, voice recognition software of Apple and Amazon, respectively.

To illustrate these concepts, the comparison with a child having to make the distinction between an apple and a banana can be made. It is explained to him that the apple is round and

green and that the banana is yellow and long. This is a strict rule. The problem is that, when the child will face a green long banana, he will be unable to say that it is a banana since it is different from what he knows. This is Machine Learning. The DL would be to show many different images of bananas and apples to the child and ask him to create his own rule. By this, he will not only look at the color and shape but also the smell, the texture, etc. (Beuvens F., personal communication, January 23, 2020).

These two concepts differ by many characteristics. First, while the performance of Deep Learning increases with the amount of data, the one of Machine Learning stops at a point. Secondly, ML can work both on Low and High-End machines while DL only works on the second type of machines. The difference between a high and a low-end machine is the rapidity of the quality process. Moreover, DL independently understands the characteristics of the data while the other type needs to be trained. Also, the problem-solving approach is more efficient in the DL. In ML the problem needs to be divided into subproblems that will independently be solved. The solution is, then, found by gathering all the results. In addition, Deep Learning requires a Graphic Processing Unit (GPU) that enables to manage huge amounts of data to realize matrix operations. Moreover, DL has a quicker execution time. Nevertheless, Deep Learning requires a long and demanding training time compared to Machine Learning (Edureka, 2018).

In conclusion, the biggest difference is that ML uses algorithms to learn from the data and make some decisions based on what is learned. In opposition, DL structures the algorithms into Artificial Neural Networks that can learn and make decisions on their own (Edureka, 2018). The Machine Learning will therefore receive rules on where to look for the information while the DL will create its own rules. They are not used separately but are complementary to each other (Beuvens F., personal communication, January 23, 2020).

Moreover, there is the ***Big Data*** that is the ability of a machine to manage large amounts of data that can be both structured and unstructured. According to François Beuvens, it is the ability to take multiple machines individually working and put all the data back together (Beuvens F., personal communication, January 23, 2020).

1.1.2.3. Range of technologies

AI works by combining huge amounts of data with predefined algorithms. It is equipped with processes that the computer follows to make calculations or problem-solving operations. It allows to learn from the data (Future of tech, n.d.). As detailed before, AI is gathering many diverse technologies. We detail some in this part.

Overall, all augmented technologies are created following a specific ***programming language*** made up to solve specific classes of problems. Creating these languages is demanding and time-consuming depending on the problem.

First, ***Artificial Neural Networks*** are inspired by the humans' brains neurons' network (Petropoulos G., 2017). It works with multiple layers (See Figure 2). The data are following a path from the input layer, where disordered data are implemented, until the solution displayed in the final layer. In between, there are multiple hidden layers. Their number depends on the problem's difficulty. Within the network, the neurons are connected with each other and can be both inputs and outputs (Petropoulos G., 2017). Artificial Neural Networks can appear under three forms: supervised learning, unsupervised learning and reinforcement learning.

Supervised learning predicts the outcome with the biggest accuracy possible based on examples of inputs and corresponding desired outputs.

Unsupervised learning is only provided with inputs and decide, without any guidance, which output is the best result.

Reinforcement learning is performing a dedicated task in a given environment by trying multiple combinations of results and receive a feedback for each of them (Petropoulos G., 2017).

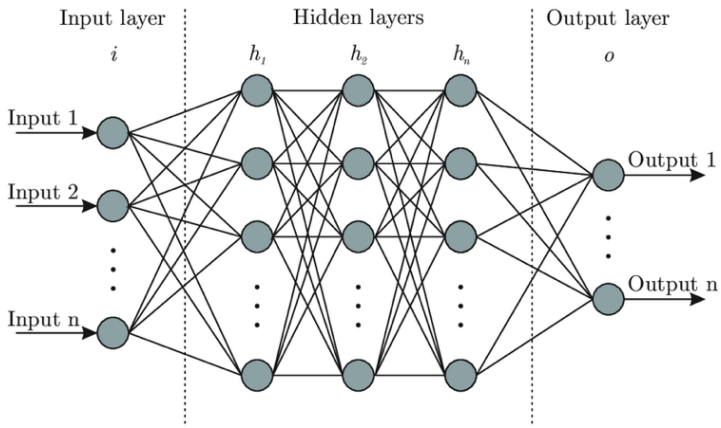

Figure [2]: Model of Artificial Neural Network (Bre F., 2017)

Also, machines are often equipped with ***automations***. It enables a device to automatically work. It is the example of Robotic Process Automation (RPA) that enables to perform repeatable tasks usually done by humans (Rouse M., 2019).

Moreover, devices are often equipped with ***machine/computer vision***. It is the ability of machines to recognize images on videos thanks to cameras. They can analyze images in real time and interpret them (SAS Insights, n.d.). Moreover, they can be programmed to see through walls (Rouse M., 2019). It is, for instance, used in marketing when a company invests considerable amounts of money to get a better visibility. In this case, it is used to detect the logo every time it appears in newspapers, at the television, etc. (Beuvens F., personal communication, January 23, 2020).

Furthermore, machines are often able to produce text from computer data thanks to ***Natural Language Processing (NLP)***. It is able to analyze, understand and generate human language. It is, for instance, used in the detection of spam emails in insurance companies. Indeed, they receive thousands of emails per day and there is often a worker who is dedicated to send the right email to the right person based on its content. The machine will be able to perform this task instead of the employee (Beuvens F., personal communication, January 23, 2020).

In addition, there is the ***cognitive computing*** trying to implement a human-like interaction with machines. Its goal is to reach the point where the machine is able to interpret images and speech in the way humans do (SAS Insights, n.d.).

There are also four other techniques considered as AI supports. First, the ***Graphical Processing Units*** providing the compute power required for iterative processing. Then, there is

the ***Internet of Things*** which generate huge amounts of data from connected devices. After, ***advanced algorithms*** are created every day to better and faster analyze data. Finally, the ***Application Programming Interfaces (APIs)*** are portable packages making possible for existing products and software packages to be provided with AI (SAS Insights, n.d.).

1.1.2.4. Characteristics of AI

AI has many different definitions and application fields. Hence, the best way to explain it is by enumerating its characteristics. It is important to keep in mind that these functionalities can appear under multiple forms in the devices.

The first AI's characteristic is its ability to ***translate large amounts of data into smaller ones***. It makes them more manageable and helps improving decision-making and judgement (Agrawal A., Gans J. & Goldfarb A., 2017). It is achieved through neural networks where the different layers enable to simplify the problem. It is the example of autonomous fraud detection systems that are created with five layers (SAS insight, n.d.).

Secondly, AI processors are equipped with ***rote learning***. It means that they can learn from mistakes thanks to learning algorithms that are implemented on computers. It enables the devices to become more performant because a mistake will only be made once. Indeed, every time the technology will face an unknown problem, it will create an iterative system that will try multiple solutions until the correct one is found. The right solution will be registered afterwards and provided quicker the next time a similar problem will be faced (Copeland B.J., 2019). Consequently, the more AI systems process data, the more they are able to manage these data and the faster they can provide the right solution (Agrawal A., Gans J. & Goldfarb A., 2017). Nevertheless, this characteristic is not perfect due to the generalization machines do. It involves using past experiences to solve analogous situations that are similar but not exactly the same and could therefore induce the machine to make mistakes (Encyclopedia Britannica, n.d.). For instance, if a computer learns the English tenses with the verb "to jump", it is able to learn for others similar verbs but if it meets an irregular verb, it will be unable to make the distinction and will then make a mistake.

Moreover, AI devices are able to make their own decisions thanks to ***problem solving algorithms.*** Those algorithms are looking through a range of possible actions with the idea of reaching some predefined goals and solutions that can either have a specific or a general

purpose. The first one is built for a particular problem and therefore exploits definite features of the situation. On the opposite, a general-purpose method is useful for a wide range of problems. But not only equipped with predefined solutions, AI machines are also able of ***reasoning***. It means that they cannot only store data, but they can also manage new ones thanks to their ability to draw inferences adapted to the situation. It involves that the data are becoming intellectual properties since the answers are hidden in it (SAS Insights, n.d.). Machines have therefore deductive or inductive abilities. The only difference is that, in deductive reasoning, the premises guarantee the solution's validity while in inductive reasoning, the truth of the final solution is not guaranteed (Copeland B.J., 2019). Moreover, the first type is more common in science while the second is more used in mathematics and logic.

Furthermore, AI is forward-looking. It has the capacity to ***predict what will happen and react according to it***. It is done through algorithms programmed to discover pattern in the data and use these data for future decision-making. For instance, if you write the sequence 1,2,1,2,1,2,…,1,2 the device will be able to predict that the coming sequence is 1,2. It is also the example of the cars that can predict the road the user will take depending on previous decisions (Ross Intelligence, 2018).

1.1.2.5. Advantages/disadvantages of AI

All these functionalities are changing the world and are bringing contrasted ideas in people's minds. Some argue that it will bring a promising future while others are reluctant because it might be dangerous. In this section, we detail the positive and negative points of these technologies.

1.1.2.5.1. Advantages

First of all, AI ***adds intelligence to existing products***. It is the example of the iPhone equipped with Siri, the voice recognition software of Apple. It enables the device to answer questions asked. It is therefore not a product in itself, but it adds characteristics and intelligence to the iPhone (SAS insight, n.d.). These technologies will enable multiple companies to empower their existing products and services.

Moreover, it enables ***personalization***. AI can remember the user's information and use them to create a personalized output. It increases the customer's satisfaction. It is, for example, used

in marketing to send a personalized advertising to each customer depending on their previous web researches.

Also, it considerably reduces ***the risk of errors.*** Indeed, if humans can make mistakes depending on the situation or the stress, computers do not. It means that they should be used in situations where hard calculations have to be made. Moreover, these devices are correcting themselves while making mistakes. Hence, the probability of making fewer mistakes increases (Kumar S., 2019). The ***accuracy*** of devices is thus increasing thanks to deep neural networks (SAS insights, n.d.). It is the example of image recognition that become more accurate the more we use it. Again, this positive aspect will increase the companies' efficiency and then, the customer satisfaction since there will be less mistakes in the analysis and reports.

Furthermore, by creating AI devices able to think and react like humans, ***the risks for humans can decrease***. Instead of sending men in dangerous situations, robots could take them. For instance, when Chernobyl occurred, robots could have been sent close to the disaster to analyze it. It would have enabled to have clear data to tackle and, hence, to provide an adequate solution to minimize the tragedy (Kumar S., 2019).

Moreover, AI devices ***do not need to rest***. They are able to work 24/7 without getting bored or distracted. They can therefore perform tasks, increase the production rate and meet the requested deadlines. For instance, if the device is programmed to produce 200 computers in seven days, they will be produced. With humans, you never know, and the uncertainty is higher. Also, it could help in repetitive jobs to enable humans to perform more creative tasks (Kumar S., 2019). Furthermore, it enables a cost reduction in the long term.

In addition, AI allows to ***create digital assistants*** to help customers. This is, nowadays, highly used online. Some chatbots or avatars are making it hard to distinguish if it is a human or a technology behind (Kumar S., 2019). These digital assistants will reduce the need for human resources (EDUCBA, n.d.).

Furthermore, devices equipped with new technologies have ***day-to-day functions***. People are getting used to them and at one point, could not live without them anymore. It is the example of the GPS. It has become commonplace to have one in everyone's car, but it is an AI nobody is thinking about. AI is also used in many companies. For instance, it is used in the detection of

frauds (EDUCBA, n.d.). It is both scary and true to say that the AI devices know us better than anyone else.

Moreover, AI brings ***more rational decisions in a shorter period of time*** than humans do. First, the decision will be made quicker as AI can analyze data and possible solutions faster than humans. Then, as they are programmed to take decisions and will not pay attention to the emotional aspect, the decision they will take will always be the most accurate based on what they already learned (Kumar S., 2019).

Overall, all these new technologies are bringing a promising future and huge improvements in many sectors (Kumar S., 2019). For now, the biggest improvement made is in the medical sector. Many machines are created to help doctors in their decision-making. For instance, "Path AI" is a machine helping pathologists to make accurate diagnosis. It is equipped with Machine Learning. More than helping in cancers' diagnosis, it also provides individual medical treatments (Daley S., 2019). It will lead to a complementarity between machines and humans.

1.1.2.5.2. Problems/limits

Obviously, AI has not only positive aspects. It is generating both technical and ethical issues. It is challenging every industry to be agile with its innovation pace. Moreover, it is going to challenge every business area that needs to follow innovation's pace to remain competitive in its market.

Firstly, using or creating AI is ***expensive.*** It makes it difficult to obtain a high development rate at the private or the public level (Kumar S., 2019; Rouse M., 2019).

Then, the ***possibility of making mistakes*** must also be considered (Agrawal A., Gans J. & Goldfarb A., 2017). Indeed, even if highly performant, these machines are not perfect and can make mistakes. Therefore, in the beginning, extra work will need to be done by people to check the accuracy of the results.

As those technologic devices can have a similar behavior than humans, it has raised some ***ethical*** issues. Indeed, the capabilities of those machines induce an unrealistic fear in people's minds and a misunderstanding of AI. To counter this impact, scientists are using the term "Augmented Intelligence" rather than AI. It helps to modify the perception that people have of AI. Therefore, people believe that these AI machines will have a positive impact by improving

the way humans can manage products and services (Rouse M., 2019). For instance, if we take the self-driving cars, a lot of issues are raised concerning the responsibility in case of accidents.

Furthermore, another big ethical issue concerns the possibilities of **AI *abuses***. AI can be dangerous if employed in bad faith. The first possibility is the idea that the device could be programmed to devastate something. For instance, some autonomous weapons have been created to protect the society. However, if this technology is controlled by someone with bad intentions, the technology could be wrongly used and bring to unmanageable situations (Tegmark M., n.d.). The second reason why AI could be dangerous is because it is programmed to do something beneficial, but it will use any method to reach its goals.

Moreover, AI brings to fear of possible ***unemployment*** induced in some sectors. Indeed, people believe that AI is especially a threat for daily tasks that do not require creativity or critical viewpoint. Robots are often performing basic tasks better and faster. Companies looking at the maximization of their revenue are therefore often interested in machines more than humans (Kumar S., 2019).

Also, since AI is learning from the ***data***, they must be accurate, complete and usable to avoid any problem in the results (SAS insights, n.d.). Indeed, if there is a bias in the data, then the results will also be biased.

Another limit is the idea that, today, AI is trained to do ***specific tasks.*** It can perform this definite task but not another one. For instance, the AI designed to drive cars cannot play poker. It means that the specialization of the devices is limiting their actions (SAS insights, n.d.).

Some people also argue that these new technologies are ***making humans lazy*** since it is decreasing the amount of work they need to do (Kumar S., 2019).

In addition, machines are ***unable to have any emotion*** what makes them unlikely to do some tasks such as team management (Kumar S., 2019). It could be a problem for some digital assistants if it is unable to understand the sentimental position of the customer. It might bring to some losses of customers by companies because they can feel not well treated or advised.

Finally, machines are programmed in a direct way and ***unable to think out of the box***. It means that they are unable of any creativity (Kumar S., 2019). They can find quick and efficient solutions, but they are unable to find an innovative one.

1.1.3. Conclusion – AI

AI is and will be an important topic that companies will need to tackle if they want to survive in their sector. Indeed, as technologies will improve, processes will become more efficient. Companies not implementing augmented intelligence will not be able to follow the production pace anymore and therefore, will collapse.

Companies must adapt and take the best out of what AI has to offer. As studying all sectors is too broad, we only focus on one, the consulting industry. Indeed, this important field includes some of the biggest companies in the world and, hence, the impact of these technologies seemed interesting.

1.2. Consulting Sector

Nowadays, consulting is a consistent business area known by every professional. The consultancy service market has experienced a continuous growth during these last years. It has become an important player in many industries. Lots of firms from different sizes are evolving in this sector and are trying to catch some market share. They all have a specific focus area and the desire to provide the best advice. Even if the consultancy market is understood by most people, its scope is very broad. We clarify it before starting the practical analysis.

In this chapter, we start by making a short history about the consultancy service market. Then, we investigate the concept of consulting and consultants to make sure that everybody has the same understanding and scope for the analysis. Finally, we conduct a market analysis to investigate the performance of the sector.

1.2.1. History of consulting industry

In the late 19th century, management was considered as a full-fledged field of an enterprise. During the same period of time, in 1886, the first management consulting firm called Arthur Dehon Little, was created by a man of the same name. This company was initially specialized in technical research. Later, it became a general management consulting firm (Poznan J., 2018).

Many years later, in 1926, the first pure management consulting company was founded. It is the well-known McKinsey, founded in Chicago by James O. McKinsey. This company is generally described as the first management consulting firm in the modern sense. Indeed,

Marvin Bower, who ran the firm for more than 30 years, was strongly believing that consultancy industry should adhere to as high professional standards as lawyers or doctors (Spencer T., 2016).

In the 1960's, a small number of new consulting firms has been developed such as Roland Berger and Boston Consulting Group. Those companies brought an analytical approach to the study of management and strategy. Lots of analytical tools and approaches that have defined the field of strategic management have been pioneered between 1960 and 1970. The development of those concepts defined the groundwork of these consulting firms and the industry they would evolve in (Street of Walls, n.d.).

It is during the late 1990's that the consulting industry experienced its first boom. At that time, several factors drove this growth: a strong global economy, the increase in computing power, the penetration of emerging markets, the globalization and the development of new technologies. A lot of new consulting companies were popping up. Established firms were having an annual growth of 20%. Consulting businesses were also doing aggressive recruiting campaigns both for experienced partners and undergraduates or MBA's (Street of Walls, n.d).

Between 2001 and 2002, a recessionary economy generated uncertainty. The budget that businesses were allowing to consultancy decreased. It led to many downsizings and declines in recruiting efforts. Nevertheless, since 2004, the consultancy industry has fully recovered, and most firms are now working at their full capacity. Lots of recruiting efforts have been made in order to increase the talent retention and consulting firms have succeeded in becoming a path chosen by 1/3 of graduating classes in top business schools. The trend is now to specify the consultancy area in which the firm is operating (Street of Walls, n.d).

1.2.2. What is consulting?

1.2.2.1. Definition of concepts

According to the Cambridge dictionary, **consulting** is defined as *"engaged in the activity or business of giving expert advices about a particular subject"* (Cambridge Dictionary, n.d). This definition shows the broadness of consultancy that can cover multiple industries.

In consulting, the major resource is the consultant. A **consultant** is someone having an expertise level in a particular field. People find it valuable and are ready to pay to access it.

Hence, a consultant is not someone with a high degree and a lot of certifications. Everyone who can give advice to a specific group of people can be considered as a consultant (Consulting.com, n.d). Depending on their job position, their working goals and their legal status, several types of consultants exist. They can be management, corporate or independent consultants. Those different categories cover all the businesses that exist around consultancy and that are performed either by large firms such as Big Four (McKinsey, Bain & Company, Deloitte and PwC) or by smaller companies, start-ups or even freelancers.

Consulting firms can be found in almost every business sector. It has opened incredible opportunities for firms. Consulting occurs in the Business-to-Business (B2B) sector. Consultants are hired by diverse companies such as law firms, retail businesses or governmental organizations (Turk B., n.d). According to a framework of 1982, the purposes of consulting firms can be hierarchized and divided into eight fundamental ones: provide information, solve problems, have an effective diagnosis, propose concrete actions, implement changes, build the consensus and commitment to change, facilitate client's learning and finally, achieve an organizational effectiveness (Turner A., 1982). The goal of consultants is thus to support companies in a change they want to implement in their business. Consultants not only have to find a suitable and profitable solution for their client but, most importantly, they have to give advices for each step of this change and make sure that every stakeholder is involved in the process.

To provide those inputs, experts are going through several steps. First, they need to better understand the problem that is at stake for the client by making analysis, cost studies, market surveys, etc. Understanding the need and explore the problem stated by the client are the most important parts of the consultant's work. Then, the expert has to find solutions and concrete actions to quickly improve the current situation. The role of the consultant is not only to provide those recommendations but also to support the client's firm in those changes to bring additional value and avoid a waste of time and money. During these steps, everyone who is concerned needs to be involved as a collaborative process is the only path leading to a successful result (Turner A., 1982).

Once again, the missions that consultants have to tackle are from a broad spectrum of different project types. According to Kennedy Information, an American research agency that has been analyzing the consultancy market since the 60's, there can be six main consulting projects' categories: strategy consulting, operation consulting, management consulting,

financial consulting, information technology consulting and human resources consulting (Consultancy.uk, n.d). All those types cover a different business area. It allows to provide a complete and deep advice to the clients who request it. The missions are customer specific and depend on clients' needs and expectations. Nevertheless, some common types of projects can be acknowledged. On the one hand, consulting firms can be hired to deal with huge and uncommon events. It includes, for example, post-merger integrations and growth strategies. Indeed, those events often require the help of external experts in order to ensure a successful and profitable end. Making the right choice and taking the appropriate decisions can be tricky. The analysis of a consulting firm is welcome to tackle this issue.

On the other hand, consulting projects can be related to more common and day-to-day life missions of the business. For example, business diagnostic, cost-reduction, organizational design or customer retention. Those missions require understanding of the client's firm and analysis of the problem to provide the best solution possible. However, there are issues that need to be tackled to improve the profitability or the quality of the existing organization's structure (Street of Walls, n.d).

1.2.2.2. Market and performance Analysis

These last years, the number of consulting firms has flourished. It can be explained by businesses that have to deal with fast-changing and a more complex economic, social and technological disruptive world. The consultancy industry is increasing and especially because the economy becomes even more international and fast-changing due to new technologies' development (Open Business Council, 2016).

This industry is a continuously increasing market, with a growth rate of 9% in 2018. It has represented more than 188 billion dollars for the same period (Gartner, 2019). Gartner, the global leading analyst firm conducted a yearly research to analyze the consulting industry. The analysts found that global expenses on management consultants have increased to $125,2 billion in 2014, up 6.1% from $118,1 billion in 2013, up 4% from $114,1 billion in 2012 (Open Business Council, 2016). This market is thus highly profitable and constantly growing since a few years.

Nowadays, more than 700 000 companies in the world have decided to evolve in the consultancy industry. As said before, the focus of those organizations differs amongst a large

spectrum of expertise such as strategy, operations, tax, finance, human resources or information technology (Kaplan S., 2017). Huge multinational groups with a broad scope of expertise are leading the market. As an example, the Big Three refer to the world's three largest strategy consulting firms by revenue. It is composed of McKinsey & Company, Boston Consulting Group (BCG) and Bain & Company. Others big players of the consulting industries are Deloitte, Accenture and Ernst & Young (EY). Nevertheless, those recent years, lots of smaller businesses, start-ups and SMEs have emerged and caught a considerable market share. Those organizations often have a more specific expertise area, but more innovative working ways and strategies provided to the client's business (Gartner, 2019).

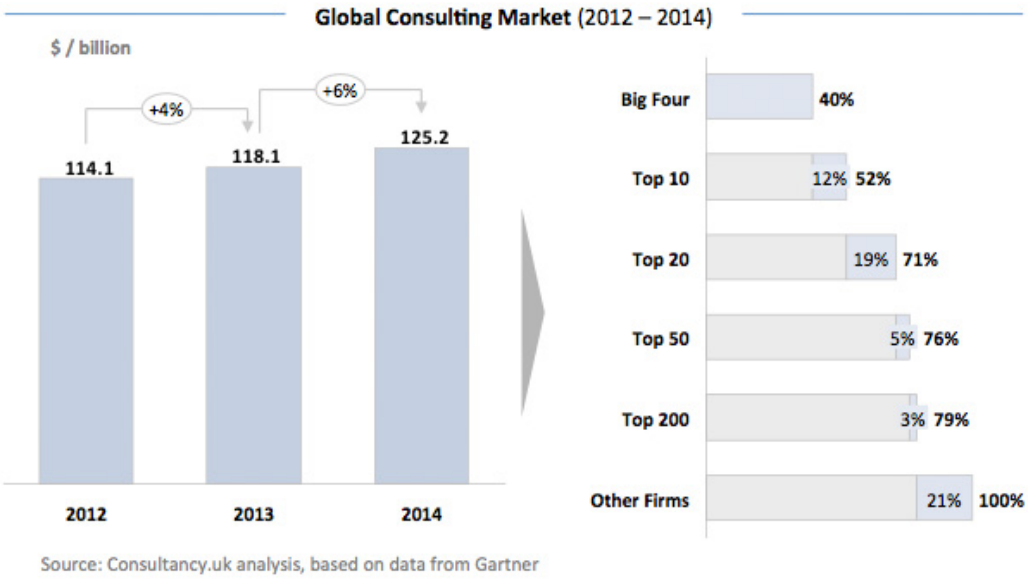

Figure [3]: The Global consulting market between 2012 and 2014 (*Open Business Council, 2016*)

The consulting industry is characterized by an unequal share of the market between big multinational groups and other companies. The Big Four (Deloitte, PwC, EY and KPMG) represent more than 40% of the market share (See Figure 3). The top 200 companies hold almost 80% of this total market. All the other firms, around 699 800, only share 21% of the consulting market (Open Business Council, 2016). It clearly demonstrates that, even if consultancy is a diverse market in terms of outcomes and skills, the largest consulting firms have a significant advantage.

As the consulting market experiences a continuous growth, most companies benefit from it. Together, the top 10 consulting firms grew from 9.8% in constant currency in 2018 consulting

revenue. Economically, the ten providers that have known the highest growth in 2018 are all huge multinational groups: Deloitte (12.5%), PwC (6.2%), EY (10.1%), KPMG (7.5%), Accenture (13.3%), McKinsey & Co. (6.8%), BCG (17.5%), IBM (6.5%), Bain & Co. (8.5%) and Booz Allen Hamilton (11.2%) (Gartner, 2019). Deloitte, Accenture and BCG gained the most in market share with a year-over-year growth of $5 billion and nearly 1% of market share. EY experienced a 10.1% of constant currency growth thanks to its investments in digital innovation. The launch of Capgemini Invent induces an increase of 37.5% in constant currency in 2018 (Gartner, 2019). Those figures indicate that the consulting market is fast-growing. It offers a lot of expansion's opportunities to established firms.

Although the first consulting firms were founded in the United States, the consulting industry is now developed in the entire world and represents a considerable part of the international business market. North America and Western Europe are the geographic area representing the biggest shares of the consulting service market with respectively 45% and 31%. Even if most of the market share is represented by those two geographic zones, Greater China, Latin America and emerging Asia/Pacific are the fastest-growth regions in consulting services. The industry's revenues follow a similar concentration (Gartner, 2019).

Having a closer look at the Benelux market, the consulting services market reached more than 2 billion euro for the first time in 2016, representing a growth of 3.6% in comparison with the previous year. Source Global Research, a UK based analyst firm, conducted a research showing that the Benelux region has recorded fourth years of consecutive growth between 2013 and 2016, following a 2012 recession of -3.1% growth. Among those three countries, Luxemburg is the best market. It has experienced a growth of 4.9% to reach €228 million in 2016. In comparison, the Netherlands has expanded by 3.3% to €1.18 billion and Belgium recorded a growth of 3.6% to hit €610 million in 2016 (See Figure 4) (Consultancy.uk, 2017).

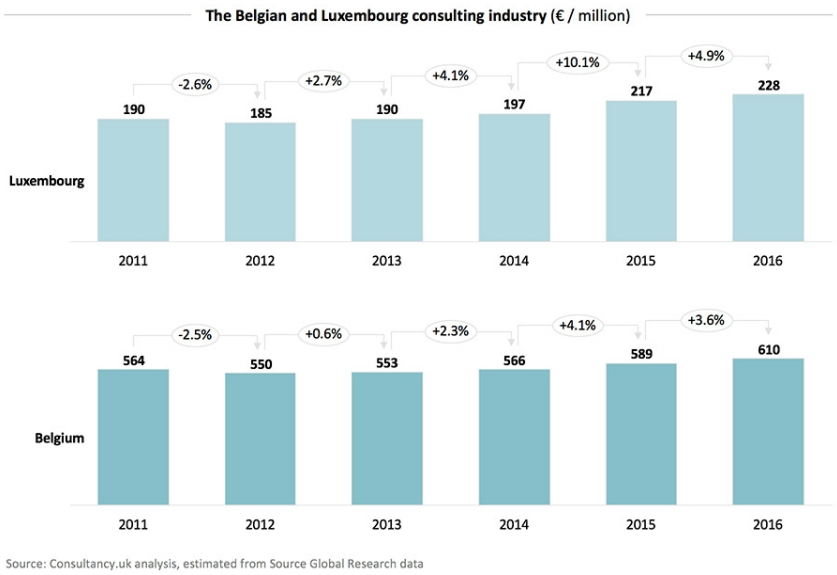

Figure [4]: The Belgian and Luxembourg consulting industry (Consultancy.uk, 2017)

1.2.3. Conclusion of Consulting Industry

The consulting market is broad and implemented in a large amount of industries across the world. Those firms have different purposes, areas of focus, ways of working and sizes. This diversity leads to the development of an eclectic market; allowing to propose a broad range of offers to client's businesses.

This promising industry has already experienced a considerable growth during these last years. With an annual growth rate of around 9%, this market attracts every year more and more entrepreneurs who want to develop their business. This fast-growing and fast-changing business sector gathers the best experts of their fields. They help their clients by giving them advices, recommendations and solutions to improve their businesses.

1.3. Link between AI and the consulting service market

To explain the link between AI and the consulting sector, we detail the relation between the two concepts according to multiple aspects: the advantages and risks of AI for consulting firms, the topics of interests, the way firms are implementing AI and the challenges they face. It helps us to have a better vision on the concepts' complementarity.

1.3.1. How AI can improve consulting companies' performance?

AI has been highly developed across the globe these last years. As these technologies are expanding, more and more industries are thinking about integrating these processes in their operations. According to a study done by Narrative Science, the number of companies implementing AI has nearly doubled in 2018 to reach 61% (Consultancy.uk, 2018). These technologies' impact is disrupting the industry. It could significantly improve the services offered and enhance the operations' strategy (Consultancy.uk, 2018). The consulting market does not deviate from the rule. AI departments are starting to be developed in large and small organizations. They know that having and advising augmented intelligence would bring many advantages to their industries.

First, it would allow consultants to ***save considerable amounts of time*** when it comes to exploring huge amounts of data. It would enable a more efficient and faster analysis (Consultancy.uk, 2018).

Then, AI would ***improve the diagnosis' accuracy***. It would allow to advise better strategies to the clients. In fact, as AI will increase the data analysis' efficiency, consultants will be more focus on the strategies given. Hence, the recommendations done would be more accurate.

Having a look at the consultant's work, he will have more time to focus on added value tasks as introducing AI allows major improvements to internal operations (Consultancy.uk, 2019).

1.3.2. What are the topics of interest for firms to follow?

When a consulting firm decides to draft its internal AI strategy, many factors need to be considered as it induces considerable organizational changes. All the stakes and risks must be enlightened to minimize the percentage of failure. Firms must consider four topics of interest.

First, companies have to adopt a ***pro-active behavior***. They must identify opportunities at the earliest. It does not mean that they should unconditionally invest in AI, but they should take time to analyze if it could bring added value to the business and where it would have the biggest impact. According to a study conducted by McKinsey, 70% of companies will adopt at least one form of AI before 2030. It could lead to a performance gap between front-runners and non-adopters. The importance of AI implementation is thus crucial (Consultancy.uk, 2019). Hence,

companies should, more than ever, pay attention to all the developments and keep an eye on competitors. Denying a major innovation could bring to the business destruction.

Secondly, as the consultancy market cannot neglect investing in AI's efforts, ***two main contributions*** are needed. On the one hand, investing in the technology by dedicating time and budget in finding the right expertise and the most suitable solution. On the other hand, investing in people. Having resources able to understand AI is crucial to avoid failures. Those profiles must appear at each level of the company's hierarchy. The AI and data scientist expert team will have an impact on the offer provided to the clients and the internal structure (Consultancy.uk, 2019).

Then, consultancy market could require ***partners' help*** to develop AI. Indeed, if firms want to keep their market share while being innovative, partnerships' developments are crucial. Firms do not have time to implement a trial-and-error learning process and most consulting companies do not have the expertise internally. Partnerships with expert organizations can make the difference and allow the firm to quickly implement changes and upskill the workforce. Considering partnerships with businesses belonging to the AI tech landscape should be one of the main concerns for firms lacking those capabilities (Consultancy.uk, 2019). Also, they should consider partnerships with smaller companies such as start-ups that are known as being more agile.

As said before, ***recruiting some AI experts*** is determining for the changes implementation's success. In parallel, the native workforce needs to be trained as quickly as possible. Indeed, the consultants' training is one of the key elements to implement a successful strategy. Even if using the new talents attracted thanks to partnerships and other processes is a winning strategy to conduct the AI implementation on the short-term, the knowledge transfer to employees should not be neglected. The use of augmented technologies will quickly have an impact on every department of a consulting firm and staff needs to know how to take advantage of this new technology (Consultancy.uk, 2019).

1.3.3. How can consulting companies implement AI?

The augmented technologies' development of consulting organizations occurs under two approaches in order to remain competitive and innovative.

On the one hand, firms can ***increase their offering range*** by developing AI products or services. Expanding the offer is crucial to adapt to the requirements of the demand and meet clients' expectations. The clients also have to keep up with the technological progress pace. They want to have up-to-date recommendations from consultants. Consulting companies must therefore implement processes to always be aware of new technologies and more, train the employees to make them able to manage, implement and advise these technologies.

On the other hand, the consulting industry needs to ***internally implement AI*** to improve the way they are working. It is important to improve the organizational structure. AI systems can be used to provide recommendations with higher quality and higher success rate. The use of AI occurs at different stages of the process. For instance, the collection and analysis of data to identify the problem faced by the client.

These two implementation ways request different processes to develop but are complementary. Both need to be done in parallel to ensure the success of the firm.

1.3.4. What are the challenges for consulting firms?

Even if the first signs of AI appeared a long time ago, the real technology boom is quite recent. Many industries have tried to adapt their offer and daily working life to keep up with this development. Even if some firms have already implemented a lot of AI processes and are ready to keep up with the pace, others are more doubtful and reluctant. Consulting firms do not deviate from the rule by taking a considerable amount of time to make the transition. The gap between ambition and execution is very broad. This behavior can be explained by several challenges that the consultancy service market has to overcome.

First, AI has been an opportunity caught by several companies, allowing them to enter a new business sector. It led consulting firms to ***deal with new competitors*** composed of large tech companies and start-ups. They often have a better AI knowledge and expertise. Large tech firms are pioneers in AI and already developed a broad range of tools. They could help mainstream companies by building speech recognition, customer-service bots or translation systems. Along time, those tech firms are becoming less focused on technical infrastructure and more on strategy and people. As a result, they will increasingly compete with consulting firms. Start-ups, meanwhile, are offering other services than large tech firms, such as cleaning up and labelling of data. They are also able to integrate personalized solutions for the clients.

Consulting firms have to efficiently react to avoid more specialized providers moving up the value chain by providing recommendations for overall business strategy (Gonfalonieri A., 2020). As explained before, the consulting companies can react in different ways. First, they can hire AI experts inside the company to try and develop their own technologies, which could afterwards be sold to the clients. This option is better in long-term operations. However, companies that have not already developed AI should better find alternatives and invest in building partnerships with other organizations such as start-ups. Indeed, hiring people takes time since the training needs to be done, while the small infrastructures are already used to work together and are consequently more agile.

Secondly, even if the technology is ready and companies want to invest in it, there are still ***legal issues*** to face. The legislation needs to constantly adapt to these new technologies. It needs to be done before any problem occurs. As an example, what would happen if an autonomous car has to choose between hitting a pedestrian and endangering the passengers of the car by crashing into a wall? What would be the consequences of such an accident? (Beuvens F., personal communication, January 23, 2020)

The fast AI development pushes consulting firms to ***adapt their business model***. Indeed, it raises organizational challenges that companies have to deal with. This disruption of the existing business model can be explained by the lower number of consultants needed, as some aspects of their daily work would be automated. Nevertheless, other experts such as data scientists will become crucial for the company's continuity (Gonfalonieri A., 2020). To better deal with this organizational challenge, the employees should be trained to deal with those new technologies (ABC, 2018). However, this completely new reorganization implies a resistance by many firms and can be experienced at each hierarchy level of a firm. It can be explained by the fear of the unknown, as investing in new technologies such as AI is something that we have little perspective on. Those changes have to be done at each level of the company and requires every employee's involvement to be a success (Beuvens F., personal communication, January 23, 2020).

Moreover, consulting firms have to face an ***economic challenge***. The investments made in new technologies are substantial. A whole economic strategy must be defined to manage this change in the best way. Even if investing in AI is a winning strategy and should be considered by every consulting firm, keeping track of the investments is crucial to assess if the organization is moving in the right direction. Firms should keep an eye on these spending to see the value

they bring to the business. They need to measure the increase in performance and efficiency that AI brings as impacts are not always tangible. It will help the organizations to better manage the implementation and demonstrate the effectiveness to the clients (Consultancy.uk, 2019). Also, consulting firms should avoid investing too much too fast because employees need to adapt to the change.

Finally, the AI implementation is a ***slow process***. It requires to find the right contacts with the appropriate expertise and knowledge. Some companies are reluctant to this development, as they do not want to give the access to all their data that easily. The first job of consulting firms is thus to build trust with the client in order to really understand the implementation's purpose. Nevertheless, even if some organizations or business sectors take time to recognize that they need to invest in those technologies, they will quickly notice that it is crucial to stay competitive on the market and to keep up with the pace of development (Beuvens F., personal communication, January 23, 2020).

1.3.5. Conclusion of the link

The fast AI development has forced consulting firms to quickly adapt their business and strategy to meet the growing demand. Indeed, consultants understood that, although it requires massive time and resources investments, technologies bring major opportunities. Firms must have a clear view of their AI objectives and strategy, seize opportunities, invest in people and find the right partners. Combining these behaviors will lead to a successful AI strategy.

Nevertheless, these new technologies have also raised organizational challenges for the consulting service market. Indeed, the raise of new competitors, legal concerns, the adaptation of existing business models and the economic threat are challenges that have to be managed by the consultancy industry. Those increased concerns have induced a reluctance from firms that has to be tackled in order to keep up with the pace and build a strong competitive advantage.

1.4. Conclusion of the first chapter

Along this first chapter, the main purpose was to get familiar with the two major concepts of this paper: AI and consulting. We deeply defined both through multiple elements such as their history, their nature, the advantages they bring as well as the risks they could generate.

In the first part, we exposed the high pace of AI's evolution with all its characteristics and complexity. However, to remain in the scope of the paper, we did not explain all types of AI. Moreover, we did not detail any precise tool since all companies are using different ones based on the same technologies. We also demonstrated that, although AI brings many advantages, it has downsides that need to be managed. Furthermore, this part helped us to understand the importance of implementing these augmented technologies in daily processes of companies to keep up with the production pace.

In the second part, we detailed three crucial aspects of the consultancy service market. To begin with, we explained the history followed by the definition of the concept. It helped to deeper perceive this major market and the importance it has in the business sector. Then, we addressed the economic stakes through many numbers. It helped to understand that consulting is a growing industry that draw all attention. Indeed, this constantly growing sector needs to adapt fast to new technologies to always have the latest advice to present to their clients.

Thanks to these two first parts, we developed the link between the major concepts by explaining not only all the positive aspects that AI could bring to consultancy but also the challenges it creates. We also tackled the reasons explaining why companies are slow to implement these augmented technologies in their processes. Moreover, we detailed the two ways AI could be implemented. All these aspects have enabled us to better understand the stakes running with the implementation of AI in the consulting sector and therefore, draw a more precise research question that is presented in the following part (See Section 2.2). This research question is englobing the two ways AI can be integrated and all the economic and organizational challenges it involves. This question will guide the practical, confrontation and discussion part.

CHAPTER 2 - METHODOLOGY

After having explained the two major concepts as well as the link between those two, we describe the methodology we used and the way we conducted our interviews. We also present the structure of the coming chapters.

2.1. Methodology

It comes to us that the best way to study the AI influence on consulting firms is by using an exploration method. It is the best way as the research focus of the paper is unexplored yet. Hence, the overall goal is to become familiar with unknown concepts. The outcome will be broad and will raise more precise future research questions (Dufour C., n.d).

To realize this exploration, we use qualitative data orally collected through one-to-one interviews. It enables us to make the link between scientific facts developed in the first chapter and the reality happening in consulting firms (Aubin-Auger I. & al., 2008). As there is not only facts but also opinions from the interlocutor, the analysis leads to subjective results (Jacquemin A., 2019; Aubin-Auger I. & al., 2008). There is a high need of interpretation to deeply understand the impact of the questions and the extent to which the interlocutor is biasing the answers. Indeed, the results are more flexible when it comes to a qualitative research. We need to continuously deal with unscheduled results (Jacquemin A., 2019).

All this information collected through interviews enables us to build the practical analysis.

2.2. Research questions and propositions

Along the interviews, we answer the following problematic:

"Nowadays, how do consulting companies manage Artificial Intelligence in their daily processes, both in the way they advise it to their clients and the way they implement it internally to improve the work quality of the consultants? What are both the economic and the organizational impacts of this AI implementation?"

To guide the research, we highlight four research propositions. Then, in the conclusion, we propose an answer for each, based on the interviews' content and the theoretical analysis.

First, we are convinced that *AI implementation has already started in many consulting companies* or, at least, that those organizations already have a clear strategic plan to integrate it in the coming years. We consider that the AI development in internal processes and offerings is a pain point that is currently tackled. However, we assume that consulting firms are facing difficulties with *change resistance and reluctance* from other infrastructures such as their clients.

Secondly, we think that *most consulting firms already started their transition by implementing AI into their internal processes*. Those tools could help them in some daily working areas, such as repetitive and administrative tasks. We assume that consultancy companies already have a clear view of the plan that they are putting in place to develop those new technologies. Moreover, we believe that they already introduced some technologies in their daily tasks.

Then, we are aware that the AI development will induce organizational changes in the consultancy service market. Nevertheless, having a look at the human resources side of those companies, we assume that the implementation of *AI will not have any influence on the number of jobs offered but more on the type of jobs that are proposed*. Hence, the industry will need to quickly reinvent itself to follow the AI development pace. People will need to reskill themselves to handle these technologies and learn new tasks, as some of theirs will now be performed by machines.

Finally, we think that AI can only have a *positive impact on the economic state of a firm*. Even if the initial investment is considerable, the return on investment will be positive in the long run. It will enable to create more at a cheaper price. Machines are able to work 24/7 and the initial cost of the development will be offset by a long lifetime. It makes the investment worth it.

Beyond those four assumptions, we are aware that consulting firms diverge in their financial resources and in the budget that they allocate to the development of new technologies. We consider those differences when conducting the practical analysis.

CHAPTER 3 – PRACTICAL ANALYSIS

After having deeply studied the theoretical concepts, we conduct a practical analysis through multiple consulting companies. It enables us to challenge the theory with real life cases and hence, understand the gap between what is explained in the literature and what is happening in practice. We conducted the interviews with the idea of discovering the way each firm was using and implementing augmented technologies.

This chapter is structured as follows. First, we explain how we selected the companies to interview and how we perform our analysis. It gives an overview of the information collected and the limits reached. Then, we explore the current situation that consulting firms are facing and the existing link between AI and the organizations studied. We divide our analysis by making three groups according to the companies' sizes and business areas. Afterwards, we draw the conclusion regarding the economic and organizational impacts of AI implementation. We add other comments regarding several aspects such as laws or change resistance to complete our analysis. Finally, we conclude by gathering the main points of the chapter to make sure having those in mind to go on with the confrontation.

3.1. Data and Sampling

To achieve a complete and efficient practical analysis, we conducted several interviews in consulting companies from different sizes and different sectors. Since AI has a high cost, it is hard to implement and new in the processes. Therefore, not every company can afford to invest in it. Having companies from different horizons helps us to understand not only how companies are investing in AI but also the differences running between the innovation possibilities in small and large firms. Six consulting companies accepted to answer our questions. After this first batch, we decided to stop interviewing new firms, considering our time constraint and observing that similar answers were coming back. We had reached some form of semantic saturation.

In this section, we first enumerate the companies and give their details. Afterwards, we explain the criteria that we used to make the groups for the practical analysis. Finally, we detail the way we conducted the interviews. It helps us to better catch their purposes and the nature of the interlocutor's point of view and then, the answers collected.

3.1.1. Our Sample

The first company having answered our questions is **Sagacify**, an AI specialized start-up based in Brussels. It has been created seven years ago. This firm is a service company aiming at producing technological programs and processes to improve companies' performance. They are active in multiple sectors: insurance, healthcare, manufacturing, etc. They analyze and understand the business' stakes to generate an AI solution aiming at increasing the ROI (Return on Investment) of their clients by automating some tasks. To develop a unique solution for each client, Sagacify combines multiple existing solutions or creates a new solution from scratch. More than a service company, Sagacify is currently developing a product that they could, in the future, sell under a license. They are working on two different problems: The Natural Language Processing (NLP) and the computer vision. The first is, as already detailed in the first chapter (See Section 1.1.2.3), the ability of a machine to understand unstructured texts. The second is the ability of managing graphical information such as images or videos. One typical example is face recognition (Beuvens F., personal communication, January 23, 2020). All these solutions are internally developed by the employees, but the client's expectations are always kept in parallel and regular alignments are organized. The projects that they follow are often quite long, from the time the first contact is made until the final delivery. Also, after having delivered the solution, the company always ensures a maintenance service. Moreover, they organize workshops and conferences for companies to be attracted by augmented intelligence. Although this start-up is young, it is already acting internationally. For instance, they are currently developing a solution to detect tuberculosis in Kenya depending on the living area (Beuvens F., personal communication, January 23, 2020).

Interviewing Sagacify allowed us to better catch the concepts related to AI and how these new technologies are developed. Afterwards, we conducted interviews with six consulting firms, that we enumerate here after by giving an overview of their business.

We realized the first interview with **PricewaterhouseCoopers** (PwC). It is part of the Big Four, referring to the four largest accounting companies of the world. The three others are Deloitte, Ernst and Young (EY) and Klynveld Peat Marwick Goerdeler (KPMG). PwC is the second company of the Big Four bringing the highest revenue with $42.5 billion at the end of 2019 (Accounting Verse, 2020). This international organization, created in 1998 with the merge of Price Waterhouse and Coopers & Lybrand, knows a huge success with about 276 000 employees worldwide and is available in 157 countries, as of year 2019. PwC nearly covers all

business sectors that a consulting company can, but is mostly famous for its insurance, tax and advisory services (Cop C., personal communication, March 20, 2020). They define their nature through five major values: Act with integrity, make a difference, care, work together and reimagine the possible. These are important because they bring together the different offices around the world with a common perspective. Moreover, it helps to create trust towards the clients that can find integrity and homogeneity depending on the business area (Cop C., personal communication, March 20, 2020). Indeed, the company is not only working country by country, but they are all helping each other depending on their specialized research area. For instance, PwC UK was the first subsidiary to develop an ethical AI framework. The other PwC offices followed by including it in their processes. Working with each other helps to be more efficient as they can assemble their strengths. PwC has a huge range of clients from every business sector. In the technology consulting, they are mainly working with public services such as the European commission, the governments, etc. They are also willing to work both with large companies and SME's, but their clients are mainly big firms that can afford their services since they are not the cheapest (Cop C., personal communication, March 20, 2020).

Following this first interview, we realized the second with **Deloitte**, the global Big Four's leader acting with 312 000 employees in 150 countries around the world. This major company is developing its business through three major pillars. The first, named "Transparency, accounting and reporting" aims at gaining the stakeholders' trust by acting through a total transparency. It helps building a strong relationship with customers to bring them the highest value possible. The second pillar is the "Corporate responsibility and sustainability". They want to drive a societal change by being environmental-friendly. To realize so, they are bringing sustainable solutions to their clients. Finally, they are claiming "Ethics and integrity" inside the company to share their identity and work in an atmosphere of trust with clients. Working with these three pillars allows Deloitte to handle its huge growth. It enables the company to work in many different business areas going from government and public services sector to the energy sector (Paridaens T., personal communication, March 26, 2020). Also, and as the other major companies, Deloitte has a well-advanced technology department allowing to provide their clients with innovative solutions.

To complete our analysis within the big companies, **Accenture** has also answered our questions. Although it is not considered as one of the Big Four, Accenture represents one of the major companies in the consulting field with about 509 000 employees implemented in 50

countries around the world. It makes them the biggest consulting company in the world in terms of collaborators (Amez F., personal communication, March 31, 2020). Its input was interesting and necessary to draw additional lessons, since this major firm is particularly known for its digital, technology and operations' solutions. Their knowledge and system of augmented technologies are hence well advanced and established. This organization is active in multiple industries: Aerospace, banking, automotive, high-tech, etc. As the other companies, Accenture is running thanks to values: Client value creation, one global network, respect for the individual, best people, integrity and stewardship (Amez F., personal communication, March 31, 2020).

The next company that we interviewed is **Delaware**, a Belgian company active in twelve different countries and currently having 2400 employees (Herthoge M., personal communication, April 2, 2020). This firm defines itself as fast growing and specialized in ERP solutions. Currently, their main goal is to deliver ICT (Information and Communication Technology) solutions to their customers to help them driving their digital transformation. Indeed, their services include a "Trending" department where multiple forms of augmented intelligences are developed such as blockchains, chatbots, etc. Moreover, one of their strategies is to become one of the leaders in AI (Herthoge M., personal communication, April 2, 2020). Nevertheless, they know that they cannot become the overall AI leader since it is a too broad topic, but their vision is still to be highly considered in this sector and get specialized in one AI branch. Also, by working closely with Microsoft, they have a sustainable advantage. Indeed, Microsoft is referencing Delaware to their own clients when it comes to solving a problem they cannot. The company is working according to defined values: Care, commitment, team spirit, respect and entrepreneurship. The last one is important in the organization but also in the digital area where the evolution needs to be quick. Indeed, it helps the company to grow fast and always be up to date according to the possible evolutions since, according to the interviewee, *"listening to every employee is the most efficient way to get the best innovations"* (Herthoge M., personal communication, April 2, 2020).

Then, **Irex Consulting** also agreed to answer our questions. This company has the vision to continue developing itself only in a niche sector and is currently specialized in the energy industry. It is also willing to develop in the pharmaceutic industry in the coming years. Irex Consulting has been created in 2012 and currently has 50 employees working in their office in Brussels. It is acting at the international level with missions in Belgium, France and is also extending its services to Germany. It is solving financial and technical problems by adhering to

an engineering approach. It has a broad scope of services going from the basic consulting advices for the client to the operational follow-up once a project has been implemented. Irex is doing project management, data analytics, change management, etc. (Deltenre A., personal communication, April 9, 2020).

Finally, the last company we interviewed is **Argafin**, a Belgian startup created in 2015 and currently having 14 employees. Thanks to their small structure, this company can afford quality and integrity towards their customers. They are acting in the financial sector through four services. First of all, they are making sure that the balance sheet of the clients is correct. Then, they are also making sure that companies are catching the opportunities to reduce their costs. Also, they are helping in decision making thanks to a performant global overview on the financial situation of their clients. Moreover, they are providing help on some specific projects. Nevertheless, the company is small and mostly acting in small structures such as start-ups and SMEs (Deboot L., personal communication, April 8, 2020). Their action plan is based on the adaptation to the client and the role they are playing in the client's business is very diverse. Even if their primary focus is the finance, they are sometimes brought to have a human resources management role, etc. (Deboot L., personal communication, April 8, 2020). Although the company is small, they are also acting through established values: Integrity, quality, client's satisfaction and flexibility. Their service is based on the idea of temporary becoming the financial director (Deboot L., personal communication, April 8, 2020). They are acting based on both short and long-term missions going from one week to two years.

3.1.2. Grouping strategy

After we explained all the companies one by one, we detail the way we sampled them, we interviewed them, and we grouped them for the analysis.

At first, we talked with Sagacify to better catch the theoretical concepts running around AI and the technologies it involves. Also, it helped to receive an overview of the current problems AI is facing and an insight of the way it will evolve in the future. Thanks to their specialization in augmented technologies, they explained the change resistance and reluctance appearing in companies' minds. This first interview also helped us to better target the questions that we wanted to ask to the consulting firms in the second part of our work.

Looking at the consulting firms, we divided the organizations in three groups depending on the company's size. Indeed, since implementing augmented technologies is time and budget consuming, there was an evidence that every firm could not invest in AI in the same way. The group of large firms is composed of Deloitte, PwC and Accenture. We chose the first two because, as part of the Big Four, their input was obviously important. Among the Big Four, we chose PwC and Deloitte because they are the major ones in terms of revenue and seemed to have a high interest in technology. Then, we also put Accenture in this group because this firm is specialized in providing digital solutions. It was obvious that their augmented technologies were up to date. Those three companies have a major impact on the market, an important number of employees and are often considered as some of the leaders of the consulting service industry. Hence, they are able to provide a wide range of solutions. They have a duty of always being up to date with the latest technology in order to not lose any market share and remain competitive. These last years, the increasing development of AI has had an impact on their business. They had to adapt their way of working by developing and implementing AI in their processes.

We put Delaware in the second group because it is a middle firm. It was an attractive company since it is innovation-driven, which means that it is following the pace of innovation in such technologies.

Finally, to deeper understand the way smaller companies could use and advise AI, we interviewed executives at Irex Consulting and Argafin. We mainly chose these two companies to complete the analysis and understand the potential fear that this continuous growth in expensive technologies could bring to start-ups or the contrary, bring them to attract many more customers if they manage to follow up with the pace.

3.1.3. Interview methodology

We subjected all the companies to semi-directive interviews. Regarding the questions asked, and apart from Sagacify that answered more AI specific questions, all the others have responded to the same questions. This interview type helped us to have more than answers to questions, a real discussion. In every company, we had the opportunity to discuss with an employee holding a job directly related to AI development. Nevertheless, in the two small companies, we interviewed consultants since the company has not yet developed an AI specialized department. The idea was to extract the same input from all companies to draw the

following section. The questions were asked according to two pillars. On the one hand, the way consulting companies are implementing AI or any augmented technologies in their clients' firms. On the other hand, the way they are internally using such technologies to improve their own performance. Asking these questions enabled us to draw a unique conclusion by comparing all organizations on the same basis.

3.2. Existing link between AI and the Consulting sector

After we explained each company and the way we selected them to answer our questions, we can perform the analysis. We divide it in three parts depending on the groups presented before. For each of them, we split the analysis in two different areas. First, we conduct an analysis about the AI deployment in the company itself. The purpose is to evaluate to which extent big firms internally implement AI to understand how AI can help consultants in their daily work. Then, we investigate the massive investment in AI made by those three firms to understand its impact on the offer and the way they are advising their clients.

3.2.1. Large companies

As all companies mentioned in their interviews, the AI development boomed eight or nine years ago, forcing to quickly add AI to the expertise field. Nevertheless, AI already existed in those companies before this boom, even if the word "Artificial Intelligence" was not used yet. Indeed, AI exists since 1950 – 1960 and it is not recent that companies implement advanced analytics or processes which are akin to AI. As an example, the interviewee from Deloitte claims that they were already using such techniques twenty or thirty years ago and have always been active in the augmented intelligence technologies market even if they are calling it proper AI for the last eight or nine years (Paridaens T., personal communication, March 26, 2020). On the Accenture side, the company was established in 2001. For them, AI has been around all the time with a massive deployment over the last six – seven years (Amez F., personal communication, March 31, 2020). Finally, according to the PwC's employee, the company has been busy with augmented technologies for four or five years (Cop C., personal communication, March 20, 2020). So, even if the technology exists since the 60's and 70's, consulting firms started a massive deployment of AI less than ten years ago. At that time, the consulting service market started its digitalization and companies engaged their investment in AI. Some reasons are explaining this gap between the AI development and its adoption by consulting firms: the cost of technology, the cumulative effect of technologies or even the change resistance, etc.

Indeed, to have a general adoption in the society and a scalable technology, it was necessary to wait for the development of several automations such as Internet, personal computers, cloud technologies, etc.

3.2.1.1. AI implementation in firms' internal processes

Deloitte, PwC and Accenture are three firms highly involved in the development of AI, as they know it is essential to remain competitive and leaders. Indeed, as soon as one of them starts to develop a technology and let the others behind, the gap can quickly appear and be hard to close. On top of it, those three firms have already started to implement new technologies in their organizations to help consultants in their daily work. Those internal developments happen at different steps of the process depending on the company.

Regarding Deloitte, they have developed an automation to help consultants in the new contract management. This automation takes care of every administrative work related to a contract with a new client. Robots are activated every time that a contract is agreed, and they encode every information needed to handle the new agreement. Moreover, another AI is helping consultants in finding solutions to bring to their clients' businesses. This new technology is not often used yet because it requires consistent data and a strong knowledge base. The documentation requirements depend on the project. Due to the large number of projects running at the same time, it is not feasible yet to develop a consistent database with all this information. Moreover, some of the documentation is very confidential and can not be shared with every employee within Deloitte. Beyond those two technologies, Deloitte also uses AI for smaller areas of its business. First, solutions such as chatbots are used for HR and Legal services to improve the understanding of disruption brought by the development of AI. Those chatbots are able to read and think at how these technologies are changing the way firms go to markets. For Deloitte, AI is an asset that is going to be increasingly developed and internally implemented to allow consultants to focus on their advice job rather than spending a lot of time doing administrative work. This will contribute to increase the quality of the work by decreasing the time needed (Paridaens T., personal communication, March 26, 2020).

Concerning PwC, the automations and AI developments have been performed at different levels. PwC developed an internal program called Dragon Step. Its purpose is to gather propositions from employees concerning either internal or external innovations. It often leads to the development of new automation products. A first example of automation implemented

thanks to this program concerns Excel. It was used to deal with a lot of different Excel spreadsheets at the same time. They started developing ways of automating the encoding of data. Regarding new contracts, the information immediately goes into the database thanks to a contract's scan. More recently, PwC introduced a digital assistant, upskilling every employee within the company on everything concerning digitalization. The purpose is to get everybody familiar with working along with used tools, increase their knowledge to enable them using new technologies developed by the company itself. Last but not least, PwC wants to develop a tool able to help consultants making decisions regarding solutions to implement in the client's business. Nevertheless, they are facing some security issues concerning private clients' data and the use they can make of it. They are figuring out which information they can use and see how they can apply it while maintaining the same level of security for their clients (Cop C., personal communication, March 20, 2020).

Finally, on the Accenture side, the investment in new technologies is crucial, and an important focus is made by the company on those implementations in the company itself. Thanks to their massive expenses in the firm's digitalization, they already developed a lot of automations in order to help employees and consultants in their daily work. Those deployments have appeared in several departments with one main purpose: the optimization of the processes. Among others, they implemented automations, robotics, chatbot solutions, etc. As an example, AI is used in the Human Resources department to improve the experience of virtual interviews. The face recognition is experimented to have a better insight in the interview. Then, AI is also used to make simulations on projects' proposals. Even in a funnier way, in the new office in Brussels, Accenture has added some screens on the walls that are able to match the color of the screen with the outfit of the person entering the building. The goal of this new solution is to improve the consumer's experience at Accenture. Furthermore, an intelligent platform called MyWizard has been developed to support accounting and teams in the delivery of solutions and intelligent propositions. This platform supports each step of a project's life cycle: the opportunity, estimations, contracting, mobilization of teams, deployment of the governance structure, predicting financial forecasts, etc. (Amez F., personal communication, March 31, 2020).

Those three firms are thus already highly involved in the deployment of AI in their internal organization. A lot of automations have been developed and they are constantly working on the

implementation of new automations in order to improve the way consultants are working and the solutions that are provided to their clients.

3.2.1.2. The extended offer to the client

The development of new technologies these last years has forced the consulting service market to adapt their offer. Deloitte, PwC and Accenture have decided to broaden their offer scope to better meet the needs of the clients. This adaptation is mainly done by proposing solutions incorporating new augmented technologies.

Concerning Deloitte, several types of AI capabilities such as robotics, process automation or software robots are part of their offer. More specifically, different solutions have been developed. First, as part of Deloitte Legal, AI based judgments have been deployed to help in the decision-making of going to trial or not. This decision is based on previous cases and assessed thanks to the win potential. Then, Deloitte also established an invoice account reconciliation based on AI. This automation is three times cheaper than any other competitor thanks to the automation potential that the solution has. The last example concerns a trade classifier. When an organization is doing trade with different countries, some taxes have to be paid to these countries. The product will then need to be classified in a tax category. The solution proposed by Deloitte will automatically classify the item in the right folder regarding the other country, based on the description. That process is more than 100 times faster than any manual operation and the accuracy is approaching 92%. As part of its strategy, Deloitte wants to integrate those solutions to its services and try to implement some form of AI whenever they see those kinds of problems in order to make the processes smoother. Furthermore, Deloitte is facing another challenge regarding clients' offering. Indeed, there is a need to update its consulting and advisory knowledge because of the impacts of all these emerging technologies on the client's strategy. The use of AI or machine learning could support the recognition of market or fault patterns. Thus, Deloitte wants to adapt to its market and bring additional knowledge to clients compared to their traditional business (Paridaens T., personal communication, March 26, 2020).

Regarding PwC, its business offers a products range gathering brainstorming, co-thinking, co-creation about a strategy, doing some studies, salesforce, etc. The range of automations that consultants propose as solutions to their clients is broad and depends on many factors. First, the quality of the data is a very important criterion. If data are not consistent or the quality is not

good enough, it is hard to implement AI. PwC will develop those capabilities as a solution in the businesses of its clients if all the conditions are met. PwC considers AI as a tool that is going to help companies to improve their products or services. Deploying AI for its own sake is not a good strategy. The solutions proposed to the client depend on the business problem met, the strategic vision of the firm and the path they want to take to solve the issue they are facing. If AI is a good solution, PwC has a broad range of capabilities, which has been developed by the firm and is ready to be implemented. Machine learning, robotics or business intelligence are part of the proposed automations that can improve a business (Cop C., personal communication, March 20, 2020).

Finally, Accenture has developed a wide range of AI solutions that they can implement in their clients' businesses. Nevertheless, the deployment of these automations in an organization depends on the problem that the firm wants to solve. The business problem needs to be well defined and clear in everyone's mind. Then, consultants pay attention to the return on investment that the AI implementation will bring. Indeed, the investment needs to be lower than the cost reduction obtained. A last factor that Accenture takes into account is the shift that is induced in human labor and the impact on workforce. Also, the client's organization needs to have a clear strategy and vision of digital transformation including AI capabilities. If any of these criteria is not satisfied, the success probability of the project is almost zero. But if all those conditions are met, Accenture has a huge amount of AI capabilities that is ready to be implemented in client's organizations. Among others, they have computer vision, machine learning, deep learning, chatbots, robotic, automations, etc. The choice of deploying a capability rather than another one relies on the business problem that is met by the client and the strategic agenda of the firm (Amez F., personal communication, March 31, 2020).

The implementation of AI in their clients' businesses is becoming crucial for those three multinational consulting firms. It allows them to keep up with the pace of development of those emerging technologies and propose the latest trends to their clients. Even if they already deployed a lot of different AI capabilities, there is still room for improvement and the strategy of Deloitte, PwC and Accenture is to become one of the leaders in the AI's field.

3.2.2. Middle-sized company

As explained before, we conducted an interview with one middle-sized company, Delaware. Before going deeply in the subject, let us make a summary about the way Delaware has

developed augmented technologies. Its real AI implementation started in 2018 when the company decided to create a data science team. This team still exists and has to constantly evolve to keep up with the market's trends. The company explains that, because it is younger, it is running a bit behind other bigger organizations, such as the ones presented beforehand. Nevertheless, regarding the implementation of data analytics, they already started around fifteen years ago but the type of AI that is deployed has changed and has become a major business area. There is the data science and engineering team but also almost ninety other employees reproducing templates to improve them. Moreover, one of their strategy is to become the leader in augmented intelligence. However, they know that AI is broad, and it is impossible to become the leader in all of them (Herthoge M., personal communication, April 2, 2020).

3.2.2.1. AI implementation in firms' internal processes

Inside Delaware, augmented intelligence is used under two different forms. First of all, it is used in the financial department for two main purposes: understand if clients are paying their taxes on time and have a better view on the clients having the biggest impact on the Delaware's cash flow. It helps to have a better accounting management and to further understand which clients should be kept and whether particular services should be deployed for them. Secondly, the company also uses augmented technologies for knowledge mining. They developed an augmented intelligence able to spot people depending on their skills and assign them the suitable project. Indeed, in the consulting sector, people are the biggest asset since the reputation of a firm is based on the consultants who are working. Therefore, it is important to put the right profiles on the right projects. It enables to deliver the highest quality to the clients. Nevertheless, in a growing company, it becomes more difficult to know all the skills consultants have (Herthoge M., personal communication, April 2, 2020).

3.2.2.2. The extended offer to the client

In order to broaden their scope of solutions, Delaware has developed multiple automations.

First, Delaware uses **computer vision**, which defines the ability of a computer to recognize images thanks to an augmented intelligence system. The purpose is to help companies that are aiming at reducing repetitive tasks otherwise manually done. Indeed, they want to give opportunities to consultants to focus on more valuable tasks that machine cannot do. Currently, companies on the Belgian market mostly use that AI solution for quality inspection (Herthoge

M., personal communication, April 2, 2020). It means that the final product, instead of being checked by a person, is monitored by a machine. It improves the quality as the machine will make less mistakes than a human. It generates a business growth and it is cost-effective (Beebe C., 2020).

The second technology developed for the clients is the **Natural Language Processing** (NLP) (See Section 1.1.2.3.) An example is the automatic reading of resumes. The goal is to find similarities between what the machine reads on the CVs and words that have been defined beforehand. The machine is then able to automatically select the best resumes that have been received. It is also useful to solve issues related to language detection. For instance, if a law about climate change is written in French, a user looking for a law in Dutch will never find it. Adding an AI can help to look throughout all the several texts in multiple languages to find the best match to the user's request (Herthoge M., personal communication, April 2, 2020).

Then, Delaware uses AI solutions aiming at **solving optimization problems**. It is more often applied for highly structured mathematical problems. An example is the planning issues companies can face. Those are called linear optimization programming. Nevertheless, regarding planning concerns, a human should always be there for unexpected issues, but the machine can help on a daily basis (Herthoge M., personal communication, April 2, 2020).

Finally, the **basic data science** is also part of their solutions. They define this last type by all other technologies that can be applied under one form or another in a client's organization. The biggest interest in this area is the demand forecasting to better understand the production needs and the workload of the different jobs (Herthoge M., personal communication, April 2, 2020).

These are the four services offered by Delaware to their clients. It is pushing for augmented technologies and consultants are convinced that AI is and will be more and more necessary for a company to evolve and follow the evolution pace. Nevertheless, they are also convinced that augmented technologies must be seen as a complementary service for the daily business but is not replacing the work humans could do.

3.2.3. Small companies

Finally, after large and middle-sized companies, we interviewed two small firms. This third vision was necessary to deeply understand the scope in which companies can implement AI but also the limits they face compared to other bigger organizations that have more resources.

Although both companies, Irex Consulting and Argafin, are SMEs, three major differences between them still need to be kept in mind. First, they are operating in distinct sectors: the energy sector for Irex Consulting and the financial sector for Argafin. As the business area plays a major impact on the pace at which augmented technologies can be implemented, the AI's development is at different levels. Secondly, while Argafin has 14 employees, Irex Consulting currently employs around 50 people. The final distinction between the two firms is the clients with whom they are interacting. For Irex Consulting, they have both small and large companies and at the international level: France, Belgium and Germany. In contrast, Argafin is only acting with smaller players in Belgium, mostly SMEs. Therefore, even in the organizations they are reaching, some differences can be spotted.

3.2.3.1. AI implementation in firms' internal processes

Looking at the augmented technologies inside the companies, both firms are at the same level with no AI implemented in their internal processes.

Both have less than fifty employees and have been established less than ten years ago. They both consider that they do not need the help of an augmented intelligence to find the perfect solution to offer their clients. Indeed, acting in small companies and SMEs only brings little problems, which can be solved without any AI (Deltenre A., personal communication, April 9, 2020). Moreover, developing an AI is not optimal compared to the cost it generates and the revenue it could bring. Indeed, helping 500 000 consultants or 20 consultants with a machine does not bring the same Return on Investment. As Sagacify explained, having a sufficient ROI is one of the major factors considered when developing an AI. As an example, implementing an automation for bills in a SME would have less sense as the amount of bills that is received every month is around 300 while it approaches 3000 for a bigger firm.

Also, according to Irex Consulting, there are other problems to take care about before integrating AI in a small structure. Before developing augmented technologies solutions, more

general problems need to be tackled such as having a clear and structured knowledge base, the way of working, the marketing, the selling plan, etc. Indeed, if the company does not know the way they will proceed, it is impossible to create an adapted solution (Deltenre A., personal communication, April 9, 2020).

However, even if they are not calling it AI, Irex Consulting has developed a pricing tool and has an internal department developing mobile apps with mathematical problems (Deltenre A., personal communication, April 9, 2020). It is not a process developed to help consultants in their daily job, but it still helps sparing time.

Looking at internal implementations in smaller companies, the conclusion that they are running behind can definitely be drawn. Indeed, due to factors such as the idea that they first need to be totally developed, AI is not their priority.

3.2.3.2. The extended offer to the client

In this part, the distinction between the two companies needs to be made. Indeed, as they are not acting in the same sector, services asked are distinct and the technological level is, thus, different as well. On the one hand, Argafin is providing financial services based on the system the client has already implemented in his company. Indeed, the consultant has a financial director role to help having a better financial overview of the company's activities. The idea is not to bring a solution to help the accounting service but to become a real team member of the internal accounting department (Deboot L., personal communication, April 8, 2020). On the other hand, Irex Consulting is providing solutions to improve the efficiency of the client's company. In this view, they are asked to come up with solutions and AI can, then, be seen as an efficient one (Deltenre A., personal communication, April 9, 2020).

Regarding Argafin, in the financial sector, they have no AI solution that they bring to their clients. Indeed, they are adapting to the solution the client already has and extract the financial data based on those existing processes. They are using the program that is already implemented because their clients are not looking for new solutions. They are looking for financial directors able to help them providing better financial indicators than they already have. Hence, clients are already working with complete programs including Microsoft Excel and other more developed propositions. Although they currently do not have any AI solution offered to their clients, Argafin knows that it could bring a higher value to their company. Being able to bring

more than a service by adding a product to implement in the customer's company could be an asset for the firm. Indeed, some of their biggest clients start asking for Machine Learning even if it is not a major trend yet. For most of the clients that are small-sized companies and SMEs, the budget that they have is reduced and, although having an AI could considerably help to replace repetitive tasks such as encoding bills, they do not have the money to afford one of those. Moreover, in a small company, there will be a reduced need for automating tasks, as there are fewer bills, contracts, etc. Nevertheless, Argafin is thinking about using Machine Learning for the handling of some repetitive bills, as the company is convinced that having an AI product could be an advantage. However, having an advantage by developing AI does not mean having a disadvantage if they do not have any AI product since it is not part of their business scope yet (Deboot L., personal communication, April 8, 2020).

Looking at Irex Consulting, they are already implementing Machine Learning (ML) in the processes of their clients for three years. As the energy sector, which was quite stable for many years, is now subject to a lot of changes with the development of renewable energies, they need to adapt fast. To do so, ML seems to be a great solution since it helps to have clear forecasts. According to Adrien Deltenre, it is not that complicated to implement ML and it helps a lot. Indeed, it reduces the time a human would take to achieve a task. For instance, for wind turbines, only five indicators can already help to make a clear and detailed forecast for the day after. However, a human can hardly analyze five indicators given the large amount of data to consider. The demand for these ML processes is quite high since, for Irex Consulting, 20 to 25% of the projects need the help of AI. Nevertheless, they are not developing these AI solutions by themselves but are establishing partnership with intermediaries recommended by Irex clients (Deltenre A., personal communication, April 9, 2020).

In conclusion, in both sectors, Machine Learning seems to be the best solution to solve problems faced by their clients. Indeed, both in financial or energy sector, it helps to gather all the data in one place and process them more quickly.

3.3. Economic and Organizational impacts of AI

3.3.1. Economic impact of AI

Along all the interviews conducted, we addressed the economic impact of implementing AI in consulting companies and in their clients' businesses. Indeed, the ROI needs to be positive through the new technologies' implementation. The economic impact is a crucial argument to

engage digitalization in a company and is a factor that is highly considered by every client before investing in an emerging technology.

All companies agree that AI is be a huge economic advantage for them. Indeed, it enables organizations to be more efficient. Increasing their production with less time needed and fewer employees involved is a benefit that will, in the end, have a positive economic impact on the firms that decide to invest in emerging technologies such as AI (Cop C., personal communication, March 20, 2020; Herthoge M., personal communication, April 2, 2020). Furthermore, AI allows firms to build a strong competitive advantage and to improve the quality of their products or services. In fact, another benefit of AI is the accuracy and the quality of the capability. Implementing AI enables firms to avoid making some mistakes and reduce the time spent on tasks in order to reallocate this time differently.

All the benefits that are brought by the implementation of AI contribute to a positive economic impact for firms by being timesaving and more accurate. This enables consultants to focus on tasks with more added value (Beuvens F., personal communication, January 23, 2020). As an example, during one of the projects of Delaware, the return on investments after having implemented the augmented technology solution was 200 - 300%. Therefore, the company provided with AI was able to decrease its prices. As competitors, it is important to follow up the pace of innovation to remain competitive and not have higher prices than other firms (Herthoge M., personal communication, April 2, 2020).

Felix Amez, the Innovation Director of Accenture, added that *"AI can only be a competitive advantage for an organization if the investment is in the strategic agenda of the firm".* Indeed, implementing AI needs to have a purpose and be part of the firm's vision in order to have a high success rate. If these conditions are met, the economic impact of AI's implementation can happen through two channels. On the one hand, AI can contribute to the development of new services and products. For example, Adobe has a capability called Generative Design, that is able to automatically design multiple proposals for a product. Those kinds of automations help companies to have newer products but also to speed up their market access. On the other hand, AI can contribute to the cost reduction. As an example, AI and predictive models are used to come quicker with new proposals such as medicine. When a new vaccine is developed, it is used to improve the efficiency of the firm and come as quick as possible with a new solution. Those automations have a purpose of increasing the efficiency of the company and, in the end, decrease costs (Amez F., personal communication, March 31, 2020).

Nevertheless, two companies that we interviewed, Irex Consulting and Argafin, added that, for smaller organizations, the AI does not bring enough capital gain. This lack of capital gain and the limited budget of smaller firms does not allow them to massively invest in the implementation of AI in their firm (Deboot L., personal communication, April 8, 2020; Deltenre A., personal communication, April 9, 2020). We can thus notice that an economy of scale principle can be applied. It is defined as a cost reduction when the number of goods produced is increasing (Kenton W., 2019). The benefit for smaller firms to implement AI is thus restricted and more interesting for bigger organizations where it will have a bigger impact.

3.3.2. Organizational impact of AI

A second question that we addressed along the analysis is the opinion of the interviewees on the possible impact AI could have at the organizational level. The technologies induce major issues and risks regarding the loss of jobs.

The overall idea that we extracted is that augmented technologies do not decrease the number of jobs. The same number of workers is still be needed in firms. However, the type of jobs performed by humans changes by being more focused on tasks that require cognitive skills.

Employees would shift from repetitive tasks to missions with more added value (Beuvens F., personal communication, January 23, 2020). Indeed, machines are perfectly efficient in executing repetitive tasks. They can execute those faster than a human and 24/7. It helps to considerably increase the organization's production. People would be exempted from these unsatisfying tasks and be focus on others, bringing more self-satisfaction. Nevertheless, even if it seems easy to spot the repetitive tasks, it is somehow difficult and requests for a long process. According to the interviewee of PwC, *"it requires to make inquiries, going to every people in the company and see the way they work on a daily basis and hence, what are the tasks that could be automated"* (Cop C., personal communication, March 20, 2020). For instance, in a consulting company, the CVs always need to be up to date. An augmented technology could automatically adapt them, the variable cost would considerably reduce. And at a low scale, it would spare one hour for each consultant every 3 months. But, at a higher scale, if you have 100 consultants it means 400 hours annually saved, thus, 50 entire working days (Cop C., personal communication, March 20, 2020). This economy of scale is consequently significant as the number of consultants increases. As automations would enable consultants to spare time,

workers would need to adapt in order to handle the new tasks. This might bring to jobs loss if people cannot accommodate (Amez F., personal communication, March 31, 2020).

Moreover, in the hiring processes, a higher qualification would be required (Beuvens F., personal communication, January 23, 2020). To illustrate this idea, we can make a comparison with the first industrial revolution. At that time, manual tasks have been replaced by machines. These are tasks that seem unthinkable to do without machines nowadays. For instance, everyone is cleaning his clothes with a washing machine and nobody thinks about doing it manually anymore. People who were doing the washing needed to learn using the washing machine as it was more efficient and had, afterwards, more time to perform other tasks. It is the same in companies. Consultants would have to learn to use the CV automation and then would have time to execute other tasks.

This aspect is highly interesting because the machines have a high fixed cost but in the long term, it is more interesting than paying variable costs for humans (Cop C., personal communication, March 20, 2020; Leigh A., 2019).

However, there are factors that a machine cannot replace. A consultant brings his or her knowledge to the client's company and helps the organization on two different levels. First of all, he would analyze the situation to understand the best solution that could be brought to the client. This first aspect could be supported by an intelligence if the program is trained with many cases. Indeed, technologies such as Machine Learning are highly efficient when it comes to gathering a huge amount of data and finding the perfect solution (Beuvens F., personal communication, January 23, 2020). Nevertheless, if the situation differs a bit, the machine would not be able to adapt an existing solution to a specific case. Once the solution has been found, the consultant needs to present it to the customer in the best possible way so that it is accepted. Afterwards comes the implementation, the answers to questions from the client company's workers and the role of a reference for that change. For instance, if workers are scared about the use of the technology or not totally convinced, the consultants need to create a strong trust relationship to make them confident. This trust between the organization and the consultants would have a positive impact on the perception of the technology proposed. It is therefore the emotional aspects to build this trust relationship that the machine is missing. The overall idea is, therefore, to say that consultants' job could be supported by machines, but humans still have cognitive abilities that machines do not have. Indeed, they have capabilities such as creativity, building relationships and building a constructive conversation that are not

deployed by machines. Therefore, at least in the coming years, humans will not see their jobs replaced by a machine (Beuvens F., personal communication, January 23, 2020; Cop C., personal communication, March 20, 2020).

Another idea about AI and the way it could impact organizations is that it would change the jobs' nature. For instance, the job of a consultant would not be replaced by a machine but would be impacted by the complementarity between the machine and the consultant. Therefore, a consultant not using the machine would be of lower quality and, more inclined to disappear (Paridaens T., personal communication, March 26, 2020).

Moreover, according to Deloitte, the increase in use of augmented technologies would create three categories of jobs.

At first, there would be the **AI creators**, who are the people writing the algorithms necessary for machines to work properly. These algorithms can have single or multiple purposes. The difference between the two types (single or multiple) is the number of tasks processed at the same time.

Then, there would be the need for **AI explainers**. Those are the people able to explain the code and the way it has been written. They would need to have a perfect understanding of the entire environment.

Finally, **AI sustainers** would also be necessary to make sure that the technologies are following an ethical framework.

Furthermore, it would also create many jobs in maintenance, technical hardware, data scientists, etc. The most important is to keep in mind that the AI implementation would create many other job categories. Organizations should take advantage of it to improve their performance (Paridaens T., personal communication, March 26, 2020).

3.4. Other comments

3.4.1. Ethics / legal

AI has an impact on the law of a country, and it raises some questions that were not existing before. Indeed, the fact that some machines could replace humans in several domains induces some changes in the legal structure of the environment.

One of the examples to illustrate that challenge is the development of self-driving cars. It is an AI that can take decisions instead of a human but what if the car hits somebody while it is driving? Whose fault is it? The car is a machine and cannot be blamed, but what about the driver, the manufacturer? That is an example of problem that is currently not covered by the Belgian laws (Beuvens F., personal communication, January 23, 2020; Herthoge M., personal communication, April 2, 2020). It is still going to need some time until the regulation can cover every case that is implied by the AI implementation.

Nevertheless, according to Felix Amez from Accenture, *"Innovation does not have to wait for regulations from the government. Innovation needs to be done in a free spirit mind. So, it is not innovation that follows regulation but regulation that follows innovation"* (Amez F., personal communication, March 31, 2020).

Last but not least, another trend is starting to grow besides the pure business and technology dimensions: it is the aspect of **ethical AI**, also called responsible AI. It induces the development of more conform, transparent and unbiased solutions. As an example, while using Google and searching for the word "Managers", the images will mostly represent males. The opposite can be observed if "Cooker" is typed, a majority of female images are shown. So, companies do not only have to implement AI, but they should develop the responsible context of AI. In order to meet those expectations, other departments start being added to new technologies development such as risk, legal or CSR departments (Amez F., personal communication, March 31, 2020; Cop C., personal communication, March 20, 2020).

3.4.2. Data sampling

Even if companies are open to make changes in their production processes to go from manual to automated tasks, there are often major problems related to the lack of proper databases available. These problems increase the implementation time and expand the difficulty for consultants to properly realize their job. Indeed, augmented technologies need to work with highly structured data. They can act fast but if there is any bias in the database, there will be bias in the results (Beuvens F., personal communication, January 23, 2020; Paridaens T., personal communication, March 26, 2020). Therefore, one of the major works to be done before implementing any AI type is to make sure that the database is clear and usable (Beuvens F., personal communication, January 23, 2020). If the database is not usable, there is no sense in

implementing a system that will not be able to properly work (Cop C., personal communication, March 20, 2020).

Moreover, not only having a proper database is needed, but there is also the need to **access the data.** One of the instances regulating data is the General Data Protection Regulation (GDPR). This institution has a major influence on the work of consultants, and it can slow down their processes. On the one hand, this data access issue can have a major influence on the work of consultants with their clients. For instance, in one of their projects in a bank, PwC needed three weeks to have access to the data because of the possible regulations, documents to sign, etc. It involves thus a longer process (Cop C., personal communication, March 20, 2020). On the other hand, the restricted access can also impact the internal development of AI in the consulting firms. Indeed, consultants have documentations that every employee cannot access because of confidentiality or security clauses. The amount of data that can be used to develop an AI is thus limited and it can induce a reduced efficiency. For instance, PwC wanted to implement an AI system to help consultants in their daily job by proposing solutions to a client based on previous cases. This program met some issues because the amount of accessible data was insufficient and its use is now very limited (Cop C., personal communication, March 20, 2020).

3.4.3. Start-ups/scale ups

In all business areas, start-ups and scale-ups are known for being more flexible and agile than bigger companies. Those last years, the increasing development of start-ups has had an impact on the competition in the sector. As an example, 100 113 new enterprises have been created in Belgium in 2018 (Belga, 2019). This large number of new small businesses has become real competitors, even for multinational consulting companies. In order to deal with this new deployment, consultancy organizations have found ways to avoid losing market shares and keep their business. All the companies that we interviewed have developed partnerships allowing to have the benefits of young start-ups while remaining a big organization (Cop C., personal communication, March 20, 2020; Paridaens T., personal communication, March 26, 2020).

For the consulting service market, benefits of those partnerships are multiple. First, those emerging business have an intellectual advantage and a superior knowledge, which allow them to develop better solutions. Consulting companies benefit from this knowledge thanks to these

partnerships and can then propose those more advanced solutions to their client's businesses. Then, those emerging start-ups are known for their ability to adapt more easily and more quickly to clients' expectations than larger firms. This agility and flexibility are two major benefits for those consulting firms that are much more subject to internal regulations.

Regarding the start-ups and scale-ups, the problem that they are facing is the go-to-market strategy. Bringing their products in a global market is the difficult part of their business and consulting firms can help thanks to their large network and international market.

There are also other options regarding the way larger firms deal with the increasing development of emerging businesses. Firstly, one of the solutions that can be applied by consulting firms is strategic minority investments in those start-ups, as part of ventures. Last but not least, the pure merger and acquisition which consists in acquiring either the company or the individuals of a firm. In that case, start-ups are integrated in larger organizations and become bigger competitors (Amez F., personal communication, March 31, 2020).

3.4.4. Change resistance and reluctance

Another major point that needs to be tackled is the typical change resistance and reluctance coming from humans when it comes to modify the perception they can have or the way they are acting. Indeed, being replaced by an automation can raise major issues and reluctance in people's minds. It is thus the consultants' work to drive this change in the company in order to make both employees and managers agree on starting the digital transformation. Nevertheless, although companies are resistant, they know that the transformation needs to be done because if they fail a major turning point, the company can collapse. For instance, if they do not implement AI, they will lose competitivity since they will produce at a higher cost and with a lower quality. Therefore, clients will go and buy to the competitor and, thus, if there is no client, there is no business (Beuvens F., personal communication, January 23, 2020).

Before entering the details about the way change resistance is perceived in businesses, let us first understand the way people perceive change in the society. It can be illustrated through the Roger's curve (See Figure 5). This graphic is based on two factors: the time and the proportion of adopters. Roger divides people into five categories starting with the innovators who adopt the technology as soon as it appears. They are the first willing to make new experiences and often spend money on it. Then, people will follow until the majority is reached

because they will see other people adopting the technology and being convinced by it. Finally, the laggards will be the latest ones adapting to the change (Gailly B., 2019).

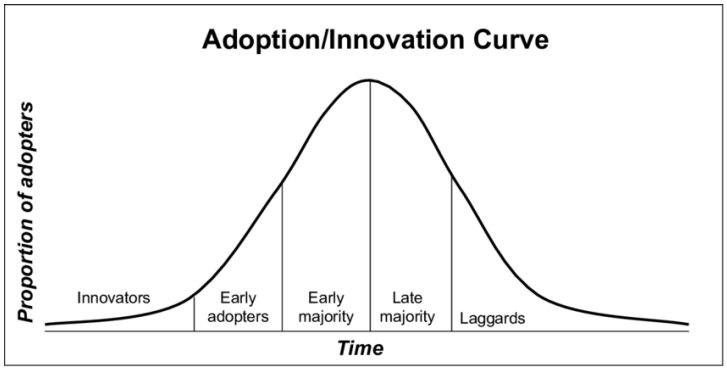

Figure [5]: Adoption/Innovation Curve (Hovav A., 2003)

This curve works for people but also for companies. It describes someone based on its adoption speed. There are the innovators, being the first implementing Augmented Intelligence. Then, there are others following because they see that it works well and that they know they need to adapt if they want to keep up with the improvement's pace. Indeed, according to Delaware, if, out of two companies in the same sector with the same problematic, only one accepts to develop the AI solution, this one will be the one with the highest potential (Herthoge M., personal communication, April 2, 2020). An example that is maybe not a direct effect but still pertinent is that, in critical situations as the Covid-19 pandemic, it brings issues to businesses that have reacted against technical improvements. Indeed, companies having refused to deploy programs with which people could work remotely are facing major challenges during those hard times because their employees are not able to provide an efficient work from home (Herthoge M., personal communication, April 2, 2020). Nevertheless, the degree of adoption also depends on the advantages that the technology brings to its customer. It means that the more the technology seems a better solution than existing solutions, the more it will be accepted (Gailly B., 2019).

A reason that could also explain the change resistance is the probability of making mistakes. Indeed, machines can have some bugs. It will induce some uncertainty; people will ask themselves "Why did we invest in it?". To counter this negative view, consultants need to demonstrate how augmented technologies can bring superior results, better insights and improve productivity (Cop C., personal communication, March 20, 2020). Showing that some successful implementations already took place in other clients' companies is also a winning

strategy. A comparison can be made with traffic lights: it is all about trust. Indeed, this AI is analyzing the traffic and trying to react the most accurately possible according to it. This is a winning implementation because drivers started trusting those traffic lights and now, drivers are trusting the fact that other drivers respect this technology as well (Paridaens T., personal communication, March 26, 2020). Again, if AI is well understood and helps in reducing the complexity and cost of products, then people will accept the solution. There is thus a need to come progressively with the solution so that people can integrate it and trust it.

Looking at the consulting service market, it is part of consultants' work to put a high effort in convincing the management of the client's firm to implement these augmented technologies. To do so, the first step is to understand the problem the client's company is facing. Indeed, if without understanding the problem, the consultants come to the conclusion that AI needs to be used, the company will not consider the change and therefore be more resistant. Then, if AI seems the best fit to counter the problem, consultants need to make people aware of the different technologies existing that could help for the task needed. Indeed, it is only from 2016 that companies and individuals started to know about AI and ask information about it. As it is quite new, it might not be the first solution coming into organizations' minds (Beuvens F., personal communication, January 23, 2020). After having made people aware of possible augmented technologies solutions, the consultant also needs to demonstrate the efficiency, to make people trust the technology before they use it. For instance, in one of Deloitte's project, a solution was able to work 100 times faster than a human and with 92% accuracy rate while the one of humans is only 50%. It was only after having seen it that the client was happy and more willing to put AI in the future (Paridaens T., personal communication, March 26, 2020). While implementing augmented technologies, it is therefore needed to start with basic automations, gain people's trust before going further with more specialized AI. Not only the efficiency but also the positive ROI needs to be demonstrated to convince companies of using AI (Amez F., personal communication, March 31, 2020).

Another major point that we figured out along the analysis is the highest change resistance and reluctance occurring in the Belgian market compared to its neighbors such as the Netherlands and Germany. Belgians are disturbed by the possible job loss that AI could involve. There is no real reason explaining why Belgians are more change resistant apart from the culture. There is, therefore, a major work to do on the people's perspectives to explain that AI will, of course, destroy some jobs by automating repetitive tasks, but it will enable to increase

companies' performances by creating more interesting jobs for others. Hence, a type of augmented intelligence used in Belgium is sometimes the co-intelligence, meaning that a machine and an employee are working in collaboration on a project. It helps to give people time to consider and trust the machine. Also, in the beginning of a process, a machine needs to get a high training to enable delivering a high quality. Therefore, starting with a cooperation phase between the machine and the human helps to have a better understanding of the possible collaboration between the two and then increase the acceptance rate (Herthoge M., personal communication, April 2, 2020). This change resistance is quite in contradiction with the number of start-ups and scale-ups growing today in Belgium. But, according to PwC, Belgian companies are improving. Nowadays, they have structured and unstructured databases. The next step is to implement augmented technologies, but they do not know what should be developed and how to deploy it. It is at that point that the consultants' job is crucial to find the best solution and demonstrate that the ROI of investing in such automations is positive and high. To realize so, not only the management but all the impacted people need to be involved in the process. Indeed, they need to understand the purpose and be able to use the tool (Cop C., personal communication, March 20, 2020). This change resistance is even there in some of the laws. For instance, there are still laws concerning cassettes but today nobody is using these cassettes anymore (Herthoge M., personal communication, April 2, 2020).

According to Deloitte, the United States and China are the countries that have a high acceptance of these technologies and they are leading the market in the sector. In China, everybody shares their data because there is a trust in the way these data are used. For instance, if they give their personal data to a shop, they are convinced that the time after when they will come back, they will get recognized and therefore have a discount (Paridaens T., personal communication, March 26, 2020).

Taking everything into consideration, AI is definitely an area of change resistance in people's minds. They are, by nature, change resistant and reluctant but they are also afraid of the possibility of the machine to make mistakes. Finally, the economic impact such as the possibility of having a negative ROI is also an area of concerns. Consultants need, therefore, to be convincing when they present such technologies to their clients.

3.5. Conclusion of the chapter

Along this chapter, we exposed many different concepts thanks to the interviews that we conducted in the companies. Asking the questions to all companies helped to understand the current position of Augmented Intelligence technologies in the consulting service market.

First, only major companies started to develop AI capabilities in their internal processes to help consultants in their daily work. On this side, Deloitte and Accenture are the most developed companies as they already have a program implemented. On the Deloitte side, this program helps consultants in the administrative tasks. Indeed, it is doing the repetitive administrative work of filling in contracts, etc. On the Accenture side, the program is aiming at supporting the consultant in every step of a project at a client's business. As a conclusion, regarding the possible influence that AI can have inside a consulting firm to help as an assistant for consultant, the conclusion is that there is still room for improvement and that consulting organizations are not that advanced on that path.

However, the analysis is different concerning the other perspective of the paper that concerns the way consultants are implementing augmented intelligence solutions in clients' businesses. It is much more developed with not only the biggest actors developing AI departments but also smaller firms such as Irex Consulting that is using Machine Learning to improve their clients' processes. Nevertheless, the AI for AI is not a solution and each firm needs to adapt their automations depending on its level of technology. It needs to be a progressive process that starts with the implementation of a clear, structured and usable database. Only after, the AI process can start to be deployed.

Looking at the advantages that AI brings according to companies, all agree on the positive economic impact of automating some tasks. Moreover, everybody seems aligned that it will not destroy any job, but it will involve a transition to jobs with AI assistants. Hence, the work quality performed by each individual will increase. People will then need to adapt fast to these technologies as they will need to work along with them.

Moreover, we investigated many other impacts. First, we detailed the ethical and legal aspects running behind AI. There, the idea that both concepts need to evolve along with the innovations has been understood. The second problem that can run while using AI is missing data or unstructured databases. Consultants need to solve these problems by having access to

the data, which can sometimes be hard because of the legislation. Then, they need to build a perfectly structured database to avoid any bias in the results. Furthermore, we also detailed the possible association between start-ups and scale-ups. Indeed, along the interviews, the fact that consulting companies were often establishing partnerships with smaller structures was shared. It helps these bigger companies to have up-to-date solutions without needing to develop them. Finally, we also investigated the possible change resistance coming from companies about a possible AI implementation. It is another major part of the consultant's job; to convince the company to use AI in their internal processes.

CHAPTER 4 – DISCUSSION

In the previous parts of our paper, we made a clear distinction between what has been seen in theory regarding AI implementation and what is concretely happening within consulting companies. Our goal here is to identify the potential gap existing between these two visions. To do so, we answer the research question cited in the second chapter of the paper (See Section 2.2):

"Nowadays, how do consulting companies manage Artificial Intelligence in their daily processes, both in the way they advise it to their clients and the way they implement it internally to improve the work quality of the consultants? What are both the economic and the organizational impacts of this AI implementation?"

Along this chapter, we answer this question based on the four research propositions that we previously raised (See Section 2.2). To provide a complete explanation, we complete the theoretical analysis with our practical investigation.

Moreover, we highlight the limits of the paper that need to be considered. Finally, we describe some suggestions regarding further work which could be done on the same subject. Indeed, our work could be completed by other complementary researches that we present at the end of this section.

4.1. Conclusion

4.1.1. First research proposition

The first research proposition was based on our belief that many consulting companies *already started their AI implementation* to the clients' businesses. If not already started, we thought that consulting companies had a clear strategic plan to start this implementation. Also, we specified the idea that consultants could face a high *change resistance and reluctance*.

We tackled this question in nearly all interviews. Indeed, many companies started the AI implementation in their clients' processes. Those are the examples of Deloitte, PwC, Accenture, Delaware and Irex Consulting. However, it is not the case of Argafin but, as explained before, they do not have the same business model. They help with the processes and programs the client's company already has. Argafin can, thus, be excluded from the analysis for this point.

The most used technology is Machine Learning. But not only: many other AI tools are also deployed. For instance, Deloitte has robotics, process automation and software robots in its range of solutions. Accenture, PwC and Delaware are also using other technologies such as computer vision, chatbots or Natural Language Procesing (NLP). Looking at Irex Consulting, it is more ML based for now, but this seems to be normal since it is a small structure that do not want to invest in other technologies. In all these possibilities, the diversity of AI can be recognized. Indeed, even if the company can propose the same technology range, each automation needs a specific program to be deployed (Beuvens, F., personal communication, January 23, 2020).

However, the major issue slowing down the technological improvement process is the **change resistance and reluctance**. This aspect is seldom considered in theory but highly important in practice. It is slowing down the innovation process in some businesses if workers are change resistant. Consultants must, in such situations, take time to explain the process and convince their clients of the stakes. On the one hand, they need to demonstrate the positive organizational impact of AI. On the other hand, they must clearly show that the ROI will be positive in the long term. In this view, we are also convinced that, as more companies invest in AI, the willingness of other companies to adopt AI will increase. Consulting companies will therefore face smaller difficulties as the adoption rate increases. More than ever, this change resistance is particularly high in Belgium.

Overall, we can definitely validate this research proposition. First, nearly all consulting firms have started to add AI technologies in their offer. Then, the change resistance and reluctance are indeed one of the major stop AI faces. Consultants need hence to adapt their behavior to convince clients.

4.1.2. Second research proposition

Secondly, we made the assumption that *companies already started to implement AI in their internal processes to rationalize their repetitive and administrative tasks*. They understood the positive impacts that AI could have on their business. The two major positive impacts raised in theory are confirmed in practice.

At first, AI could allow consultants to **save a considerable amount of time**. It can be done either by helping in some of their tasks or in the decision-making speed. Companies have well

understood this concept. In this perspective, Deloitte implemented a contracts' management program automating the contracts between Deloitte and the clients. Consultants can spare this time to handle other tasks with more added value. For the other businesses where it is not clearly developed yet, the strategic plan is existing. At PwC, the idea of implementing a program able to renew CV has been raised. It would avoid consultants to refresh it in a different template every three months and save precious hours.

Then, theoretically talking, **AI improves the accuracy of the analysis** thanks to its ability to analyze huge amounts of data in a short period of time. It helps the consultant to suggest better strategies to the clients and be more focused on value-added tasks. In this view, Accenture has developed a platform called MyWizard aiming at helping consultants in the entire life cycle of a project. Delaware developed a knowledge-mining tool able to put the right employee's profile on the most suitable project. It is provided with all employees' profiles and abilities and can identify who is the best worker for a specific project. Irex Consulting has also implemented a pricing tool. It helps to make contracts before the work starts. Deloitte is also currently trying to develop an automation aiming at helping consultants to make the best decision while facing a problem. However, the system is not provided with enough data yet and thus, not largely used. PwC is also looking for a solution to help consultants to take the best decision while facing an unknown situation.

This research proposition is therefore validated as the two major advantages that AI can bring are applied by companies. All organizations agree that saving time and improving accuracy help to increase the work quality. However, although AI can bring massive improvements, it is not adapted to all companies. For example, Argafin believes that AI is useless, at least for now. While acting as financial directors, they need to adapt to processes that the client's firm already has. Moreover, as it is a small business, implementing AI does not bring a sufficient ROI. Depending on the size and the sector of the firm, the AI interest can change. All companies also agree that, when they are facing a problem, augmented technologies are not always the best solution. AI for AI's sake is never a good idea.

4.1.3. Third research proposition

Then, we wanted to discover if AI was going to have an *organizational impact*. In this perspective, we made the assumption that augmented intelligence will not destroy jobs, but create new ones asking for a complementarity between the worker and the AI.

All interviewees agree that an AI could not replace a human because there are too many aspects that a machine cannot catch. For instance, the ability to interact with a client to build a real trust relationship. Indeed, a machine is not be able to feel the mood of the interlocutor and might, therefore, not act as expected. Then, there is also the inability to deal with uncertainties. Machines are trained to solve problems by gathering huge amounts of data but cannot deal with something they never did. In conclusion, all aspects linked to the emotional intelligence cannot be replaced by a machine or, at least, that step has not been reached by AI so far.

Although AI does not destroy jobs, the company still needs to organize itself if they want to provide the best solution to their clients. They need to invest both in technologies and in people.

At first, to invest in technologies, they have two solutions: develop strong partnerships with other firms or deploy the technology internally.

To make partnerships, consulting companies have a broad range of options. Indeed, many incumbent companies understood the high opportunities behind technology. But, besides them, there are also many new businesses entering the market. They often have a high expertise level. Also, as they are mostly start-ups and scale-ups, their structures enable them to be more flexible and agile. They are offering solutions and expertise that bigger companies cannot provide. For instance, the cleaning and labelling of data. All the companies that we interviewed agree that establishing partnerships with start-ups is the best solution to access the latest new technologies within the shortest period of time. Indeed, consulting firms do not always have time for an entire production process with trials, back and fronts, etc. It also makes it possible to combine the respective strengths of both structures: budget and organization of the large company with the agility and ideas of the smaller one. It is also an advantage for the smaller structure, as its go-to-market strategy will be better. They can make partnerships, merge or even make investments as venture.

For long-term technological developments, companies can also internally invest. It means either hiring AI experts or training employees. Delaware followed this second option by creating a data science team in 2018. This team is closely following the market's trends to always propose the best solution to their clients. Also, many other large companies have their own technology department strongly implemented.

But, investing in people also mean providing them trainings to learn dealing with the new technology. This must be done as soon as possible. In this view, PwC developed a digital assistant able to upskill employees. It trains them to get familiar with tools that are internally implemented.

In conclusion, AI definitely impacts organizations. It does not destroy jobs, but the industry needs to always reinvent itself to be able to have the latest technology possible by investing in other companies or internally. Moreover, they have to train their current workforce as they need to deal with these new technologies that ask for a complementarity with the worker.

4.1.4. Fourth research proposition

The last research proposition that we developed is about the *positive economic impact AI could bring to companies*.

Implementing AI is an economic challenge. Whether it is deployed internally or externally, the ROI always needs to be positive for the project to be interesting. Consultants must keep track of all changes occurring to ensure they move in the right direction.

Also, companies should not invest too much too fast, as AI takes time to bring results. If the investment is too big and the results are slow to come, it could lead to demotivation. It means that companies should invest in one product/process at a time. The process needs to be made step by step and employees must follow the improvements.

All companies interviewed agree that investing in AI is only a good idea if the ROI brought is positive, which can be predicted thanks to clear and precise forecasts. Irex Consulting and Argafin are the perfect examples of useless AI. Indeed, economies of scale apply for AI and these firms are too small to have a significant impact if they implement AI tools.

Therefore, AI brings a positive impact if correctly implemented. But companies must always compute a forecasted ROI to make sure about their investments. Moreover, the more the organization is big, the more the ROI is high because of economies of scale.

4.1.5. Other comments

Companies must have a clear and detailed strategic plan while starting to invest in augmented technologies. To do so, there are some other points of interest to consider. Those have been highlighted in theory and also seen in practice.

AI is facing **legal issues**. The decision-making tool of Deloitte, for example, is not used yet because all workers cannot access the information. The technology is thus ready but cannot be used because of confidentiality and security clauses. PwC faced the same problem for their assistant tool. According to Felix Amez from Accenture, it is the legislation that needs to adapt to the innovation, not the contrary. Moreover, François Beuvens explained that some technologies are ready, but the legislation is not. Legal issues are slowing down the innovation effects. Along our interviews, the aspect of responsible AI has also been addressed. Organizations need to take this trend of responsible and ethical AI into consideration in their decisions or investments.

Also, to remain competitive, companies need to adopt a **pro-active behavior**. It means that they need to identify opportunities as soon as possible. These implementations can take place either internally or in the solutions they propose to their clients. It helps to be always updated and avoid lagging behind competitors. In a fast-moving sector, this aspect is highly important, and a momentary lapse could be fatal. To keep innovating, PwC has decided to involve its employees in the process. They developed a platform called Dragon Step that gathers all propositions for internal and external improvements. Other than PwC, companies do not have any special process to monitor those innovations, but they know that keeping an eye on their competitors is crucial.

Although they need to stay up to date, firms should avoid any type of precipitation. AI is a **slow process**. Finding the right partner with the appropriate knowledge and expertise is essential to develop a high-quality solution. Another aspect explaining this slow process is the lack of proper databases. It induces that consultants, before implementing any type of AI, have to take time to build clear and usable databases. If the database is not clear enough or presents bias, the outcome will not be the one expected and it could lead to the failure of the AI implementation.

Overall, the **business model** of the firm needs to be adapted. AI replaces repetitive and administrative tasks that workers are currently doing. They would have more time for tasks with more added value. All companies need to be proactive, to constantly reinvent themselves and do internal mobility. They must also train their staff at each level of the organization to improve the success rate.

4.1.6. Conclusion

As a conclusion, there is no clear gap between the theory and what is concretely developed by consulting organizations. This consistency is even more real when it comes to bigger companies. Indeed, these companies have understood the stakes of implementing AI and have the budget to realize the deployment. They have a clear strategic plan that is aligned with the vision and the mission of the organization. Some dedicated departments have been developed, some partnerships have appeared, and strategic plans have been built to stay up to date. Nevertheless, concerning smaller firms, a bigger gap exists. The interviewees explain that difference by the fact that they have lower budget and fewer employees. The ROI is not large enough for them. Moreover, the willingness of their clients to implement AI is lower and, hence, AI is not the priority of smaller consulting companies.

Our analysis also suggests that AI does not have any negative impact on the Human Resource department of companies. Indeed, the biggest fear of firms and employees is to destroy jobs. Nevertheless, all the interviewees seem quite confident. They believe that the number of jobs offered will even increase a little bit.

Finally, the economic impact of investing in AI for the consultancy service market has been shown as being positive. Even if the initial investment made by consulting organizations is massive and requires a lot of budget, expertise and time, the return on this investment is described as being positive by all the experts who have been interviewed. Nevertheless, a clarification must be made. The economic impact of an investment in AI is positive only if the technology that is implemented is the right one and suitable for this specific firm.

Overall, AI is a real added value for consulting businesses. Whether it is internally or in their offer, AI has become necessary for consulting firms. However, investing in these technologies is not always easy as they need to build strong partnerships or massively invest internally to develop these technologies. Also, they always need to compute the forecasted ROI

before making any operation. Be proactive and careful about AI is a winning strategy that could bring to a better performance if done correctly. But firms should never invest too much neither, they need to find the perfect balance.

4.2. Limits of the paper

During the elaboration of this thesis, we faced some limits that also need to be considered in order to realize where there could be missing information regarding the study. We further explain these limits by illustrating the bias it could have involved on the paper.

First of all, the **worldwide situation** linked to the Covid-19 pandemic and the lockdown in Belgium has implied difficulties, especially regarding the practical analysis. On the one hand, the interviews have all been conducted online and rescheduled several times on the companies' side. On the other hand, the access to libraries and books has been restricted, which induced that the majority of our sources in the bibliography have been found on the Internet. Taking into account those two factors, we managed to have a consistent and relevant sample of consulting firms that we interviewed. We also succeeded in finding consistent and reliable online to support our theoretical analysis. Nevertheless, we found some relevant ones.

Moreover, we decided to only interview companies acting on the **Belgian market**. Some of them are worldwide players but all the interviewees are employed in Belgium. To have a complete analysis, firms from other countries such as China or America might have been interesting. Those two countries have been mentioned several times by the interviewees as being more AI advanced than Belgium. The information that has been collected can thus be biased compared to what is currently happening in the world and in other countries. However, we always tried to stay critical regarding the answers given by the interviewees.

Finally, the **lack of scientific data** on the studied subject has been a limit to build a strong theoretical analysis. Indeed, as the subject of AI has recently boomed, the number of previous relevant studies on the subject is limited. Collecting **real data** enables to make statistics on the subject would have been more complicated. Therefore, we decided to rely on the interviews and the employees' opinions. Nevertheless, as this is one of the first paper on the subject, it provides an overview, but further researches could be made and be focused on precise data.

4.3. Suggestions for further researches

In order to further investigate the subject, several paths could be interesting to take. Indeed, understanding the stakes that the consultancy service market is facing can be done thanks to multiple investigations' types.

A first interesting study would be **deeply analyzing one consulting company** before implementing any AI both internally and in the services that they propose. It would gather an empirical study about the revenues, the employees' number, etc. Afterwards, the company will start by developing two parallel processes: one internal and one external. Once the projects would be and accepted, a second empirical study would be done to see the differences that occurred. This would lead to more precise results regarding the economic and organizational impacts of AI in an organization.

Secondly, an interesting research question could be **to analyze the differences between several business sectors.** Indeed, as seen during our interviews, the development and implementation of AI is different between firms, depending on their size, their needs, etc. Analyzing those variations can help to deeper understand most advanced business sectors. Furthermore, a deeper investigation of each sector could be interesting to have a complete overview of the AI's implementation on the market.

Finally, a relevant work that could be done is to **conduct a global analysis** by expanding the scope of the research. Indeed, some other countries have been mentioned during our interviews as being more advanced regarding AI. That is the case of the United States or China. Therefore, it would be interesting to analyze the difference around the globe that can take place concerning the development of AI. Increasing the number of interviews and have the opinion of firms all around the world would allow to have a clear picture on the current global situation.

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APPENDICES

APPENDIX 1 - Entire AI history

Currently, Artificial Intelligence is a fashionable topic raising many questions both in the private and the public sectors. Indeed, its applications and consequences in the are considerable and could change our daily lives. But even though this topic is only discussed since the 21st century, it has a long history behind. Indeed, some pieces of evidence demonstrate that already in the antiquity, the opportunity of doing things artificially was discussed.

The real Artificial Intelligence's story began in 384-522BC when Aristotle called syllogisms some codified reasoning styles. A few years after, Ramon Llull built a machine, Ars Magna, able to answer questions developed by a set of wheels (Nilsson N., 2009).

In the 1600s, some philosophers and mathematicians including Thomas Hobbes, Gottfired Leibniz and René Descartes believed in the idea that all rational feelings could be thought the same way as algebra or geometry, referring to the previous discovery made by Aristote. They were convinced that all human decisions are based on rational thought and could therefore be learned by programming a device. During the same century, Descartes also examined the concept of 'thinking machines' and proposed a test to determine intelligence.

One century after, in the early 1700s, some philosophers started to raise questions about the possibility of developing machines able to have a human way of thinking. A bit after, Jonathan Swift, in his novel "Gulliver's Travel", talked about a device called "engine" with the purpose of increasing knowledge and mechanical operations using the assistance of a machine (Reynoso R., 2019).

In the following century, only one major change can be pointed out. It occurred in 1872 when Samuel Butler discussed the possibility of having machines with a consciousness in his novel "Erewhon" (Reynoso R., 2019). However, at that time and until the 19th century, Artificial Intelligence was just an idea developed in books, but no real device had been created since the technology was not developed enough.

The discoveries continued in 1921 when Karel Capek, a Czech playwriter, talked about artificially made people, the robots. It was the first time in history that the word "robot" was used. This idea was developed in his fiction play "Rossum's Universal Robots". It was a real

turning point since it was the inspiration for many people who started to invest the possibility of creating robots. Also, it was at that time that many movies showing robots went out. It is the examples of Metropolis or Star Wars (Reynoso R., 2019).

In 1929, the first real robot, called “Gakutensoku”, was built in Japan by professor Makoto Nishimura, with the ability of learning by looking at the external environment. For instance, it was able to learn walking just by looking at the way humans do (Reynoso R., 2019).

A decade later, John Vincent Atanasoff created the “Atanasoff-Berry Computer (ABC)” able to solve up to 29 linear equations simultaneously.

Nevertheless, it was only in 1943 that the first real computer programs started to appear with McCulloch and Walter Pitts creating an artificial neurons’ model aiming at using a considerable number of neighbor neurons. When one of the neurons switched to “on” it means that a lot were used (Robin, 2009). Two years after, Vannevar Bush made the proposal of a system able of increasing humans’ own knowledge and understanding. Then, in 1949, Edmund Berkeley, a computer scientist wrote the book “Giant Brains: Or Machines that Think” highlighting the machines’ ability to handle large amounts of information quickly and with quality (Reynoso R., 2019). The same year, Warren Weaver had the idea of a machine able to translate languages.

However, although the history was already flourishing for many years, many historians consider that AI’s story only started in 1950 when Alan Turing, a famous British mathematician, published an article named “Computing Machinery and Intelligence” in which he detailed the Turing test (Blanchot V., 2018). It was created to explore the possibility of some devices to think and imitate a human’s mind by creating a famous imitation game in which a machine could have an intelligent behavior equivalent to humans by reacting to their actions. The test was working based on a conversation between a human and a machine that would be judged by an external supervisor in the degree of human-like behavior. This judge would be aware that one of the two participants is a machine, but he does not know which one. His role is to determine which player is the human and which one is the machine. If the supervisor is not able to make the difference, the test is succeeded (Petropoulos G., 2017). Unfortunately, this test was just an idea since there were no computer powerful enough at that time (The Royal Institution, 2017). In the same year, Claude Shannon published the first article talking about a

computer playing chess (Reynoso R., 2019). Also, Isaac Asimov created the three laws of robotics (BootstrapLabs, 2017).

Then, in the same decade, the story evolved a lot. In 1952, Arthur Samel developed the first checkers-playing computer program able to play independently (Reynoso R., 2019). In 1955, the first self-learning game playing program was created (BootstrapLabs, 2017). The following year, the term of "artificial intelligence" was used for the first time by John McCarthy, computer and cognitive scientist, when he held the first academic conference on the subject, in Darmouth. He defined it as "the science and engineering of making intelligent machines". This time is considered as the birth of artificial intelligence in scientific domain (Blanchot V., 2018). In 1958, McCarthy developed a programming language for artificial intelligence research called "Lisp". The year after, Samuel said the word "machine learning" to talk about an artificial intelligence program able to play a game of chess better than the one who has created the machine (Reynoso R., 2019). Also this year, the MIT, an Artificial Intelligence based lab has been created.

During the following decade, seven advancements in the history have been made. Firstly, in 1961, an industrial robot called "Unimate" was invented by George Devol. It was the first able of working on General Motors assembly line in New Jersey. Secondly and in the same year, James Slagle developed a technology called "SAINT" (Symbolic Automatic INTegrator) a heuristic problem-solving program. Then, in 1964, Daniel Bobrow created a program called "Student" able of solving algebra problems which can be compared to a processor of current AI programming (Reynoso R., 2019). In 1965, the computer scientist and professor Joseph Weizenbaum developed an interactive computer program called ELIZA at the IT laboratory of MIT able to maintain a conversation with a human. The goal was to show the similarities between the discussion of a robot and the one of humans (Reynoso R., 2019; The Royal Institution, 2017). Moreover, in 1966, Charles Rosen and his team developed the first general purpose mobile robot who is also known as the first electric person. The following year the first science-fiction movie called the Space Odyssey appeared. This movie was showing HAL (Heuristically programmed Algorithmic computer). Finally, in 1968, Terry Winograd created SHRDLU, an early natural language computer program (Reynoso R., 2019).

In 1970, the first anthropomorphic robot in the world, called WABOT-1, was built in Japan at Waseda University. This robot was able to see, move and converse (Reynoso R., 2019). Its conversation skills were limited to Japanese and it was able to move thanks to external receptors

and well as artificial eyes, ears and mouth. It was also able to catch and transport objects thanks to its tactile sensors. According to the scientists, it had the capabilities of a one and half year-old child (Waseda University, n.d.).

Seven years later, the movie Star Wars came out and showed two robots. The first one, C-3P0, a robot able to maintain a conversation in more than seven million forms. The second one is R2-D2 an astromech droid unable of human speech but really good at electronic. In the movie, he is created to do small repairs and co-piloting (Reynoso R., 2019). In 1979, the Stanford Cart was created. The cart was guided thanks to a 2.6 seconds delay between it and the remote operator. The Cart was able to cross a chair-filled room in 5 hours. It was one of the first example of autonomous vehicle (Reynoso R., 2019).

The eighties also brought some considerable changes. First, in 1980, the robot WABOT-2 was built at Waseda University, improved from the WABOT-1 detailed before. It was created with the purpose of demonstrating that robots could also be able of art since it requires human-like intelligence and dexterity. It was therefore defined as a specialist robot (Reynoso R., 2019; Waseda University, n.d.). The following year, artificial intelligence was becoming more and more important not only for engineers but also for states. Indeed, in this year, the Japanese Ministry of International Trade and Industry gave 850 million dollars to the Fifth Generation Computer project who had the goal to develop computer having the ability to converse and translate languages but also to interpret picture and provide some human reasoning (Reynoso R., 2019). In 1984, the movie “Electric Dreams” went out and was figuring a triangle love story where one of the occupants is a computer called “Edgar” (Reynoso R., 2019). This was showing that computers have humans acting by showing some feelings. In 1986, Mercedes-Benz launched cars able of self-driving. It means these cars were equipped with cameras and sensors. The car was able to drive on a road but this one needed to be without humans or other cars (Reynoso R., 2019). Two years after, the book “Probabilistic Reasoning in Intelligent Systems” was published by Judea Pearl, a computer scientist and philosopher. This same one invented the Bayesian networks (Reynoso R., 2019). The same year, Rollo Carpenter was the first to design and program chatbots. He created two of them including one having the ability to act like a human as well as doing humor (Reynoso R, 2019). In 1989, Cargenie Mellon created the first autonomous vehicle using a neural network.

In the last decade of the 20th century, some other changes that occurred need to be detailed. In 1995, the computer Scientist Richard Wallace developed a chatbot called A.L.I.C.E. inspired

by the previous ELISA model with the only difference of the number of languages ALICE can manage (Reynoso R., 2019). In 1997, two major changes occurred. Firstly, a Long Short-Term Memory (LSTM) prototype used for handwriting and speech recognition was developed by the two computer scientists Sepp Hochreiter and Jürgen Schmidhuber. The second change had been done when IBM created a chess-playing computer. It was the first device able to win a chess match against a world champion (BootStrapLab, 2017; Reynoso R., 2019). The year after, the first robot pet toy was developed by Dave Hampton and Caleb Chung and was called "Furby" (Reynoso R., 2019). In 1999, with the same vision that Furby, Sony created AIBO, an artificial intelligence robot. This appeared under a pet dog and had the ability to learn from his environment. He had also the ability to understand more than 100 commands and to interact with its owner (Reynoso R., 2019). In the same year, the MIT AI labs created the first artificial intelligence able of emotions (BootStrapLab, 2017).

After all these discoveries the 21th century arises along with also many big improvements along with the technologies' developments. Also, many movies were created based on science fiction. The pace of innovation, at that time, was therefore really high.

During the first year of this century, many changes occurred. First, there were a lot of problems with the computers created in 1900 because they needed to get into the new format of 2000 what is known under the Y2K problem. Then, the robot Kismet was developed by Cynthia Breazeal and was able to recognize and stimulate emotions with its face that was designed as a human. Finally, Honda created ASIMO, an artificially intelligent humanoid robot (Reynoso R., 2019). In 2001, the science fiction movie A.I., or Artificial Intelligence, was released by Steven Spielberg. It is kind of showing the future by explaining the story of David, a humanoid child programming with anthropomorphic feelings. (Reynoso R., 2019) In 2002, the Roomba I-Robot was released. It was an autonomous vacuum robot able to clean your house and avoid the obstacles (Reynoso R., 2019). In 2004, the NASA discovered the way to go to Mars without man intervention. In the same year, the science fiction movie I ROBOT directed by Alex Proyas is released (Reynoso R., 2019). Moreover, DARPA introduced the first autonomous vehicle challenge (BootStrapLab, 2017). In 2006, the term of "machine reading" went out for the first time in order to define a machine able to autonomously understand a text (Reynoso R., 2019). In 2007, Fei Fei Li a computer science professor and his colleagues created the database "ImageNet" provided with a recognition software. The goal was to be able to

recognize images (Reynoso R., 2019). In 2009, Google started to try building a self-driving car (BootStrapLab, 2017).

Then, from 2010 until now, the improvements were even faster. First, ImageNet launched the first software able of Visual recognition. The same year, Microsoft created Kinect for Xbox 360 which was the first device able to recognize humans' movements in order to redo them in a virtual game (Reynoso R., 2019). The following year, two other incredible creations appeared. IBM created a machine able to answer some questions that was more powerful than the two champions in the domain and Apple launched Siri, the first speaking assistant which is currently well know and has been developed by other companies (BootStrapLab, 2017). This technical improvement gave the user the opportunity of asking some questions to his phone by only using the voice and a wake-up word and then, the device is able to look in all the database for a clear answer (Reynoso R., 2019). For instance, instead of looking the weather on its phone, the user can ask it aloud and receive a direct answer. In 2012, Jeff Dean and Andrew NG, two google researchers, launched a neural network made of 16 000 processors able to recognize cats' images. They managed to create it by showing the device more than 10 million cats' images on YouTube (Reynoso R., 2019).

In 2013, researchers from Carnegie Mellon University released NEIL (Never Ending Image Learner) a semantic machine learning system able to compare and analyze relationships between pictures (Reynoso R., 2019). The year after, two new voice recognition software were released. First, Microsoft created Cortana and Amazon launched Alexa. The only difference is that Alexa is only available on a speaker released by the company. Those are similar to Siri created few years ago (Reynoso R., 2019). In 2015, Elon Musk and some other people announced that they will do a one-dollar donation to open artificial intelligence (BootStrapLab, 2017). Between 2015 and 2017, there have been improvement in virtual players since Google DeepMind's AlphaGo was able to beat champions at the board game Go (Reynoso R., 2019). In 2016, the first artificial citizen was released by Hanson Robotics and answered to the name of Sophia. It was seen as the first citizen since it was the first robot able to act nearly like humans. Indeed, it was able of image recognition, facial expressions making and communicate with other people thanks to an artificial intelligence software (Reynoso R., 2019). In the same year Google released its home assistant called Google home. This one is using Artificial intelligence to act as a personal assistant by remembering the tasks the owner has to do but also by answering to many questions he could ask (Reynoso R., 2019). And the same year, Google's

deepmind defeats the Korean alphago champion (BootStrapLab, 2017). In 2017, Facebook tried to launch Chatbots able to communicate with each other to learn a way of negotiation. However, since the Chatbots were chatting between them, they developed their own language which was impossible to understand. Even if it was not the first goal, it made AI at a much higher degree (Reynoso R., 2019). In 2018, the language processing AI created by Alibaba scored 82.44 out of 100 questions. There are still defaults but not that much (Reynoso R., 2019). In 2018, Samsung introduced its virtual assistant Bixby. This device was not only able to speak and answer questions but also to see and to be a home assistant (Reynoso R., 2019).

From this period, many scientists tried to create artificial intelligence prototypes. However, the first artificial intelligence approach was not about machine learning but more to specify rules of logical reasoning and real-world conditions which machines could be programmed to follow and react to.

Currently, the artificial intelligence's definition relies more on machine learning and on the big data world. It follows the idea of Turing saying that we should teach a machine as if it were a child. By building a machine with sufficient computational resources and offering training examples from real world data, machines could learn from their own experience.

APPENDIX 2 – Interviews

2.1. AI Specialized company

QUESTIONS

Presentation of the interviewee

- Can you introduce yourself? What did you study? How did you manage to get in the position you are currently? What is your role in Sagacify?
- How does the company work? By project? By team?
- Are you only working in Belgium or do you have international activities?
- Are in the B2B (business-to-business) or B2C (business-to-customer) market?
- What are you specialized in?

AI and Sagacify

Our thesis aims at understanding the influence AI has in the consulting sector. By this interview, we would like to better understand the way AI works. Moreover, we would like to better understand the way it is used in the business area.

- According to you, what is the real definition of AI? What are the characteristics?
- Thanks to our research, we understood the broadness AI could have? Also the different technologies such as Machine Learning, Deep Learning, etc. Can you detail us the characteristics according to you?
- What are the most used AI systems in companies currently?
- What are the next evolutions that will occur in the coming years around AI?

AI and the consulting sector

- According to you, what are the AI possibilities for the consulting sector?
- Do you think it would be possible, at one point, that an AI system replaces totally a human in his work? Or do you think it would more lead to a complementarity between these two?
- Do you think it will more create jobs or destroy them?

- Do you think AI will change the business sector? Meaning it will destroy companies while creating new ones?
- Obviously, companies are reluctant about AI. Why are they so slow to make this change?

2.1.1. Sagacify – François Beuvens

Bonjour. Nous sommes deux étudiantes à la LSM et notre mémoire, comme expliqué dans le mail a pour objet de définir l'influence de l'intelligence artificielle dans le milieu de la consultance. On vient donc vers vous pour un peu mieux comprendre tout ce que représente l'intelligence artificielle et les conséquences que cela va engendrer avant d'aller interroger des entreprises de consultance qui nous aideront à entrer plus dans la conclusion de notre sujet.

D'accord. Avant de commencer est-ce que vous voyez ce que fait Sagacify?

Oui on avait vu que c'était aider les entreprises à mettre plus de l'intelligence artificielle. Vous créez des logiciels d'intelligence artificielle à implémenter dans l'entreprise.

Oui c'est ça. Nous sommes une société de service en intelligence artificielle donc on accompagne des entreprises dans beaucoup d'industries différentes : Assurances, hôpitaux, etc. et on est en train de se pencher vers tout ce qui est plutôt manufacturing. Il y a donc pas mal de contextes différents. Notre objectif en tant que entreprise est de comprendre les enjeux du business et voir avec nos connaissances techniques si on peut apporter une solution à cela. On les accompagne de la phase de génération d'idées, de compréhension de l'intelligence artificielle, etc. donc on récupère leurs données et on les traite en mode laboratoire chez nous pour s'assurer que on peut avoir un ROI suffisant pour qu'on puisse leur apporter de la valeur. En effet, derrière ils vont payer plus pour avoir une bonne production afin d'avoir une amélioration dans leur travail de tous les jours. Il faut vraiment que ça ait du sens pour eux.

Après, quand on implémente on le fait étape par étape parce que il y a jamais de certitude car c'est nouveau dans toutes les industries, il y a des techniques d'intelligence artificielle qui existent mais les appliquer dans un contexte particulier avec des données qui ne sont, peut-être pas qualitatives, ça peut amener à quelque chose qui ne fonctionne pas bien ou à moitié. Le but

c'est donc vraiment d'avancer petit à petit pour enlever le risque au maximum et ne pas faire payer des sommes énormes pour quelque chose qui ne marcherait pas au final.

On a pas mal de projets différents et on adresse deux types de problématiques. Ce qu'on appelle le Natural Language Processing qui est la capacité à comprendre des textes non structurés. Par exemple, des email, des documents d'entreprise qui sont bruts. Avec le NLP on va arriver à les comprendre et à en tirer de la valeur. Par exemple, pour les assurances on fait du routing automatique. Donc ils reçoivent des milliers d'emails tous les jours pour leur gestion de sinistres, etc. mais les juristes qui les reçoivent ne savent pas lire tous ces mails pour savoir auxquels ils doivent répondre donc du coup entre les deux ils ont des départements de gens qui lisent les emails, les classifient dans certaines catégories pour les envoyer aux bonnes personnes. Ca permet de faire une partie du boulot : Lire le contenu de l'email et déterminer si il s'agit d'un accident de voitures, etc. En fonction de cela ça va être routé aux bonnes personnes. C'est un exemple mais il y a aussi l'idée de faire de la détection de fraude. Tous les avocats ou médecins qui vont remettre des honoraires dans le cadre d'un sinistre, on va lire les factures, on va comprendre ce qui a derrière et potentiellement trouver des anomalies par rapport au volume global sur le même type de facturation. Par exemple, si les médecins facturent toujours des montants d'une certaine moyenne puis que certains médecins s'en écartent de trop, on va dire au gestionnaire : « Attention là il faut vérifier ». Là, on parle donc plus de NLP.

A côté de ça, il peut y avoir des problèmes de computer vision, ce qui est la capacité à traiter les images ou les vidéos donc là c'est vraiment très graphique. Par exemple, on a eu un projet de détection de logo dans la presse pour le benchmarking marketing. Par exemple, si Mercedes investit un million d'euros dans le marketing, savoir comment ça se représente vraiment dans la presse papier. Donc là on reçoit beaucoup de presse papier. L'objectif est donc d'aller voir tout ce qui se trouve dans la presse mais aussi en dehors. Si un joueur de foot a un logo Mercedes sur son maillot, on doit aussi être capable d'aller le trouver. Ca permet donc vraiment d'aller retrouver des logos visuellement.

Pour tout ce qui est du manufacturing on est en train de parler de projets d'analyse vidéo pour détecter des comportements bizarres. Des gens qui ne devraient pas être là, des gens qui n'ont pas de casque, etc.

On travaille aussi avec une start-up en Afrique qui font tout ce qui est détection de tuberculose avec des pays comme le Kenya. Là on les aide à trouver sur base d'images satellites ou se trouvent les centres tuberculeux.

Ca ce sont des exemples au niveau de ce qu'on ou d'autres sociétés en Belgique car évidemment on n'est pas les seuls. On est quelque en Wallonie et beaucoup en Flandre. Derrière ce dont on parle, il y a beaucoup de concepts, on pourrait aussi parler de Big Data. Le Big Data, en réalité ce n'est pas de l'apprentissage machine mais plutôt la capacité à gérer de gros montants de données. On parlerait plutôt de sociétés qui ont des énormes volumes de données. Ca veut dire que ces données-là elles ne peuvent pas être traitées sur des machines. Là où nos solutions que on délivre à nos clients se trouvent dans le cloud, ils sont chez Amazone en Irlande sur lesquels on a un pouvoir parce que c'est là que on a des interfaces sur lesquelles on peut agir. C'est là qu'on déploie tous les logiciels. Derrière un logiciel, il n'y a pas un ordinateur mais plutôt une multitude qui travaillent ensemble et le Big data c'est la capacité d'une multitude de machines de traiter des morceaux de données pour les reconstituer ensuite. Ca c'est vraiment tout un point de ce qu'on appelle le data engineering mais ce n'est pas du Machine Learning.

Si on en vient au machine learning, aujourd'hui ce qui fait un gros boum c'est aussi ce qu'on appelle le deep learning. Pour l'expliquer, on aime bien prendre l'analogie d'un enfant qui apprend à distinguer une pomme et une banane. L'une est verte et ronde et l'autre jaune et allongée. Ca c'est une pomme parce que c'est rond et vert et ça c'est une banane car c'est jaune et allongé. Donc c'est une règle stricte et dure qui a été donnée il y a plusieurs années. Du coup ici le problème de l'enfant c'est de savoir ce qui va se passer le jour où on va lui présenter une banane allongée mais verte. Ca va pas tomber dans les règles qu'on vient de lui donner donc il va être incapable de trouver ça. Du coup on est passés il y a déjà une dizaine d'années. On va lui dire « Je vais pas te donner de règles aussi dures que ça mais je vais te donner plein d'exemples de pommes et de bananes mais par contre je veux que tu regardes la forme et la couleur pour les discriminer l'un de l'autre ». On va lui montrer plein de pommes vertes et de bananes jaunes, etc. A un moment on va lui montrer une banane verte et on va lui dire que c'est une banane. L'enfant va donc créer sa propre règle et que si c'est long et vert c'est une banane. Donc il va y arriver tout seul. La question est donc de sa demander ce qu'il va se passer le jour où on va tomber sur une banane ronde et verte. L'enfant il va voir ça il va dire : « Moi je peux regarder seulement la forme et la couleur, c'est rond et vert et donc c'est une pomme ». Là on arrive alors au deep Learning où on doit même plus donner les caractéristiques à chercher. On

va lui dire « Je te donne plein d'exemples de pommes et bananes mais à toi de trouver des caractéristiques pour discriminer » et ce jour-là il va voir une banane ronde et verte. Il va donc regarder l'odeur, la texture, etc. afin de pouvoir dire que c'est une banane. C'est très imagé mais si on prend l'exemple des emails où on va devoir comprendre de quoi parle un email, c'est la même chose. On peut mettre des règles en dur (si il y a le mot « incendie », c'est qu'on parle d'un incendie). On peut toujours le faire parce que ça peut aider mais c'est impossible de tout lister à l'avance. Si on parle de la voiture et l'assuré marque Volkswagen, on peut pas commencer à énumérer toutes les marques de voitures possibles ou si il commence à utiliser des mots du style « ma caisse, etc » ça commence à devenir impossible de tout lister. On peut aussi passer sur du machine learning, etc. mais alors ça veut dire que on va devoir découper le texte et de dire sur quoi il doit se concentrer. Pour tout ce qui est les problèmes de NLP, pourquoi le deep learning est puissant ? On laisse vraiment la machine aller trouver toutes les règles qu'il peut trouver et parfois ça va être des choses que en tant qu'humain on va pas être capable de dire, des tournures de phrase, etc. Peu importe mais il va trouver beaucoup de règles dans tous les sens et à la fin on va optimiser une découverte de quelque chose et ça va marcher. Nous à la fin on va benchmarker tout ça. La manière dont ça fonctionne on va demander plein d'exemples du passé. Par exemple pour les emails on avait des milliers d'exemples d'apprentissage et nous notre job était de programmer le cerveau qui de base est novice et puis on va lui faire ingérer tous les exemples et il va s'entrainer de plus en plus. Et dans le futur quand on va donner un nouvel exemple, il va être capable de le classer. Attention qu'il y a toujours des marges d'erreurs parce que le but du cerveau c'est d'apprendre et continuer à apprendre car il y a toute une boucle d'apprentissage. Par exemple, l'intelligence va dire que c'est voiture puis le gestionnaire va trouver que c'est incendie, le mail va alors être renvoyé dans le système en disant que c'est un incendie et la machine va apprendre de son erreur. Donc vraiment aujourd'hui quand on parle d'intelligence artificielle c'est ça.

Donc le Machine learning il faut lui apprendre en découpant les phrases et le Deep learning il apprend lui-même ?

Oui le Deep Learning son job c'est d'apprendre de lui-même. Les règles dures c'est de dire que on crée les règles nous-mêmes tandis que le Deep Learning va se créer ses propres règles.

Donc le Deep Learning va créer ses propres règles quand le Machine learning a besoin qu'on lui dise quoi faire ?

Quand je parle de lister les règles en dur, je parle pas de Machine learning. Le Machine Learning c'est entre les deux, c'est une méthode sur laquelle je vais dire à la machine quoi regarder. Par exemple, « regarde le dernier mot de la phrase ». Le machine Learning je lui donne les caractéristiques sur lesquelles regarder, comme la pomme ou la banane je lui dis de regarder la forme et la couleur. Ce qui est toujours intéressant parce que en tant qu'humain si on sait que ça c'est important, probablement que la machine va le regarder de manière important. Donc c'est toujours bien de donner des explications. Comme les règles en dur, si on en connait autant les lui donner mais à la fin le Deep Learning va aller trouver lui-même les règles et il est aussi capable de mettre du poids sur ce qui est important ou pas.

Est-ce que dans les entreprises on utilise le Machine et le Deep Learning plutôt ensemble ou séparément ?

Comme je le disais, même si on fait un projet de Deep Learning sur les emails, c'est juste que dans le Deep on va aussi donner des indices comme du machine Learning. Les deux s'interposent et s'utilisent en même temps. C'est un peu imagé mais c'est ça l'idée.

Vous faites vraiment du cas par cas chez Sagacify, ça va être personnalisé par rapport à l'entreprise avec laquelle vous allez travailler ? Vous n'avez pas de logiciel principal que vous utilisez comme base?

Dans le service pur c'est du cas par cas donc clairement on va créer un nouveau algorithme mais on peut voir ça comme des briques de Lego aussi donc finalement il y a des couches, des briques que l'on peut appliquer les unes aux autres qui ont déjà été utilisées mais il y a surement aussi d'autres briques que l'on va devoir créer pour un client spécifique. Donc ça veut dire que quand on va développer un projet pour un client qui demande du routing d'email alors que j'ai déjà fait un routing d'email pour une autre compagnie d'assurances, on peut utiliser la même base mais il va toujours avoir des choses particulières à développer car le contexte est différent et donc on va devoir réadapter. Maintenant si je fais de la détection de cas sur des vidéos c'est différent et donc c'est déjà très différent même si les technologies derrière tout à la fin restent similaires. Donc il y a des choses que l'on réutilise.

Donc nous on est une société de service mais notre objectif à travers la société de services est de découvrir des besoins business pour savoir ce qu'on peut adresser ou aider le mieux et le moment où on va trouver quelque chose où il a beaucoup de sens, on aimerait bien en faire un

produit. Il y a d'ailleurs un produit sur lequel on travaille actuellement, il s'appelle squeeze et c'est un outil d'extraction automatique dans les factures et documents semi-structurés. Du coup ici, de nouveau dans les comptables et tout ça, il y a des gens qui vont passer leur temps à déchiffrer les factures. Par le passé, des solutions assez structurées de cela se sont développées sur base d'un Template ils allaient pouvoir dire, je sais que c'est tel fournisseur donc le montant va être là mais le problème c'est que dès que le Template change, ça marche plus ou dès que il y a un nouveau fournisseur ça ne marche pas mais maintenant avec les technologies de Deep Learning, on peut mélanger des technologies qui vont lire des milliers de factures d'ordres différents, de gens différents et qui vont arriver à se raccrocher à quelque chose qu'ils connaissent donc même quand ils voient une nouvelle facture, un nouveau Template, etc, ils vont être capable de retrouver le montant global parce que de manière globale ils savent. Ca c'est le produit qu'on développe sur nos propres fonds, on n'est pas payés directement mais comme tout produit du coup on prend un certain risque et on a l'objectif de le vendre plutôt sous forme de licence. Il y a plus de capacité que du service ou c'est moins risqué puisque on est payé par contre la propriété intellectuelle est distribuée. C'est moins risqué mais on ne le développe pas comme un produit de base.

Il faut arriver à trouver quelque chose de suffisamment commun avec une confiance de pouvoir le vendre. C'est un investissement pour arriver à un MVP qui commence à faire payer.

Ce sont donc les gens de Sagacify qui développent ou des gens que vous employez en externe par projet ?

Non tout est fait en interne, on a une équipe assez pluridisciplinaire. On a des développeurs business pour comprendre le scope business et des ingénieurs machine learning qui travaillent sur le cerveau.

Mais le cerveau faut lui créer des jambes et des bras pour qu'il s'intègre dans la vie de tous les jours donc on a des ingénieurs software qui vont créer des applications web, des EPI qui vont du coup englober le cerveau et faire en sorte que on l'intègre dans les entreprises mais du coup on crée une équipe pluridisciplinaire qui permet de créer toute la chaine de valeur pour nos clients. On va pas juste faire le cerveau et dire que on peut automatiser à 80%, dire au client de lui-même l'implémenter chez eux.

Vous faites vraiment de la demande première de l'entreprise jusqu'au produit final?

Oui c'est ça.

Est-ce que vous pensez qu'on peut vous définir comme une entreprise de consultance ?

Oui et non parce que la consultance c'est plutôt le fait d'envoyer des gens en interne, ce qu'on ne fait pas. On est plutôt une société pas de produits mais on crée des solutions clés en main. C'est donc un peu entre les deux.

Après ça dépend ce qu'on appelle la consultance, si une entreprise envoie deux consultants pour augmenter une équipe chez un client et ils vont s'intégrer et se structurer et ensemble faire une solution. Ca on ne fait pas. Maintenant, on crée une solution qui marche en tant que telle et on la lie avec les gens en interne. Évidemment si on parle des grosses boites de consultance, eux ils font tout. C'est sûr que on n'est pas comparables à eux mais nous on crée des équipes pointues que l'on garde en interne. Puisqu'on n'est pas beaucoup, si on commence à envoyer des gens dans les autres entreprises, on va se retrouver en sous-nombre pour créer le reste du produit.

L'entreprise vous annonce le problème, la solution qu'ils veulent avoir et vous vous développez en interne la solution via des réunions?

Oui parce que on est dans un monde où les besoins ne sont pas définis donc si on sait dire « Je veux ça », oui c'est facile mais dans la plupart du temps on doit les prospecter, découvrir les besoins avec eux, etc. Donc ça c'est déjà une des phase qui met beaucoup de temps. On est assez dans un monde nouveau pour l'industrie de manière générale mais sinon l'idée oui c'est ça et à partir du moment où on a défini le scope, nous on travaille de notre côté mais on doit en permanence rester en ligne avec leurs besoins. On peut très bien découvrir un truc qui fait que au final on doit faire d'une autre manière.

Donc vous travaillez vraiment en parallèle avec l'entreprise ?

Oui, là par exemple on travaille avec une compagnie d'assurances et on a une première phase de scoping pendant plus d'un mois composée de réunions en interne pour définir tous les processes business et comprendre comment ils fonctionnent, faire des schémas, etc. pour qu'on soit alignés sur ce que la solution finale va être, ou elle va être démontrée, etc. On a déjà pas mal de temps avant même de commencer à développer pour être surs qu'on est alignés sur le scope mais même quand on commence à développer, on peut avoir des surprises, on peut encore

devoir rechanger un peu mais donc oui il y a beaucoup d'interactions avec eux mais les sociétés elles s'équipent peu à peu car elles savent que l'intelligence artificielle est cruciale et donc il y a des gens qui rentrent en interne et qui sont là pour supporter des programmes d'intelligence artificielle. Donc nous les project managers avec qui on travaille, il y en a deux, ce sont des gens dédiés à lancer des projets d'intelligence artificielle en interne. Ce sont des gens qui ont le rôle de coordonner le tout chez une compagnie d'assurances tout comme on en a chez nous. Donc les sociétés se structurent aussi pour ça car c'est pas facile de faire le tri dans tout ça.

Les sociétés elles vous trouvent par internet? Comment ça marche pour que les sociétés travaillent avec vous ? Ce sont eux qui viennent ?

Non justement, c'est plus l'inverse, c'est compliqué. De plus en plus, parce que on a fait un effort de marketing des sociétés viennent via Inbound Marketing mais la majorité, c'est plutôt nous qui allons les prospecter. Et on va vraiment essayer de les appeler, trouver le bon interlocuteur, voir si ils ont des besoins puis aller en meeting, etc. Mais on est sur des processus de vente qui sont très longs, généralement c'est 6 mois, 1 an entre le moment où on prospecte et celui où on signe le contrat.

Depuis quand l'entreprise existe ?

6 ou 7 ans. Donc ce n'est pas vieux mais nous on début on s'est plutôt créés sur du service applications web, mobile. On avait déjà des composantes data et des applications avancées où on traitait des données mais le gros boum de l'intelligence artificielle il a eu lieu plutôt vers 2016 mais avant ça, ce n'était pas si facile que ça de se poser comme une société d'intelligence artificielle alors que maintenant les sociétés savent que il y a quelque chose d'important dans l'intelligence artificielle mais elles savent pas quoi. Donc ça change quand même les enjeux. On s'est donc il y a deux ans, redirigés vers ça. On peut donc même pas dire que on est une société d'intelligence artificielle, pour se focaliser sur l'intelligence artificielle, on a engagé des nouvelles personnes, aussi parce que le concept business avait du sens. C'était quelque chose vers lequel on voulait aller avant mais c'était pas si simple.

Vous pensez que maintenant c'est crucial pour une entreprise d'installer de l'intelligence artificielle pour pouvoir réussir ?

Oui je pense que c'est nécessaire. Ceux qui le font pas ils vont perdre en compétitivité par rapport aux autres. Ca va couter plus cher. Effectivement ça fait de la réduction de cout mais ça

augmente aussi la qualité. Les entreprises avec lesquelles on travaille, ils ne réduisent pas spécialement leurs effectifs, ils les réaffectent à des taches avec plus de valeur ajoutée. Si on remplace la tache de traiter des emails qui n'est pas une tâche avec une énorme valeur ajoutée mais indispensable, ces personnes-là vont pouvoir se focaliser dans des taches qui ont plus de sens.

Pour vous l'intelligence artificielle ne va pas détruire des jobs mais plutôt en reconstruire des nouveaux ?

La difficulté c'est la vitesse d'expansion. Donc oui je pense que ça créera des nouveaux jobs donc il y a toute une catégorie de personnes qui vont pouvoir reprendre ces rôles-là. Mais ça risque aussi de laisser toute une série de personnes qui vont pas réussir à monter en compétences et utiliser l'intelligence artificielle. Parce que il y a des personnes qui vont utiliser l'intelligence artificielle, pas que celles qui vont les créer. Il va falloir un niveau de qualification et toute la société ne va peut-être pas y arriver en si peu de temps. Parce que on avance à une vitesse vraiment énorme, ça n'arrête pas d'accélérer, au plus les sociétés rentrent dans le jeu, au plus ça va vite.

Des Amazone, Google, etc. ont des briques d'intelligence artificielle que on peut réutiliser, ils n'arrêtent pas de monter le niveau. Nous on peut réutiliser pour intégrer dans les outils des entreprises. Donc c'est vrai que si on parle de tout ce qui est voitures autonomes (qui vont clairement arriver dans les prochaines années), si ça révolutionne tout le secteur du transport routier, est-ce que tous ces gens vont pouvoir retrouver un emploi ? En partie, oui mais donc du coup, c'est un défi de société, il faut que ça s'accompagne de formations, etc. mais la vitesse à laquelle ça risque de se passer fait que ça peut être difficile pour certaines personnes.

Est-ce que vous quand vous cherchez des clients potentiels, vous faites face à beaucoup de société réticentes à cette implémentation ou bien les gens sont-ils ouverts et prêt à opérer ce changement?

Non, la plupart du temps ils sont quand même ouverts mais il y a pas mal de contraintes et certains vont être freinées par ces questions-là. Au niveau syndical, par exemple, cela peut être compliqué mais également au niveau de la gestion des données, certaines sociétés sont réticentes à l'idée de donner accès à toute leurs données facilement avec toutes les nouvelles normes (ex: normes RGPD). Donc, il existe des contraintes qui font que cela peut freiner un

petit peu. D'autres sociétés sont très motivées et pour celles qui freinent un peu, ils verront qu'ils n'ont pas le choix. Mais, la plupart du temps, le discours de l'intelligence artificielle est bien reçu contrairement à avant 2016 où c'était un petit peu plus compliqué car il n'y avait pas les mêmes croyances en l'intelligence artificielle que maintenant. L'intelligence artificielle existe depuis très longtemps au sens global mais les gens n'y croyaient pas trop car il y a eu des tentatives qui n'ont pas données grand-chose mais maintenant, ils savent que cela marche et qu'on en parle partout.

Au niveau de la concurrence, vous vous situez comment dans le marché? Avez-vous des grosses entreprises comme concurrents directs ou est-ce plus des start-ups?

Il y a les deux. Les start-ups comme nous ont tendance à être plus pointues, plus agiles. On offre un environnement technologique assez avancé par rapport aux gros acteurs. Mais, ces gros acteurs ont plus de moyens financiers, une solidité sur le marché... Lorsque nous recevons un appel d'offre, il y a généralement de tout. Les clients essayent de voir ce que vous leur proposer des plus grosses et plus petites entreprises. Par exemple, le dernier appel d'offre que nous avons eu et remporté, il y avait sept sociétés dont des très gros et des plus petits. Finalement, ils sont partis avec une société comme nous. Je pense qu'on a la taille minimale car, si tu as commencé il y a un an et que tu es tout petit, cela va être difficile de convaincre une grosse société de travailler avec toi parce qu'il y a des craintes que la société ferme. On fait également face à ces craintes contrairement aux grosses entreprises comme Accenture qui ne rencontrent pas ce soucis. De l'autre côté, on a une capacité à délivrer assez vite, on est technologiquement très avancés et on a un contact plus direct avec le client. Il y a donc des avantages et inconvénients dans les deux options. Donc, si on regarde nos compétiteurs directs, il y a des entreprises allant jusqu'à 50 personnes, mais on doit également citer Accenture, EY qui s'équipent petit à petit là-dedans.

Donc, même si le développement de l'intelligence artificielle est très récent, il y a quand même quelques gros acteurs sur le marché.

Ils savent que c'est inévitable et qu'ils doivent investir là-dedans si ils veulent proposer de la valeur.

Les grosses entreprises comme Accenture ont commencé à développer l'intelligence artificielle il y a donc pas si longtemps mais je suppose qu'ils ont plus de moyens et que cela va donc plus vite.

Oui, c'est sûr qu'ils ont plus de moyens. Mais juste les moyens, cela ne suffit pas pour créer toutes les technique nécessaires etc. Mais c'est sûr qu'ils font aussi des bonnes choses donc on ne peut clairement pas les ignorer dans nos compétiteurs.

Au niveau des consultants, pensez-vous qu'une technologie puisse être développée pour les aider et pourquoi pas, un jour, les remplacer?

On n'y est pas encore. En soit, il n'y a aucune limite à ce qu'une intelligence artificielle pourrait faire dans le futur. Si on parle dans 100 ou 200 ans, pourquoi pas mais on n'est pas proche de cela. On est sur des choses très pointues, il faut une compréhension globale et c'est du cas par cas. L'intelligence artificielle peut être définie par un réseau de neurones, on essaye d'imiter la manière dont le cerveau humain fonctionne mais dans un contexte très précis. Aujourd'hui, il faut que cela soit dans un contexte très fermé, assez précis et très routinier. Par contre, une fois que cela fonctionne bien dans ce contexte précis, cela va clairement dépasser ce qu'un humain sait faire car la machine peut ingérer des quantités monstrueuses de données du passé, ce qu'un humain ne sait pas faire. Mais l'humain a des capacités cognitives bien plus importantes car il fait des liens entre plein de choses. On parle d'intelligence artificielle générale et arrive presque à la singularité, au moment où la machine égale l'homme. Tout cela n'est clairement pas impossible, mais ce n'est pas pour tout de suite. Remplacer le boulot de consultant, non mais les gros fournisseurs comme Google ou Amazon créent des briques de Lego. Par exemple, Google a développer un outil qui permet de trouver toutes les boites de texte liées aux factures. Après, c'est notre travail de compléter cela. Donc, ces fournisseurs produisent des briques et il n'est pas impossible que demain, ils développent une brique qui va plus loin que cela. Mais, eux, petit à petit, montent dans les briques qu'ils donnent. Au plus ils donnent des briques avancées, au plus les sociétés de consultance, qui utilisent beaucoup ça, seront avancées. Nous, on crée nos propres briques contrairement à eux, qui utilisent ce qui existe déjà et les connectent ensemble. Au plus ces briques vont être poussées, au plus le travail techniques des consultants va diminuer et cela va aussi ouvrir des barrières à d'autres sociétés. Par contre, le boulot de comprendre les problèmes business, les raccrocher à une technologie et savoir comment l'implémenter, c'est un problème plus large qui ne peut pas être automatisé de sitôt.

Le métier de consultant et l'intelligence artificielle sont donc complémentaires et aideront à développer de meilleures solutions.

Tout à fait. L'intelligence artificielle n'est jamais qu'un outil pour améliorer un processus existant.

Le problème dans ces entreprises est qu'elles doivent aussi bien le proposer dans leur offre au client, aussi bien l'implémenter en interne.

C'est sûr. Certaines entreprises le divisent en deux parties. Certains employés travaillent sur la réduction des coûts en interne, donc automatiser des tâches. D'autres sont dédiées à la partie externe et l'usager va directement avoir son service amélioré grâce à l'intelligence artificielle. Donc, soit on améliore son service clientèle, soit on diminue les coûts en interne. Mais, les deux doivent se faire.

Et vous, avez-vous déjà eu une entreprise de consultance comme client?

Non. Par contre, on est en discussion avec des entreprises comme ça, Capgemini par exemple, car on crée des briques très custom qu'ils n'ont pas spécialement envie de créer mais qu'ils aimeraient proposer à leur client moyennant partage de bénéfices. Ils sont donc intéressés d'augmenter la valeur pour le client mais n'ont pour autant pas envie de développer ces technologies en internes. On peut donc partager des revenus car nous, on a créé des choses qui peuvent les intéresser. On est donc en discussion pour faire des partenariats. Nous, on a la technologie et eux ont l'accès au client.

Cela nous ouvrirait tout un nouveau business parce que cela ne nous intéresse pas de faire toute la partie qu'ils font même si elle est très importante car ils se maintiennent avec le client, ils ont en plus un portefeuille énorme dans tous les pays. Ils ont un accès au marché qui est gigantesque donc effectivement, faire des partenariats avec des entreprises comme ça, cela nous intéresse. On essaye de trouver différents types de partenariats et c'est un des types possibles. On n'en a pas encore mais on est en discussion.

Selon vous, quelles sont les prochaines étapes dans le développement de l'intelligence artificielle?

C’est difficile à dire. Tout ce qui fonctionne vraiment bien et de plus en plus, c’est le traitement d’images et de vidéos mais également les voitures autonomes. Un autre domaine qui marche de plus en plus, c’est tout ce qui radiologie et comprendre automatiquement où il pourrait y avoir des problèmes. Ce sont des choses qui avancent beaucoup. La technologie est maintenant prête et en place mais le temps que les sociétés intègrent cela, c’est pas demain la veille. Ce sont des processus qui prennent du temps, peut être 15 ou 20 ans.

Cela prend du temps car il faut trouver les bons interlocuteurs, il faut changer les manières de faire, accéder aux données. Tout le monde n’est pas au courant en même temps donc c’est un processus lent. Cela dépend aussi du pays car il y a des pays comme nous ou la Chine ou cela se développe énormément. La Chine a un gouvernement qui peut imposer tout ce qu’il veut. Maintenant, les citoyens sont filmés en permanence et ils sont capables de définir les bons et mauvais citoyens. Ils utilisent l’intelligence artificielle à des fins de contrôle pur. Mais, il peut y avoir des dérives. Ce sont des questions de société: la société va un jour dire que c’est trop mais cela ne va faire qu’augmenter.

L’intelligence artificielle, ce sont tous les problèmes de droit, de tracking avec Google et tous les sites qui récoltent et traitent les informations. Tout ce qu’on n’aurait pas accepté il y a quelques années, on les accepte maintenant. Cette intrusion dans la vie privée, on n’en a pas vraiment envie mais d’un autre côté, cela apporte un certain confort et des avancées que les gens sont prêts à accepter au final. Par exemple, Google traque tout ce que l’on fait mais a-t-on envie de changer de moteurs de recherche pour autant? On finit par l’utiliser même si on le sait. Au niveau de l’intelligence artificielle, la Chine est donc beaucoup plus avancée car ils font ce qu’ils veulent au niveau droit.

Tout ce qui est agriculture sont des choses qui vont et son déjà en train d’être touchées par l’intelligence artificielle. Par exemple, les drones qui survolent les champs et sont capables de faire des topologies et d’automatiquement détecter quand il y a des problèmes à certains endroits. Même pour ce qui est pesticides qu’on utilise actuellement, on est en train de créer des drones qui tueraient les insectes et animaux de manière propre et sans pesticide.

Donc dans les années à venir, on assistera plus au développement et amélioration des technologies existantes plutôt que la création de nouvelles?

Effectivement, il y a des technologies aujourd'hui qui sont prêtes et qui sont en train d'être mises sur le marché. Toutes les barrières font que cela va mettre du temps. Par exemple, pour les voitures autonomes, ce n'est pas la technologie qui va mettre du temps car elle sera prête l'an prochain mais c'est les problèmes légaux. Que va-t-il se passer quand la voiture va décider d'écraser une personne plutôt qu'une autre car elle a du faire un choix entre le conducteur ou les personnes qui traversaient? La société doit se préparer à tout ça et ce n'est pas tant la technologie qui va mettre du temps mais plutôt la société à accepter.

En même temps, à côté de cela, la technologie elle-même va continuer à croitre et à s'améliorer. Le Deep Learning est apparu plus récemment et d'autres techniques arrivent encore comme le reinforcement learning où l'on a plus besoin de données du passé pour entrainer mais on laisse la machine faire des choix et on lui donne des récompenses. Avec ce genre de techniques, on peut faire d'autres types de problèmes comme les Generative Adverserial Network (GAN) qui permettent de supporter ce qu'on appelle les deep fakes qui sont des vidéos qui paraissent très réelles et qui permettent de faire dire quelque chose à quelqu'un. Pour le moment, ce sont moins des applications business mais on arrive à faire des choses assez bluffantes. Et il y a des techniques qui augmentent et s'améliorent petit à petit.

J'imagine qu'il faut aussi du temps pour l'accepter. Par exemple, la technologie permettant de détecter les cancers, un médecin va peut-être repasser derrière au début car c'est quand même sérieux...

C'est sûr qu'il y a des risques à tout niveau. Lorsqu'on développe un projet, on fait toujours une prédiction du niveau de confiance. Généralement, on met cela en perspective et si on n'est pas plus sûr qu'un certain seuil, alors le travail sera fait par un humain. Là, c'est un travail des consultants de déterminer les risques de confondre ce qu'on doit faire et à quel moment. C'est vrai que l'on va moins vite pardonner à une machine qu'à un humain de faire une erreur. Par exemple, si une voiture autonome se crashe demain, cela va faire la une des journaux alors que des milliers d'humains le font tous les jours. La société va plus appuyer ce genre de choses. Il y a des niveaux d'attentes élevés et il faut donc faire attention.

Au niveau de la technologie, on est donc déjà à un niveau beaucoup plus élevé que ce que les entreprises acceptent et mettent en place.

Clairement, il y a pleins de société qui pourraient profiter beaucoup plus de l'intelligence artificielle. Mais cela dépend des industries car certaines sont beaucoup plus avancées que d'autres. Par exemple, dans le manufacturing, ils n'implémentent pas encore aujourd'hui ce qui existait il y a 20 ans. Il y a des industries où c'est trop compliqué de directement proposer de l'intelligence artificielle. Il vaut mieux d'abord améliorer un processus existant et avancer petit à petit quand la confiance a été établie.

C'est donc un processus très lent...

Oui, parce que le niveau de connaissances et de savoir ce qu'on peut faire est encore assez bas même si les gens ont entendu parler de l'intelligence artificielle. Le processus de comprendre le problème et comment le résoudre est donc beaucoup plus long que l'implémentation de la solution même si cela reste un challenge.

Et il y a aussi la qualité des données. Si la qualité de base des données est mauvaise, on a beau avoir les meilleurs cerveaux derrière, ils vont apprendre des choses mauvaises. C'est une des grosses difficultés quand on commence un projet avec les client, c'est le data management qui consiste en la récupération de données, les rendre propre. Et c'est beaucoup de temps, on tombe parfois sur des données incomplètes ou inutilisables. Il y a des projets qui se passent directement bien et d'autres où c'est plus compliqué car on se rend compte que la manière avec laquelle les données ont été labellisées dans le passé n'est pas la bonne, elles ne sont pas consistantes.

Il faut changer les mentalités, que les gens en interne comprennent l'intelligence artificielle, qu'il y ait du support, du budget, que derrière on crée la confiance. Souvent, il faut un premier case qui marche bien, pas trop compliqué mais qui va faire en sorte qu'ils se disent que cela marche bien et qu'ils soient prêts à changer. Donc, c'est lent mais cela peut s'accélérer car le plus dur est de faire le premier projet dans une société.

Pour l'instant, on vend assez bien les suites de projets car les premiers projets se sont bien passés mais on a beaucoup plus de mal à trouver de nouveaux clients.

Combien de clients acceptez-vous en même temps?

En général, on est autour de 3-4 clients en parallèle, c'est une grosse moyenne. Cela dépend des projets. Quand je dis 3-4 clients, je parle du développement. Car, une fois qu'on a développé et que le système est en production et tourne bien, on rentre dans le mode maintenance qui veut

dire qu'on s'assure que tout tourne bien et qu'il n'y ait pas de problème. Ca, on en a beaucoup plus car cela demande moins de temps et donc tout ce qu'on a développé par le passé est en maintenance. Mais, en cours de développement, on tourne autour des 2-3-4 projets en parallèle.

Une fois que le projet est développé, vous le délivrez à la société mais vous restez présent en tant que support?

Exactement. Soit ils nous appellent lorsqu'il y a un problème, soit on travaille aussi de manière proactive pour comprendre si il y a des problèmes. Donc, on reste les gestionnaires de la solution.

Je pense que vous avez répondu à toutes nos questions. Avez-vous peut-être quelques chose à ajouter?

Je me demandais quel était l'output de votre travail.

Notre but est d'aller interviewer des entreprises de consultance de plusieurs tailles et de voir à quel degré ils implémentent l'intelligence artificielle et le changement que cela implique.

Ok. C'est vrai que c'est un secteur qui connait une grosse croissance donc il faut aller dedans. Je serais curieux de lire et voir vos conclusions car on voit ces sociétés de l'extérieur mais on n'a pas de retour interne sur la manière dont ils voient les choses.

Merci beaucoup pour votre temps et vos réponses.

Pas de soucis, si vous avez encore des questions, n'hésitez pas à me contacter.

2.2. Consulting companies

QUESTIONS

Presentation of the interviewee

- Can you introduce yourself: What is your background and how did you get to the position you hold today? What is your role within the company?
- Can you tell us a bit more about the company you work in, its organization and scope of activities (international / national), its preferred sectors ...?

- Why do you think your clients choose you rather than another consultancy firm?

Artificial Intelligence in the consulting sector

Our thesis deals with the influence of artificial intelligence in the consulting industry. We would like to know what its current influence is and the extent of its implementation within companies, but also to analyze its impact on the sector and the consequences it will have on the industry.

First, in your business, do you use artificial intelligence or machine learning (or any other augmented technology related to it)?

If YES

- In what form does artificial intelligence appear in the company? In which department (s)?
- Since when have you developed AI within the company?
- Do you use it more to attract customers (online assistants) or do you use it more in the sense of advising customers?
- Is it complementary to the human work provided or is it rather to replace one of the tasks? In other words, do you think that using artificial intelligence will decrease the number of workers in the company?
- What is the exact function of artificial intelligence in your company?
- What are the economic impacts of using this artificial intelligence in the enterprise? Could it have been seen significantly on the company's turnover?
- Do you observe a form of reluctance when implementing AI within the company or with your customers?
- Has the development of AI had an impact on competition in the sector? Have new competitors appeared?
- In terms of AI development, can you compare Belgium to other countries? Or do you think that Belgium is in its level of AI implementation?

If NOT

- Why is AI not implemented within the company? What are the factors that played a role in this decision (budget, time, change resistance…)?
- Does it have an impact on the competition? Are you losing clients because your company does not propose AI?
- Is it in the vision of the company to develop AI in the coming years?
- In which departments or for which tasks do you think that AI would be the most useful for?
- Do you think that it would be a benefit for the company to implement AI both internally and in your offer to the clients (organizational, economic…)?

Personal point of view

- How do you think artificial intelligence will develop within your company in the coming years?
- Do you think it will change the consulting service market and if so, how?
- Do you think that at a point, human consultants will be able to be replaced by an artificial intelligence? Or will their jobs be complementary?

2.2.1. PwC – Christophe Cop

Hello, before starting with AI, you can you start by introducing yourself, what is your position and how did you managed to get there?

I am Christophe, data scientist and manager at PwC. When there is any project around AI, data science and data migration, I am most often involved. The topics ranged from public services for governments also for public industries, banking sector. So, it can range across all the spectrum of companies. I will try to answer your questions on AI.

We will introduce ourselves too. We are two students currently in the last year of business engineering. We are doing a thesis on the Influence of Artificial Intelligence on the Consulting Sector. To answer this issue, we want to have the point of view of multiple companies, that is why you are here today. Could you start by introducing PwC, the way the operations are managed both at a national and an international level?

PwC is an international company. I don't know in how many countries but let's say the entire world, main cities in America. The main seat is in America (of PwC - the company) and we are part of the PwC Europe network which does not include all PwC companies within Europe but Germany, Swiss, the Netherlands and others. PwC is a consulting company considered among the Big Four and we are mainly known for our revisory work, the screening of companies in due diligence for their compliance, etc. But I am not the expert on that. PwC has many divisions and one of them is Advisory. Advisory offers consulting to companies and governments on a whole broad range of topics. We have PwC legal, doing things about things legal and juridical. Within technology consulting, for instance, we consult on data strategies and we have people who work with software like SAP, Salesforce, etc. I am in the data and analytics team where we do data science and analytics. We also have management consulting, financial consulting, risk and assurances, cybersecurity, etc. Data and Analytics is still emerging but is becoming more and more advanced: More people become aware of the potential value and start looking into it.

"Data and analytics" is a growing business, and growing within PwC as well. Over the years, the amount of people using and being able to apply data science, has grown (within Technology Consulting).

We work together with other consulting departments within PwC: if they need specific technical expertise, technology consulting gets involved. Depending on the project, we work together with PwC Italy, Poland, UK, the Netherlands or Germany. They have their data analytics team and for some projects, they are more specialized in some aspects, or have more specific experience in a business area or with a public service.

What is the type of clients that you have? Is it mainly one industry or is it broad?

For technology consulting, our biggest clients are the public services. We have a lot of contracts for the European commission. Also, for the Belgian government, Flemish government and, more recently, for Brussels and the Wallonia as well. I think that it is about 60% of our portfolio at technology consulting. Other than that, we have projects at banks, the financial sector, insurance and manufacturing. Additionally, there are minor projects in law and employment, Telecom, etc. We are open to all companies but most of our clients are bigger companies, as consulting is rather expensive for SME's Although we work together with startups. For instance, within technology consulting, we also keep a broad view about all the emerging

technologies so that we understand them and improve our advice. We not only advise and give strategic insights on which direction the company should take but we also do proof of concepts ourselves. Sometimes, we work together with startup companies in a form of partnership. We have partnerships with Google, Microsoft for example. We want and need to know which technologies apply for our customers and which are the best for them. We investigate whether these new technologies might provide some new business cases and opportunities for us and our customers.

You don't have one technology that you advise all clients about? It's really depending on the situation.

Yes. On the one hand, for example, ABSI is a company that is now part of technology consulting specialized in salesforce. There are 70 people just doing salesforce. We sell this product (or service) and maintain it for the customers that they already had and to new customers that are coming in. That is a specific product but, like I said, we do offer a range of services going from brainstorming, co-thinking, co-creation about which strategy. That would be the advice part. A third aspect is doing studies. For example, we did a study on AI and which direction Belgium should follow. We need to know where we stand on AI in Belgium so that the government can base their strategy on that.

In General, it is better to first talk with the customer, to really know the problem(s), the client and what they want. After those initial contacts, , you can for example conclude "For you, maybe Machine Learning is not the solution and maybe you need some robotics and some business intelligence first because we see that your maturity on the level of AI is still too low or that your data quality is just not there yet". So, it really depends, it is taking them on a long journey and see how they can advance, improve from where they are now to where they want to go.

You propose ML only if they are already advanced because you need to have the correct data to implement?

In a sense. I would never advise a company to do machine learning because of machine learning. ML is a tool and it's a tool that can help you to solve specific problems. For example, Churn Analytics, (a client at a companies or service provider goes away to another provider) the energy sector. A company doesn't want to lose customers (Churn) and want to keep their customers as

much as possible. Given that they have customers information, then, it's a good idea to do advanced analytics, statistical s analysis on that data in order to try and predict whether a customer is likely to leave that company. In that case, yes, machine learning is a good idea. Recently, we did a hackathon as part of our advice for the Flemish government and there, we identified that the main issue is data quality. They wanted to use AI, but their data quality was too low. Our advice was: don't build AI now, but first, improve your data quality.

Don't run before you can walk. On the other hand, if they really want the technology, we need to explain them that sometimes the more difficult (algorithm) is not always the best solution.

What do you mean by low quality of data?

In this case, it was in the context of Natural Language Processing for document labelling. They had been doing document labelling manually by different people. Out of the 20 000 tags that have been added to these documents, 17 000 were unique. It means that each person uses different words for the same data. The tagging was not consistent and too specific to make grouping possible. So, first, they need to discuss which tags they want to assign, which are similar, etc. It was highly technical, legal language.

Since when has PwC started to use AI? Were you one of the first?

I only work at PwC for two years and before that technology consulting already a part of PwC. They had been doing projects like chatbots, machine learning and other advanced technologies. They have been busy with that for 4 or 5 years. During the previous financial crises, in 2008, PwC and other big companies lost a part of their IT that they started to rebuild some years later. AI is not that new. It is just a new name for similar things that were done in the past (statistics, data science…). because of deep learning, image recognition, and text analytics, AI got a new turning point. At PwC, we advise, we build proof of concepts show how it works. Of course, in big companies and universities you have the most advanced technologies, but it takes a while before companies start to apply and use it.

Among the other big companies, did you all start at the same moment?

I'm not sure but I know that all companies have their data analytics teams specialized in some areas depending on the company. Since all Big Four are always keeping track on what is happening in the world, I would assume that it is more or less at the same level. For example,

recently, the whole ethical AI issue is growing. We have been working on itWe made a study and proposed an ethical AI tool (which we developed over the past months) as soon as we heard that it was talk of the town. Inside the company, there is a need to know how to adopt ethical AI to the daily activities, to the portfolio, etc. For example, PwC UK already developed a framework on ethical AI and then we took that one as a start, we also took the European commission guidelines on ethical AI and put them into a new service. It enables us to say that we know what ethical AI means, what you have to take into account, what you have to think about when you are doing an AI project and embed the ethical aspects in the whole process. When you start a new project, just think from the start: What about the GDPR, etc.

Talking about the Big Four, is it a race between the 4 of you to be the first one to have "the" technology to give to the client?

I don't think so, it's not our main purpose. I think it's good to keep an eye on what technologies there are, but we are not developers of these technologies. I think that you find that more often at start-ups and technology developing companies. What we do is developing platforms, etc. and we use ML and AI, and package them to provide them as a service. But I don't consider that as the latest technologies. It is nice but it's not like we are going to develop the latest ML technology. That's for other companies to do. We may use these techniques for new applications, however.

When you advise the clients to put ML, are you asking another firm to create the program for you and then you give it to the clients? How does it work, what's the process?

It's a possibility. Indeed, we do some white labelling which means that a company has developed the product and PwC makes a product out of it by developing some aspects to make it nice visualized and learn the company how to use it. That is one way how to approach the technology. For European commission, we really developed something from scratch, we looked for the data, we built webscrapers, etc. There, we showcased what is possible to do, a full development project. But it can also just be an advisory project where a company wants to start with ML and want us to evaluate which vendor is the best for them. That's where we give advice and see what matches best for them. We don't focus to one type of solution. The important type is that you have to understand what your client's problems are, where they want to go and see how in the best way, we can help them. So yes, sometimes we do things ourselves, sometimes we say, "look in your case we think this technology from this startup is good". Or

for a more conservative company you can say “Look this is a good developed piece of software, and since you’ve been using something similar in the past, we suggest you continue using it but just going one step further”.

When you are in a company and you advise them to put AI, are they open or change resistant?

Yes, there is some resistance and reluctance. Especially, I think that the Belgian market is lagging still a bit behind. But the thing is that it’s improving. Ten years ago, companies didn’t even have a data strategy. At PwC, we have a data strategy team and nowadays most of companies have their databases either on the cloud or on premises, but it’s quite structured and they have their unstructured data stored as well. Now, they have experience with business intelligence, and, for them, the next step is starting to do AI. They don’t know where, when or why to start first. In this case, we are helping them identify the problem, the KPI and what they want to achieve, what data they have, what they want to acquire. Can we put that together and see where the first low hanging fruits are? Then, we demonstrate them what is the return on investment of investing in such technologies. We take the customer and involve them in the whole journey: the IT, the people involved, the management, people who are going to use the end tool so that everybody gets involved and know their information. The people management part comes into play as well because people might need to use this new tool or need to understand how this process gets automated or partially automated. In the end, you implement a tool, you do the validation and you show the results by demonstrating what you have done. It can be done through a dashboard where the decision makers have been part of the project within a company.

For example, another project where we worked together with an image recognition software provider doing ‘predictive maintenance. We improved in a factory the detection of breakdown of a production line. A breakdown implied cleaning and re-starting the process due to the nature of the physics of that product. With a camera and machine learning, we could detect that something is going to go wrong. It was an early detection of the problem and, because of that, they now can shut down the factory line earlier and they don't have to clean all the materials and restart the production faster. So, it's really for them and improvements in the speed of working and the quality of their product has improved.

Why do you think that people are reluctant to it at the first step? Do you think it is more for economic reasons and the fact that they have to be profitable or that they are afraid of changes?

Those are reasons and it is part of novelty. So, it is something new, it gives you uncertainty. Figuring out which AI algorithms are going to work is actually a part of data science and science itself Trial and error is essential. Sometimes, an algorithm will provide good predictions or will provide a good result. But sometimes, because the data was not good or because there is absolutely no correlation, the result may be quite lousy. Sometimes it is a confirmation about your gut feeling and business knowledge that they already have. So, the customer might say: "why did we actually do it?" or "why should we start to do it if we don't see what the advantages are?". So, there, you really need to reassure them and show them the possibilities. You need to do the right expectation setting so that they look that there are possibilities that can give you better results, better insights, better productivity in whatever service you want to offer or want to improve. The thing is that, you have to take them on that journey. It's like cold water fear, you need to make that step and if needed assist them. Of course, there are companies that don't want the help but there are also historic examples of your competitors who use an incredible technology and then, put you out of the market.

Internally, in PwC, do you have artificial intelligence or machine learning implemented to help the consultants in their jobs?

A lot of AI is hidden in programs. For example, your smartphones, your inboxes, are full of AI for example in your spam filters. You have standardized technology that, every company is using. So, PwC is using it as well because it's part of the existing technologies. On top of that, we do have an internal program called *Dragons' Den*: Employees come up with ideas for either internal innovation or external innovation for new products and services. Often, that can lead to products of automation within the company. For example, within legal, there is a lot of work that is done with Excel spreadsheets. Now, they are moving towards more advanced techniques to automate processes that are still done manually. Also, for contracts, you can scan a contract and immediately the information goes into the database instead of manual typing. Those are aspects that we are using and developing or buying. We recently started, I think since this year, with a digital upskilling program for everybody within the company on everything digital. It's meant to make people familiar with digital (AI enabled) tools to get them all a little bit more knowledgeable and enable them to use those new technologies to improve their work.

This program is on a PwC global level, it's a worldwide directive so that there is digital upskilling across the whole company to use those tools more and to take more advantage out of them. Of course, they're not learning everybody how to make a neural network.

But there is no tool helping the consultants with their daily job life? For instance, in the first step of your job you go like to the client and there is no AI that says: "In the past 1000 cases, we used this technology when we were in that situation. So, let's use this one"?

I proposed to make something like that in December last year. I came up with an idea "There is a lot of data on companies that we have. We use SalesForce and we have a lot of information data stored there: let's use AI to improve our understanding of our customers.". But the thing is that there is also a data policy. So, within PwC, we need to see which data we can use internally. Because, of course, data is the fuel of machine learning. First, you need to have good data access and some parts of PwC are really very restricted because it's has companies' documents that are highly confidential. Not everybody at PwC can have access. We also have a really strong ACR that says, "Are you allowed to use this information?". In terms of data, we need to follow the law. We need to figure out how to enable that information that we can use and see how we can use it while maintaining the same level of security. It is really a difficulty now at PwC. I think it might also be a reason why some companies are reluctant to it because there is a lot that comes on the side. For example, when I did a project for a bank, for me to get access to their data, it already took 3 weeks because of regulations, documents to sign, etc. That process is normal and logical but, at PwC, we are stepping forward to that as well because practice what you preach is something that you should do. So yes, we are stepping towards it.

So, you don't have it currently but it's in your mind and you want to develop it in the future?

We have it partially. The thing is that the future is already here but it's not equally distributed. But yes, there is still a room for improvement.

You were talking about the fact that Belgium was a bit behind compared to other countries. According to you, where are we in Belgium compared to other countries?

On the one hand, there are a lot of good start-ups in Belgium and good scale-ups that really provide good services. And also, existing big companies, all have a lot of AI and expertise that they can sell and provide. I think, on that level Belgium is doing quite good. The adoption rate however is hard and that is because of the culture, we are not the early adopters of this world.

If you look at America and the Netherlands, they are much more advanced. On the other hand, we are picking up. Companies are more and more likely to start and test something. But I think it has to do with the cultural issues. It is not only with AI but also with trends.

Belgium is not the first on the track for AI improvements?

Yes. But then, again, if Belgians are not the first, it allows them to wait and see a bit. And it allows them to have the advantage of the second movers.

If we talk a bit more about your point of view: At which point do you think AI could help/replace the consultant in the tasks he is doing?

There is one thing I have been thinking about for years and years and it still applies for any company. What you can do is to go with one person of IT, of HR, etc and you go to a subset of the company who are doing a specific task. You talk to them, see what they are doing on a day-to-day basis. If you, then, brainstorm together, you can easily see that some aspects of their job are repetitive. These tasks are the one that could be automated. The problem is that if you do it like that you will probably end up with batches of IT everywhere and you don't come up with an integrated solution. Secondly, I think that what is currently needed is to rethink the overall data strategy because, in the end, it's not so much about the machine learning but the ground source needs to be good quality data and good label data, good semantic data, etc. Because the research that you can do depends on the data that you have, how you can access them and use them. One example is like something we need to fill our CV's and each time they ask for updates or it needs to be in a new format. It could be solved by storing the data of our CVs in a database and, then, make a template. It would appear automatically. It is the "create once - use often" strategy: I think that's a useful one. Solutions like that are very interesting and useful. If you get a data access right and make it so that it is better accessible for people that are data scientist, etc.

For example, the whole process of tendering is already within a good software suite. But the thing is that there are always some repetitive tasks that are not your core tasks that could be automated. We also did a cross-sell analysis: If we have a customer, do we also serve our customer with other solutions developed in PwC? We did analysis on that to see if we could find some patterns in it, where are good connections/where are weak connections? Those are used by the partners. Now, there is more integration across the different lines of services.

If you manage to develop in the coming years a technology that could replace the repetitive tasks of some people, do you think it could have a good impact in that company?

How I see it, if you look at the first industrial revolution where mass production, where human labor production got automated by machines. What you do is that a lot of human labor got replaced by non-humans. Our payment system in this world is that you pay humans but not machines so it's easier and cheaper to use machines and not humans because of our economic system. Currently, we are starting to automate a lot of cognitive processes that we were still doing as humans. Of course, the repetitive ones first but more and more humans will be replaced by cognitive agents and AI. It will probably not be the next 20-50 years, but you will get production done by algorithms, machines. So, more production and more in mass. More labor gets done with fewer people. So, the whole that has an economical benefit for companies and for individuals and society. For instance, we have dishwashers, clothes washers, etc. So that we have time to do other stuff. That's the whole point: you have time to do other things (preferably things you like to do). I don't think we will not have to work anymore because there is always plenty of things that you can do. For instance, social interaction, I think there are always aspects in society that need the human side. Creativity, negotiating, etc. will always need people.

Talking more about the consultancy, one part of the job could be done by machine but there would still need part of the job done by humans?

Yes, because part of the job of being a consultant is being able to provide your knowledge and insight and your work to different customers because you are somehow specialized in something and the company you are providing the service for is specialized in it as well. So yes, but as companies change, the tasks of the consultant can change as well. Like, there were no IT consultants 40 years ago, there will be more AI consultants in the future as well and that is of course what consultancy companies are doing. They are looking at the type of consultancy companies need now and how is the world changing and which type of consultancy do we need to offer today, and which one will appear tomorrow.

So, basically, for PwC, AI is an opportunity which has a positive impact on the company that you need to care about and adapt every day to keep the pace?

Yes, I think so. I think it would be unwise to not follow these trends of automation.

I think we have answered the biggest of our questions and understood that AI could replace the consultants in some tasks but not for the emotional aspect?

No, of course not. And also, if you look at what AI can do now, they are good at speech, text, image recognition and before that there were already some algorithms like the chess player. However, currently, AI is not good at creativity, detecting and acting on reactions. It is not good in having conversations. There are still things that needs to be developed before AI could come to that direction. Even if you have created an artificial human, you would need the human side of humans and I don't think we want to replace ourselves, but this is more a philosophical aspect.

Of course, there are other questions: The HR, the jobs, the legal part, etc.

Yes, and all that complexity in the open world. I think humans are still the best resource for now and for a lot of things. But it doesn't mean that the ongoing outsourcing of what we want to do now will not be developed. Also, we can get more complex insight of all the data that are generated all the time and it's the thing that we, humans, cannot do. We are good to have 10 chunks of information in our minds, but we can't cross 7000 pieces of data and find patterns in them. So, we still need to summarize and need to make meaning out of it and getting this meaning is something data science, etc. can help you with. I think it's actually where you want to use AI to help people in their work, their services to make things easier.

I think we have asked all our questions. Maybe you have something to add?

One thing maybe that I am currently occupied with, it is the whole idea of data decentralization or with decoupling data from applications and this is a major part or shift that I see coming up. It's like if you can store data where the data owners are. These data should not all be stored in a few companies or in a government. When you open that up and find a paradigm where it is much more regulated then startups can also access this information better and faster. Therefore, they can develop better AI on it. I think there will be changes in 5-10 years there.

Ok thanks that could be useful for our thesis. I think we have all the information we need. Thanks a lot.

Thank you too. Good luck with the thesis.

Bye.

2.2.2. Deloitte – Tim Paridaens

Hi, first thanks for taking time to do this interview. Before beginning maybe let's introduce ourselves. We are currently at the School of Management studying business engineering with a major in Innovation Management. We are doing our thesis on the influence of Artificial Intelligence in the consulting sector so that's why we're contacting you.

Ok my turn, I am working in the consulting business but before going any further can I ask you if you are investigating in all industries or you have a more specific type?

We are focusing on the AI in the consulting sector and on two different horizons. First, the way the consultants are implementing and advising the other companies to implement AI in their processes and on the other hand we also want to know how AI is implemented inside Deloitte to help in the daily lives of the consultants.

First about me and my background, I am a director at Deloitte, and I have the internet of things business. So, I have strong connections with AI. I think you know the GPUs which are currently in your smart phones are supported now by processing units, etc. So, in the future, every device will have AI inside. I did studies on MIT around the strategic impact for AI on our business. I did take these studies a year and half ago and I actually did my thesis for that on Deloitte's company. Because you have different types of AI: you have basic automation like robotic process automation. The ultimate known the existing process through a software robot. That is of course something which happens in a lot of different companies so at one hand we use these types of artificial intelligence on ourselves to optimize the processes from higher to retire for instance. When a contract for a consultant has to be created, we do not execute that entire process manually anymore. You just have the robots which is activated every time that we agree upon a contract, all elements are happening automatically, meaning the provisioning of basic material, cards, the conflict generation, everything which is sitting around that happens automatically. So at one hands we use different types of AI for our internal services, the new client stuff I will say so that we can actually have more cost efficient work so it's not intended that we spend a lot of our time in in the administrative burden that consulting projects bring with them. We use AI on different types like chatbots, like for our HR or legal services learning

to read and think at how artificial intelligence in the different formats is changing the way that we go to markets then we see a lot of different new areas.

It's a lot of information. If I understand well so you are using AI inside Deloitte for all the processes that are more about new clients and encoding all the data of the clients understanding also in the legal processes but are do you have like any artificial intelligence helping in the job itself of the consultant? For example, if you have a new client that as a problem do you have I don't know a technology that is going through all the different clients you already had that say "under 1000 cases we add, 200 at the same problems and we solve this with this technology so let's use this one"?

To find solutions yes but do we do that often? Not yet because to do that you need very good data, so we need to have a knowledge base, and we have knowledge bases globally and locally, that contain detailed information on the client and the solution that they have selected. Therefore, and to build it up everybody needs to do it in the same way so if you would now run an AI through our knowledge management database we would be able to find similar cases which is today in a traditional search function, which is already using parts of AI that is certainly feasible. But if you take Deloitte, we ran thousands of projects in parallel and not always with the same documentation requirements. Now to give another example we have of course Deloitte legal. Typically, their clients or cases will be assessed based on the win potential and so typically when a client goes into a case like that you already have AI based judgments whether you should go to trial or whether you should go and try to settle. Because of cases which happened in the past which led to this outcome either positively or negatively. There, the paralegal work that you will typically do when you enter in such a file can be done automatically and with a support of AI. It's why in my thesis, when I was defining the impact of AI on the way that we do business I looked at three angles so that one you can deliver what we call our traditional services, that you can deliver that in more innovative manner. Like, we recently developed the solution for clients which is doing sort of an invoice an account reconciliation based on AI. In that regards, that solution which was offered to the client is I think 3 times cheaper than any given competitors because of the automation potential that the solution has. We also have something we call a trade classifier so when you do trades with different countries: if I produce it in Belgium and I ship something to China for instance I will need to pay taxes In China. And so, the item will need to be classified in a tax category when we go across the border. Now all that entire process is typically done manually at a client, so they have

hundreds of people in house that do these classifications. Now we've built a solution that does that completely automatically so it will look up the category in which based on the description, it will predict what the best classification should be in another country. That process is more than 100 times faster than any manual operations and I think the accuracy is today 92% of every classification. A human is only for 50% right so it's a huge quality improvement and still it is not always easy to things to sell that that kind of solution although the benefit has been proven. Now for the first time we see people trusting the AI which is at hand and therefore accelerating the sales potential. We are integrating that in our services and wherever we can, whenever we see the classification problem or an automation problem of repetitive tasks, we will try to integrate some form of artificial intelligence to make the process smoother. So that is in our traditional business. Then there's a second challenge that we see in the client offering that we have is we need to update our consulting and advisory knowledge because the impacts of all these emerging technologies on our client strategy and then their landscape can be actually supported by the use of artificial intelligence, machine learning. You can recognize market patterns or fault patterns the lot easier and through the use of AI. So even using classification in a company that doesn't have AI would help. It would already bring them the knowledge. So, we bring knowledge, from artificial intelligence and machine learning outside of our traditional business to the clients.

The clients are not always willing to implement those new technologies, since the economic impacts have been demonstrated, do you think it has improved during the years that people are more willing now to put it now?

Yes, it's all about trust. If tomorrow, you are driving on the roads and you see traffic lights and if it is red or green you will trust the signal that is right. There is a mini artificial intelligence on the traffic light that analyze the traffic out of all directions and tries to adapt the lights as good as possible. So, we do not have any trust issues when it comes down to these kinds of applications. Whether it's more about the traditional work where we have what I call biased data going into a process with bias algorithms which produce a certain bias outcome. Then people have difficulties in absorbing that. Because they do not understand the data that is going in, they do not understand how something is processed and therefore they do not trust the results. So, most of the work that we do is about making people aware and understand what actually happens in an algorithm and then explaining how it improves their freedom and how they do their work. Work in high volumes needs to be predictable and in high volume that we

see that the complexity also increases for that work. If your AI helps in reducing the complexity and it gives you high degree of freedom to absorb changes in the closest then people will accept the solution. For instance, I was working with the client in production on a very complex good processing process. At the beginning he was reluctant to the algorithm but after a couple of weeks, he noticed that the algorithm is actually making a better judgment than he would do himself. And then, the quality complaints went from 40 quality complaints per month to 0 so no more productions issues in that part of the process. So there are success cases that really helped in accepting artificial intelligence for a factory worker but at the same time when the same applies when your insurance is foreign banking or in trading you have to trust your inputs, you have to know how it's processed and then can rely on the outputs.

And looking at the data in the companies you want to implement artificial intelligence are the data OK or are they often some data missing? I mean is it easy to implement artificial intelligence in other companies looking their data or do you have often some issues?

We often have issues with the data because companies often think they have quality of data but when you then start to work with these data, then there are a lot of problems of completeness accuracy, liability all that data. Hence, while 70% of the work that you do in these kinds of analytics or advance notice or artificial intelligence projects is about preparing and improving the data flows. Only 30% goes to the proper creation of algorithms.

Since how long do you implement the AI in Deloitte because we've seen that it's quite like recent trends in the world and in the consultancy industry so since when have you started to implement those AI technologies in your daily business?

There are two answers to that question: if I look at when was AI created, it was in the 60s so if you look at the advanced analytics which today people call machine learning and we do that already for the last 20/30 years and so rule based decisions which is actually a primary form of artificial intelligence now since it has been called machine learning or AI, 9 years ago the term actually really it was hyped into the markets we're doing this kind of projection.

So, like since eight or nine years you're doing this kind of project.

Yes, if you look at proper process automation to disclose variance, we do that since the technology existed but if you will see we had we always had been in AI. Now if you tell that something is artificial intelligence, people think it's something new but it's really not. So, in that

sense, we have always been working in AI since it exists but calling it proper AI, I think 8-9 years ago.

Inside the big four companies in Belgium or in the world, do you think that to add the last AI technology both inside the company and to present to the client, is it like a race between those for big companies or and or do you place Deloitte compared to the others? Do you think Deloitte is more advanced than the others or all are quite equal, on the same level of knowledge about AI?

I think all of the big four have created the disciplines around and technology in AI in general. Now, if you look at the big four, we have the largest consulting practice of the big four so by nature we are in front of everyone. So, we are market leaders in what we do, we are market leader in artificial intelligence solutions certainly. When it comes to applying artificial intelligence in certain business areas like accounting, tax & legal, I think we are one of the front ones. But then again, we have an ecosystem of young startups and scale-ups which often have more flexibility and innovation potential. So, we try to integrate them in our landscape to have the benefits of starting scale-ups while being a corporate.

So, you are working for the AI along with other small startups and scale-ups implemented in Belgium or anywhere else in the world?

Yes, absolutely. So, did you see that we have a couple of programs in which we support these young startups. One of them is the fast 50 program and so it's a competition and it rewards the best technology companies and one of the categories is of course emerging technologies such as AI and IT. We also have a boosted program we have rendered for couple of years where we put the most successful scale-ups that we try to scale them up globally. So, they have already proven their technology, they're quite successful in the market but they have difficulties in bringing their products in a global market. So, they might have local clients, but they need to compete in the global markets with new types of contracts. I'm coaching one of these startups. They have been very successful on the Belgian market but now, they go to Russia, to Asia, to the US for larger deals, large contracts with more working capital requirements and more investment investors are required. So, we help them in these capital rounds and the legal structures that have to be set up.

About those new technologies, using some robotics instead of human resources that are costing more is going to have an impact on human resources. Do you think it will create jobs or leading to the loss of some jobs?

It will certainly create jobs. MIT has been very explicit and has brought out quite nice articles around it, but you have seen in the past with all other technology innovations. When the steam engine was created, everybody thought they would lose their jobs but now there are more jobs being created as never before. They're only not the same type of jobs. So, if people ask me whether AI will replace jobs, then I always get the same answer. AI will not destroy the job of the doctors, but it will make sure that the doctor that is using AI is more successful than the doctor which is not using AI. And so, therefore, the job of a doctor without AI is probably going to disappear. So, the job content will change but you will still have doctors. And all that guessing and intuition which is being used by a doctor today can be augmented through the use of computer vision for instance or by the use of analyzing sensors on the body. So, will jobs change? Absolutely. Will it become a new set of jobs? Yes, and there are three types of jobs which will be created. At one hand, you have the AI creator, the one that is actually writing the algorithms whether it's single purpose AI or general-purpose AI. I guess you know the difference between. A single purpose is doing just a one task and the general purposes is doing multiple tasks and is intelligent to switch between them. So, we will need to have the guys who are writing the code and you will then need to have the people explaining what has been written and why it is reacting in a certain way. So, the AI explainers and then you have the new role and it's not clear yet who will take that role which is that the AI sustainers. So, that will make sure that whatever has been written is written according to an ethical framework. The one that will sustain because if I was tomorrow unleash machine learning all an insurance algorithm which is classifying the risk of a certain person to be insured. Then, by default, because of the data, it will give less insurance to a single woman with two children. There is bias in the data because we think that the risk is higher from that and, therefore, you create a negative system for all single mothers with children. So, the one that is sustaining the artificial intelligence should prevent that from happening and, we think it might be a role for the government, but the government will not be able to sustain or regulate all artificial intelligence which had been written in the world. So, there needs to be companies that are responsible for that. When we talk about the future of health, where all types of data will be used for investigating a pathogen, so also data from a healthy period collected through variables or collected through the different kinds of sensors and the data from an unhealthy period where the packaging has materialized

of. There will be data companies, new types of organizations that will analyze all of this data. So, there is a completely new world being created outside of the current ecosystem. So, we really believe that there will be more types of jobs in the future than there will be today.

Maybe more like a global view of the AI, according to you, where is Belgium in that AI development? Do you think that the development of AI in Belgium is already quite high, or we are only in the start of this development?

I get these questions often. So, a simple reply would be that we are underinvesting in Europe in general. In Belgium, we have a very good make community, we can be very proud of our startup ecosystem but as said, in the ecosystem, it's often easier to sell your products outside of those because we're very critical as mindset. If I look at the investments which are being done globally in artificial intelligence development, I think the US is by far spending the largest ratio of growth mutual products towards the development of AI. So, the GDP is going more to AI developments than wherever in the world. Then, China or the Asian countries are running right after. So, if I look where AI is being created the most currently, it is in the USA and China. And, we try to regulate heavily that industry not always have the right effect. So, I think we should be more lenient in the regulation towards investments in AI than to be able to catch up with US and China.

More about your personal point of view, how do you think AI will influence in the coming years the consulting sector?

It will be more and more integrated in every step of the way. I was talking about administrative borders that will become lighter through the automation of some processes. But also, the support of the consulting work itself will increase. Today, we do a lot of calls to talk about a client or projects, can you imagine that virtual assistant is listening and is making the synopsis of the conversation that you have had on a specific client and interesting or functional topic by the date, the time that you get to the office, your assistant has already collected multiple sources of that specific problem across the globe and it's telling you in which documents you should look for finding potential solutions. So, I think these kinds of assistances will dramatically increase the effectiveness of any given consulting assignments. I strongly believe that we will be more supported by other consultant practitioners in the way that we do our work, because we can consult a lot more sources of data to go into any given assignments. Secondly, the level of artificial intelligent solutions that we will bring to the market will only increase.

So, it will increase also inside the company by helping the assistants and also of course the solutions to develop, to help the clients will increase and, therefore, there will be more and more solutions to propose.

Absolutely. But then, we're building more and more of our assets within AI component in there. And, that will only accelerate because the more we do with AI, the more time we get to spend on new assets which also include AI.

So, you think it will have a major impact on your daily work? It will change the way consultants are working.

Absolutely.

Do you think that one day AI would be able to replace the consultants?

I've asked myself the question a couple of years ago as well because I have a viewpoint that a lot of the work that we do is based on the experience that we have. So, can a 20-year-old consultant replace 50 years of experience by figure speaking? And then, there is all about the interpretation. I think artificial intelligence is very good in classifying information, in finding patterns. Therefore, make sure that you understand the context and the specific situation that you are in. That is allowing you to go a lot deeper in the analysis of any given financial statement, for instance. But then, when you have to consult and interpret, artificial intelligence is not yet able to do that. It's not able to turn that around with reasonable assurance that the thing that we would propose is the best solution for that specific business context and market. Then, we're not there yet but it might be that in 20 years, when general AI will more become a fact, so the terminated scenario as people call it. But, when you have a child and parent AI working together and improving their algorithms, you might be able to do more and more of the pre-processing, the processing but real advice which you have to think out at the explanation of why certain things will work or not work, there will still be consultants.

I think you answered most of our questions, and that we have all the inputs that we wanted. Maybe one thing that would be interesting is, your thesis actually seems quite interesting in our subject. Would it be possible for you to send it to us?

I'll look at what I can share of it and then I'll send you that.

Perfect and, also, do you allow us to make a transcript of the interview?

Sure, go ahead!

Thank you very much for your time and all your answers.

I hope you realize what you want in that thesis. I'm looking forward to the results so if you could send it afterwards, I will be very happy.

We will do that! Thank you very much, bye.

2.2.3. Accenture – Felix Amez

Good morning! How are you?

Good and you?

Good, thanks! We will maybe start by giving you a quick introduction and then, you can maybe start by introducing yourself, your job and the company you are working in. We are two students in Business Engineering at the LSM and we are currently doing our internships. We are also working on our thesis that is studying the impact of AI in the consulting service market. Accenture seemed very interesting for us as they describe themselves as being very innovative and digitalized. But you can maybe give us more explanations regarding your job and Accenture?

Okay, so maybe first let me give you a quick introduction. I'm already working for 21 years so I'm a bit an old crocodile. I finished my studies in 99. I worked in multiple domains. First, I have been working for 9 years for a telecom supply company, Alcatel which is now named Nokia. And then, in 2007, I moved to Accenture. Until 3 years back, working in SAP, so doing program management or international programs. For 2,5 years, I took the role for Belgium and Luxemburg as Innovation director cross the services cross the department that we do have but also internal and external management. The four domains of responsibility that I do have is, first of all, resources. Globally, we have 250 people doing researches, predicting trends on markets and technologies. But, on a local level, I do have a partnership with Vlerick Management School where we have digital chairs developing point of views and frameworks for new products and services. So, that's the research part. Secondly, I manage also all the partnerships that we do have with incubators, accelerators and startups environment, startup

scalers. So, we call it open innovation ventures. In total, I have 50 partnerships, a number of important ones started at KPC, Digital Attraxion in Wallonia, Tomorrow Street in Luxemburg, Credit Agricole. We have quite a good view on what are the different startups in the landscape of Belgium and Luxemburg. Thirdly, the pillar around locks. So, it applies research and development in technologies around artificial intelligence, extended realities, quantum computing and organic computing for example. How you store data within your DNA, so no longer needing a USB track but just to go on buddy to carry data. And then, the fourth level of responsibilities we do have in the office in Brussels is an innovation location, an innovation center, called Liquid Studio where we have clients from inspiration up to the development of proof of concepts and minimum viable products. So, this is my field of responsibilities. In the four spaces, I would say around 250-300 people are actively working on innovation. Not directly in my organization but it's based on initiatives, on projects so it's quite an on-growing organization. And I'm also part of Accenture Belgian and Luxemburg Executive Committee. So, I have quite a good view on what's happening in the space around innovation.

That's good! Maybe, the first question we can ask you is how, inside Accenture, do you develop artificial intelligence? Are you developing it by yourself or are you working with start-ups?

First, artificial intelligence is maybe one of the elements that you need to make more granular as part of your thesis. Artificial intelligence is very broad. AI can be very simply said a chatbot, can be robotic, can be an automation which is not very high-level rocket science when it comes to artificial or applied intelligence. You have fields within AI talking about computer vision, you have domains talking about machine learning, deep learning so it depends on what are the sub-capabilities of artificial intelligence. Are we able to cover them all? Yes, because in each of the domain, we do support our clients to deliver solutions. But then, it comes to what are the technologies that you will use. For example, in automation, you have multiple platforms from HP or even to Blue Prism allowing you, whatever software code (C, Python…), to develop solutions based on the technology platform. So, you also need to rely on software suppliers. When we look in the spaces of enterprise resource planning with companies like an SAP, Oracle. Even Google and Amazon, they provide out of the box artificial intelligence services which can be used by companies like Accenture to develop solutions for clients.

Inside Accenture, how do you bring ideas to your clients, when you do some consulting jobs, that they should use any type of AI? How is the decision made that the solution for them is to use AI?

There are two elements. First of all, you start with what is the business problem that you want to solve. It's not that you come in a company and say: "yeah, let's have a nice workshop about how to use artificial intelligence in your company". No, you need to turn the debate around. What's the problem that you want to solve? That's the first one. Secondly, what is the return value making the investment? Talking about robotics for example, you can say "we will automate a certain process by mean of robots". But if it only solves 5 men days of efficiency on a year, 5 men days on a cost of 10 000 euros, you will not do it because it means that the return on investment is only after 4 years. Investing 50 men days of development and you are able to save 10 full-time equivalence in an organization, then the value becomes interesting. So, it's what is the business problem that you want to solve and what is the return on investment that you will obtain. And, a third element where you need to be very careful, applying AI capabilities means that there is a shift in human labor. When somebody in the past was doing an activity, now it's replaced by an artificial solution. It means that, either you reskill the individual that he is able to take a different role, or you need to fire people. So, applying artificial intelligence also has a huge impact on workforce. And, when you start talking about workforce, let's assume that in a company, you have to fire 100 people because of an AI project, no doubt that the working unions will jump on it. So, it's what's the business problem, what's the technology, what's the return and what's the organizational impact on AI.

If you arrive in your client's company and you manage to demonstrate that, economically talking, AI will have a great impact. And, let's assume that all the people that will get their job replaced, could have another job in the company. Are they still change resistant regarding AI or are people now more willing to implement it in their companies?

There are numbers of elements. If you do this type of work with a company without a clear strategy and vision of digital transformation, including AI capabilities, there is no success rate. There is resistance from day one. So, it's very important that digitalization is part of the strategic agenda. On the other hand, if you come only with engineers and technical people introducing AI as a technical solution, there will be business resistance. So, applying AI in an organization is a multitude of individuals in the organization that you need to make it successful. What we also start to see besides the pure business dimension, technology dimension, is also the aspect

of ethical artificial intelligence, responsible artificial intelligence. So, they indeed can want solutions which are conform, transparency and removing bias in the organization; A very simple example of bias is when you would use Google Search and you would type “managers” and have a look at the images, you will see that the majority of the images are represented by males. If you type in “cook”, the majority would be females. Even Google still has bias in the response of their AI capabilities. Another example of responsible AI is autonomous driving vehicles. What do you do in a decision process when the car needs to make a validation between 2 options: either hitting a number of individuals on the pavement or an elderly lady on the crossroad? So, by developing AI, you also need to develop the responsible context of AI. Then, you start to work with legal departments, risk departments, which is another dimension that is also included. And eventually, also CSR of organizations.

A question more about Accenture. Do you know since when they started to invest massively in AI? Now, Accenture is quite famous for technologies, digitalization and AI but I guess that it has not always been the case…

AI has been around all the time. Accenture was found in 2001 and basically, AI is already existing for 50 years. So, AI has been there all the time. That’s also the evolution of technology, you can imagine the pros from a mathematical perspective already had an idea about neural networks and deep learning in the 60’s and 70’s but they had to wait to have scalable technologies and there, I’m talking about mobile, cloud… And also, the cost of technology to have a general adoption of a technology in the society. So, there are the reasons why you start to see massive deployment of AI the last 6-7 years because that’s also the moment when companies started to think about how to become a digital company. But that’s the reason why you see the deployment of AI the last 7 up to 10 years, with a very strong acceleration the last 1 or 2 years. Because, I talked about technologies such as quantum, extended reality and that’s maybe an element that you can add in your scrimption, look at Gartner and the Hype curve of technology. Because it starts in the 60’s with main frame, then in 80-90’s with the development of Internet, personal computers, in the 2000 you get into cloud technologies. What you start to see is a cumulative effect of technologies. An example is the CO2 scandal of Volkswagen. The emission scandal that they were manipulating the software to get lower emissions than the reality. To be able to have the proof point that Volkswagen cars are now indeed conform to norms, they created a blockchain solution because every car is sending emissions data in a trusted repository which can be controlled. They applied quantum computing to be able to

calculate because they have such an amount of data that you need to have very powerful machines, so quantum. And, they combined it with machine learning to have predictive models coming out of it. SO, it's not about one technology as a vertical pillar but it's about the strength of the combination of multiple technologies.

What do you think about the Belgian market regarding AI? Do you think it's a bit slow compared to the rest of the world or are we following the pace of other countries? Of course, countries such as US or China are way more advanced than us, but compared to European countries, where are we?

There, you see 2 dimensions. First of all, Silicon Valley in terms of early adoption was one of the front runners for 15 years and they have a huge concentration of companies. Secondly, the boom of AI in China is based on their strength of technologic countries. I'm not only talking about China but also Taiwan or Korea which are, by nature, technologic countries. But also, the regulation in China is different. In Belgium, we talk about GDP regulations. In China, the government has basically said to implement AI besides the regulations that need to apply in the country, in an area. Specifically, for Belgium and Luxemburg, there is a huge traction in startups and scale-ups companies. Mergers and acquisitions are also important. Basically, they want to have a market share. So, you have a consolidation of the market on AI. Maybe one element to add. If you want to have a very relevant interview about AI, you could contact ML6 which is one of the biggest companies in AI in Belgium.

And, what are they doing? Are they developing AI software?

They develop AI models and software. What is quite interesting if you would have a discussion with Julie. She was at Accenture 2 years back and she is now part of the management of the young ICT year contest.

Thank you! I have a question more related to the consulting industry. Accenture is a huge company in Belgium, would you say that it is more advanced compared to other consulting firms or that you are at the same step of the development?

First of all, I want to demystify. They were called "The Big Four" in the past but Accenture is currently the biggest consulting firm worldwide. We reached in January, the total amount of staff that we have is above half a million consultants that we do have. They call called themselves the Big Four because it's a lot of egos together, but Accenture is the biggest. And

then, specifically in AI, I believe that we are, indeed, frontrunners on AI compared to other competitors. The reason I'm claiming this is that, the past 5 years, we have made a big effort in mergers and acquisitions in the space of what we call digital interactive. So, we bought 50 companies with a total staff of 50 000 people. So, it's interesting, it's 5-5-5: 5 years, 50 companies, 50 000 people. And, you know a number of them. Lucie, you are working for Emakina but in Leuven you have Kunstmaan which is actually part of Accenture Interactive. Another example where we use quite a lot of extended reality, computer animations and graphics is Game of Thrones. It's developed by Accenture, done by one of our division in Stuttgart which is called Mackevision. Also, another interesting thing: We are the first company, compared to our competitors, putting toolsets on the market where companies can benchmark their AI models and tools against transparency and fairness. It's also called the Fairness Toolsets. So, it's actually to investigate how much of transparency is your AI capability lacking. And then, another field where we are quite active around AI, maybe a movie that you need to look at, it's a total field of fake news. So, where we gather multiple solutions. So, fake news is one we develop in AI and there is also the first gender neutral voice like Siri or Alexa. They have either male or female voice and we developed a neutral one. JFK is another example where we are using AI. JFK, the US president who got killed in the 60's, was on his way to a big convention when you had to give a speech. Based on AI and other audio recordings, we actually made a recording as he would have given his speech at the convention. So, we had the text of his speech and we used, based on AI, other pieces of his voice to reconstitute his speech that he was supposed to give. I can give you a lot of examples like that to show you that we are very knowledgeable in the space.

I will ask you a question more internally oriented. You are proposing AI solutions to your clients but, do you have any AI in your company to help consultants in their daily job?

Yes! From automation to robotics, chatbot solutions, optimization of our processes, experimenting with virtual interviews in HR, using AI to capture face recognition and voice flags just to have a better insight in the interview. We are using AI to make simulations on projects proposals. Even in the new office in Brussels, we have a solution from Ocular which is a company in Gent providing interactive displaces; In the new office, in the ceilings, they are big screens and assume that Charline enters the office and you are wearing an orange shirt, the screens will become orange. By means of computer vision, you are able to see who is entering but also create an experience based on computer vision caption.

In the daily jobs of consultants, do you have AI helping in the decision of the solution they will implement in the companies? Is there an intelligence able to say: "We faced the same problem 10 000 times, and we used this solution every time"?

Yes! It has an internal name, it's called MyWizard, and it's an intelligent platform supporting accounting and teams delivering solutions on intelligent propositions.

I didn't really get the point of this platform. Is it proposing solutions for a specific problem?

Yeah, a project has a certain life cycle. You are starting with an opportunity, you are getting to estimations, contracting, mobilization of teams, set up of the teams, deployment of the governance structure that the team will use, making predictions on financial forecasts. So, to support this life cycle, there is a platform with intelligent solutions supporting each of the phases.

More on your personal opinion, do you think that AI can reach the point where it can replace the job of consultants?

Certainly! Nd this is not only for consultancy but for any industry, any function you can apply intelligent solutions, intelligent support. There are 2 documents that you need to read that I will send you. It talks about how AI could be implemented in our day-to-day life, AI supporting humans in daily activities. And then, there is a second one which is interesting, and this is about one of our digital agencies and trends. One of the trends they are tackle is IT (Internet of Things) and Internet of bodies. By using computer vision, geo-localization and tracking of individuals, you can go to a next level of personalized services.

If you need to say some blockers about AI to replace humans. Of course, there are the ethical ones, the part that it could destroy jobs, do you think there are other blockers for AI?

But then it's more philosophical type of debate. There are two types of limitations: technology but there is also a huge debate: "Can AI replace the creativity of humans?". Is AI able to make a drawing like a painter? That's a big element on which they are doubting on. Are these stuff that AI, a robot can learn? Ad it's quite interesting. I always like to make the parallel with movies. If you would look at the movie IRobot, with Will Smith, which talks about the ability of robots to adopt human behaviors. From my perspective, I believe it's the only technical limitation.

Also, I guess that there is also all the relationship part with the client that you can obviously not create with a robot.

That's the 6th or 7th sense. Can a robot smell, feel, create, be creative? And there, most likely, the answer would be no. There would be a limitation. And a second limitation is the anti-countability. Talking about the debates that we see about the development of the European Union; the European commission puts some blockers because there is no control on the outcome and decision of AI. And there, the rule that each organization, country or government are taking is that, a human needs to be responsible for the outcome of AI. As an example, in Germany, Audi is responsible for an accident that one of its autonomous vehicles could do.

Of course, it will raise some problems to companies if they have to be responsible for all the possible errors.

Yes!

We also had an interview with an AI company, and they told us that one of the biggest problems is that the law is not ready yet for AI and that's the part which is going to take a lot of time. Is it something that you can feel in your daily work or is it not a limit for you?

Yes! But there, I disagree with the statement that we need to wait for the government to make regulations. Innovation needs to be in a free spirit mind. I'll put it differently, so take the example of Uber. There was no regulation on how a company like that could enter the taxi industry. They did anyway and regulations follow innovation. It's not innovation that needs to follow regulations. But I do believe that you have to stimulate innovation, assess what is the risk and put regulations before you go to more scaling. There is a proper sequence: you start with innovation, you assess the risk, you control and regulate the risk, and then you go for general adoption.

As Accenture is the biggest consulting firm in the world and as there has been a huge boom of AI those last years, have you seen a difference in your competitors? We know that a lot of startups are popping up with AI software, that they are more flexible and can deliver more personalized solutions. Is it a change that you can feel?

Absolutely! Bigger corporates started to partner with startups because with all innovation, you start with inspiration and a small proof of concepts. But then, after a successful proof of

concepts from startups, bigger corporates start to incorporate more and more use cases, still working with those startup companies. So, yes, startups and scale-ups companies are clear competitors. But they also have weaknesses and that's a reason why Accenture is partnering with startup companies because we want to benefit from the knowledge, the assets and intellectual property that such companies do have. But, in most cases, they have the problem of scaling. But, in the end, they have intellectual advantage because they have better solutions. But then, there is also a second element arising, if you would look at a big corporate platform like Oracle, they start to incorporate startup technologies as part of their bigger products portfolio. SAP stand a market of startup companies, including AI to see whether technology they can incorporate in the wrong products. And, an example there is a Belgian company called AIvidence. It's a startup company and they develop predictive models for companies on cash collection and revenues. It will be a solution which will be embedded in SAP as a product. So, you see that startups are competitors. They can be partners, but they can also be integrated in bigger organizations.

So, as a company, Accenture has to remain really agile and active on the market to see which startups are growing and which one you want to integrate in your firm or not.

They are three options. Either, you have a partnership, so a joint go-to-market. Secondly, as part of ventures, we do make strategic minority investments, so investments towards series A, series B. And then, a third option is the pure merge and acquisition. There, we acquire either the company or he individuals of a company. Knowing that Accenture has a turnover in 2019 of 40 billion +, we invested 3% of those 40 billion in acquisitions of startup companies.

Perfect! A more general question. In your mind, artificial intelligence will help companies on the economic side? It will bring more revenues.

Yes! There are two elements. Either, more revenue meaning your topline, so by developing new businesses, or your bottom line which means less costs. AI can contribute in the reduction of costs and in the development of new service and products. And there, you need to look at an example of Adobe, which is developing design software, computer able design software. There is a capability which is called Generative design. It's a mechanism which protect designers, a service designer can use to develop products. Let's assume a bicycle. Based on a number of parameters that you add to a machine learning capability, the AI will design themselves automatically multiple proposals of a product. So, this will also help companies to have newer

products but also quicker go to market. For example, yesterday, there were the announcement about Covid-19 of Johnson & Johnson on the development of new vaccines. No doubt that artificial intelligence and predictive models have been used to come as quickly as possible with new medicines. So then, automation and the robotics in terms of efficiency of the company, so from a bottom-line point of view and the example on generative design is a top line because you create a new product faster.

I have a question more about the future of AI. According to you, what's the next big development which is going to disrupt the market? Because Ai does not really have any limit…

Yes, there is no limitation. There, I would recommend watching with a very open mind series like Black Mirror. This is already a good indication on where AI can go to the next 5 to 10 years. Because, whatever you read in public domains, that's information which is publicly available. But I can imagine that some private and secret research are already 20 years in advance. There is a movie on Internet from Elon Musk, it's an interview and if you would look on YouTube, you need to look for Elon Musk. And the, he was smoking a joint in the studio and there he is talking about limitations of humans. Because, today, we have Internet and big solutions available. If the technology was available, we could connect our own brain directly to the Internet would reduce the limitations on capacity. And it's not the first time that I hear this type of speech. Even in environments where I'm closely connected to, there were already solutions available to do brain veins reading. First, you had to put someone in a big scanner, an MRI scanner and today, there are technologies available where you can read brain veins just like you would have a WIFI connectivity. So, even a brain extension, they put a ship in your brain to have a capacity action. Those are things which are on the board around with public and in secret development. Can I make a prediction about when it will end? No, I only can observe the speed of new technologies and adoption.

I don't have any question left, you answered all of them thanks to your explanation. Maybe, do you have anything to add which could be useful for us?

No, it was great! And, when do you need to submit the thesis?

End of May.

I can still give you 4 or 5 pointers of companies that you can talk to and which are interesting. I will give like 10 startups which have quite interesting AI capabilities. What I would recommend is to have discussions with each of them and then, in a number of weeks, when you have a bit more body around insights, then we can have another of an hour just to see where we are and if you have additional questions.

Let's do that! Thank you very much for your time and answers.

Talk later then and enjoy the rest of the day!

2.2.4. Delaware – Marten Herthoge

Hello, maybe to start we can ask you a bit more about yourself, what is your background, your position and how did you get there?

I studied computer science engineering then I went into studying business economics all and while doing business economics I got in touch with a number of the board of directors from Delaware. I did my thesis together with him and that's how eventually in 2015 I joined Delaware. Originally, I joined Delaware in the Performance Management Department so cost management, strategic costing, etc. About a year and a half after that I noticed that, so I wanted to do some more technical stuff. I switched internally towards the Microsoft business intelligence team. A year also after that, our CEO approached a colleague and myself "look in Delaware you want to do something with AI, we want to do something with data science, are you guys up for it to create a team and to provide us with go to markets about AI within Delaware? So, in January 2018 we officially launched in Delaware those AI and the data science team and currently I'm still holding the position of team lead for data science engineering. So, all things with AI, all things with big data, IoT it all fits in my shop. Just finished my story at Delaware, three different teams in five years so I have seen some things

Maybe we can also present ourselves because we didn't do it. We are two students in business engineering at Louvain School of Management and we have a major in Innovation Management. We are doing our thesis on the impact of Artificial Intelligence on the consulting industries. The goal of this interview is therefore to discuss about how you develop AI in your Delaware and how it's impacting your daily work and the vision of the company and so on. Maybe just like before starting, a more technical question: do you allow us to register the interview to make a transcript afterwards?

Yes, no problem, just send me the interview afterwards.

So, let's start with the basic questions: How do you use artificial intelligence in the daily life of Delaware. Like how do you implement it in the clients?

Do you mean internally in Delaware or how do we implement artificial intelligence at customers?

Actually, we are focusing on the two questions for our thesis so you can start with whatever you want.

I think we use AI for two main topics. One is a payment behavior of customers to understand which customers might deferred payments and which customers does give an impact on our Cash Flow. The other big topic is that we use AI for knowledge mining. The biggest asset of any consulting company is the people themselves. You put people on projects, you send them to trainings, they get certificates, they have a certain educational background but it's sometimes quite hard to understand which profile you can set up on which project. When we receive an email from somebody saying "Look I want to start a personal project but this person is not available anymore" and then they don't start thinking about the first time or something about a certain skill set and then we need to find an easy way to quickly identify the persons with similar or even better skills towards said person is asking for it so this is something that we use internally for scheduling to better understand where do we develop skills within Delaware and how can we more efficiently put the right people on the right project. Especially when corona times, this is quite important because we do have a lot of projects shifting, some scale down, some scale-ups so we need to be able to very quickly put the right person on the right project. That's mainly internal in Delaware.

Of course, the main focus of the consulting companies of course at the clients. What you see there is we have three major blocks within AI or maybe 4.

We first have computer vision so visual recognition of images by an IT system. The main application of computer vision that we see on the market space is about visual quality inspection where companies want to automate certain manual processes where labors have to manually inspect each and everything that is going through. They want to automate this to some extent to get higher throughput to give people more interesting job because you don't have to stands near line. It can also be used to reduce error rates. The main application you can do with

computer vision, image recognition in Belgium at this point is that companies are focusing on quality inspection.

The second major block that we see for AI in Delaware is an LP or natural language processing You might think of bots and things like that. Creating bots is something that we do in Delaware but it's not our main focus, it is more of sidetrack. With an LP we really try to focus on the language mining for example, like a knowledge mining for example. We have internal bases reading texts for CV for instance. By using an LP, we try to find a connection, we try to find links that are written down to help to look through all these different elements. It could also be between different languages. We did a project for the European Commission. Think about the fact that a year ago the European Commission did not have a lot of documents but they're stored in different languages and the very big issue that they had is when they would search for example for climate change in English for example they won't get hits about topics about climate change when it's written in Dutch, in French, German or any other language. It was quite difficult for them to understand where they had knowledge stored and how it would be more easily able to search this. This is something where an LP and AI can come into the picture in sense that it's able to form a link between different languages, form a link between different notions of concepts within a text and therefore make for example search engine more intelligent.

Third one that we see in Delaware is a smaller one but it's what we call optimization problems is more than mathematical thing. While using an optimization problem you try to describe a problem in a very mathematical way and then you ask computer “look this is my problem please solve It”. This can be used for example for planning issues. We did it for a couple of customers in Belgium for the simple reason that planning resources on machines to complete certain orders can be quite tedious some personal faster or slower and specific tasks. You might need specific training. It can be quite difficult with many parameters to form an optimal planning your protection line. This is very use technique called linear programming optimization problems to assist planners with planning their production more efficiently for more outputs.

The fourth topic that we see in Delaware, we describe it as classic data science, but this is basically everything else. You have to go to market with the name on it one way or another what we see as the most common application of classic data science in Belgium is demand forecasting. Also when I go to events, when it presents to people what is AI, what's the best practice to apply to AI, I typically use the forecasting as an example because it's such a simple case and you can use it as an enable for so many other cases. The multiple costing is about

knowing how much you will sell in the future this means you can have a better understanding of the capacity; you have a better understanding of where jobs or where output might slow down. You can link it back towards your stock, it can have an impact on more soft skills so some more soft communication around it. For example, for stakeholder management. I mean the forecasting is such an easy case that you can apply to so many cases and that has an impact on so many flows within a company. This is what we see as one of the major flows within the Belgian market at this point when it comes to classic data science problems.

Just think about another large topic here in the classic data Sciences is drive analysis. A topic that's quite a hype at this point is something that's called customer 360 or you need to get it 360 overview of your customer or 720 or whatever you like to call it but for driver analysis we tried to understand what drives your sales or drives a specific process in your company. This is something that we use primarily for process optimization. So, we use it primarily for process optimization, yield optimization, it could be used to more specifically targets like a marketing campaign because you better understand what drives your sales what drives a customer to buy your specific product. Sadly and this is a weird thing I think the Belgium markets is quite concerned about this driver analysis and marketing nothing process optimization this is something we see on a global scale but specifically driver analysis and marketing is something that in Belgium is in my opinion very conservative, very slow, but if you go to for example the Netherlands everybody is doing it everybody sharing data it's a whole different story. It's quite interesting to compare those two markets in the sense that someone from the Netherlands will be very open, they want to move forward, for them sharing that doing something without a is common business well here in Belgium if you talk driver analysis if you talk driver analysis to position something towards people then neither of them they always tell us look we don't want to be associated with. I mean this is something that got my eye, it's for me it's a major difference between Belgium and the Netherlands.

In conclusion, these are more or less the four big topics in Delaware so: computer vision, natural language processing, optimization problems and legal science topics. I don't have examples but for me it's the model for custom.

Do you think that Belgium is slower because the data are missing or did the way to organize them is not good or just because here, in Belgium, we are more change resistant?

I think we are behind the other countries. If I compare what Belgian companies are doing with AI or at least what they are publicly telling that they're doing with AI, if you compare this to the Netherlands, to Germany, we are running behind. So, this is more or less from a mindset that a lot of people think that AI will be so disruptive that they will lose their job, you will lose personal contacts, etc. For some reason we are quite change resistant, we don't like the idea that a computer is potentially telling us what we need to do. All the sides of the story if you have Belgium most conservative, you might see that China's the most progressive. I had a talk with Pascal Copens a couple of weeks ago, he wrote a book called I think it's already called China's new normal. In China, everybody shares his data, everybody is just used to this and they just expect something in return, they expect a better service in return and they don't care that you have bought a product at certain grocery shop if this means that the next time you go that you get a coupon for discount and they don't mind just wanted to share your data. While in Belgium, we have a different vision on what's the possibility of things. I think another example, we did a project with visual inspection in a company and the main focus was that we had a union that said: "look we don't want this to go into production for the simple reason that people will lose their jobs". Well this effect yes maybe in a couple of years they would hire less people to do manual quality inspection at the same time the current situation was that the people doing manual quality inspection kept their jobs. We had the computer vision platform running side by side to it and the people instead of doing 8 hours a day manual inspection it had about 5, 6 hours day manual inspection and for 3 hours, they just had to review images. We did this because we know that we needed a lot of training data to get our machines as good as the people and we know that at a certain point in time the machines we call this co-intelligence in the sense that people put enough trust in the machines, people understand that the machine is making the decisions equally as good as them and maybe even better so that they can put trust in the machine so that they can focus on other types of work. Well there will never be any more manual quality inspection, I mean a human is just a lot more capable than a machine, but they won't need it. For example, from 100 people doing it might need 40-50 people specifically for manual quality inspection and you might get 70 people more in IT Department, in a more technical apartments maintaining information or focusing on new business, new products, etc. This is a mindset that was very hard to get to in Belgium while in China, let's take Alibaba for example Ali Baba ships easily four 500 million packages on a daily basis so that's huge and this is mostly done by robots. In China, they did have a discussion to know if this is going to steal away jobs but at the same time without putting the robots in place, they won't be able to ship this number of packages and without the solution Alibaba simply wouldn't exist. It's a bit

double, I think. We need to dare more, to try to experiment certain jobs drop and the number of people that you need for. At the same time I think it will also create more jobs in the sense that you will need maybe more people for technical hardware, maybe more maintenance people, you will need extra data scientists maybe because of a higher throughput you have more revenue you can focus more on for example online marketing to be able to sell the extra product.

About the economic impact do you think that it will have like of course it will be positive I think using machine instead of people because they have like all those functionalities that enable to work faster but do you think the impact will be measured on economical side?

I think not at first, it's actually quite a hard question to answer. If people ask me about the impact of AI, I compare it with the Internet 30 years ago everybody was saying "OK now we have the Internet so nobody will sends normal letters anymore, nobody will go local shopping, everybody will shop online, all things like that. So yes we might have lost some jobs in local shopping and things like that at the same time because of the Internet we had a whole new range of possible jobs, we had online market yes, we have data scientists, we had data professionals, we had web designers. The Internet did cost a lot of jobs but at the same time it created all these new professionals that wouldn't have existed without the Internet. It also creates new companies. I mean the introduction of the Internet was huge, will AI be the same? I don't know maybe it's quite hard to say but the job loss in another sector, you always have to see the big picture. I think AI can have a major economic impact if we want to go with it if we keep resisting, if we keep challenging everything that it does we also don't allow it into our lives and maybe it's this Corona price is nice example: we have customers that on the first moment, on the first years, tried remote working with for example Skype for business, Microsoft Teams, etc. was a big thing they said "OK I want this, I want my people to be able to work anywhere anytime" while other companies always said no I don't want this I want to see my people work on my floor. What I see now is the companies that refuse the innovation of allowing remote work or not the companies which are being hit the hardest with coronavirus. I think this also might be an issue with companies refusing to incorporate the AI if you have a true put of maybe 1000 units per day because for the simple reason this is the maximum throughput that you can have with people having to review everything or to produce everything while your competitors can produce 10 times as much with 10 times less people, your competitor has a clear advantage. This is very easy to understand case same with for example driver analysis I know in the Netherlands how they were certain companies targets and people and I also know what their

investment is. I've seen outcomes of projects where the return on investment was easily 200-300% and that's huge. If your competitor is not doing this then basically this is just money that you're showing away. Will the impact be noticeable in short term? I don't think so. There were a lot of scandals in recent years, the Facebook one was the most major one, we often get response from companies group you can do in the eye project with us but you cannot use a reference you cannot use your name not even spoken to another customer or in a completely different sector just we know we did the project but never mention it again and for the simple reason that they don't want their name to be associated with AI with the fact that they let computers help them in the decision making process. It's quite surprising for me actually in a sense that for me AI is nothing more than if you have a meeting, AI is just another person, another source of information that you have to take a certain decision. You don't have to use AI in it my prescriptive way that if AI says A, that you're going to execute A. If you use it, I think at this point the most easy way to grow as a company and using AI is that you just see it as an extra person roundtable helping you with finding a solution with directing your business um and then maybe in 2/5/10 years you might come up to a point and notice that "this AI is actually doing quite a big job or quite nice job maybe we should put it some more into the front and going to a true story of Co intelligence where you just take decisions side by side with a machine". It might seem a bit less personal but might be an evolution that we're looking at.

I think obviously AI will need to be implemented in companies otherwise the companies that will miss this evolution at one point will die because as you said if your competitor is producing more with less resources then it will be cheaper and customer will go to them.

Inside Delaware, I am not in one specific sector or another so I can do work on a food company the others next on defense company I don't know but still the difference can be quite large even within a single sector. I have one example but I cannot name the sector but I'm working for two direct competitors in a branch: one company is struggling with allowing a specific AI solution to help them with the task in the company and they're already at IT for I think almost two years now. We had got a lot of resistance, they were saying "look it's nice but I don't trust this number I still want to use my own Excel or whatever I have flying around to do my calculations" while the other company that's exactly the same case, exactly the same starting point that we had but within less than three months the AI is up and running and at this point they just use the input from the AI too to do their planning, to do their safety stock levels, to basically have better understanding of what might come in the near future for their company. They are producing

almost exactly the same product, it's the same branch but these two companies are so far apart and honestly I have more trust in the company that was able to introduce AI within three months to move forwards, to understand that the world is moving that they need some innovation and they just went for it. It is quite a success story, it's so strange that some companies just don't want to use AI in one way or another even if it is just completely transparent, I don't know, it's very typical in the Belgian markets.

Do you think that the law has something to do with it? Maybe the laws are stricter in Belgium?

We do have stricter laws than China on some aspects but it's quite interesting to read the book of Pascal Coppens "China's new normal", China's privacy laws are actually stricter than in Europe or in any other country in the world. But the take on it this is quite different, in China you have a blind trust in the government: if you give your data to any company within China, they assume that the government will check on this that will make sure that the company that you're giving your data to is not abusing your data. Is this a false sense of privacy? I don't know they just blindly trust government and they go with it. But it seems to work at this point I'm not a China native, I never lived in China, but the model seems to work one way or another. Here in Belgium we simply do not trust the government which anything especially with innovation things because you don't associate the government in Belgium with being innovative organization. That's reality sadly. On the other hands I have worked a lot for government organizations in Belgium, think my largest project at this point is for Fluvius which and actually I mean previous might have quite conservative made towards the outside world but the technologies that they're willing to work with, the cases that they bring forward is actually very innovative, I don't see this the same cases when I visit customers in the private sector. So, it might be somewhere over perception and coming back to the law aspect that's a tricky one in a sense that yes, if you take self-driving cars for example. A self-driving car is an AI that can take decisions for you but if your car hit somebody else while it's driving whose fault is it? This is something that it's simply not covered. Who will you blame? You can't blame the car obviously because it's a machine, it's broken. Can you blame the driver? Can you blame the manufacturers? It's strange also given the fact that their system on technology can be quite old. I know that there's a law on Copyright around Belgium that's still being used today, and it dates from 1994, basically I've I think they still speak about cassette players and things like that when it comes to digital music. It's not really an innovative character of Belgium if you have things

like cassette players and vinyl still in their laws, talking about cities and things like. Also, I used to be involved in a start-up which had something to do with drones. It was for them quite easy to do projects for example, China, Singapore, Dubai everything was OK but doing a single project in Belgium with a drone, forget about it was this hard to get through with exactly the same drones, exactly the same software. To put in a drone show in Belgium I think they negotiated for six or seven months to do a show for specific events and eventually I think one week before the event it did got cancelled yet again for simple issues juridical issues. We tend to have somewhat of a protective law, and it tends to be quite more progressive, more liberal and things like. We might make mistakes, we might have failure, we might have severe consequences of an AI or machine doing the wrong thing but at the same time just like a child is learning from mistakes and growing up, this is something that we need to do with AI, we need to understand that at some point you will have issues, you will have failures, you will have problems caused by machine. Currently our laws are focused on "never have any problem" but this also means that we cannot make any mistakes in the sense that if we cannot make a mistake, we cannot learn from them and we cannot grow towards more intelligent future in my opinion.

I have a question more related to Delaware because you said that the AI department has been created around 2 years ago, right?

Yes, I think we started with the idea in summer 2017.

So, this is quite a new Department in Delaware. We made some others interview with other consulting firms and bigger ones such as Accenture and so on and then said that they were investing in AI since almost 10 years. Why 2 years did you decide to invest in AI? Why didn't you do it before? Do you have any idea or is it because of the budget?

I think multiple reasons. We were doing AI projects in 2016, I even did an internship project in Delaware in 1014. So, Delaware was doing efforts, but it is quite a young company, I think this year we're 60 years old. That's not a long time. We're founded in 2003-2004 with a main focus on ERP implementation so very operational, very focused in the processes. And I think 14-15 years ago we also started to do something with data, with business intelligence, with classic reporting and we just grew together with our companies but for the simple fact that Delaware started as a very ERP focused which now is one of the many things that we put in the markets, and hence the management while starting up a company were focus on the thing that you're known for. I know in 2014 Delaware was with 600 people globally I think this year even with

Corona will going towards 3000, five years ago we were mainly active in Belgium, in one country and 50 years later, we are active in 17 countries. It's just natural progression. Another thing I have to say is that I know a lot of companies claim that they're being using AI a lot. But you have AI and you have AI, if you have a system that has fixed rules and it just executes those rules it gets a specific input, in a very strict sense that's already AI because the system can take an action by itself without human intervention. We define AI within Delaware with signs like, more machine like, where you have the possibility that a machine can do actions independently but also can learn these actions independently. If we going towards in AI in the sense of rule engines, of more formally declaring the logic that has to be built, that the machine has to go to, then we are easily also doing AI for 10 years but I consider this somewhat less as innovative AI or augmented intelligence in a sense that it's just rules that you put into a system and it works. This is basic programming and it has been around for 40/50/60 years. But in a sense, yes, we might be quite late, on the other hand, if I look to our growth currently, we start from smaller projects from small, medium enterprises to different organizations like the European Commission for example. We've seen a tremendous growth since summer 2019. I don't know what happened there and as of summer 2019 we are overwhelmed with work. I don't know what happened in the Belgian market, but something changed we are mainly focusing on IOT, on data platforms and every single time this is for us the basis to continue to do something with AI.

Does AI has really become an area of Focus for Delaware or is it still like a quite small Department in the company?

If you go to Delaware.AI this is basically our global go-to-market branding. Now, within Delaware you have for example data science and engineering this is my team, we were basically some of the core competence centers of anything that has to do something with the AI. Are we the only people that do something with AI? No, we have over 90 people now doing something with data and a lot of times they implement a small aspect which lot of people would say it's AI but it's not their core business. We helped them creating templates and approach so that they can reproduce it on all the pressure that they do. Same for the ERP people, we have some AI templates that we can easily set up next to big package to make the flows more intelligent, to make their way of working more intelligence. Setting up these packages does not require deep science of machine learning or statistics or anything like that but incorporating this might also be seen as AI related. So, I think all in all, we easily have 200-300 people doing something

intelligent with data but not seen as AI. I mean building a chat bolts or using an API that's readily available on the Internet to recognize images sometimes is classified as AI for me this is an integration question, this is not AI, this is just feeling towards an API getting response back and showing this response and other branches in other sectors, other companies do implement AI. They haven't called machine learning engineers who just disable to integrate the machine learning model in production, you do need this sort of people but this is not purely AI anymore this is also the reason why we call ourselves the design engineering and for the simple fact that data scientist truly the core AI, core machine learning, deep learning things like that. This engineering is more everything around it, getting your data there, getting up your data plot lines points, your models into production, your camera systems ready integrate within an ERP package and things like that.

Is it in the vision of Delaware to become one of the leader in AI on the Belgian market or is it more a way to keep up with the pace of development of the other consulting firms or is it really something that Delaware wants to become really into it?

It’s one of our strategies to become the leader in AI. If we compare ourselves towards others well known AI companies then and we see that our revenue with higher and we do have a little bit more people. I think it's quite hard for a consulting company to put yourself into the market for AI. You can put a lot in it, and you cannot be the experts in every single area. I know that companies like KPMG are really into a chatbot story but at that point in time they had actually quite a lot of people active on just building chatbots and then when asking it was more integrating data sources just letting bots services from Amazon from Azure from Google just taking all the data and those platforms generated the bots based on the framework. Is this AI? In a sense yes, you are coding a bot and on the other hand it is just integrating data. Becoming a leader, I don't know. For me personally, I don't know I'm not really busy with trying to be the best or trying to be the number one in Belgium or in Europe. I just see that we get the fun projects, we easily get a revenue targets, we get a project, etc. If I see that we have to refuse quite a lot of projects for the simple reason that we are fully booked for almost the rest of the year then I do have the feeling that we stand out that people find our company. I think it's quite hard to be the champion in AI because you have so many domains.

Of course, but there are so much competition between consulting firms and some are bigger than Delaware and maybe have more budget to invest in those new technologies, so I guess it should be more difficult for smaller firms?

If you look at the Belgium market, actually Delaware is one of the largest firms specific for consulting company. I think IT talking, Delaware is one of the larger players in Belgium and what we basically hear as feedback if Microsoft has a customer coming to them in Belgium for something Azure cloud related, where it's a AI, ERP just I think it's right to Azure cloud, they mainly have three major basement in Belgium, none of them are big companies, they're all smaller companies below 5 from those people and then you have Delaware. So, we're doing something good that that major vendors are also looking at Delaware as a major player in cloud and AI and even on the European level we're doing a lot of projects for the European Commission, this is for the simple reason that we're doing these projects together with Microsoft. If Microsoft gets a request from European Food safety authority, from the environmental agency, they have a lot of companies to choose from and they always come back to us and tell us "look we got a question from a customer, we don't do this and you guys do it, please help us in building the next AI platform for the food safety authority" for example we say yes and we just go for it. We're doing something right, personally I think we're all good firms, I rarely look at competition, I tend to be focused on what we're doing and if I believe that we're doing the right things that we move forward but you actually got me triggered and I might take some time to read up on the competition. If I see the number of people we will need to require if you see the number of people in the revenue we get, I have the feeling that we're doing a great job.

Maybe now talking about the competition, I know that this development of new technologies and AI has brought new competitors to consulting firms such as new startups which are sometimes more flexible and do more personalization in their projects, so how do you deal with that, are you making some partnerships?

We have for example a partnership with data stories and also in partnership with true vision for the simple reason if we strongly believe in a start-up and we see that they have very great products then we also have the mindset "OK look these guys are doing great job we're not going to invest the efforts of lagging behind of trying to catch up with just partner up and we work together on projects" this is really quite successful strategy. Can starters be more flexible I think yes, on the other hand I think one of the strong points in Delaware is that we are quite a pragmatic company. We often get the feedback from larger customers that we don't think like a big four for example we are more open, more pragmatic in the way that they work. This goes both ways in a sense that it gives flexibility of working with customers, they appreciate this

flexibility, we tend to go along way together customer happy and if they do want to change things, we can be quite flexible in that. On the other hands, now that Delaware is growing towards larger companies, I sometimes also understand why other consulting firms have more strict policies in place to work with customers to work on a blue pen and things like that. We have projects that don't go as well for the simple reason that we are sometimes too pragmatic, too flexible. On the other hand, I believe that this is what makes us strong. I mean I'm not even 30 years old and Delaware gave me a team neutral to set up new team. Basically, a question loop and think at that point in time I was 26/27 something like that, Delaware said: “look we believe in you, just go for it. We will give you some guiding lines, we will help, you can use us as a review check, sanity check but everything else just go for it execute your idea and if it’s good we will tell you and if it's not good, we will tell you as well. Delaware always says we have a value that's called entrepreneurship basically with data science engineering, three years ago we were a starting point in Delaware. We did have a safety net in a sense that if we did not have any projects we did have, Delaware to fall back on. At the same time we got a lot of flexibility if we were going a certain direction, we did get challenged but if we could motivate our decision then the partners basically said “it's OK” and this is something that's quite powerful in Delaware, I don't think in other much larger consulting firm this is something that you can easily do. Especially not as a 26-year-old.

More about the AI inside Delaware just a question about your own point of view, to what extent do you think that AI can help or replace a physical consultant?

In a sense, as a consultant you're supposed to have very deep expertise about a specific knowledge area and you also have to be able to execute this in one way or another. I don't think any AI will be able to do this. I think consultants will be around forever and they might use AI as an extra resource I think for example, communication people they do a lot of interviews and then now starting to have better algorithms to transcribe spoken words towards text. This is also basically AI, understanding spoken text and writing it down. This is getting better than this might help them in their job but won't replace their job. You still need somebody who to come up with the questions, with a reasoning behind, with science behind. I have found in a recent request for proposal, we have a company that is able to let AI create an entire website so they found a way to describe the websites to some extent to make some mockups and the AI with using robotic process automation basically generates many flows of code and in the end we get a working website and it works perfectly and it has the added benefits if you just simply change

the mock-up a little bit and then the bot just starts working and a couple of hours later it's created by the bots and you have to incorporate the changing our website. So, this is quite an interesting revolution, I'm actually quite interested to see how they would tackle the problem and to see their product work. Will this replace consultants to some extent? Yes maybe, maybe you'll have less web designs and things like that. At this point in time I don't see my job replaced by a machine if that's what you're asking for. I think for us it's more of a like the knowledge mining on skills that people have and this is something that we put a lot of time in and we need to put a lot of time in because knowledge is money in a consulting firm. We need to know where our knowledge is to be able to provide personal customers. These manual processes might be automated, might be made easier to some extent with AI; maybe there will be others as well. We had actually a recruiting experiment where we had a robot interviewing some people. It was it a success more or less, the robot had lot of difficulties with understanding spoken language, but it was actually quite a nice experiment, we do it with the person in the room. It was nice to just experiment with it. Where I do see an advantage, more in augmented reality, in a sense that we can help our colleagues in virtual way. But still the knowledge would be inside the mind of a human not at this point inside the minds of an AI. I see some signals from the markets from a large family that you were together with you have created an AI able to create power points, sales deck. So, you just if you go to specific customer you type in the name of a customer, type in some keywords and they generate for you a completely complete sales deck made towards that customer including visuals, logos of the customer, etc.

I don't see another question to add but maybe you have something else that you want to add that could be useful for us?

What's your personal opinion on AI in Belgium?

What we see from or interviews is that everybody is quite aligned. Having a personal opinion is quite difficult because we are less expert than you.

Maybe if tomorrow you would sign a contract with a company and you will know that an AI is giving you orders, how would you think about this?

In my point of view uh there is always the problem that a I cannot really, for now at least, cannot feel uh the human side of people. I mean I want to work in a company with AI of

course because I think I'm convinced it's the future and companies need to have so but I'm not sure that I would be quite agree with if my boss is an AI giving me orders.

I am just asking the question because I know companies are thinking about like with the optimization problems that we do is that they are thinking of just having no human planner interaction anymore on a day-to-day basis and just have one review in the beginning of the week and every correction for the rest of the week will be done by computers so that's basically means that people working on the line they come and they get a work order "OK today have to do this and this and this" to get these orders out and they were getting them directly from the machine. And they still have a human operator ready but their plan or day-to-day basis by machine. I think it's a bit strange but at the same time also why not.

Yes, it could be great in that sense, but I think there you always need a human at least for an unexpected problem that the machine could solve.

Well it's an interesting topic to talk about, I think if for your thesis if you have time to read one more book and I'm sure you will like "China's new normal" from Pascal Copens it gave me a whole other look at china and how China is looking at innovation. It's quite interesting to see how they look at it and then compare it with their own more western vision on AI and things like that. It's quite a big contrast and at this point it also helps me position AI more easily at companies. So, don't take it site purely scientific literature he also tells some somewhat about his life, I think he lived about 20 years in China so it's a little bit about his personal experience as well. So, it's not scientific literature but it might give you some inspiration for the thesis.

We will have a look at this, thanks.

If you would have any more questions, feel free to reach out. It's quite busy nowadays with Corona and things like that. Honestly, I don't know what's happening, some departments have less work, we keep getting more and more work for some reason, it doesn't stop which is good but at the same time it gives some challenges. But if you have any other question just give me a call or put them in an email and I'll try to respond as fast as possible.

Ok perfect, we will make the transcripts and come back to you so that you can check if there are some information that we cannot write on it.

Yes, if you want to review something, we work together with all of these students on a yearly basis, sometimes it is interesting to read, sometimes not but I think this will be interesting.

Ok perfect, thank you.

2.2.5. Irex Consulting – Adrien Deltenre

Bonjour, avant de commencer vous pouvez peut-être vous présenter, expliquer un peu votre parcours, etc. ?

Je m'appelle Adrien Deltenre. J'ai fait mes études à la Louvain School of Management avec comme option innovation Management et marketing digital. J'ai donc fait une immersion en digital marketing qui se faisait à l'époque à Mons et ça fait maintenant un an et demi que je travaille pour Irex consulting. Je suis en projet pour l'instant chez un client, Solvay, qui est plus connu pour le pôle chimie en Belgique mais qui a également un pôle au niveau de l'énergie sur la France. Mon projet est situé à Paris donc je travaille depuis Paris. Mon rôle au sein de l'entreprise, on va dire que j'ai plusieurs rôles donc j'ai mon rôle de consultant, de Project manager pour la partie externe et ensuite j'ai un rôle interne où je suis je m'occupe beaucoup de process internes et également tout le pôle marketing et une partie du recrutement également.

Irex agit bien au niveau national et international ?

On agit au niveau national oui pour la Belgique en effet et on tend à évoluer, on est acteur en France également et on a commencé à voir des clients en Allemagne. Donc on s'ouvre à l'Europe avec principalement une activité très centrée sur la Belgique pour l'instant mais aussi également quelques clients en France, en Allemagne.

Irex représente une entreprise de quelle taille plus ou moins ? Si on parle notamment au niveau du nombre d'employés ?

On peut plus être considérée comme une start-up étant donné que on est 50 consultants. On a une maturité de 8 ans car Irex a été créé en 2012. Au niveau des consultants, la moitié sont des ingénieurs de gestion et l'autre moitié des ingénieurs civils qui ont aussi un intérêt pour le business et principalement pour l'énergie.

Pour directement rentrer plus dans le vif du sujet. Notre mémoire a pour but de définir quelle est l'influence que l'intelligence artificielle peut avoir dans le milieu de la consultance. Pour ça, on étudie vraiment 2 aspects: d'un côté on va étudier tout ce qui est comment est-ce que les entreprises de consultance implémentent de l'intelligence artificielle chez eux, en interne pour aider les consultants dans leur job de tous les jours et comment est-ce qu'elles conseillent à leurs client de l'implémenter dans les processus pour résoudre les problèmes. Est-ce que d'abord chez Irex vous utilisez où vous conseillez de AI ?

Au niveau interne, on n'a pas implémenté d'AI étant donné que on est une société en croissance, il y a des structures qui doivent être mises en place avant de pouvoir mettre de l'AI. On est dans une startup plutôt PME donc tout ce qui est intelligence artificielle n'est pas encore développé chez nous.

Et c'est quelque chose que vous voulez faire dans le futur, qui est programmé ?

Ce n'est pas forcément une priorité chez Irex. Mais on a aussi une partie ou on développe des applications mobiles pour le secteur de l'énergie mais également pour la construction et dans la partie énergie, étant donné qu'on travaille sur un pricing tool, on a une partie de l'intelligence artificielle au niveau de tout ce qui est modélisation mathématique, etc. où on essaie d'intégrer un peu d'intelligence artificielle. Mais on va dire qu'au niveau utilisation interne au jour par jour pour les employés, il n'y a pas d'intelligence artificielle qui a été mise en place pour l'instant.

Au niveau des clients, vous nous avez dit que vous aviez un pricing tool, quel est le type d'AI que vous utilisez pour vos clients ?

On fait beaucoup de ML, plutôt que de l'intelligence artificielle comme on peut le voir avec en marketing avec des chatbots, etc. On va plus être vraiment sur du machine learning, de la modélisation donc mettre en place des modèles mathématiques. C'est aussi au final ce qu'on fait chez nos clients, c'est les conseils qu'on donne au niveau de l'implémentation au niveau de l'intelligence artificielle ça va être pas mal de machine learning. Si je peux donner un exemple, on va implémenter des modèles de forecasting de prévisions de production d'électricité donc on a des éoliennes un parc éolien où il va falloir prédire au mieux possible la production d'électricité et donc on va faire appel à machine learning, du Random Forest etc. pour réaliser cela.

Donc vous utilisez quand même pas mal parce qu'en fait la machine learning c'est quand même une grande part de l'intelligence artificielle au final donc vous, chez le client vous implémentez quand même pas mal et c'est quand même dans le quotidien de mettre cette solution-là chez le client ?

Avec la digitalisation, c'est une chose oui arrive de plus en plus. Ce sont des demandes qu'on a de plus en plus de nos clients car ils voient que leurs concurrents sont de mieux en mieux au niveau de tout ce qui est forecasting de modèles, etc et donc ils se posent la question pourquoi nous on n'est pas aussi bons dans ce domaine est donc le pas à sauter pour eux ça va être d'implémenter tout ce qui est ML.

Donc dans le domaine de l'énergie c'est vraiment très important d'avoir tout ce qui est plus machine learning, l'intelligence artificielle et tout ça ? Les clients y font attention ?

Ça dépend un peu, on ne peut pas prendre tous les projets liés à l'énergie où on devra faire de l'implémentation en machine learning mais on va dire que 20-25% de nos projets il y a de l'implémentation machine learning nécessaire.

Et donc vous disiez que ce sont même les clients qui venaient vous demander d'implémenter du machine learning parce que du coup dans d'autres interviews beaucoup d'entreprises nous disais que les clients étaient plutôt réticents à l'implémentation parce que ils avaient un peu peur du changement, de l'inconnu etc et que du coup c'est pas toujours évident pour les consultants parce qu'il y avait d'un côté cette peur du changement et de l'autre côté que les entreprises étaient pas spécialement prête à cause de problèmes de données. Est-ce que c'est quelque chose que vous rencontrez ou pas du tout ?

Ce sont souvent les grosses problématiques qu'on a quand on arrive chez un client, c'est qu'ils ont des bases de données qui ne sont pas propre donc ça fait au final partie de toute notre process de conseil c'est de partir sur quelque chose de pas du tout propre, de pas assez bien ficelé au niveau de leur base donc faire un travail sur cette partie en amont et ensuite après avoir fait ce travail-là commencer à utiliser et implémenter le machine learning.

Je reviens sur le fait que vous avez dit que vous commencez à vous développer plus en Allemagne. Est-ce que vous voyez une différence entre la possibilité en Allemagne d'implémenter de l'intelligence artificielle et celle en Belgique ? Parce que quand d'autres interviews, on a pu comprendre que les Pays-Bas, l'Allemagne étaient souvent bien avancés

au niveau technologique en comparaison à la Belgique, est-ce que vous voyez une différence ou pas spécialement ?

Étant donné que j'ai travaillé sur la France je n'ai pas trop de vue sur ce qui se passe en Allemagne ou en Belgique. Je pense même qu'en Allemagne on n'a pas encore eu de projet lié à ça donc on a eu des projets un peu stratégiques de fusion-acquisition d'entreprise mais on n'a jamais eu de de de projets liés à tout ce qui était machine learning.

Au niveau du développement du ML, est-ce que vous faites en interne par des développeurs, est-ce que vous avez votre propre programme que vous mettez chez le client ou alors est-ce que vous faites appel à des entreprises externes ?

Ça dépend des disponibilités du client on va dire et de ce que le client veut. Notre objectif c'est de travailler, développer des choses chez le client en interne avec ses propres équipes donc on a des consultants par exemple qui développent par exemple en python du machine learning où ils font appel à des d'autres bases de données pour mettre en place des modèles Random Forest ou d'autres. On l'a déjà fait de notre côté, par exemple, à Paris on a utilisé une plateforme qui s'appelle data IQ qui est justement centrée sur tout ce qui était machine learning donc ils ont vraiment une connaissance à ce niveau-là et c'était une demande de notre cliente de passer par ce prestataire-là pour l'implémenter donc nous on a dû travailler avec le prestataire souhaité et les équipes en interne.

Donc vous n'avez pas de produit que vous mettez chez le client, c'est plus au cas par cas ?

On l'a implémenté sur notre pricing tool pour qu'il soit le plus optimal possible et encore c'est du cas par cas pour nos clients mais on ne vient pas avec une solution toute faite de ML. On vient plutôt avec un conseil et une expertise sur base des différents projets que on a pu avoir là-dessus.

Est-ce que c'est dans vos envies de développer un produit ou ce n'est pas dans la stratégie d'Irex ? Ou c'est plutôt de s'adapter à la demande ?

Aujourd'hui je vais dire que ce n'est pas forcément une de nos stratégies mais c'est possible étant donné que nos stratégies évoluent assez rapidement et en fonction du marché et des demandes du marché, si maintenant on a on voit qu'il une forte demande et qu'il y a du potentiel

à le faire on a une partie de développement en interne donc on a des personnes qui sont totalement qualifiées pour pouvoir le faire. Mais aujourd'hui ce n'est pas notre priorité.

Donc vous suivez vraiment les tendances du marché et l'évolution. Ensuite, en fonction de l'évolution vous vous adapterez ?

Oui mais étant donné que le marché de l'énergie c'est notre secteur de niche dans quel on veut devenir les meilleurs et vraiment continuer à évoluer là-dessus on est toujours à l'écoute tous du marché de l'énergie et des tendances actuelles, des évolutions que ça soit digital ou autre ou l'entrée de nouveaux acteurs. On doit avoir un œil attentif sur tout ce qui se passe sur le marché de l'énergie aussi bien en Belgique niveau national que à l'international.

Au niveau du marché et des nouveaux acteurs, on voit les startups qui sont très au point au niveau technologique, qui développent leur programme d'intelligence artificielle et sont plus performantes à ce niveau-là. De plus, les startups sont parfois plus flexibles ce qui leur permet un meilleur service. Est-ce que ce sont des concurrents pour vous ?

C'est plutôt positif pour nous l'arrivée de toutes ces start-ups parce que étant donné que nous on vient avec vraiment notre expertise sur le secteur de l'énergie, sur le marché de l'énergie avec des clients qui sont dans le marché de l'énergie on voit plutôt travailler avec ces start-up qui développent des modèles en intelligence artificielle étant donné que nous on vient pas avec notre propre proposition donc on va plutôt mettre en place des partenariats ou aller vers eux plutôt que de les voir comme des concurrents.

En parlant de concurrence justement au niveau des grosses d'entreprises, si on prend vraiment les acteurs principaux tels que KPMG, Deloitte, etc. est-ce que vous ressentez une forte concurrence avec eux ou ce n'est pas vraiment le cas ?

Aujourd'hui au niveau de Irex, tout ce qui est Big Four, Big Three, on ne les considère pas comme des concurrents parce qu'au final on ne s'est jamais retrouvés au même endroit au même moment. Justement je voyais dans vos questions que vous demandiez pourquoi une entreprise va venir vous chercher vous plutôt qu'avec une autre ? C'est justement grâce à notre expertise, nos connaissances sur le marché de l'énergie et notre réputation que on fait une différence sur le marché de l'énergie. Je pense aussi le fait qu'on soit une entreprise de plus petite taille, on va peut-être avoir des files un peu moins élevées donc on apporte peut-être des solutions un peu

plus pointilleuses au niveau du marché de l'énergie. On est plus petits, plus agiles et les choses peuvent aller plus vite aussi.

Pour clarifier est-ce que le domaine de l'énergie est le seul domaine où vous êtes présents ou vous avez des clients dans d'autres domaines ?

Aujourd'hui c'est notre domaine de prédilection. Après, on voudrait évoluer dans le Pharma qui est un deuxième marché cible qu'on vise mais on n'a pas envie de partir sur des marchés comme la banque, l'assurance où on voit toutes les entreprises de consultance travailler pour ce secteurs-là. Nous on cherche plutôt des marchés de niche comme l'énergie, le Pharma.

Pour être sures, vos clients sont plutôt des entreprises PME ou aussi des grosses entreprises ?

On a tous les gros acteurs en Belgique, par exemple Lampiris, ou encore le groupe Total. En France on a direct énergie, Solvay. On travaille avec le groupe Colruyt, etc. Et également d'autres entreprises fournisseurs en Flandre également. On a un portefeuille de clients assez diversifié entre grandes entreprises, multinationales et plus petites.

Pour plus revenir par rapport à l'intelligence artificielle dans le milieu de l'énergie est-ce que vous pensez que développer cette intelligence artificielle pourrait vraiment être un plus pour le secteur et que ça pourrait vraiment apporter un gros impact et économique au niveau des conseillers du secteur ?

Implémenter l'intelligence artificielle pour des entreprises au niveau de l'énergie ça a un avantage concurrentiel pour eux parce que le marché de l'énergie est assez précis. Si tu veux être le meilleur il faut aussi que tes data soient les plus claires pour être les plus performants. Pour moi le secteur de l'énergie a de l'avenir sur tout ce qui est intelligence artificielle mais beaucoup plus ML surtout avec la montée du renouvelable qui est beaucoup moins stable et plus difficile à prédire. Justement tout ce qui est intelligence artificielle à une valeur une valeur ajoutée sur cette partie-là.

Pour mieux comprendre, vu que l'intelligence artificielle ça fonctionne fort avec des données avec des tâches répétitives est-ce que vous ne pensez pas que le fait que justement tout ce qui éoliennes le soleil etc, c'est un peu imprévisible, on ne sait jamais être sûr à 100% du coup est-ce que le machine learning va vraiment réussir à prendre toutes ces données en compte au jour le jour ?

Nous on a implémenté par exemple chez mon client enfin chez Solvay en France en fait ils sont responsables d'équilibre donc ils doivent nominer les consommations d'électricité les productions en J+1. Tous les jours ils doivent nominer ce que fera le parc éolien pour le lendemain. Pour cela, si on ne met pas en place des machines qui vont aller rechercher les données météo et mettre des poids derrière ces paramètres, c'est difficile pour l'humain de faire cette prédiction tous les jours de manière précise. L'implémentation de tout ce qui est machine learning fonctionne mieux que la manière de faire en utilisant un humain. Après on va dire que ce n'est pas forcément le plus facile mais ça ne demande pas beaucoup de paramètre non plus. Par exemple pour l'éolien on aura le sens, la vitesse du vent ce qui veut dire que sur 5 paramètres on peut déjà prédire.

Plus au niveau de la consultance dans l'entreprise est-ce que vous pensez que développer du machine learning, une intelligence capable de dire par exemple « voilà on a déjà eu 100 entreprises qui avaient le même problème sur 100 entreprises on a utilisé à chaque fois cette technologie-là qui a été implémentée de cette manière donc on va agir de la même manière ». Est-ce qu'avoir une intelligence qui permettrait de faire ça serait bénéfique où pas spécialement ?

Pour prodiguer du conseil, pas forcément. A voir comme ça je dirais que ça n'a pas vraiment de valeur ajoutée. A notre échelle, je dirais que ce n'est pas important parce que on n'a pas encore assez de projets et clients pour ne pas pouvoir tout gérer nous-mêmes donc typiquement ce genre de message que pourrait mettre en avant une intelligence artificielle on est capables de le faire par nous-mêmes aujourd'hui.

Plutôt au niveau historique, depuis combien de temps que vous avez décidé d'implémenter le ML chez vos clients ?

Je suis seulement arrivé il y a 1 an et demi et ça se faisait déjà quand je suis arrivé. Je dirais que ça fait 3 ans que on l'implémente sur le marché de l'énergie. Mais je pense que à cause des digitalisations et notre marché qui est plus sous pression qu'avant, chaque entreprise et fournisseur veut être le meilleur et il sait que il doit travailler sur ses données donc implémenter une partie de machine Learning derrière. C'est aussi le principal pour nous parce que on doit être là pour les aider dans ce sens.

Donc pour vous c'est vraiment important dans le domaine énergétique de s'adapter sans cesse ?

Ça dépend, on va dire du type de clients mais pour tous les clients qui sont responsables d'équilibre en Belgique, c'est une demande importante. Après pour des entreprises qui sont focus que sur la distribution d'énergie ça sera peut-être moins important pour eux. Mais oui une grande partie des fournisseurs d'énergie en ont besoin. Par exemple le groupe Colruyt qui a également développé son pôle au niveau de l'énergie, c'est important pour eux parce qu'ils doivent savoir prédire combien vont produire leurs éoliennes tous les jours pour pouvoir savoir s'ils vont être dans le rouge au niveau de leur consommation d'électricité ou pas et donc eux ils ont intérêt justement avoir vraiment une vue bien détaillée et d'utiliser un peu de machine Learning à ce niveau-là.

Ces entreprises qui ne sont pas encore passées au ML pour le forecasting, ils font tout manuellement ?

Il y a encore des entreprises qui travaillent manuellement aujourd'hui, qui reposent sur des modèles Excel créés par des internes chez eux un peu experts, un peu ingénieurs on va dire. Mais on va dire que le marché de l'énergie était fixe tout un temps mais maintenant doit bouger pour aller sur quelque chose de beaucoup plus robuste. Si je prends l'exemple de mon client, on travaillait sur de l'Excel quand je suis arrivé et quand je suis parti c'était des bases de données robustes avec un prestataire en ML.

Pour réaliser un projet total du moment où vous arrivez jusqu'au moment où la nouvelle technologie est mise en place prend combien de temps ?

Pour le projet qu'on a implémenté il a pris 6 mois mais on ne considère pas ça comme un énorme projet mais la transition a pris 6 mois.

Pour revenir plus sur la réticence, je comprends que les clients veulent implémenter de l'AI. Mais, donc, est-ce que vous avez aussi tout ce travail à faire au niveau des employés de les convaincre que l'AI peut les aider ? Est-ce qu'ils n'ont pas peur de perdre leur emploi ?

Personnellement au niveau de mon projet, ils n'ont pas vu ça comme une menace. Ils n'ont pas eu peur de perdre leur job mais ils voyaient plutôt une plus-value et quelque chose qui était plus ennuyant à faire allait être repris par une machine. Que ça allait engendrer un gain de temps et

de couts. Parce qu'avant le cout des écarts entre ce qui était annoncé et ce qui était réalisé, on les ciblait en disant que c'était de leur faute. En implémentant ces modèles, c'est plutôt la faute de la machine.

Ils ont vraiment vu ça comme un outil qui pourrait apporter de la plus-value pour eux ?

Oui exactement.

Vous parlez qu'en France ils sont peut-être plus en avance que la Belgique au niveau de l'implémentation de l'AI ou digitalisation, est-ce que vous auriez des exemples ?

Je ne dirais pas qu'ils sont en avance parce que quand on est arrivé ils avaient rien implémenté enfin en tout cas chez notre client mais on entend souvent et on voit souvent que la France au niveau digital sont un peu plus en avance que la Belgique. Ce sont des choses que j'ai pu voir dans mes cours à l'époque qu'il y avait une tendance que la France était plus en avance que la Belgique. Je ne sais pas si c'est votre ressenti aussi ?

Dans toutes les interviews que on fait ça ressort en effet que la Belgique est quand même derrière les autres pays en ce qui concerne l'acceptation du digital et l'implémentation. Et puis justement c'est un peu un contraster avec le nombre de start-ups qui proposent des programmes et des solutions de plus en plus innovantes et au final d'un autre côté l'implémentation des entreprises qui est beaucoup plus lente et encore un certain niveau le niveau d'acceptation encore assez faible. Et que du coup les consultants ont parfois un travail important à faire pour convaincre l'entreprise que c'est intéressant de faire ce pas dans le digital.

C'est sûr qu'au niveau change management on a des choses à faire parce que toute personne est un peu réticente au digital et c'est justement notre rôle aussi en tant que conseiller et consultant de faire passer le message aux entreprises qui nous sollicitent.

Ça fait partie j'imagine de ce que vous présentez quand vous apportez la solution ?

Oui, nous on va toujours se tourner vers une solution hum on va essayer d'automatiser le plus le plus possible de process avec ou sans machine learning avec ou sans intelligence artificielle ou digitalisation mais on cherche à automatiser les processes et donc oui ça fait partie au final

de notre plan quand on va démarcher un nouveau client ou quand on va démarcher un nouveau projet chez un client.

Par rapport à quoi votre avis personnel, comment est-ce que vous pensez que l'intelligence artificielle va pas encore se développer dans un coté de l'énergie et au sein de Irex directement ?

De manière très générale ça peut que s'améliorer parce que tous les secteurs et industries vont devoir aller dans ce sens-là un moment donné et on le voit bien, comme vous le dites avec l'émergence de toutes les nouvelles start-ups etc qui se lancent là-dedans on doit se mettre au goût du jour. Après on va le pousser au niveau des conseils qu'on va prodiguer aux entreprises mais est-ce qu'on va l'implémenter en interne où est-ce qu'on va produire nos propres outils liés à l'intelligence artificielle ? Peut-être pas mais on va plutôt peut-être alors chercher à avoir des partenaires dans ces nouvelles start-ups qui ont du temps et qui se lancent à fond là-bas.

Vous êtes peut-être encore un peu encore trop petit on va dire, même si vous êtes 50, pour développer maintenant. Est-ce que c'est plutôt une question liée au fait que vous n'en avez pas besoin ou aussi au niveau du budget de l'entreprise qui à ce stade de croissance peut-être n'a pas envie de dépenser ?

C'est plutôt que on ne le voit pas comme un intérêt réel et comme une demande de nos clients et on ne démarche pas ça comme potentielle source de revenus pour Irex dans le sens que on se concentre sur ce qu'on fait et on veut s'améliorer sur ce qu'on fait et dans un deuxième temps, pourquoi mais aujourd'hui on se concentre beaucoup plus sur ce qu'on est en train de faire.

Au niveau aussi de votre opinion personnelle, pensez-vous que l'AI serait capable de remplacer un consultant, dans quelle mesure ? Par exemple en déployant des AI qui permettraient de voir les problèmes que on a eu dans les entreprises avant, que tout se fasse automatiquement. Un programme de decision-making de la solution pour augmenter la précision des conseils donnés au client.

Donc un peu des AI basées sur des statistiques qui vont faire ressortir ce qui a été fait dans le passé ?

Oui c'est ça.

C'est vrai que moi de mon côté, je n'y ai jamais pensé et j'ai toujours vu l'intelligence artificielle comme une force plutôt qu'une une menace pour nous. Donc je dirais qu'au jour d'aujourd'hui je ne considère pas l'intelligence artificielle comme une menace et on va dire que je suis pas entre effrayé d'avoir une intelligence artificielle qui se mettent en place. Je pense qu'il y a des parties du métier de consultant qui sont difficilement transformables en intelligence artificielle.

On entend beaucoup par exemple les aspects humains, la relation qui doit se construire aussi avec le client, une relation de confiance c'est aussi le fait de comprendre le client qui est peut-être la partie la plus compliquée à remplacer vraiment par une intelligence.

Oui tout ce qui est gestion sociale et tout ce qui est justement on en parlait de toute la partie de change management c'est une partie qui pour moi a une grosse importance dans la consultance et qui justement risque d'être compliquée à amener justement l'intelligence artificielle. Après prodiguer des conseils je pense que oui ça pourrait être fait par une intelligence artificielle qui pourrait sortir exactement le même résultat qu'on sort mais il y a cette relation de confiance et cette connaissance derrière qui joue aussi.

Dans tous les cas, ce ne sera pas pour tout de suite mais peut-être plus comme un allié pour augmenter la performance mais pas une menace.

Oui je pense aussi que en tout cas jusque son arrivée à maturité ça sera plutôt une force qu'une faiblesse pour le secteur de la consultance. Ça va venir compléter le job du consultant plutôt que le remplacer. On risque de pouvoir l'utiliser de manière profitable pour nous aussi parce que ça final ça va nous faire gagner du temps sur les conseils qu'on va prodiguer aux entreprises. Par exemple, un conseil que on aurait peut-être pris 2 semaines pour le mettre en place grâce à l'intelligence artificielle il va nous faire notre étude en 2 jours donc ça peut apporter un gain de temps et dans la consultance le gain de temps est très important. Ça va aussi permettre de pouvoir élargir le nombre de projets, etc.

Parfait, je pense que vous avez répondu à toutes nos questions mais peut-être que vous avez quelque chose à ajouter ?

Non je ne pense pas, bonne chance pour votre mémoire.

Merci au revoir.

2.2.6. Argafin – Louis Deboot

Salut Charline, Salut Lucie, comment ça va?

Ca va et vous?

Nickel! Vous en êtes ou dans le mémoire ?

On a déjà rendu une première partie et là, on est dans la rédaction de la partie pratique. Du coup, on organise nos interviews en parallèle.

Super ! J'espère que je vais pouvoir vous aider parce on n'utilise pas l'AI chez nous et j'espère que ce sera quand même intéressant pour vous.

Justement, c'est intéressant de comprendre un peu plus pourquoi certaines entreprises ne l'implémentent pas. On a déjà eu quelques interviews avec des grosses entreprises et c'est intéressant pour nous de faire le contraste avec une plus petite entreprise comme Argafin.

C'est vrai qu'ici ça va être fort différent parce que Argafin est beaucoup plus petit qu'un Big Four ou que les autres boites de consultance. Et en plus, nos clients sont toutes des petites PME ou des start-ups, donc même nos clients sont beaucoup plus petits. Les Big Four, en général, ils vont dans les grosses multinationales du BEL20 et tout ça.

Et du coup, Argafin existe depuis quand ?

Ca existe depuis 4 ans. C'est tout récent, j'étais le 7e employé. Maintenant, on est 14 mais l'année passée, on était 7. C'est encore petit mais on grandit bien.

Et c'est spécialisé en finance ?

Oui, donc c'est du consulting financier mais ça reste assez large. C'est principalement de la finance mais aussi un petit peu de gestion et tout ça. Chez Argafin, on prend le rôle de directeur financier mais à temps partiel. Nous, on vise les PME qui sont trop petites pour avoir un directeur financier à plein temps et qui, du coup, font appel à nous pour prendre ce rôle 2-3 jours semaines. Comme ce sont des petites boites, ils n'ont pas besoin d'un plein temps et en 2-3 jours, il y a moyen de gérer la finance de la société. Un manager prend ce rôle de directeur financier, avec l'aide des seniors et des juniors. Ils ont quand même les services d'un vrai

directeur financier mais sans l'avoir à plein temps, c'est sensé leur revenir moins cher. Le but c'est vraiment de prendre ce rôle de directeur financier et de faire tout ce qu'un directeur financier fait. En fait, dans les PME, le directeur financier il fait plein de trucs : la finance, la compta, la gestion, les processes, le cash, le RH. On a un rôle assez large et on touche un petit peu à tout. On a un gros impact chez les clients parce que ce sont des boites de 30-40-50 personnes et du coup, c'est assez flexibles. Le rôle est à chaque fois un petit peu différent mais en règle général, c'est le rôle du directeur financier.

Et, vous ne visez pas du tout les grosses entreprises ?

Pour le moment, pas trop. C'est plus difficile à atteindre et pour le moment, on est trop petit pour viser les gros. Il faudrait qu'on ait une équipe stable avec le personnel nécessaire pour aller viser les grosses boites.

A combien de consultants êtes-vous sur une mission ?

En général, sur une mission, on est 1-2 ou 3 maximum. Souvent, 2. Mais, il y a aussi pas mal de mission où on est seul. En plus de ce rôle de directeur financier, on fait plein de petites missions qui sont vraiment diverses, parfois des startups viennent parce qu'ils ont besoin d'un plan financier, d'autres parce qu'ils doivent lever les fonds et qu'il faut réunir des documents pour la banque… Une société voulait mettre en place un programme pour le département financier et ils font aussi appel à nous. On a donc d'autres petites missions plus ponctuelles et plus variées. Sur ces missions-là, tu peux être tout seul. Mais, pour moi, les missions long-terme où on a le rôle de directeur financier, ce sont des missions indéterminées et là, en général, on est 2.

Donc, tu n'es pas 5 jours sur 5 chez le même client, tu varies ?

Non, comme ce sont des missions long terme. En général, les autres boites de consultance, elles ont une mission bien spécifique pour un projet, ils arrivent à 2-3 chez le client, font 5 jours sur 5 chez le client pendant 4-5 mois et puis après le projet est fini et tu passes au suivant. Nous, ce n'est pas comme ça. C'est plus du long terme et donc c'est quelques jours par semaine mais ça va peut-être durer 2 ans.

Est-ce que vous faites aussi les comptes, de la révision ?

On fait toutes les clôtures mensuelles quand les sociétés clôturent leurs chiffres. Il faut rendre un rapport chaque mois pour clôturer les comptes du mois en question, ça c'est nous qui le faisons. Et alors, revoir les comptes, ce sont des auditeurs et nous on ne fait pas d'audit. On ne pourrait pas le faire chez nos clients parce que tu ne peux pas être consultant et auditeur en même temps chez le même client. Les 2 clients chez qui je suis, elles sont auditées. C'est moi qui prépare les chiffres de la société pour que les auditeurs puissent revoir les comptes.

Concernant l'AI, vous nous avez dit que vous n'en faisiez pas. Quand vous faites les comptes à la fin de chaque mois, quel logiciel est utilisé du coup ?

A chaque fois, le logiciel est différent dépendant du client. Nous, on arrive chez le client et on est intégré chez le client. Chez Argafin, on n'utilise pas de logiciel informatique. A chaque fois, on utilise le logiciel du client pour faire les comptes. Chez un de mes clients, c'est NetSuite, un des programmes d'Oracle. De l'autre côté c'est Atilissima, qui est encore plus petit. NetSuite est assez connu, assez nouveau mais commence à bien se développer. Donc, c'est le programme informatique du client mais il ne sert pas seulement à faire les comptes. C'est utilisé pour la logistique, la gestion du stock…

Donc le principe, c'est vraiment d'avoir la mission, d'aller dans l'entreprise et d'utiliser le logiciel que l'entreprise utilise. Vous n'allez jamais proposé des nouvelles solutions à utiliser?

Oui, nous on arrive et on s'intègre vraiment. On n'arrive pas avec un programme à nous. On reste chez le client et on est comme des employés du client. Certains ne savent même pas que je suis externe. Pour le moment, chez Argafin, on n'amène pas de solution chez le client.

Est-ce que c'est un choix de ne pas faire du consulting « banal » et de se mettre comme un employé ou c'est lié à la taille et la jeunesse de Argafin ?

Je ne sais pas si c'est une volonté mais, quand les clients viennent nous voir, c'est parce qu'ils ont besoin d'un directeur financier, de chiffres plus clairs. Ils ont déjà un programme informatique, ils n'ont pas de directeur financier mais ont toute une équipe de comptables et nous, on arrive mais on ne va pas faire changer tout ça chez nos clients. Le but, c'est qu'on arrive, qu'on apporte de l'information et du support tout en s'adaptant au client parce que chez les clients, ils ont des processes qui fonctionnent. En général, le problème chez eux, ce n'est pas lié au programme informatique. Donc, c'est à nous de s'adapter, d'utiliser les programmes

qu'ils utilisent et, en fonction de chaque client, il faut s'adapter pour utiliser les données qu'ils possèdent.

Au niveau des clients, est-ce qu'ils utilisent plus des tableaux Excel ou des logiciels bien définis ?

Oui, ils ont des logiciels bien définis. Évidemment, on travaille beaucoup sur Excel mais pour la compta, les processes, ils ont déjà un programme informatique. Moi, les 2 clients que j'ai, il y a à chaque fois une cinquantaine de personnes donc ce sont déjà des grandes PME. Il y a peut-être d'autres clients chez qui il n'y a rien de mis en place.

Selon votre point de vue, cela pourrait-il être bénéfique pour Argafin de développer une solution de Machine Learning, d'AI, à implémenter chez le client ?

Je pense qu'il y aurait moyen. Je pense que les petites boites ne peuvent pas se payer des consultants pour installer de l'AI car elles sont de trop petites tailles. Nos clients, tout seuls, ne pourraient pas. Par contre, chez Argafin, si on avait une solution en interne, on pourrait apporter ça chez nos client et ce serait un argument en plus, quelque chose qui viendrait s'ajouter au programme informatique de chaque client et qu'il faudrait adapter à chaque client. Mais, je pense que cela pourrait être vraiment pas mal.

Par exemple, toutes les petites taches de comptabilité rébarbatives, les grosses boites ont des départements en Roumanie où toutes les factures sont envoyées et, là-bas, tout est encodé. Soit, c'est fait de manière informatique, soit c'est envoyé à l'étranger. Parfois, c'est aussi fait automatiquement grâce à l'AI mais ce sont des choses que les petites PME ne peuvent pas se permettre. Chez les clients chez qui je vais, c'est quelqu'un qui encode toutes les factures une par une. A un moment, cela va être dépassé et, pour l'AI devrait être assez facile à mettre en place chez nos clients et cela pourrait servir à tout le monde car les factures de PME, ce sont les mêmes chaque mois, c'est très répétitif. En comptabilité, cela doit être très facile et très utile d'amener de l'AI mais je pense que les PME n'ont pas les moyens.

Par faute de moyens financiers je suppose ?

Oui, par manque de moyen financier et alors, la plus-value est beaucoup plus petite pour une PME. Une grosse boite qui reçoit 3000 factures par mois, l'AI a une grosse plus-value. Dans une PME, il y a peut-être 200-300 factures par mois donc c'est moins nécessaire et utile. Mais,

je pense qu'il y aurait aussi des bénéfices à l'implémenter mais comme il y a moins de moyen et de plus-value, ils ne le mettent pas en place.

Et du côté d'Argafin, au final c'est aussi lié au besoin du client de ne pas proposer d'AI ?

Oui, c'est ça ! Chez Argafin, on n'en a pas vraiment besoin pour le développement interne car une petite boite de consultance, on ne reçoit quasiment pas de facture, il n'y a pas de processes, pas de stock. On a juste 15 employés. Par contre, chez nos clients, on pourrait amener une solution en AI en plus d'un support financier, en amenant un encodage automatique des factures. Au final, on doit gérer le département comptabilité et ce sont toujours les mêmes problèmes. On pourrait arriver avec une solution pour régler ces problèmes-là, c'est notre rôle aussi.

Au lieu de vendre juste le service de consultance, vous pourriez aussi vendre un produit en développant cela en interne…

Exactement. Ce serait un argument en plus. On pourrait dire « Si vous nous choisissez nous, on peut amener cette solution-là pour améliorer le département financier ». Ca ne serait pas mal.

Développer une AI, est-ce un projet qui a déjà été évoqué chez Argafin ou vous n'en parlez pas ?

Chez Argafin, je ne pense pas. Chez un de mes clients, on va changer de système informatique et je sais qu'on aimerait bien trouver un programme où l'on pourrait encoder les factures automatiquement, intégré dans le programme informatique qu'on va choisir dans le futur. Cela existe déjà des programmes de Machine Learning ou tu scannes les factures et la machine détecte automatiquement et encode la facture toute seule. Chez un de mes 2 clients, on cherche un programme où cela serait inclus dedans.

Pour Argafin, cela n'engendre pas des pertes de client ? Avec toutes les startups qui se développe, cela n'impacte pas la compétitivité ?

Pas vraiment, on ne propose pas de programme donc on n'est pas en concurrence avec ces gens-là. On propose un service financier et il n'y a personne qui ne va pas nous choisir parce qu'on ne propose pas de programme informatique en plus. On pourrait apporter cela en plus, mais ce n'est pas lié. Cela serait un bon atout mais ce n'est pas notre business principal. On propose des

conseils en finance et, quand on parle avec des futurs clients, on ne parle pas de programme informatique. Les futurs clients ne vont pas choisir une grosse boite de consultance à la place de nous parce qu'ils ont des moyens d'AI. Je ne crois pas qu'on ait de désavantage par rapport à ça parce que, quand les clients viennent nous voir, ce n'est pas ça qu'ils cherchent pour le moment.

En fait, avec Argafin, on a de la chance parce qu'on a pas beaucoup de concurrents. Les grosses boites comme les Big Four, elles visent les multinationales et pas du tout les PME. Et à l'inverse, les PME ne peuvent pas se payer les consultants des Big Four parce que c'est trop cher.

Vous disiez que vous rencontriez souvent les mêmes problèmes chez les clients, serait-il intéressait de développer une AI capable d'aider les consultants dans leur job quotidien ?

Je ne sais pas trop parce que, même si on rencontre souvent les mêmes problèmes, cela reste des problèmes de petites sociétés que l'on peut résoudre sans AI. Pour le moment, je pense que cela serait vraiment difficile de faire ça et on n'a pas un nombre de client assez important. Pour nous, c'est aussi le même problème que chez nos clients, on est trop petits pour développer ça en interne et, même si on a rencontré le même problème chez 3-4 clients, cela reste un petit nombre. On n'a pas assez de clients ni assez de volume pour développer ce genre de chose. Je ne m'y connais pas hyper bien mais je pense que c'est surtout utile dans des tâches qui reviennent tout le temps et qui peuvent être automatisées. Il y a plein de possibilités dont on ne se rend pas compte mais, moi, je vois cela comme automatiser tout ce qui se fait encore manuellement. Chez nos clients, ce ne sont pas des problèmes énormes. L'encodage des factures pourrait être automatisé, c'est un problème qu'on a chez tous nos clients. Sinon, les autres problèmes, je pense que ce serait difficile de résoudre avec l'AI.

Pour l'instant, ce n'est donc pas dans le scope d'Argafin ?

Non, on n'est pas encore assez grand et on n'en parle pas.

Est-ce que le but d'Argafin, c'est de grandir et de viser les multinationales ou de rester sur les PME ?

Le fondateur d'Argafin a beaucoup d'ambition et le but, c'est de grandir assez vite. On a une bonne croissance, cela grandit très vite. Il a parlé du fait qu'on pourrait s'attaquer aux grandes

sociétés mais ce serait un truc en plus. Notre business principal n'est pas là. Un des objectifs serait aussi d'avoir des missions dans les grandes sociétés mais, pour le moment, on se concentre sur les PME.

Mais, votre cible principal resterait les PME ?

Oui, je pense. En tout cas dans les prochaines années.

Ce n'est donc pas un problème lié à votre taille qui vous empêche d'atteindre les grosses entreprises ?

Non, le business d'Argafin est vraiment de viser les PME. Comme on grandit assez vite, ce serait bien d'avoir des missions dans les grandes entreprises mais cela ne serait pas nos principaux clients.

Dans nos précédentes interviews avec des plus grosses entreprises, le développement de l'AI est un gros point de concentration.

Cela ne m'étonne pas. Si l'une de ces boite développe de l'AI, les autres doivent suivre. Mais, même avec l'AI, ils ne vont pas attaquer les PME et ce sera quand même pour viser les grosses multinationales. Je ne pense donc pas qu'on aura un désavantage par rapport à ça. Mais, niveau volume, ces entreprises sont beaucoup plus grandes aussi.

Merci beaucoup, je pense que nous avons toutes les réponses à nos questions.

Avec plaisir, j'espère que cela a quand même été intéressant pour vous.

Oui, quand je pensais aux réponses que l'on aurait de cette interview, je m'imaginais le problème de budget mais je n'avais pas pensé que les clients n'avaient pas ces besoins-là.

Oui, c'est vrai que souvent, c'est en fonction du client. Chez Argafin, en interne, ce serait compliqué de développer ça. Il faut qu'on puisse amener ça chez les clients parce que chez nous, en interne, cela ne nous servira pas.

Donc, au niveau de votre job de tous les jours, vous n'avez aucune AI pour vous aider ?

On a ça, à toute petite échelle. Moi, je suis pris 5 jours sur 5 avec les clients chez qui je vais mais, quand tu viens de te faire engager, tu n'as pas tout de suite tes clients à toi. Eux sont en

backup au bureau et parfois, quand j'ai trop de boulot et que je peux donner quelque chose à quelqu'un, j'envoie à quelqu'un qui est libre pour m'aider mais c'est rare. En consulting, t'en as en mission et d'autre en stand-by qui sont là pour aider si besoin.

Au niveau de votre point de vue personnel, pensez-vous que l'AI pourrait un jour remplacer le job d'un consultant ?

Je ne pense pas parce qu'on aura toujours besoin d'êtres humains pour comprendre le problème et au moins implémenter l'AI. L'AI ne vas pas s'implémenter toute seule et il faudra des consultants pour pouvoir l'implanter. Et, la consultance, cela reste du conseil. Le job premier, cela reste du conseil et tu ne peux pas demander un conseil à l'AI. En général, ce sont des problèmes complexes qu'il faut résoudre et on pourrait faire appel à l'AI pour le résoudre mais, je pense que pour comprendre comment fonctionne la société, les processes, la boite et puis amener une solution, il faudra toujours des personnes réelles pour analyser tout ça. Mais, plus tard, je pense que de plus en plus de solutions seront apportées par l'AI mais pour comprendre le problème, il faudra toujours des gens qui travaillent dans la consultance.

Je pense qu'on a plus de question, peut-être que vous voulez encore rajouter quelque chose ?

Non, j'espère que j'ai pu répondre à tout, et que vous avez toutes vos réponses. J'espère que c'était clair. Si vous avez une question qui vous revient à un moment, n'hésitez pas à m'envoyer un message.

Parfait, merci beaucoup !

Bonne soirée, au revoir.

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Place des Doyens, 1 bte L2.01.01, 1348 Louvain-la-Neuve, Belgique | **www.uclouvain.be/lsm**