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Saku Patana

# Artificial Intelligence and Machine Learning in Expanding Business Opportunities

## Case Study: Global Tech Strategies

Metropolia University of Applied Sciences

Bachelor of Engineering

Industrial Management and Engineering

Bachelor's Thesis

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Dear reader,

In front of you lies the thesis report “Artificial Intelligence and Machine Learning in Expanding Business Opportunities”, which introduces the study I have done to support Artificial Intelligence and Machine Learning implementation and business development for Global Tech Strategies in Valencia, Spain. The project is written as a bachelor’s thesis at Metropolia University of Applied Sciences in Finland, in the Industrial Management and Engineering program. I started the thesis in October 2019 with a great amount of enthusiasm and the interest remained strong until the end when the report was finished in January 2020.

The thesis was carried out as the beginning of AI and ML implementation project of GTS to address the need and provide company-specific guidelines to support the company in decision-making and starting up the project. The objective and outline of the thesis were set together with GTS and Metropolia. The topic was broad and challenging, but with careful planning and deep research successful results were achieved on schedule. The successful results were greatly assisted by the instructors at Metropolia Anna Sperryn and Sonja Holappa, the supervisor of GTS Rafael De la Cuadra, and all the other company members including IT and project management units.

I would like to thank GTS and Metropolia instructors for their invaluable assistance and support during the thesis. Without their help it would not have been possible to achieve results to the same extent and with the same value. I would also like to thank my girlfriend very much for supporting and sparring me throughout the whole thesis project.

In case you would like to know more or ask questions about anything, my business card can be found in Appendix 1.

I hope you enjoy reading, it is reasonably long but certainly profitable!

Saku Patana  
Valencia, Spain  
January 22, 2020

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<p>The objective of the thesis was to propose a model to implement AI and ML and a process model to build new business opportunities with AI and ML and create a summary of the implementation benefits and drawbacks. Moreover, the thesis aims to support the company with AI and ML implementation and thus improve its possibilities to grow locally and globally with new business opportunities. The company has a great amount of accumulated data from the software and the thesis addresses the possibility to utilize it for AI and ML solutions in order to maintain or/and improve competitiveness on markets.</p> <p>The thesis is based on the company's internal documents, interviews with the CEO and CIO, tacit knowledge gathered during the working period, available knowledge and best practices about AI, ML, IoT, Big data, and Business Development. Moreover, the thesis was conducted according to a structured approach that first discovers the current state of the company on behalf of services and business models, then explores available knowledge and best practices regarding the above topics, and finally builds an initial proposal which after validation becomes the final proposal that consists of three different parts.</p> <p>The key findings of the thesis revealed that GTS employees do not have enough understanding and skills of AI and ML and are also unaware of the possibilities these bring to the company. However, as a positive finding, it revealed that GTS has huge opportunities to utilize AI and ML competences with accumulated historical data and software that can operate in various sectors and markets. Additionally, it must be acknowledged that the implementation requires consistency and good planning and to increase the prospects of success various business development strategies can be utilized.</p> <p>The outcome of the thesis is a proposal that consists of three different parts: (1) A model to implement AI and ML supported by BD methodologies, (2) A process model to build new business opportunities with AI and ML, and (3) Summary of the benefits and drawbacks related to the implementation of AI and ML. The results help the company to start the AI and ML implementation, make decisions, understand all the required perspectives of the change as well as to find new business possibilities and innovations to expand GTS service offerings. Furthermore, the results can be used as well for other companies in the industry by making a re-evaluation and small changes to the models.</p>	
Keywords	AI, ML, BD, Implementation, Software, Data, GTS

Tekijä Otsikko	Saku Patana Tekoäly ja koneoppiminen liiketoimintamahdollisuuksien laajentamisessa
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Ohjaajat	Rafael De la Cuadra, Ekonomisti, GTS:n toimitusjohtaja Anna Sperry, Lehtori Sonja Holappa, Lehtori
<p>Insinööriyön tavoitteena oli ehdottaa mallia tekoälyn ja koneoppimisen implementoimiseksi, prosessimallia uusien liiketoimintamahdollisuuksien rakentamiseksi tekoälyn ja koneoppimisen avulla sekä luoda yhteenveto toteutuksen eduista ja haitoista. Lisäksi tutkimuksen tavoitteena on tukea yritystä tekoälyn ja koneoppimisen implementoinnissa ja parantaa siten sen mahdollisuuksia kasvaa paikallisesti ja globaalisti uusilla liiketoimintamahdollisuuksilla. Yhtiöllä on suuri määrä ohjelmistoihin kertynyttä tietoa, ja tutkielmassa käsitellään mahdollisuutta hyödyntää sitä tekoälyn ja koneoppimisen tarjoamissa ratkaisuissa kilpailukykyyn ylläpitämiseksi tai parantamiseksi markkinoilla.</p> <p>Insinööriyö perustuu yrityksen sisäisiin asiakirjoihin, toimitusjohtajan ja CIO:n haastatteluihin, työjakson aikana kerättyyn hiljaiseen tietoon, käytettävissä olevaan tietoon ja parhaisiin käytäntöihin tekoälystä, koneoppimisesta, IoT:sta, Big datasta ja liiketoiminnan kehittämisestä. Lisäksi opinnäytetyötä tehtiin jäsenellän lähestymistavan mukaisesti, missä ensin selvitetään yrityksen nykytilan palveluita ja liiketoimintamalleja. Sitten selvitetään saatavilla olevia tietoja ja parhaita käytäntöjä yllä olevista aiheista ja lopuksi rakennetaan alkuperäinen ehdotus, josta validoinnin jälkeen tulee lopullinen ehdotus, ja se koostuu kolmesta eri tuloksesta.</p> <p>Keskeiset havainnot insinööriyöstä paljastivat, että GTS:n työntekijöillä ei ole tarpeeksi ymmärrystä ja taitoja tekoälystä ja koneoppimisesta, ja he ovat myös tietämättömiä mahdollisuuksista, joita nämä tarjoavat yritykselle. Positiivisena havaintona se kuitenkin paljasti, että GTS:llä on valtavia mahdollisuuksia hyödyntää tekoäly- ja koneoppimiskompetensseja kertyneellä historiallisella tiedolla ja ohjelmistolla, joka voi toimia eri aloilla ja markkinoilla. Lisäksi on otettava huomioon, että implementaatio vaatii johdonmukaisuutta ja hyvää suunnittelua ja menestysmahdollisuuden lisäämiseksi voidaan hyödyntää erilaisia liiketoiminnan kehittämisstrategioita.</p> <p>Insinööriyön tuloksena on ehdotus, joka koostuu kolmesta eri osasta: (1) Malli tekoälyn ja koneoppimisen implementoimiseksi, jota tukevat liiketoiminnan kehittämismetodologiat, (2) Prosessimalli uusien liiketoimintamahdollisuuksien rakentamiseksi tekoälyn ja koneoppimisen avulla, ja (3) Yhteenveto tekoälyn ja koneoppimisen implementoimiseen liittyvistä eduista ja haitoista. Tulokset auttavat yritystä aloittamaan tekoälyn ja koneoppimisen käytönoton, tekemään päätöksiä, ymmärtämään kaikki muutoksen vaadittavat näkökulmat</p>	

sekä löytämään uusia liiketoimintamahdollisuuksia ja innovaatioita GTS:n palvelutarjonnan laajentamiseksi. Lisäksi tuloksia voidaan käyttää myös muille alan yrityksille tekemällä uudelleenarviointi ja pieniä muutoksia malleihin.

Avainsanat

Tekoäly, Koneoppiminen, Liiketoiminnan kehittäminen, Implementointi, Ohjelmisto, Data, GTS

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## List of Abbreviations

AI	Artificial Intelligence is a machine or software that produces intelligence actions equal to simulations of human intelligence processes including learning, reasoning, and self-correction.
API	Application Programming Interface is a bunch of routines and tools for building an application, as well as an interface between a client and a server.
B2B	Business-to-Business is a form of transaction where companies or sales-people sell products principally to other businesses.
BD	Business Development is a method used to identify and acquire new potential customers and business opportunities to enhance the possibilities on the market.
BI	Business Intelligence is a technical infrastructure that collects, stores and analyse the data produced by the company's activities encompassing e.g. data-mining, analytical processing and predictive analytics.
CEO	Chief Executive Officer is the highest-ranking executive in the company whose primary responsibilities are corporate decisions, managing operations and resources, and communication between stakeholders.
CIO	Chief Information Officer is responsible and in charge of the company's information technology strategy and computer systems.
CSA	Current State Analysis is a process management strategy used to analyse and evaluate the current situation of a whole company or a specific process.
CSV	Comma-Separated Values is a text file which can be created or edited by text editor. The data fields in the file are mostly separated by a comma.

DevOps	Development and Operations is a software development phrase used to mean the relationship between development and IT operations where the person is in charge of communication between these units.
DL	Deep Learning is a subset of Machine Learning that enables computers to learn more complex patterns and solve more complex problems by extracting high-level abstractions.
FS	FlowSense is a software platform for the development of Smart Cities providing data from a global perspective. FS acts as an intelligent heart of the cities.
FTP	File Transfer Protocol is a protocol for transferring files between a client and a server on a computer network.
GIS	Geographic Information System is a system designed to capture, store, manipulate, analyse, manage, and present all types of spatial or geographical data.
GTS	Global Tech Strategies is a technology-based start-up company specialized in Smart City and digitalization of business projects from Valencia, Spain.
HTTP	Hyper Text Transfer Protocol is an application protocol used by the Internet that defines how messages are formatted and transmitted, and what activities Web server or browsers should take to respond to various commands.
ICT	Information and Communication Technology includes all the technologies that provide access to information through telecommunications and thus helps individuals, businesses and organizations to use it.
IoT	Internet of Things means a system of devices, machines, objects, animals or people that connects all to the internet chiefly via sensors.
JSON	Java Script Object Notation is a lightweight data-interchange format that uses human-readable text to transmit data objects consisting of attribute–value pairs and array data types.

LDAP	Lightweight Directory Access Protocol is a client/server protocol used to access and manage directory information. It allows the sharing of information about users, systems, networks, services, and applications throughout the network.
ML	Machine Learning is a category of algorithms that provides the system with the capability to automatically learn and improve from experience without being explicitly programmed.
NN	Neural Network is a concept of multi-layer model which consists of multiple layers, in other words, artificial neurons.
PSC	Project-Specific Contract is one of the business models the company is using. In that model, the services are sold by unique contracts based on the need of the project and customer.
R&D	Research and Development means innovative activities that company undertakes to develop new services or products, or to improve existing services or products.
RAID	Redundant Array of Independent Disks is a data storage virtualization technology that uses multiple disks in order to provide fault tolerance, to improve overall performance, and to increase storage capacity in a system.
SaaS	Software as a Service is a software licensing and delivery model in which software is licensed as a subscription model and a third-party provider hosts application to make them available to customers over the Internet.
SAMU	It is a coordination Unit of the Framework Program for Health Emergencies. SAMU comes from Spanish words: Servicio de Asistencia Médica Urgente.
SML	Solver Machine Learning is a start-up company specialized in software and Machine Learning from Valencia Spain.
SOAP	Simple Object Access Protocol is a message protocol that permits distributed elements of an application to communicate between each other.

SQL	Structured Query Language is a standard computer language used in programming and designed to manage data held in relational database with queries.
TF	TenFour is an Emergency Management system capable of managing one or multiple integrated agencies (such as the police, fire brigade, healthcare) simultaneously.
WS	Web Service is a software service, or a server used to communicate between two devices on a network.

## 1 Introduction

Nowadays, technology and digitalization are highly changing the way how business is operated throughout the organizations. With digitalization, it is now easier than ever to make automated and optimized decisions to obtain better results in everyday business. Especially in technology-based businesses, Artificial Intelligence and Machine Learning are increasing the possibilities to utilize big data and thus create new business models to increase the company's opportunities. Companies whose business activities are related to data collection, must adapt to the new demands of digitalization to ensure business success also in the future. Therefore, knowledge and skills of AI and ML have become more important for the organizations, especially for the ones that are working around big data and information management systems. Business productivity and opportunities can be highly increased by implementing AI and ML competences into the company's operations.

Artificial Intelligence and Machine Learning are rapidly growing and offering all the time more accessibility for organizations to utilize data and thus the markets are extremely competitive. Currently, it is recommended and even required from companies to use these competencies to create competitive business models and expand business possibilities. Start-up companies need to differentiate in some way from the markets, and these competencies enable better chances of success.

### 1.1 Business Context

This thesis is focused on a technology-based global start-up company, Global Tech Strategies, who is one of the market leaders in Smart City and digitalization of business projects in Spain. Additionally, the company specializes in emergency and IoT management software and turnkey online marketplace projects. The company has five core values: innovation, sustainability, development, resilience, and co-operation which all are constantly integrated into the company's strategy. The company was founded in 2016 by Rafael De la Cuadra. (The company's website)

GTS is a start-up company with six employees, and it is mainly working now in Spain but has experience in working in multinational projects around the world. Its software is used in big cities like Valencia and Barcelona in Spain and customers are mainly B2B including

public administrations, municipalities, cities, and government. This thesis is conducted in co-operation with the management and IT units of GTS and working closely with the CEO. This includes all the employees of the company consisting of three from the IT unit and three from the management unit.

## 1.2 Business Challenge, Objective and Intended Outcome

The company presently has an information management software used for various purposes, such as controlling command and control centres and managing Smart City and IoT software. Now, however, the company wants to expand the capabilities of this software by integrating Artificial Intelligence and Machine Learning competences to the system to be better competitive on the markets. Thanks to its information management software, the company has a large amount of accumulated data over many years and it can be utilized with these features. GTS has unique software, but without fast response to the market's needs, an advantage can be caught and lost, and thus quick actions need to be taken. Currently, there is no information on how this change could be implemented, and this thesis is a study and a proposal on the subject. To address this challenge, GTS is willing to make co-operation and possibly create a joint venture with Solver Machine Learning to enhance the possibilities of success.

This thesis aims to help and support Global Tech Strategies with AI and ML implementation and to improve its possibilities to grow locally and globally. **The objective of the thesis is to propose a model to implement AI and ML and a process model to build new business opportunities with AI and ML and create a summary of the implementation benefits and drawbacks.** In practice, by integrating AI and ML into the software, automated decisions and predictions are possible and thus new business opportunities can be created.

The outcome of the thesis consists of a proposal in three parts: (1) A model to implement AI and ML supported by BD methodologies, (2) A process model to build new business opportunities with AI and ML, and (3) Summary of the benefits and drawbacks related to the implementation of AI and ML. With the outcome, GTS will be able to see better the possibilities around AI and ML and consider implementation more analytically. To achieve this goal, the thesis carries out an analysis of the company's current situation and competence to apply AI and ML and new business opportunities into the strategy.

### 1.3 Thesis Outline

The thesis is carried out using qualitative research approaches, such as interviews and discussions with GTS employees, proposal workshops, participating in conferences and webinars, exploring internal documentation of GTS, business research, and continuously researching available knowledge and the best practices of the topic of the study. Figure 1 below illustrates the scope of the thesis on the timeline of the whole project, which is to implement AI and ML competences into GTS business operations.

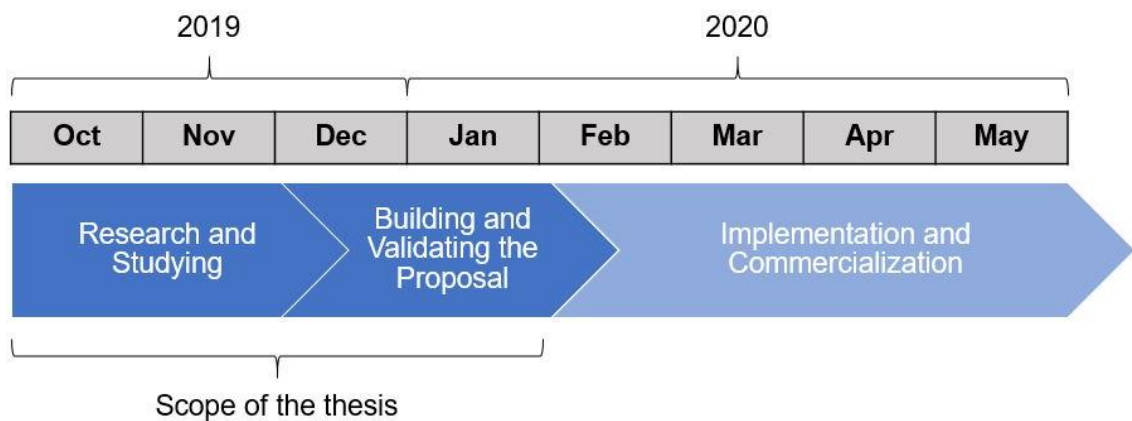


Figure 1. Scope of the thesis

The project as a whole is bigger than the tasks carried out in the thesis. As Figure 1 visualises, the scope of the thesis is limited to the beginning of a longer project. The thesis includes research, studying, and building and validating the proposal, but excludes the next steps such as implementation and commercialization.

Moreover, this thesis is built upon seven major sections. Section 1 contains an introduction to the thesis and company. Section 2 describes the research and design and introduce the methods and material used in the thesis. Section 3 investigates the current state of the company and its current business operations. Section 4 explores the available knowledge and best practices that can be utilized to achieve the thesis objectives. Section 5 builds a proposal for the implementation and describes new business opportunities with AI and ML. Section 6 contains validation of the proposal built in Section 5, and Section 7 includes a summary and conclusion of the thesis.

## 2 Method and Material

This section provides an overview of the methods and materials used in the thesis. It consists of three parts starting with Research Design and is followed by Project Plan and Data Collection and Analysis Approach. More specifically, it includes the thesis schedule in a Gantt-chart form and data research strategy and data analysis methods explanations in a research design figure.

### 2.1 Research Design

This thesis was carried out in five stages: (1) Objective, (2) Current state analysis, (3) Available knowledge and best practices, (4) Building the proposal, and (5) Validating the proposal, as identified in Figure 2 below. Additionally, Figure 2 visualises the data sources and outcomes of each stage of the process.

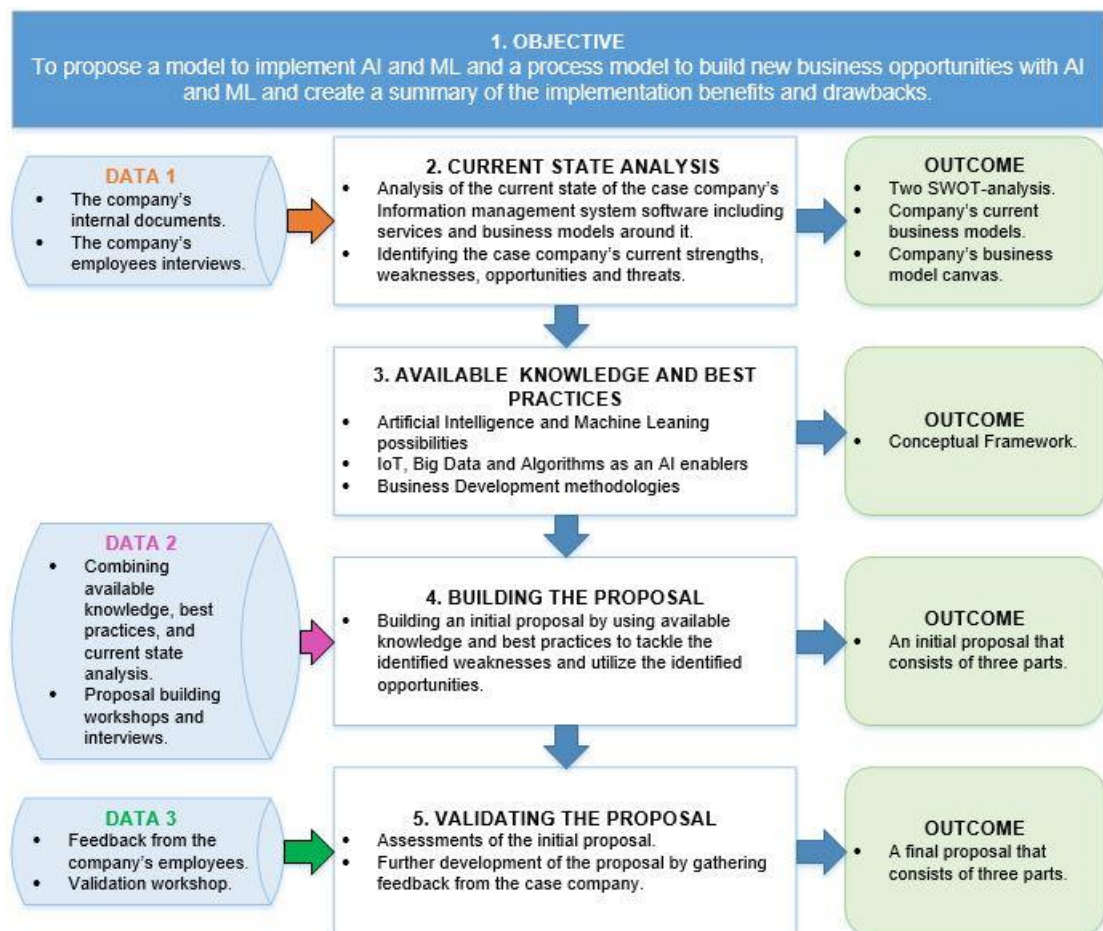


Figure 2. Research Design of the thesis



As shown in Figure 2, this thesis begins with a definition of the objective. In this part, the business challenge, objective, and outcome are defined to obtain clear targets to follow throughout the whole study. Next, the current state of the company was investigated by internal documentation of the company and interviewing employees of GTS to get a better understanding of the operations and models. Together this information produced Data 1 of the thesis which supported in building the CSA of the company. The stage has three outcomes: (1) two SWOT-analyses that point out the case company's strengths, weaknesses, opportunities, and threats both on behalf of software and business, (2) explanation of the current business models around GTS software, and (3) new business model canvas of the company. Furthermore, Data 1 and the results are very useful in a proposal building phase.

In the next stage, the thesis focused on exploring available knowledge and best practices related to AI, ML, IoT, Big data and Business Development including literature available and materials and knowledge of GTS. The outcome of the stage is a conceptual framework that presents the key elements of available knowledge and best practices needed to build the proposal and find the best possible opportunities for the company by combining it with the CSA outcomes. Finally, after investigations, the proposal was built in a collaboration with GTS employees. The proposal is based on the findings from stages before and the information from proposal workshops and further interviews, in other words, Data 2 of the thesis. The outcome of the stage is an initial proposal consisting of three different parts. After the initial proposal was complete, it was presented to the CEO of GTS in the validation workshop and from the feedback of that meeting, Data 3 was collected to make the validation and final enhancements to the proposal. The outcome of the stage is the final proposal of the thesis.

## 2.2 Project Plan

The thesis was executed as a bachelor's thesis at Metropolia University of Applied Sciences in Finland, in the Industrial Management and Engineering program. Taking advantage of the major, which is International ICT Business, the thesis was completed abroad in Spain to get more experience in an international working environment and to enhance international opportunities in the future. The study was carried out from October 2019 to the end of January 2020. Figure 3 below visualises a more detailed schedule of how the thesis was carried out.

# THESIS

Global Tech Strategies

Saku Patana

Project start:

21/10/2019

Display week:

1

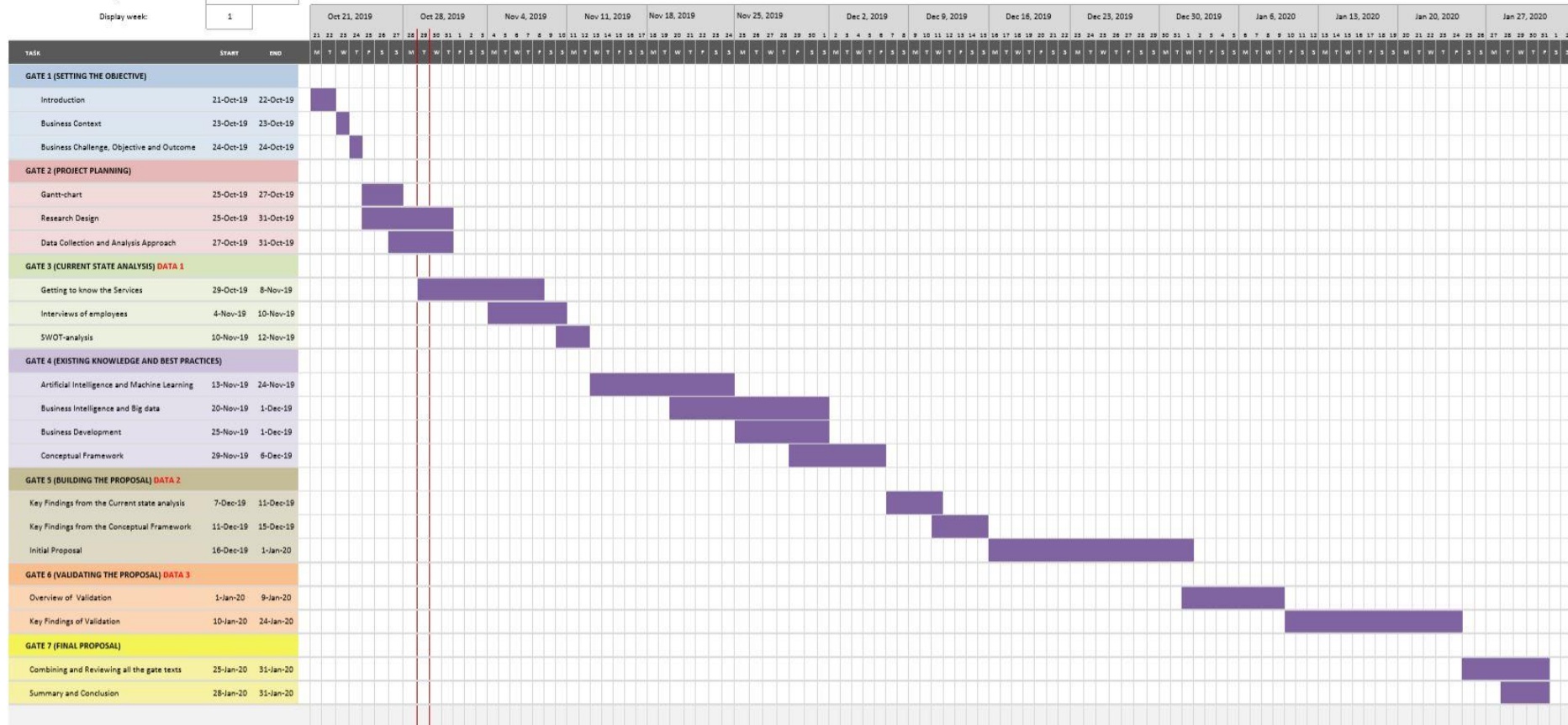


Figure 3. Gantt-chart of the thesis

Figure 3 provides a daily-basis overview of the project progress. As can be seen, the total duration of the thesis project is 3.5 months. The thesis is made up of seven different stages representing the '7-Gate' approach process for a bachelor's thesis. It includes seven different gates where each gate is a stage that leads to the next gate, and the next gate cannot be started before the earlier stage is completed. This methodology helps to put the thesis in smaller pieces and plan the schedule. Additionally, it helps to make a more specific project plan which again improves the success of the final result. The seven gates are: (1) Setting the objective, (2) Project plan, (3) Current state analysis, (4) Available knowledge and best practices, (5) Building the proposal, (6) Validating the proposal and (7) Final text.

The thesis is part of a real-life business project lead by GTS. The thesis project was carried out in the business development section of the case company working closely together with the company's CEO, and it is based on a variety of analysis of data sources. In the following, the thesis data sources are presented, and data analyses are described in more detail.

### 2.3 Data Collection and Analysis Approach

The data for the thesis was gathered from multiple data sources with three separate data collection rounds, Data 1-3. The collected data from these rounds were utilized to build the CSA and description of the current business models of GTS, as well as for building a proposal and validation for it. All the data collected during the thesis is described in detail in Table 1 below. The thesis started with a kick-off meeting with the CEO of GTS where overview, objective and expected outcome were clarified. Field notes from the meeting can be found in Appendix 2.

Table 1. Details of interviews, workshops, and discussions, in Data 1-3

#	Participants / Role	Data type	Description	Date, Length	Documented as
1	R.D.C (CEO of GTS)	Face-to-face discussion	Thesis overview, objective and outcome specification	17 Oct 2019, 30 min	Field notes
<b>Data 1, for the Current State Analysis (Section 3)</b>					
2	R.D.C (CEO of GTS)	Face-to-face meeting	Business models and opportunities of GTS	4 Nov 2019, 30 min	Field notes
3	C.L (CIO of GTS)	Face-to-face meeting	Services and possibilities of GTS, and data utilizing	14 Nov 2019, 30 min	Field notes
<b>Data 2, for Proposal Building (Section 5)</b>					
4	R.D.C (CEO of GTS)	Workshop	A linkage between Section 3, Section 4 and Section 5	3 December 2019, 45 min	Field notes
5	R.D.C (CEO of GTS)	Workshop	A proposal idea	4 December 2019, 45 min	Field notes
<b>Data 3, from Validation (Section 6)</b>					
6	R.D.C (CEO of GTS)	Face-to-face meeting	Validation of the initial proposal and further enhancements ideas	10 January 2020, 45 min	Field notes

As shown in Table 1, the first data collection round was used to gather information to construct the CSA of the company. The purpose of conducting this information was to get a clear understanding of the current services and business models of GTS and the company's opportunities, so subsequently it was easier to build the proposal around the operations. Data 1 was mainly collected by reading the internal documentation of GTS and was backed up with interviews of the CEO and IT people of the case company. The interviews were held on the company premises and are based on pre-defined questions. The pre-defined questions and field notes can be found in Appendices 3-4. The internal documentation of GTS was explored especially for services to build a picture of current operation models in the company. These internal documents are listed in Table 2 below.

In the next round, Data 2 was gathered to get suggestions and ideas from GTS employees for developing the proposal. This round consists of workshops where findings from the CSA and available knowledge and best practices on AI and ML points of view were presented. All the earlier findings were discussed and assessed and combined with the help of experienced people. As a result, from the Data 2 collection, an initial proposal was created. In the last round of data collection, Data 3 was gathered to make validation for the initial proposal. The initial proposal was presented to the same people who have been all the time part of the project. Data 3 consists of feedback from the CEO of GTS. With the feedback, improvements and validation were made to build the final proposal.

Table 2. The company's internal documents used in the CSA, part of Data 1

	Name of the document	Extent	Description
A	Fleetr_Spanish.pdf	9 pages	A description of Fleetr service
B	Smart City Solutions by GTS_Spanish	20 pages	A description of FlowSense service
C	Arquitectura-flow.pdf	5 pages	Description of functional scope and architecture of FlowSense
D	Flowsens v.3.pdf	17 slides	FlowSens solutions to Smart City and more detailed description
E	TenFour – Safety_Security.pdf	10 pages	A description of TenFour service
F	Booking. Gestión.pdf	14 pages	A description of Booking service
G	Lista de instalaciones.pdf	1 page	List of GTS current customers and services installed
H	Ingorme camara comercio de gts.pdf	102 pages	GTS Chamber of Commerce report

Table 2 shows internal documents of GTS used to build the current state analysis. As can be seen, the explored documents include presentation and descriptions of GTS main services and technological information of the systems architectures. The documents were mainly analysed for the CSA to get an understanding of the current services and business models of GTS. Most of the documents are written in Spanish since the company is Spanish and it is mainly operating in Spain, thus a vast amount of translation of languages was required during the exploration.

Field notes from all meetings, interviews, and workshops can be found in Appendices 2-6. The major part of data collection was done for the CSA stage, to establish the current state of the current services and business models of the case company. The next chapter describes more specifically the findings from the CSA carried out on GTS services and business models.

### 3 Current State Analysis of GTS Services and Business Models

In this section, the current state analysis of GTS current services and business models is carried out and presented. First, an overview of the section is presented. Secondly, this is followed by the introduction of services that GTS is currently providing and business models used to provide the services. Next, the key findings from the CSA are summarized with two SWOT matrices. Lastly, the summary of key findings from the CSA is presented.

#### 3.1 Overview of the Current State Analysis Stage

The goal of the current state analysis was to understand GTS services and business models, so further improvement concepts can be conducted. The analysis was built in two steps. First, information about the current services of GTS was collected to understand the current state of the services that the company is providing. After that, these services business models were investigated to understand how the services are provided to customers. This analysis was performed by interviewing the key people of the company including CEO and CIO and exploring the company's internal documents. As a result of the analysis, two SWOT matrices were created. Figure 4 below visualises an overview of the CSA.

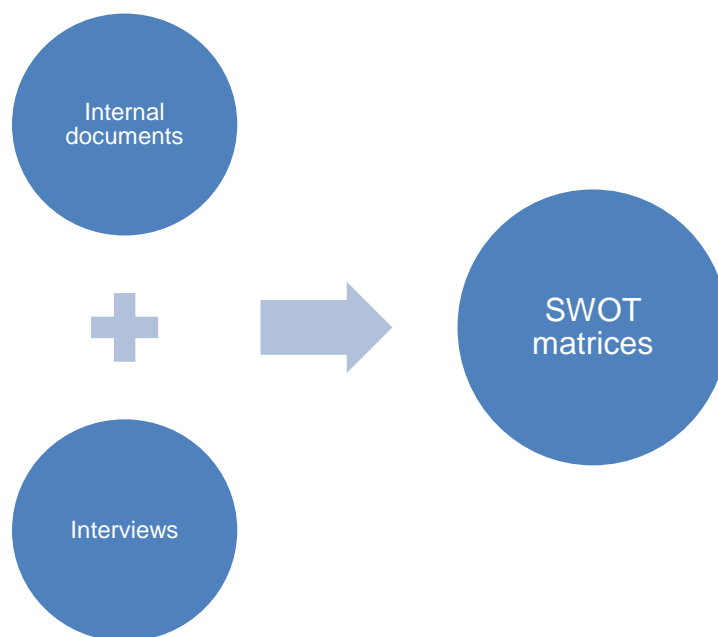


Figure 4. An overview of building the SWOT matrices

As Figure 4 visualises, the SWOT matrices were developed by combining insights from internal documents and interviews. More specifically, the purpose of exploring the internal documents was to obtain a deeper understanding of the four main services of GTS: Fleetr, FlowSens, TenFour and Booking, and how these are aligned with each other. In addition to exploring the documents, interviews formed a big part of the comprehension process. Pre-defined questions were asked in the interviews to obtain a deeper understanding of the business models and income sources of the services as well as information about the data used and provided while running the services. It is required getting to know these profoundly in order to find expanding possibilities for the case company's business operations.

### 3.2 Current Services of GTS

The goal of this section is to explore GTS current service models. This is required information to understand in order to build the proposal of new business opportunities with AI and ML at the end of the study. To learn about the services, the internal documents of GTS were explored, and the information was supported with interviews. The next parts introduce in detail all the services including Fleetr, FlowSens, TenFour, and Booking.

#### 3.2.1 Fleetr

Fleetr is a powerful fleet management system used to handle the entire life-cycle of customers' activities such as real-time monitoring of vehicles and employees. It offers an all-in-one web-based platform to track and analyse fleet operations in real-time, as well as provides the exact location of each vehicle and employee. The software integrates various technologies into one single platform including database, the geographical information system (GIS) and communication and mobility technologies. Additionally, it performs the command and control of mobile resources on a cartographic base. Fleetr is capable of managing both small fleets and fleets of thousands of devices since it has been created based on modularity, flexibility, and scalability.

### 3.2.1.1 Concept

As visualised in Figure 5 below, Fleetr system architecture is divided into four layers: sensors and devices, networks, platforms, and applications. The platform layer is the engine of the service where data is managed and provided to customers.



Figure 5. Fleetr service architecture

Fleetr collects georeferenced information from all mobile devices that have been previously registered in the system. This information travels bidirectionally from the device to Fleetr, allowing the system to obtain an exact location and direct communication with the mobile resources that it manages. The wide range of mobile devices deployed in the field (mobile, TETRA radios, searches, GPS modules, etc.) sends data to the system through existing communication networks such as Wi-Fi and 3G / 4G / 5G. Next, collected data is analysed and manipulated by Fleetr platform, so it can be used for various applications.



### 3.2.1.2 Features

Fleetr features can be divided into three main categories: geographical management, activity management, and integration services and technology. The main two features that give competitive advantages for the service are: (1) Manage fleets from various sectors at the same time e.g. the police and the fire brigade. This provides an effective sharing of common information and (2) The management of the complete lifecycle of the activity: the creation of an automatic or manual service and identification of the resources to be used, resolution of the service and closure of the service. In addition to these, all the other features are listed in Figure 6.

Geographical management	Activity management	Integration services and technology
<ul style="list-style-type: none"> <li>• Monitor, manage and track the vehicle fleet (mobile resources) in real-time.</li> <li>• Effective command and control over mobile resources such as notifications, schedules and speed.</li> <li>• Geographical control: proximity alerts.</li> <li>• Proactive monitoring of vehicular fleets in real-time to optimize the management of human resources including staff management and shift management of employees.</li> <li>• Tactical planning and control through alerts and warnings (email, SMS, etc.).</li> <li>• Integration with clients or external information such as traffic, cadastre, affiliation, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• A call centre that provides telephone assistance, information and data gathering, and geocoding.</li> <li>• Control and monitoring that provides associated services and actions, mobilizations and programmed information, mobile resources assignment and timeline of services.</li> <li>• Monitor and track the activity of the fleets, both in real-time and historical time to compare the information.</li> </ul>	<ul style="list-style-type: none"> <li>• Integration of mobile and fixed telephony, as well as digital and analog radios.</li> <li>• Integration of video cameras.</li> <li>• Sensor integration equipment.</li> <li>• Resource management in a web environment for tablets and mobiles.</li> <li>• Mobile resource control through apps and customized alerts, in order to keep the organization informed.</li> <li>• Control table with indicators.</li> </ul>

Figure 6. Fleetr features divided into three main categories

As can be seen in Figure 6, Fleetr can be used for various geographical management applications and it can help customers to optimize fleet management. Furthermore, it can be integrated with clients' services or external information to enhance efficiency. With activity management features, Fleetr provides continuous controlling and monitoring of the fleets and the same time call support service for any kind of technical assistance. Fleetr service is highly integrable with other systems such as mobiles, radios, sensors, and third-party applications.

### 3.2.1.3 Applications

Fleetr can be used for various purposes as well in the public sector as in the private sector. Figure 7 shows a list of applications and how GTS has currently implemented it. Green “success sign” describes that GTS is currently using Fleetr for that application.

Private sector	Public sector
<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/> Transportation (e.g. taxi or a truck company)	<input checked="" type="checkbox"/> Security (Police, fire-fighters, etc.)
<input type="checkbox"/> Electrical and electronic waste	<input type="checkbox"/> Urban waste management
<input type="checkbox"/> Health insurers	<input type="checkbox"/> Public parks and gardens
<input type="checkbox"/> Security companies	<input checked="" type="checkbox"/> City lighting
<input checked="" type="checkbox"/> Maintenance and technical services	

Figure 7. Fleetr applications and current customer sectors of GTS

Currently, Fleetr is used by various companies and public administration from different sectors and markets. Local police is using the service in many cities in Spain such as Valencia and Alicante. Additionally, Barcelona is using the service for city lighting management.

### 3.2.2 FlowSens

FlowSens (FS) is a horizontal platform for the development of Smart Cities providing data from a global perspective. FS acts as an intelligent heart of the city and can be defined as a framework for sensing, for communications and intelligent decision making. The platform combines multiple tools to manage the environment and make the city more sustainable. By providing on-line information in real-time, cities can optimise the use of resources for various operations such as waste management, lighting, intelligent water systems, all to improve efficiencies and reduce costs.

### 3.2.2.1 Concept

The data gathered from sensors or any other kind of external data source are transported via a suitable communications network and then stored in the servers. Once stored, they are normalized, homogenized and processed by the platform to obtain information suitable for decision-making processes. This information can then be accessed and visualised either by applications developed by GTS in-house or, thanks to the open APIs, also by newly-developed third-party applications.

The platform is responsible for the collection, processing, and exploitation of any type of data removable from sensors or third-party data networks. Figure 8 visualises the architecture of the platform. Any data that can be extracted through sensors or third-party data networks is transported through the existing telecommunications infrastructure to the data centre of the platform, where all the layers of capture, processing, and logic necessary for the filtered and meaningful data exposure are applied for the consumption of the own- or third-party visualisation and exploitation applications.

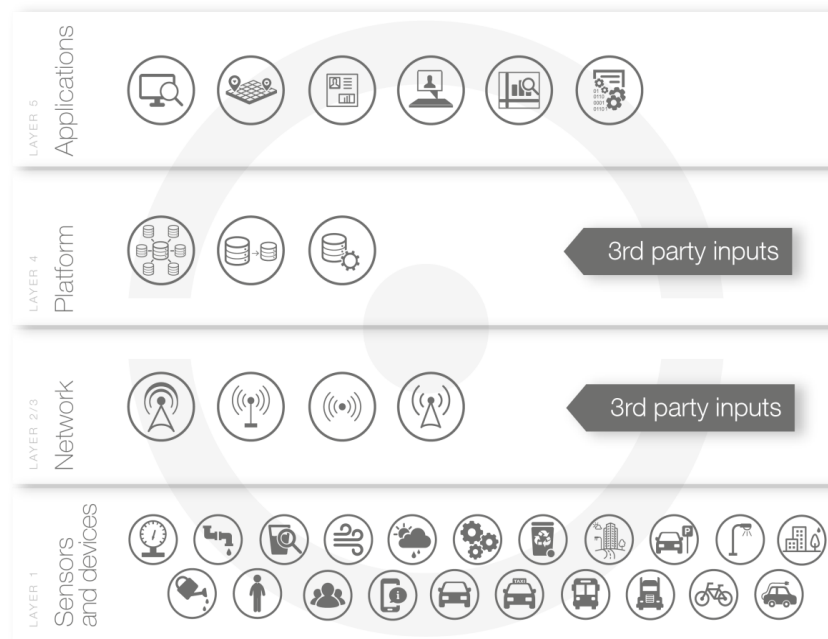


Figure 8. Data architecture of FlowSens platform

Figure 9 below helps to understand in more detail the functional scope of the FS platform. It introduces the whole process from acquiring the information to the moment of utilizing it for various purposes, and all the procedures occurring during the process with four different layers.

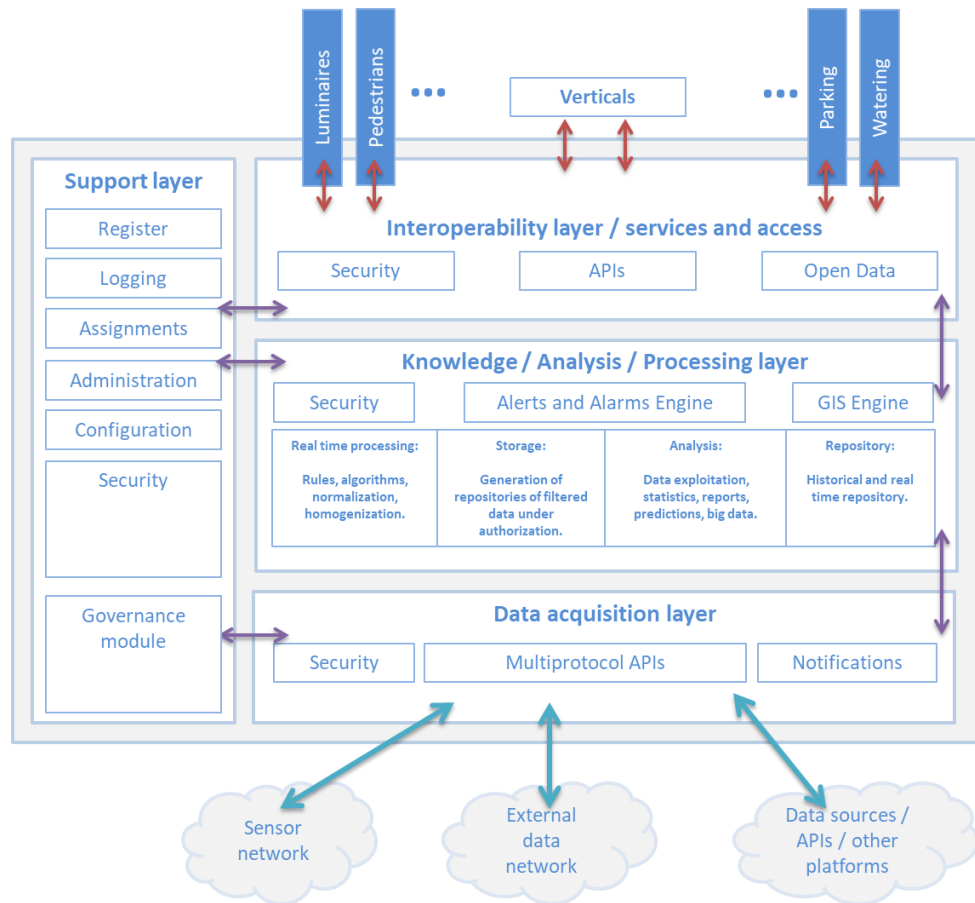


Figure 9. The functional scope of the FlowSens platform

The FS system is divided into four layers that can be seen in Figure 9 above. The first layer is Capture system and data acquisition layer, the second is Knowledge/Analysis/Processing layer, the third is Interoperability layer/Services and Access and the fourth is Support layer.

1. **Capture system and data acquisition layer:** FS obtains the information through the acquisition layer using Web service, API Rest, FTP or any integrable protocol. In this way, the platform can obtain the data from sensors, third-party data systems, social networks, management networks and this makes it independent from the hardware. All hardware to be integrated must have the corresponding API interconnection with the platform. FS possibilities are limited depending on the sensorization and actuation capabilities of the hardware associated with the sensors. The module is horizontal for the entire platform so that the data acquisition is forced, and it fulfils maximum security requirements. Due to the nature of the continuous evaluation of communications with third-party systems, the module is developed to obtain maximum flexibility and scalability.

2. **Knowledge/Analysis/Processing layer:** After the communication has been established and data collection started, the platform is in charge of normalizing, homogenizing and applying all the pre-established rules in the system. This means generating alerts, alarms, events and converting the raw data provided by all types of sensors into a usable form, understandable and exploitable for third-party applications. All of this is done in real-time and stored for historical exploitation. All the data is segmented in the different database schemes for easy exploitation by the GIS, webs of visualization and administration of FS. Any data obtained can be used for exploitation by third-parties, or by maintenance systems present in FlowSens.
  - a. Knowledge layer has a “Governance module” that oversees grouping, authorizing and hierarchizing the information, in a way that access is restricted according to the user. In this way, third-party applications have only access to the data corresponding to them and this increases the security in the system.
3. **Interoperability layer/Services and Access:** This layer allows data exposure for the applications provided by FS, as well as webs, information portals, dashboards, and real-time and historical GIS, and for third-party applications that want to integrate with FlowSens as a data source. This is the module where most of the development and adaption of the requirements to the client is done. Here each vertical data that is available to integrate is configured with style, access, indicators, summary pages, and performances.
4. **Support layer:** The support layer is transversal to the entire platform including integrated vertical data exploitation applications. In this module, all processes, systems records, logs, and users are audited, and configurations are established for access data, users, contact, mail, alerts, alarms and the master information of the system. The monitoring of resources and systems is done internally with the data centre. The layer stores the security and data backup configurations and can encrypt all the traffic under the relevant security certificates.

### 3.2.2.2 Features

FlowSens functionality is conducted with five main features: Data analytics, Real-time sensor maps, FS Dashboard, alarms and notifications, and API. With these features, FS offers a great possibility to use the service for Smart City projects and thus improve the people's quality of life in the cities. A list of features can be found in Figure 10 below.

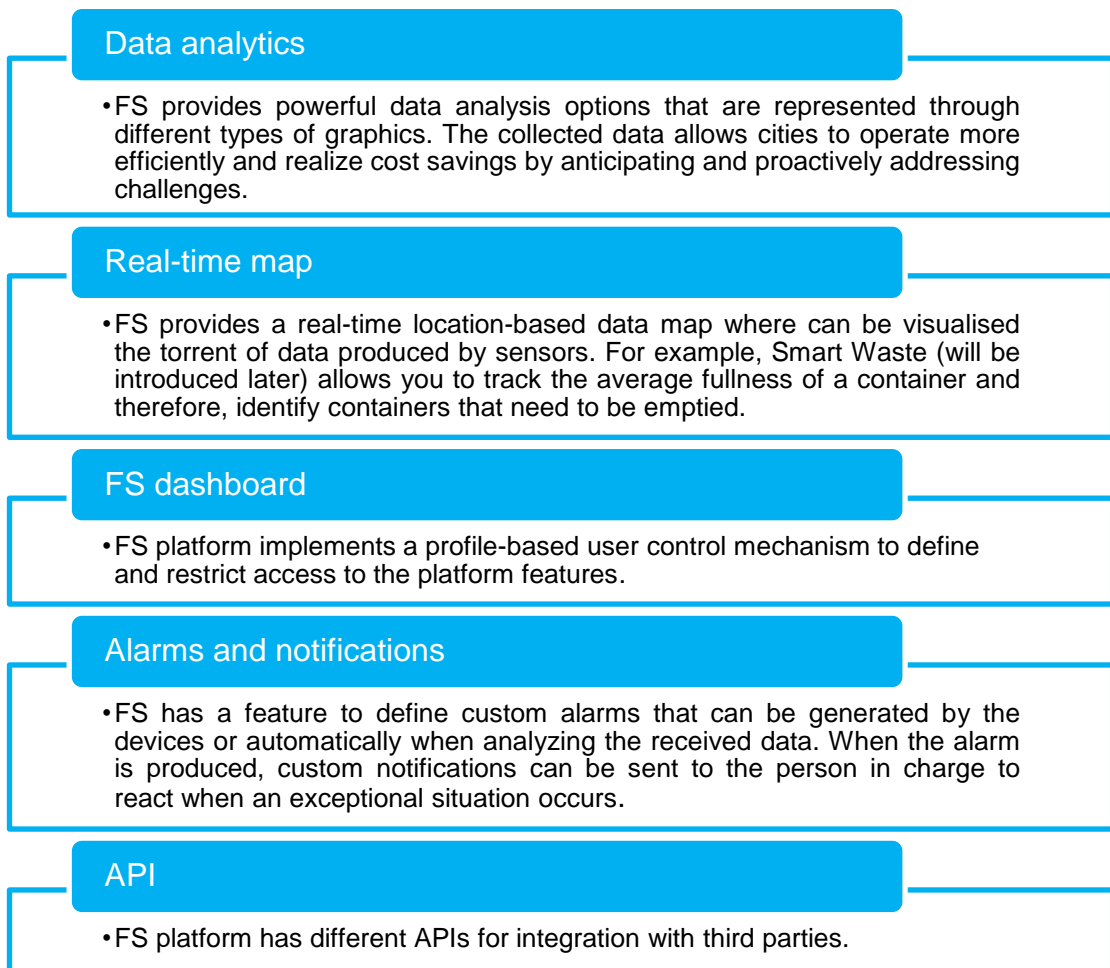


Figure 10. List of FlowSens platform features

With data analytics options of FS and data collection, customers can optimize operations and obtain significant cost savings. The real-time map allows a user to manage all the installed sensors and visualise the real-time information on the map to optimize e.g. containers emptying services. Alarms and notifications provide real-time information on the situation to the customer and it can be customized based on the need of the specific user e.g. when the container is full or when a problem occurs. FS can be integrated via APIs to other external information and third parties.

### 3.2.2.3 Applications

FlowSens has many application possibilities and can be used in various Smart City solutions, visualised in Figure 11, such as Smart Bottles, Smart Waste, Smart Meter, Smart Cover, Smart Building, Smart School, Smart Home, Smart Airport and Smart Pier.

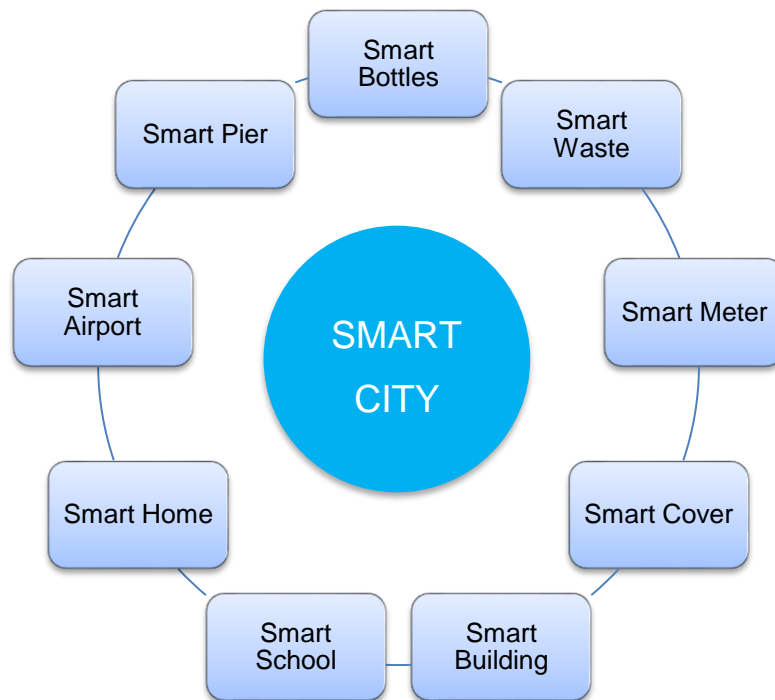


Figure 11. Smart City applications of FlowSens

**SMART BOTTLES** and **SMART WASTE** are an intelligent waste management system working via ultrasonic sensors installed inside the containers and bins. These sensors allow data collection which is taken as a basis to plan the best route for waste collection. These solutions can help to fulfil sustainability goals, improve services for residents and reduce operational costs.

Benefits of Smart Bottle and Smart Waste are listed below:

- Intelligent glass and waste collection planning and route optimization.
- Increased business efficiency by decreasing the operating costs of waste collection.
- Contribution to a better quality of life by reducing gas, emission, and noise pollution.
- Improve service for residents.

**SMART METER** is an automatic meter reading that collects data remotely and automatically. This device allows quick and effective management of the supply network to detect any damage or leakage of the system.

Benefits of Smart Meter are listed below:

- Control of water consumption.
- Detection of leaks and faults.
- Efficient management of the production, storage, and distribution of water.

**SMART COVER** consists of a signalling system specifically for manhole and drains covers installed in the roads for access to drains or underground conduits for water, electricity or gas. Installing sensors in these items will prevent and manage any incidents or acts of vandalism that could cause more serious problems in the future.

Benefits of Smart Cover are listed below:

- Robbery and sabotage detection to prevent and manage incidents or acts of vandalism.
- Provide real-time information on the state of each drain cover.
- React quickly if a drain cover were to be stolen, broken or suffer any other kind of incident in the area.

**SMART BUILDING** improves operational efficiency, safety, and comfort while reducing maintenance costs for buildings and infrastructures. The data captured from connected buildings can be used to enhance building performance or optimize resource usage.

Benefits of Smart Building are listed below:

- “Healthy building”.
- Improve asset reliability and performance.
- Reduce energy usage.
- Space optimization.
- Minimization of the environmental impact of buildings.



In addition to the above, FS can be used for Smart School, Smart Home, Smart Airport and Smart Pier solutions e.g. to improve the user experience and safety and reduce building and maintenance costs. The collected data can be used to optimize different sorts of processes and resources and so improve the efficiency of the specific operations such as customer flow, vehicle usage, and heating systems.

Currently, FlowSens is used for various Smart City solutions by different sectors. Biggest customers are water services in Valencia and Mallorca, SaaS and tracking for Cellnex company, Martos town hall, Ecoglass and Abertis highways.

### 3.2.3 TenFour

TenFour (TF) is an Emergency Management system capable of managing one or multiple integrated agencies, such as the police, fire brigade, healthcare, simultaneously allowing to share data and critical information within different modules. The main purpose of TF is to reduce the response time of the emergency centre by integrating all the technologies available into the same platform. Therefore, TF enhances the ability for organizations to make timely, accurate decisions based on updated information easily accessible. TF integrates different technologies into one platform, such as the Database, the geographic information system and communication, and mobility technologies. It also performs the command and control of mobile resources on a cartographic base. TenFour is specially designed to work 24/7 for high-availability and critical environments.

#### 3.2.3.1 Concept

TenFour is specially developed to respond rapidly to emergencies and to provide communication between all the parties involved in the incident situation. This kind of software needs to be highly reliable and well tested to be able to be operative in the critical sectors of services. The system concept of an incident is visualised in Figure 12 below. More specifically, it describes that when an incident happens, the TF service provides whole communication between the incident location and emergency agencies in real-time and automatically.



Figure 12. Concept of TenFour service

The scheme, visualised in Figure 13 below, describes the architecture of TF which is implemented for large area systems working uninterrupted 24/7. The system architecture is built to serve high importance services and thus it does not stop working even a problem or failure occurs.

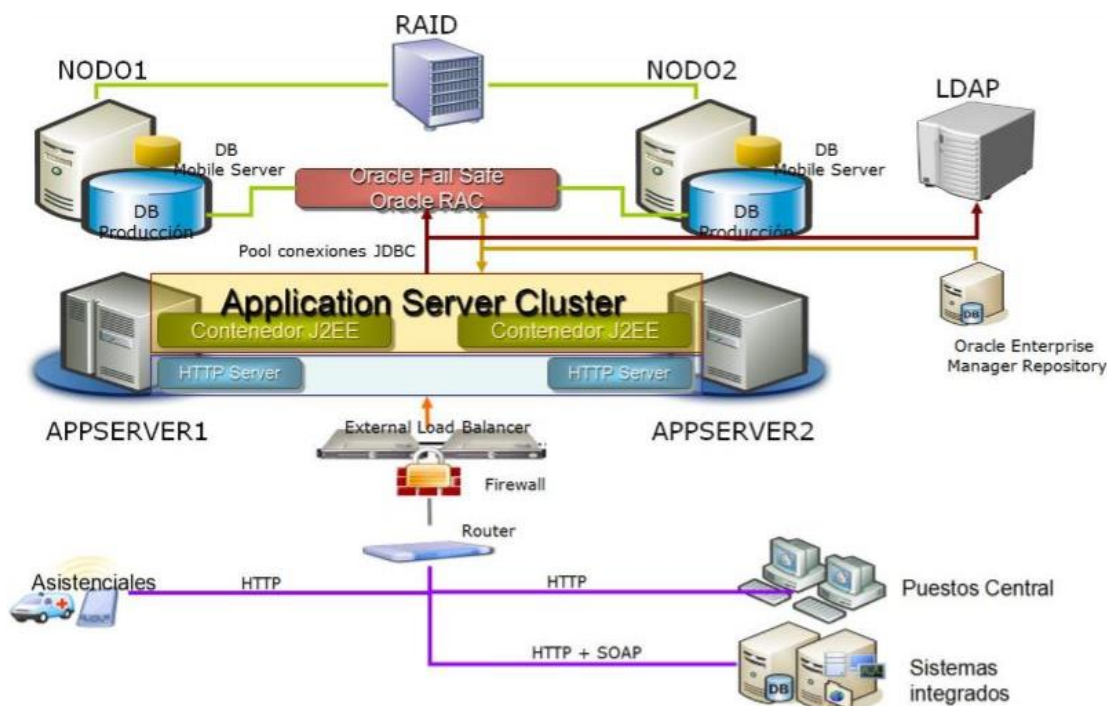


Figure 13. Platform architecture of TenFour

Looking from the bottom, there are central posts, which are devices where users run emergency applications. This can be also connected with integrated HTTP + SOAP or JSON systems, or third-party applications embedded in mobile resources e.g. ambulances and police cars. All the information is channelled through routers through the client entity's firewall to GTS servers: APP SERVER 1 and 2. The servers are responsible for serving the data to the applications and the number of servers can be chosen depending on the specific system's load. The servers connect to the Oracle cluster, which allows having several databases of replicated data, like a "twin" in case of error or fault, and thus maintain the system working 24/7 without delays or stops. In Figure 13, these "twins" are called NODE 1 and 2. Only one of two is online and another is there in case of failure when all traffic is redirected to that while solving the problem with the other. RAID is used to replicate the information and create backups with LDAP from a server to the server at intervals specified, which can be hours or days.

### 3.2.3.2 Features

TenFour features can be divided into three main categories: geographical management, incident management, and integration services and technology. The main feature which gives the competitive advantage is Communication sharing with the ability to manage multi-agency centres such as 112 + healthcare + police + fire-fighters to share critical information across multiple agencies. In addition to these, other features are listed in Figure 14 below.

Geographical management	Incident management	Integration services and technology
<ul style="list-style-type: none"> <li>• Monitor, manage and track the vehicle fleet (mobile resources) in real-time.</li> <li>• Effective command and control over mobile resources such as notifications, schedules and speed.</li> <li>• Geographical control: proximity alerts.</li> <li>• Proactive monitoring of vehicular fleets in real-time to optimize the management of human resources including staff management and shift management of employees.</li> <li>• Tactical planning and control through alerts and warnings (email, SMS, etc.).</li> <li>• Integration with clients or external information such as traffic, cadastre, affiliation, etc.</li> </ul>	<ul style="list-style-type: none"> <li>• A call centre that provides telephone assistance, incident management, information and data gathering, geocoding, and classification of incidents.</li> <li>• Management of those affected by an incident, identification and association.</li> <li>• Control and monitoring that provides associated services and actions, mobilizations and programmed information, mobile resources assignment and timeline of services.</li> <li>• Monitor and track the activity of the fleets, both in real-time and historical time to compare the information.</li> </ul>	<ul style="list-style-type: none"> <li>• Integration of mobile and fixed telephony, as well as digital and analog radios.</li> <li>• Integration of video cameras in the same interface associated with incidents.</li> <li>• Sensor integration equipment.</li> <li>• Incident and resource management in a web environment for tablets and mobiles.</li> <li>• Mobile resource management via alerts and notifications.</li> <li>• GIS and Database fully integrated.</li> <li>• Easy integration with any type of communication.</li> </ul>

Figure 14. TenFour features divided into three main categories

As can be seen in Figure 14, TenFour can be used for various geographical management applications and it can help customers to optimize emergency and fleet management and it can be integrated with clients' services or external information to enhance efficiency. With incident management features, TF provides continuous controlling and monitoring of the fleets and involved people, and the same time calls support service for any kind of technical assistance. Additionally, TF service is highly integrable with other systems such as mobiles, radios, sensors, GIS, and other communication systems.

### 3.2.3.3 Applications

TenFour is designed to work with one or multiple security and emergency agencies simultaneously. A multi-agency data-sharing system allows agencies to impeccably share data with other agencies. Figure 15 below visualises with a circle the connections between all security and emergency agencies.



Figure 15. TenFour applications throughout all Security and Emergency agencies

Currently, TenFour is used by multiple administration services including SAMU and 112 in Asturias north of Spain, local police in Valencia, Torremolinos, Terrasa, Elda and Marbella, and municipal crane management in Valencia and Alicante. In addition to these, fire-fighters in Valencia, Imelsa Valencia, and Abertis Telecom are using TF service.

### 3.2.4 Booking

Booking is a reservation management system for advertising spaces. The user of the application is dedicated to the management of advertising spaces in cities and uses this tool for controlling. The application is based on four main concepts which are Spaces, Advertising Campaigns, Reservations, and Incidents. When a third-party company asks Booking users to create an advertising campaign, the system can check what spaces are available and for how long. Finally, the reservation can be made, and the user is

followed up automatically by the system such as mails, alerts and reservation management with calendar tools. The tool can be extrapolated to any reservation management e.g. rooms, vehicles, etc. Technically, everything is served from architecture in SaaS mode, which can be housed in the client premises, or by GTS. This allows different configurations or installations of the same application for different end customers.

### 3.3 Current Data of GTS

The four services introduced earlier collect a great amount of different kinds of data that can be utilized to analyse real-time situations and optimize various processes as well as make predictions for the future. As have been seen, GTS is working in multiple sectors and markets with the software and thus it has a massive amount of various data stored from the customers. Currently, the data is used mostly to make decisions in real-time and helps customers to improve the quality of services and processes, but the historical data is not utilized as highly as possible. As described in Table 3, depending on the service, the company has historical data from year to 15 years which opens a massive chance for GTS to utilize AI and ML capabilities. Interview with CIO of the company also relieved that presently GTS does not need any open data or third-party data sources and thus they are not used.

Table 3. Service-specific data and possibilities of GTS

SERVICE	DATA	TIME	POSSIBILITIES
<b>Sensors</b>	Observations of the sensors depending on their type (temperature, humidity, position).	6 years	Cross-analysis of the information sensors send. Relationship between meteorological measurement variables and management variables (filling of containers, pedestrian crossings, watering of gardens).
<b>Emergencies and Fleets</b>	Vehicle positioning data and operations management data (incidents, mobilizations, chronology, actions).	15 years	Analysis of vehicle positioning and comparing it to the map of incidences in real-time and thus analysing the resources assigned, and the responses given to the emergency agencies.
<b>Online Market-places</b>	The stock of sales products and orders placed.	4 years	Everything related to Machine Learning about purchase and sale.
<b>Booking</b>	Management of reservations for advertising spaces.	1 year	Analysis of reserve trends according to dates for commercial actions to clients.

As can be seen in Table 3, GTS has multiple different data sources with years of collection. Currently, this data is only used to create SQL reports commissioned by clients occasionally published with Jasper Server Reports. GTS services are built in the way that customer has access to the historical data via the web site with filters, CSV downloads or through the configured reports. GTS only provides the tools and support but does not analyse the data for customer and thus the customer is responsible for extracting and analysing the data by itself. The software is working without any algorithms, only SQL queries are used to find information from the databases and create reports.

### 3.4 Current Business Models of GTS

Business models of Global Tech Strategies are related to these four services introduced earlier. The main business model used is a SaaS model, where the software is hosted on a cloud infrastructure and customers pay a monthly fee to get access to the software. The advantage of SaaS is that it is fully hosted on the cloud and thus it requires only membership not any user licenses to activate the software. (Elfrink 2016)

Currently, GTS provides two different business models for the customers including SaaS and project-specific contracts. GTS would like to provide only the SaaS model since it is more cost-efficient for the company, but all the customers are not willing to use that model, so PSC's are needed. All the emergency fleet management software services, in other words, TenFour and Fleetr, are provided to customers by SaaS with monthly payments. Booking service is provided mostly by SaaS but it can be also sold as a PSC/license. On the other hand, all the Smart City services, in other words, Flow-Sens, are provided by PSC's because of the uniqueness of each project. These contracts require more resources and time from the company than SaaS and thus are not so ideal for a start-up company.

Table 4 below describes GTS business model in the form of a business model canvas. The canvas describes the company's value proposition, infrastructure, customer, and finances. From the information provided in the table, it can be seen the operational structure of GTS business. The information is collected mostly from the company's internal documents and tacit information collected during employment.

Table 4. Business model canvas of GTS

<b>Key Partners</b> <ul style="list-style-type: none"><li>• Cities</li><li>• Government</li><li>• Municipals</li><li>• Public administration</li><li>• 3<sup>rd</sup> party companies</li></ul> <b>Key Suppliers:</b> <ul style="list-style-type: none"><li>• Data providers IaaS &amp; PaaS</li><li>• Map tech providers</li></ul> <b>Key resources acquired from partners:</b> <ul style="list-style-type: none"><li>• Agreements</li><li>• Knowledge &amp; Skills</li><li>• Information &amp; Data</li></ul> <b>Key Activities:</b> <ul style="list-style-type: none"><li>• Sustainability</li><li>• Smart Cities</li><li>• Circular Economy</li><li>• Digitalization</li></ul>	<b>Key Activities</b> <ul style="list-style-type: none"><li>• Software development</li><li>• Business development</li><li>• Innovation</li><li>• Maintain the DevOps pipeline</li><li>• Selling, B2B</li><li>• Partnership</li><li>• Negotiation</li></ul>	<b>Value Propositions</b> <ul style="list-style-type: none"><li>• Easy accessible software</li><li>• Improving business productivity &amp; collaboration</li><li>• Improving customer satisfaction</li><li>• Real-time information &amp; communication</li><li>• Reliable 24/7 software</li></ul>	<b>Customer Relationships</b> <ul style="list-style-type: none"><li>• Automated services</li><li>• Online &amp; call support</li><li>• Consultancy</li><li>• Face-to-face meetings</li><li>• Customer conference</li><li>• Analytics</li></ul>	<b>Customer Segments</b> <ul style="list-style-type: none"><li>• Government</li><li>• Municipals</li><li>• Public administrations</li><li>• Cities</li><li>• 3<sup>rd</sup> party companies</li><li>• Emergencies</li><li>• Private services</li><li>• Market places</li></ul>
	<b>Key Resources</b> <ul style="list-style-type: none"><li>• Code base</li><li>• Developers</li><li>• Software</li><li>• Market place</li><li>• Collaboration</li><li>• Connections</li><li>• Experienced employees</li><li>• Real-time&amp; historical data</li></ul>	<b>Problems solved:</b> <ul style="list-style-type: none"><li>• Communication</li><li>• Management</li><li>• Time</li><li>• Optimization</li></ul> <b>Needs satisfied:</b> <ul style="list-style-type: none"><li>• Environmentally friendly</li><li>• Easy &amp; fast to use</li><li>• Safety</li><li>• Cost savings</li><li>• Time wasting</li></ul>	<b>Channels</b> <ul style="list-style-type: none"><li>• Sales team</li><li>• Marketing ON: Web</li><li>• Marketing OFF: fairs &amp; congresses</li><li>• Connections</li><li>• Word of mouth</li><li>• API</li></ul>	
<b>Cost Structure</b> <ul style="list-style-type: none"><li>• Salaries</li><li>• Research, Development &amp; Innovation</li><li>• Maintenance &amp; Platform costs</li><li>• Partner costs</li></ul>			<b>Revenue Streams</b> <ul style="list-style-type: none"><li>• SaaS &amp; project-specific contracts</li><li>• Investors / Government</li><li>• European Union grants</li></ul>	

As can be seen from Table 4, GTS has a great deal of partners and it is working in many different sectors to improve the possibilities. Customers are mainly B2B and high importance public administrations, municipalities and government, and they can be classified as high-level customers since they have a big importance in the cities, and they affect all the citizens. Software is the core of the company and most of the activities and resources are related to maintaining and developing it to keep a competitive position on the market. The services of the case company provide many important values to customers which helps them to be satisfied with the software and its different services.



The relationship with customers is really important for the company as it is maintained by good services such as online and call support, consultancy, and a face-to-face meeting at regular intervals. The distribution channel is mainly a sales team, but also ON and OFF marketing and connections are used to attract new customers aboard. The biggest costs for GTS are salaries and research, development and innovation since the company is all the time researching how to improve the current software and how to create innovations with it. The main revenue streams are SaaS and project-specific contracts, but GTS is active in seeking grants from the European Union and other investors/governments to raise capital and enhance possibilities.

### 3.5 SWOT-analyses

This section introduces the key findings from the current state analysis listed in two different SWOT matrix tables 5 and 6 below. Table 5 presents results from the service part, and Table 6 for the business part. Additionally, some of the data gathered for the CSA is used to build the proposal, and it is presented in Section 5. Data 1 for this outcome was gathered from the internal documents of GTS and from interviews that can be found entirely from appendices 3-4.

The SWOT matrix table consists of four segments including Strengths, Weaknesses, Opportunities, and Threats. Further information, Strengths and Weaknesses are internal factors while Opportunities, and Threats are external factors. The analysis is divided into two matrixes to get a clearer understanding of the current state of the case company.

Table 5. SWOT matrix of GTS Services

INTERNAL FACTORS	
STRENGTHS (+)	WEAKNESSES (-)
<ul style="list-style-type: none"> <li>• Unique software</li> <li>• Software versatility allowing to work in all sectors and globally</li> <li>• Flexibility, scalability, and integration</li> <li>• Proven to work in challenging conditions and environments</li> <li>• Historical data from incidents and other information</li> </ul>	<ul style="list-style-type: none"> <li>• Currently not much AI and ML knowledge, skills and understanding</li> <li>• Unawareness about AI and ML possibilities</li> <li>• Resources (3 IT people)</li> </ul>

EXTERNAL FACTORS	
OPPORTUNITIES (+)	THREATS (-)
<ul style="list-style-type: none"> <li>• Co-operation with SML</li> <li>• AI and ML capabilities by combining GTS historical and real-time data with open data sources</li> <li>• Big data and Technical needs of cities</li> <li>• Algorithms are not yet used</li> </ul>	<ul style="list-style-type: none"> <li>• Much competition</li> <li>• Going out of the comfort zone</li> <li>• Ethical issues (AI and Machine Learning)</li> <li>• To meet with norms and regulations</li> <li>• Timing on the market</li> </ul>

From GTS Services matrix can be seen the identified Strengths indicate that the software is currently working well, and it has proved to be capable of servicing customers in challenging conditions and environments. As mentioned earlier, the software is providing four different services and its versatility allows GTS to work in all sectors and globally. One of the biggest strengths is the collected historical data from incidents and other information during the last 15 years which is in the same format and thus easily utilized by AI and ML.

The identified Weaknesses indicate that GTS currently does not have much knowledge and skills as well as awareness about AI and ML possibilities. Also, the investigation revealed that GTS has currently three IT people working around the data and programming, which might be a problem or at least aggravating factor when implementing AI and ML into the company's services.

What comes to Opportunities, GTS has a great chance to expand the business by using AI and ML. Digitalization is changing the world all the time and especially big cities, thus big data and technical needs of cities are massive opportunities for the case company. Furthermore, to use algorithms and open data sources in addition to historical and real-time data to expand the data sources can create big opportunities for GTS. One huge opportunity is to make co-operation with Solver Machine Learning which can highly increase the success of the project.

The identified Threats, in turn, show that ethical questions, norms, and regulations when using data to predict for example incidents, can create challenges and obstacles. Furthermore, it must be understood that by taking AI and ML into the business operations, competition increases, and GTS is going out of the comfort zone. One big threat is timing on the market, and it needs to be considered. Is it the correct time for this kind of business change and are current and new customers ready to pay for it?

Table 6. SWOT matrix of GTS Businesses

INTERNAL FACTORS	
STRENGTHS (+)	WEAKNESSES (-)
<ul style="list-style-type: none"> <li>• International experience and high-level technical knowledge</li> <li>• High-level customers</li> <li>• Low costs maintenance and servicing (SaaS)</li> <li>• High revenue level</li> <li>• Sustainability and impact on the environment</li> </ul>	<ul style="list-style-type: none"> <li>• Unawareness about AI and ML business possibilities</li> <li>• No experience of AI and ML related business</li> <li>• No proper marketing and business plan</li> <li>• Financing needed for R&amp;D and starting new projects</li> </ul>
EXTERNAL FACTORS	
OPPORTUNITIES (+)	THREATS (-)
<ul style="list-style-type: none"> <li>• Worldwide market area</li> <li>• Worldwide and local contacts</li> <li>• Co-operation with SML</li> <li>• Business possibilities are huge when operating in various sectors and markets</li> <li>• R&amp;D funding programs by the European Union</li> <li>• Climate change</li> </ul>	<ul style="list-style-type: none"> <li>• Big companies can partly copy</li> <li>• Wider competition when adding AI and ML capabilities</li> <li>• Experienced employees can be hired by bigger companies</li> <li>• Customers are not interested in the concepts</li> </ul>

The Strengths identified in the GTS Businesses matrix shown in Table 6 indicate that the company has international experience and high-level technical knowledge, thus it is capable of expanding business also abroad. Current operations and high-level customers in the administration and municipal sectors lay a solid foundation to build a larger market area in Spain. Software is working and sold as a SaaS, which requires only a low level of maintenance and servicing and thus costs can be minimal and revenues high. Sustainability and all the impact on the environment help the company since currently, climate change is a big twister in the world.

The identified Weaknesses indicate that GTS employees are unaware of AI and ML business possibilities, and they do not have experience of business related to AI and ML. Additionally, the investigation revealed that GTS does not have proper marketing and business plan, and external financing is needed for R&D and for starting new projects.

Regarding to Opportunities, GTS has a great chance to expand the business with the help of SML co-operation and worldwide contacts. Business possibilities when operating in various sectors and markets and by combining the company's software with AI and ML competences are huge and it can be expanded throughout the whole world to reach a worldwide market area. Additionally, the European Union provides a great opportunity with R&D funding programs and climate change enhances GTS possibilities to bring more sustainable solutions in the world.

The identified Threats, in turn, show that although the software is unique, expanding the business abroad the competition is larger and ruthless, and it may attract bigger companies that can partly copy the business idea and steal the experienced employees out from the company. Additionally, it is needed to take into consideration whether the current and new customers are interested in this kind of business and new concepts or not.

### 3.6 Summary of Key Findings from the CSA

After deeper exploring of the services of GTS, it was found that the same software is used for four different services: Fleetr, FlowSens, TenFour, and Booking as visualised in Figure 16. All of them have the same software functionality behind, and the concepts are highly related to each other excluding the service's characteristics. The main purpose of all the services is Information Management which provides information for the customer to improve operations in many different ways. Fleetr and TenFour are working almost similarly under the same platform but for different purposes to optimize fleet and emergency services. FlowSens provides all kinds of possibilities to Smart City solutions by collecting and visualising a large amount of various data. Booking helps customers to manage reservation by combining data from various data sources. Data is the main variable in all the services, and it needs to be considered while building the proposal of using AI and ML to expand the business opportunities of the case company.

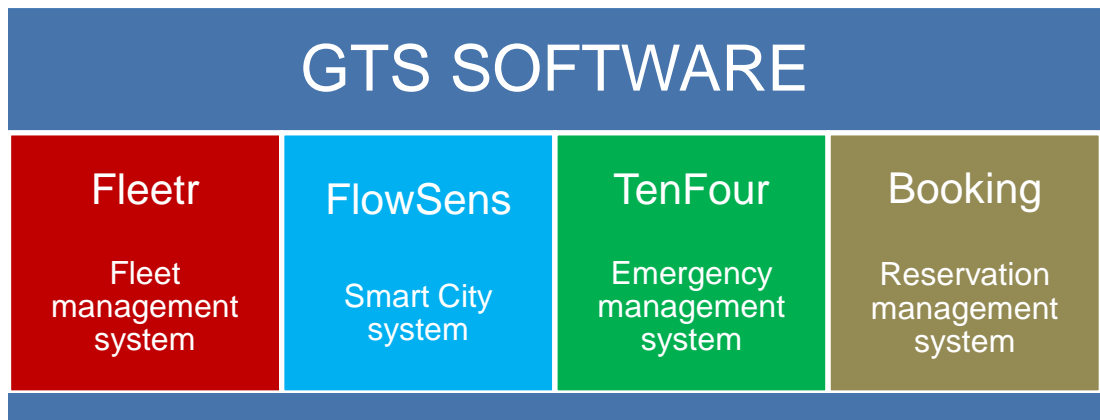


Figure 16. GTS information management software services

After deeper exploring of the business models of GTS, it was found that currently, the company has two different business models including SaaS and project-specific contract. As visualised in Figure 17, SaaS is used by TenFour, Fleetr and Booking, and PSC by FlowSens. According to the CEO, the company is more interested in using the SaaS model since it is more cost-efficient and overall easier for them. The company has customers from a wide range of sectors are some of them high-level organisations that have an impact on all the citizens such as public administrations and municipalities. GTS can bring many important values to customers and maintain a relationship with a good supporting and consultancy system. Currently, maintaining the business does not require much resources, but R&D is necessary to further develop the software and create new business models to keep the market share and find new possibilities.

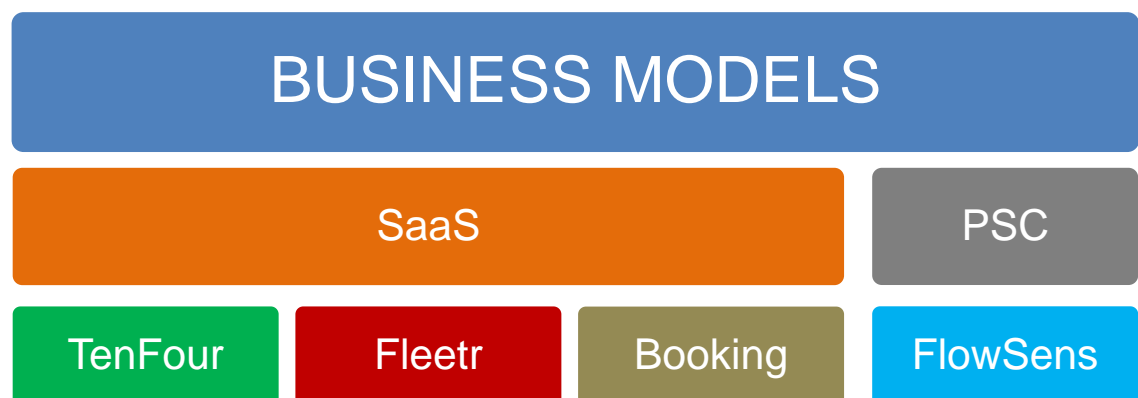


Figure 17. Overview of GTS business models

With the outcome of the CSA, available knowledge and best practices are reviewed to retrieve a deeper understanding of them in order to support the building of the proposal. Table 7 below describes available knowledge and best practices that were chosen for review based on the CSA results.

Table 7. Available knowledge and best practices to be explored in Section 4

Key Findings from CSA	Reference in Section 4	Purpose of Explored Knowledge and Best Practices
Weakness is that currently, GTS does not have much AI knowledge, skills and understanding.	4.2 Exploring AI and ML 4.2.1 Artificial Intelligence	To get basic knowledge and understanding of AI and what are the best practices, opportunities, and benefits around it.
Weakness is that GTS has unawareness about AI possibilities.		
Weakness is that currently, GTS does not have much ML knowledge, skills and understanding.	4.2 Exploring AI and ML 4.2.2 Machine Learning	To get basic knowledge and understanding of ML and what are the best practices, opportunities, and benefits around it.
Weakness is that GTS has unawareness about ML possibilities.		
Opportunity is to use AI and ML capabilities by combining GTS historical and real-time data with open data sources.	4.3 AI enablers 4.3.1 IoT 4.3.2 Big data 4.3.2 Algorithms	To get basic knowledge and understanding of algorithms, IoT and big data, and what are the opportunities they provide. Especially instructions and utilization possibilities for open data sources.
Opportunities are algorithms and big data and technical needs of cities.		
Weakness is that currently, GTS has unawareness about AI and ML business possibilities.	4.4 Business Development 4.4.1 What is business development? 4.4.2 Tools for Business Development	To get basic knowledge and understanding of Business Development methodologies and what are the best possibilities for GTS to develop business with AI and ML.
Weakness is that GTS does not have experience in AI and ML related business and what is the best way to expand the business.		
Opportunity is that GTS business possibilities are huge with software that can operate in various sectors and markets.		

As shown in Table 7, most of the identified Weaknesses, marked as red, and Opportunities, marked as green, are related to an understanding of AI and ML and utilizing all kinds of data sources. Furthermore, most common Business Development methodologies were explored to find the best possibilities for the case company. From the outcome of CSA, many other key findings were found and those are used to build the proposal in Section 5. Next, in Section 4, the thesis focuses on discussing the identified available knowledge and best practices for tackling the listed key findings and find information to achieve the intended objective.

## 4 Available Knowledge and Best Practices on AI, ML, IoT, Big Data and BD

In this section, available knowledge and best practices are inspected to enhance the understanding of the topics to build a proposal on how to expand the business possibilities of GTS with AI and ML. Since the objective is the preceding, this section mainly focusses on topics such as Artificial Intelligence, Machine Learning, Internet of Things, Big data, and Business Development.

### 4.1 Overview of Available Knowledge and Best Practices Stage

The purpose of the section is to understand how AI and ML works, and what the possibilities are for GTS to utilize them to expand business opportunities. Additionally, to gain a wider understanding of the possibilities and functions, AI enablers including IoT, big data and algorithms are examined. The main objective of the thesis is business development, thus it is crucial to explore best practices and methodologies on how to develop business with AI and ML to understand the entirety, as visualised in Figure 18.

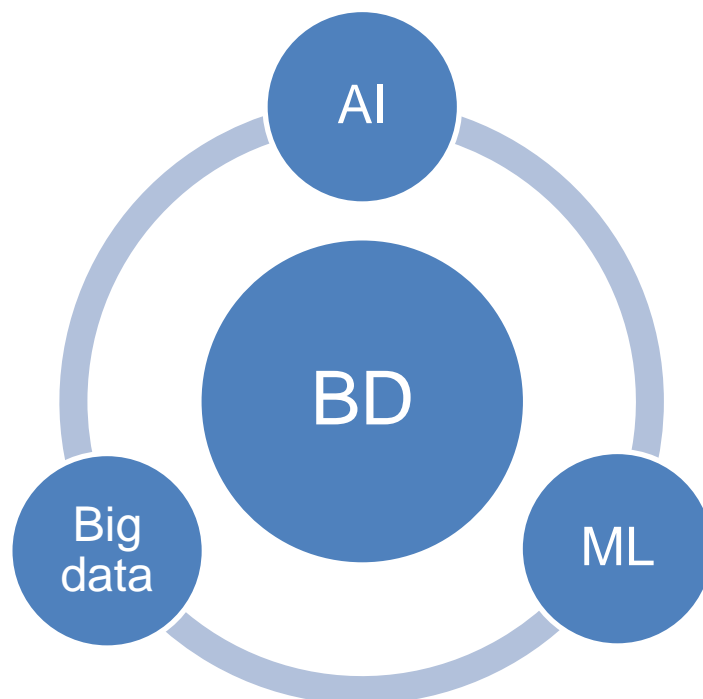


Figure 18. The connection between AI, ML, Big data and BD



As exemplified in Figure 18, the combination of all the knowledge and best practices provides a good opportunity to find the best opportunities for GTS around AI and ML. BD is in the middle of the figure since it is the core objective of the thesis. Around the circle, there are AI, ML, and Big data that are together enabling this development. It is crucial to understand how to utilize AI, ML and, Big data to develop the business and create new business models. In the following headings, these four topics visualised in Figure 18 as well as IoT and algorithms are introduced in detail.

## 4.2 Exploring Artificial Intelligence and Machine Learning

This chapter introduces Artificial Intelligence and Machine Learning in detail and at the same time deals with topics that are important for the thesis. The investigation is carried out in the way to best tackle the opportunities and fix weaknesses found in the CSA. Firstly, an overview of AI is presented and secondly, an overview of ML is presented. For both themes, explored topics were chosen to best support the proposal building stage.

### 4.2.1 Artificial Intelligence

Artificial Intelligence has been dividing opinions for years and thus it is ambiguous and has multiple different descriptions, none of which are right or wrong. This chapter introduces Artificial Intelligence again from a new perspective and focuses on topics that are important for building a proposal for GTS. First, an overview of AI is given with an explanation of what it is and what types of AI exist. Secondly, it is described what can be done with AI and what are the applications for it. Thirdly, how AI is nowadays in business is explored. Fourthly, it is described what the benefits and obstacles of AI are. Fifthly, the best practices to apply AI into the business are explored. Lastly, the future of AI is presented.

#### 4.2.1.1 What is Artificial Intelligence?

The history of AI starts in the middle 19<sup>th</sup> century when people thought automatic reasoning and intelligence are possible to achieve, so scientists tried to make simulations of human intelligence to manipulate symbols to perform different basic mathematical tasks. The problem during that time was hardware and processing power which was not enough to achieve calculations quickly enough to create simulations, and at the same

time, people did not understand how humans work, thus no result was obtained. The first concrete and important AI systems appeared in the 1970s and 1980s when expert systems were introduced. This means that systems were able to make statements, organize databases, establish relationships, and algorithms started to be able to solve mathematical problems, and finally, results were seen when the first machine learning robot was built in Japan. (Ray 2018; Mueller & Massador: Part 1)

After this an era began, called AI winters, which take place from the 1980s until the mid-1990s. During this time scientists and corporations used plenty of money in investigations without concrete results and started to lose faith in AI since it was extremely difficult to create intelligence in machines. The biggest problem was that AI applications require a massive amount of data and computing power, and at that time the computers were not capable to do that. However, in the late 1990s, America and Japan started to be interested again in AI and people believed that soon computers would be able to carry conversations, translate languages and challenge humans in sports. Results began to be obtained and in 1997 the first computer ever beat a current world champion in chess. During the 20th century AI development has massively increased, governments and corporations have been able to use machine learning and other capabilities with increased computing power and a massive amount of data storage to create different kinds of solutions. (Ray 2018; Mueller & Massador: Part 1)

Nowadays, there are multiple definitions of AI and some people tend to think that AI is human intelligence, or can even surpass it, and for some people, it is any data processing technology. Generally, AI is focused on achieving the same goal than humans or understanding of humans, which means being a human-like, but not becoming human. AI is able to embrace human intelligence including speech recognition, decision-making and language translation that gives it the competence to perform human tasks in two most common forms which are digital computers or computer-controlled robots. (Marr 2017; Mueller & Massador: Part 1)

As can be seen, AI cannot be defined only with one sentence since it has various utilizing possibilities, such as intelligence that can adapt to situations, or intelligence designed to perform some tasks well and specifically. This is the reason why it is divided into two different types, as visualised in Table 8: Narrow AI and General AI. Narrow AI can solve only one problem which has been taught to it and this limits it to two categories: Reactive machines and Limited memory. General AI can solve a wide range of various problems

simultaneously which makes it a more advanced version of Narrow AI. General AI can be divided into two categories: Theory of mind and Self-awareness. Practically, all the AI currently used is Narrow, and General AI still needs decades to become reality. AI is classified in these four different ways to form a better understanding of it. (Mueller & Massador: Part 1; Wang & Bay 2019)

Table 8. Different types of AI

NARROW AI (PRESENT)	GENERAL AI (FUTURE)
<b>Reactive machines:</b> These machines can be seen playing different games against humans such as chess or football. This version of AI does not have memory or experience before and thus it mostly relies on computing power and algorithms to make the decision extremely rapidly in real-time.	<b>Theory of mind:</b> This machine is a combination of Reactive machine and Limited memory version. For example, a self-driving car that is completely autonomous with the capability to act in conflict situations that have not happened before and react for those diversely.
<b>Limited memory:</b> These versions can be seen driving a car independently or other similar autonomous robots. The machine has a small amount of memory and with that, it can rely on the experience while being in a new situation. With the experience, it can reduce reaction time and make completely new decisions that have never been made before.	<b>Self-awareness:</b> This version of AI has not been yet accomplished but it has been seen in multiple movies. It would be a machine that has a sense of both self and consciousness and thus it requires technologies that are not yet possible to implement.

#### 4.2.1.2 What can be done with Artificial Intelligence?

With the classifications, AI has multiple outcomes, more specific questions, that it can be utilized to find an answer. Figure 19 above visualises seven different types of AI outcomes with seven different questions. The questions start from the easiest (1) Perception and the bigger the number gets to (7) Situational Awareness, the more challenging it gets for AI to find an answer to the question. AI has the capability to continuously learn from all the seven outcomes back and forward and thus independently improve itself. (Wang & Bay 2019)

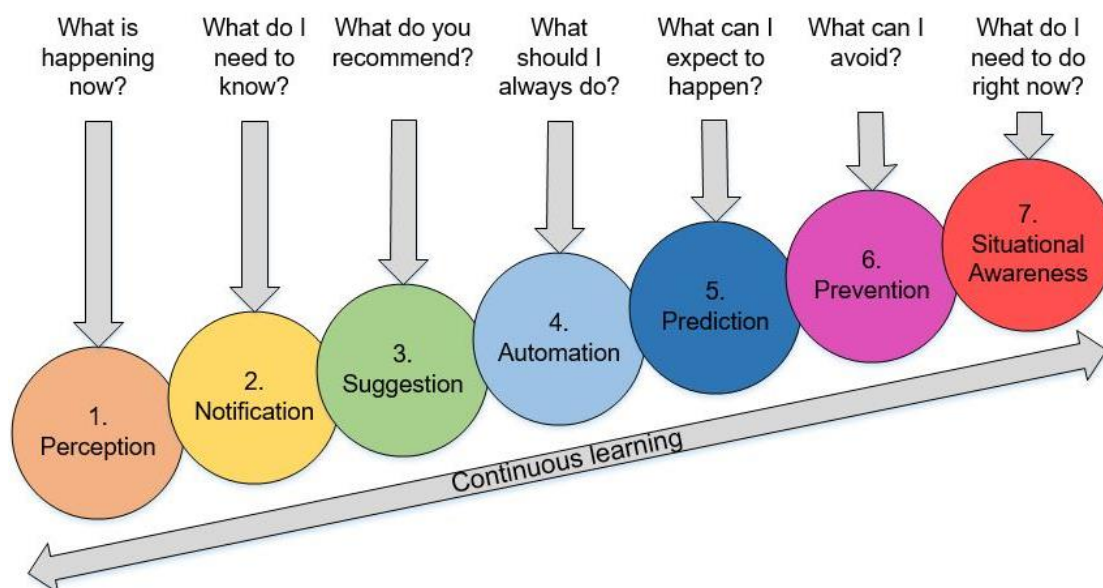


Figure 19. Different outcomes of AI (Adapted from Wang & Bray 2019)

Perception level (1) is the simplest outcome when a normal understanding of the situation is formed. Notification (2) level requires a bit more to inform and it forms a reminder of something. Suggestion level (3) again needs more from AI to be able to recommend different options. Automation level (4) requires remembering in order to perform the same process continuously. Prediction level (5) can already make a prediction in the future and use this to guide decision-making. Prevention level (6) can create a vision of the future and avoid an unwanted situation with the collected information and knowledge. When reaching the final level, (7) Situational Awareness, AI can tell exactly what needs to be done in real-time. With these questions, AI can be used for various purposes to support decision-making. (Wang & Bay 2019)

Currently, there are massive amounts of data available in the world and with this information, AI is developing rapidly, and it can be used in various applications in people's everyday life to improve the quality of life and enhance the efficiency of different tasks. Some people explain AI as the second coming of software, in other words, software that makes decisions by itself. Figure 20 visualises how versatile AI is and what it has already achieved and what is yet to come. (Uzialko 2019)

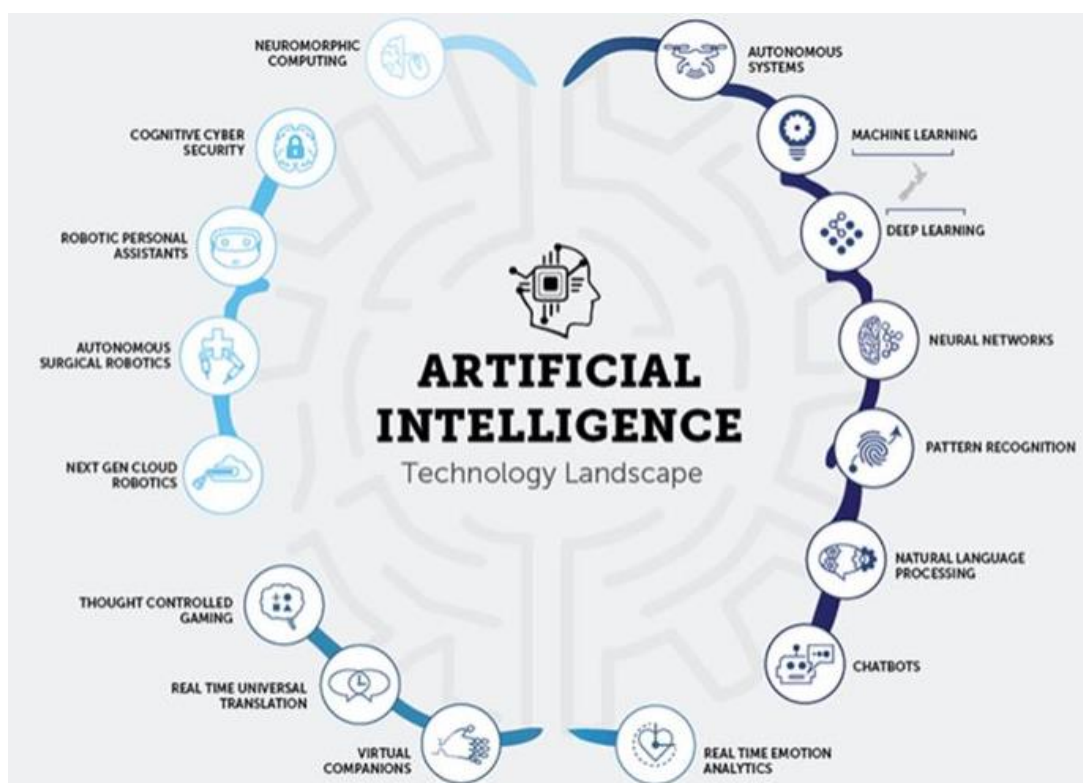


Figure 20. AI potential for exploitation (Adapted from Callaghan Innovation 2017)

As can be seen in Figure 20, AI is a special technology that has multiple potentials for exploitation, and they are increasing all the time. On the right side of the figure, marked in purple, are all exploitations that AI has already achieved. At the bottom of the Figure, marked in dark blue, are all the exploitations that are currently making the breakthrough to the markets and will be fully achieved in a few years. On the left side of the Figure, marked in light blue, are examples of the exploitations that are not yet achieved and still need years of development to be accomplished. (Callaghan Innovation 2017)

#### 4.2.1.3 Artificial Intelligence in Business

Artificial Intelligence is considered to be the next big thing throughout the world because of its potential to help organizations to drive better results. AI is capable of dramatically enhancing the operational efficiency of the company's business by improving processes such as marketing, sales, and services. By applying different sorts of data-driven processes, companies are able to create new business models by predictions or other ways that will be introduced later in the proposal building stage in Section 5. AI-powered solutions can go far beyond the results of typical solutions by offering tools to provide more

accurate and better-performing business processes. These AI tools are becoming necessary for companies to optimize key processes and keep the competitiveness on the market. Currently, the majority of business processes are still designed by humans, but it is quite clear that in the future majority will be designed by AIs. (Tang 2019)

Implementing AI into the organization's business strategy is not a simple process and companies are mostly unable to gain a business advantage as planned. On the other hand, AI brings huge business opportunities for the company, especially Pioneers, who are organizations with no AI adoption and little understanding of the technology. According to MIT SLOAN survey, strategic opportunity and revenue impact from AI for the Pioneer companies is approximately 50 %. The risk for the companies is as well approximately 50 % since AI-equipped competitors are increasing in every market area. (Ransbotham et al. 2019)

For companies who are starting the implementation of AI, it is extremely important to align the AI-specific strategies to the overall business strategy already at the beginning of implementation to get successful results. Also, to help reimagine the effects on business models, it is required to think of how AI can provide values to the company's services, such as improving the experiences and decreasing costs. Figure 21 visualises an interesting result that companies are more likely to gain value with AI integration if AI is managed by the company's high-level executives such as CEO or another C-level executive, not by CIO. The reason is that the CEO can see the whole process and invest in new AI talents while CIO relies more likely on outsourcing, and this problem occurs even more among Pioneers. (Ransbotham et al. 2019)

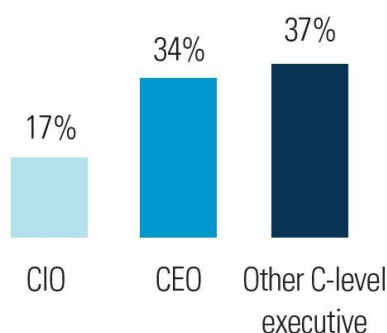


Figure 21. Percentage to gain value when different executives are leading AI (Adapted from Ransbotham et al. 2019)

Three main applications can be used to implement AI into the company's business strategy: cost reduction, revenue generation and product/service development. Most likely the Pioneer companies are applying AI in at least two ways. A company can focus on two different paths: (1) Focusing more on digital initiatives and (2) Focusing more on revenue generation. When focusing on digital transformation, companies strive to redesign various work processes, systems, and structures with the help of AI and gain cost reductions or revenue growth with the solution. When focusing on revenue, companies strive to cut costs and create productivity benefits. There is a clear difference in people's opinions when a company achieves to grow the revenue or to reduce the cost. Almost 50 percent of those who were able to get cost reductions believe that the same reductions and positiveness would not continue, while over 70 percent of those who gained positive revenue growth expect that the same success would continue. As a result of this outcome, over 50 percent of Pioneers are moving to boost revenues with AI though it is more likely to earn fast results by reducing costs. (Ransbotham et al. 2019)

It has been investigated that companies are more likely to gain value from AI integration when they hire or rent AI talents than relying on own staff. On the other hand, as Figure 22 shows, when the company has problems with hiring AI-talents, continuous re-skilling of the workforce to gain AI skills brings a better impact on the AI efforts. (Ransbotham et al. 2019)

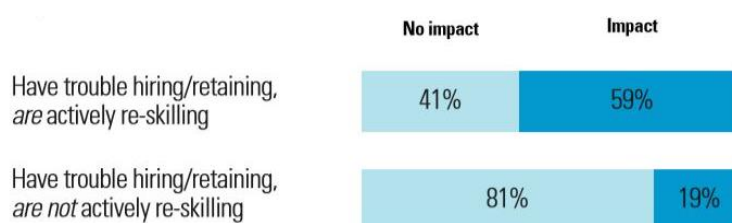


Figure 22. Difference between re-skilling and not re-skilling staff (Adapted from Ransbotham et al. 2019)

It is proved that relying on internal talent is sometimes insufficient and companies that hire outside have a better chance to deliver business value from AI integration. The truth is that there is no simple answer to this problem, and which one would be a better path for the company. It is highly dependable on the staff and their skills and willingness to learn AI-related skills, the size of the company and on the specific AI targets of the company. (Tang 2019)



#### 4.2.1.4 Business Benefits and Obstacles of Artificial Intelligence

AI can open many opportunities and benefits for the company, but at the same time, it might be challenging and bring drawbacks for the business. It is forecasted that AI will contribute over \$15 trillion to the global economy by 2030, which helps companies to gain massive benefits from it. Figure 23 shows the areas where companies can gain the biggest benefits of AI integration into the strategy. (Technostacks.com 2019)

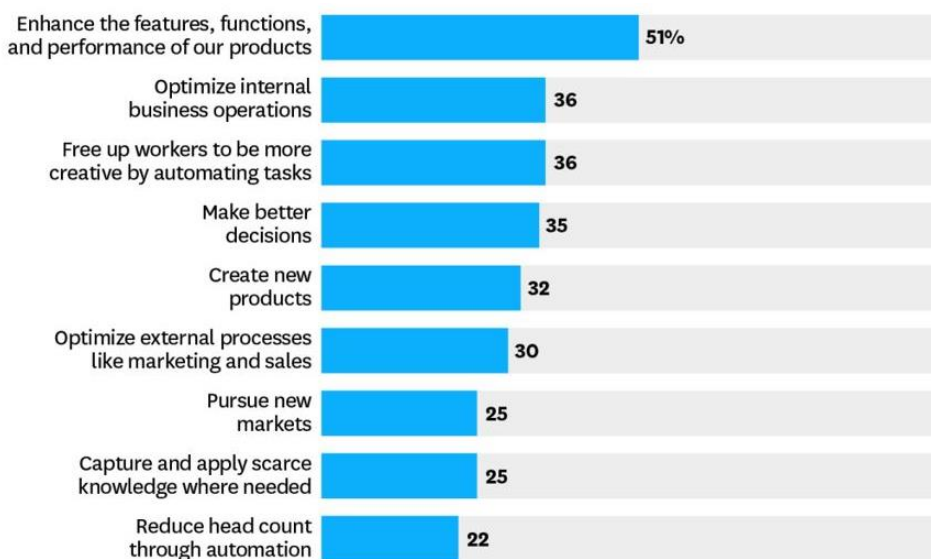


Figure 23. Benefits of AI integration (Adapted from Technostacks.com 2019)

As can be seen in Figure 23 above, over 50 % of the companies have gotten benefits from AI for enhancing the existing products/services. The next areas in the list that stand out include optimization of internal business operations, automating tasks and improve decision-making. Figure 23 can be noted that improving current products/services by AI gives far better benefits than creating new products/services by AI. These are the areas companies are most likely to focus when integrating AI and thus following more specific benefits can be achieved: (Lvivity 2018)

- **Business process automation:** AI can manage the automation of production operations and service delivery. For example, robotic lines in the factories, control, and maintaining product storage, process payments, and service customer requests.
- **Further development of IoT:** This is beneficial both for businesses and customers. IoT devices based on platforms with AI bring far-flung utilizing benefits that could lead to innovations.



- **Better customer experience:** For example, AI-based chatbots can provide 24/7 support to the customer in any sector. It improves interaction quality and response times and thus possibly the quality of the service.
- **Cost reduction and profit enhancement:** AI provides multiple highly valuable opportunities to achieve pecuniary benefits such as forecasting and minimizing risks.
- **Data security and maintenance improvement:** AI can be used to detect fraud attempts, unauthorized accesses to data and automate the maintenance.
- **Staff training:** AI can significantly reduce the costs of training events and improving employees' qualifications and abilities by implementing individual approaches to each employee.
- **Predictive analytics:** Various AI technologies can handle massive amounts of data, identify patterns and predict future, and these capabilities can bring huge benefits for the company.

AI integration does not have only benefits, but also some obstacles and challenges as Figure 24 illustrate. When integrating AI into business strategies, many variables need to be taken into account before success is ensured. These obstacles and challenges might be both internal and external, depending on every company and its situation on the market.

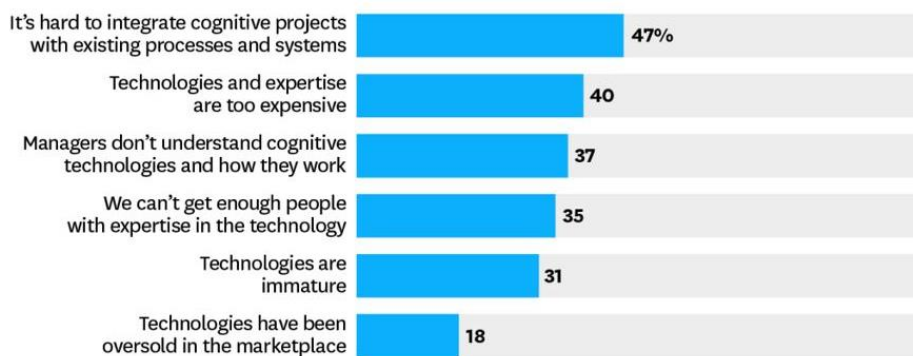


Figure 24. Challenges of AI integration (Adapted from Davenport 2018)

As can be seen in Figure 24 above, almost half of the executives express that it is challenging to integrate AI projects with existing processes and systems, and almost half of the cases AI technologies and expertise are too expensive or difficult to acquire for the organization. Other crucial obstacles are that high-level executives do not understand the AI sufficiently and thus strategies might intersect with AI, and the market might be oversold for solutions that the company is providing and thus makes it harder to get a successful result. (Lvivity 2018)

#### 4.2.1.5 Applying Artificial Intelligence into the Business

It has been investigated that over 80 percent of business executives confirm that AI enables companies to obtain a competitive advantage on the market if the market is not filled with AI solutions, and 75 percent release that AI brings new business possibilities for the company. These numbers sound promising, but before starting the implementation and developing the business models with AI, many things need to be taken into consideration. Firstly, it is a must to understand the technologies behind and what types of tasks and strengths, and limitations each of them has. When the implementation strategy and technology used are clear, time and money-wasting can be avoided. Secondly, it is a must to understand the capabilities of employees for the job needed to be done. AI integration needs employees' knowledge, skills and willingness to learn new job tasks, and if they are not able to do that, external services are needed to achieve the AI change. (Davenport 2018; Lee et al. 2019)

The next steps are following the AI transformation Playbook done by Andrew Ng who successfully implemented AI into big companies such as Google and Baidu and is the CEO of Landing AI. This guideline can be followed by any organization to become a strong AI-based company and increase the market value significantly. The AI transformation is divided into the following five steps: (Ng 2018)

- Execute pilot projects to gain momentum.
- Build an in-house AI team.
- Provide broad AI training.
- Develop an AI strategy.
- Develop internal and external communications.

Before it can be started to follow these steps above, a couple of things need to be defined to make sure that AI is the right path for the company. The company needs to evaluate the needs and capabilities to integrate AI into the operations, which is highly recommended to be done in the company's internal workshops, or if needed, with consulting services. In these workshops, all the opportunities to integrate AI are identified. After the company's possibilities around AI are explored, it is time to create user cases to determine whether the benefits are high enough and is it worth to make the change. When these questions above are answered with YES, following the Ng playbook can be started. (Davenport 2018)

First, AI projects need to be tested with pilot projects to get successful outcomes. In the beginning, it is more important to see the possibility and success and learn from the AI than gain the biggest possible value. In pilot launching phase AI capabilities are tested in the company's operations in small-scale before making the final roll-out plan. This phase can be called, proofing the concept phase, where the benefits and disadvantages can be discovered. Suggestions for the pilot project are to be easily achievable for the AI team and possible with current technology. Also, these need to have a clearly defined and measurable objectives that generates some kind of business value for the company. (Ng 2018; Davenport 2018)

Secondly, it is important to build an in-house team that is capable of carrying out AI-based projects. When the knowledge and skills are internal, the company has a better possibility to build a more unique competitive advantage than while resorting to external companies. This in-house team should be led by the CIO of the company to increase the possibilities for success. This new AI unit should report progress to every other unit in the company as well as the CEO. Thirdly, not many companies have enough AI talent in-house and it is extremely hard to find them, and albeit the acquiring is successful, in most cases the wages are very high. For pioneer companies that do not have many employees to train, it is recommended to utilize the rising digital content online. A massive number of online courses are available that might be as good as hiring a consultant to give personal training, and much cheaper than a consultant. Everyone in the organization should be trained to get knowledge of AI in order to implement it in business strategy as a whole. More training obviously for the AI unit, but also training for the executives, so the strategy can be more easily aligned with AI. (Ng 2018)

Fourthly, developing the AI strategy can be started when success has been seen in pilot projects and the AI-team has gained a deeper understanding of AI projects. After this, it is easier to identify and create AI solutions that create the most value for the company. One good idea is to focus on creating something new on the market and become a leading AI-company in that sector. Another idea is to design the strategy aligned with a virtuous circle of AI, where better products bring more user and more users bring more data, and with more data better products and services can be created, as visualised in Figure 25. In other words, this can be called a continuous positive-feedback loop. Furthermore, data is a key asset for the AI-system and thus many companies create data strategy to gain better results from AI. (Ng 2018)

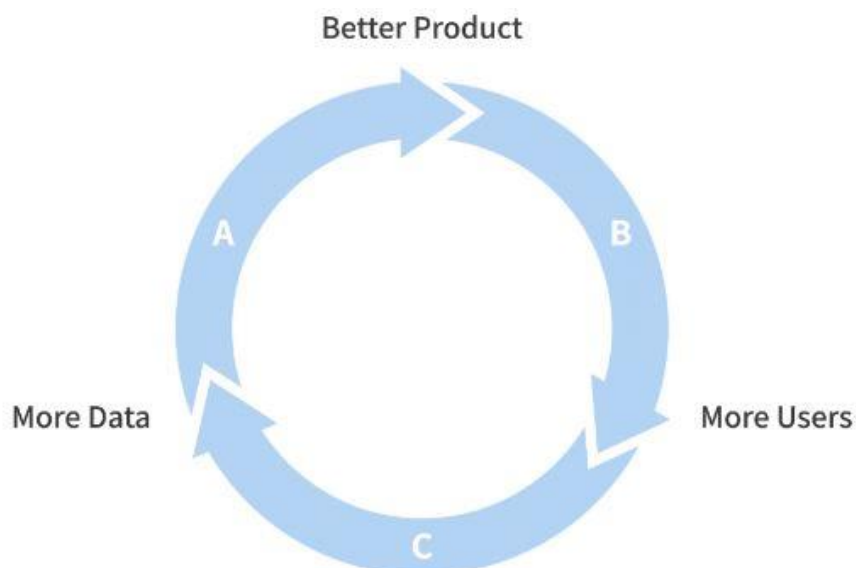


Figure 25. The virtuous cycle of AI (Adapted from Ng 2018)

When the concept has been proved to give benefits to the company, it is time to redesign the business processes by deciding how big role AI is going to take in the processes. Is it going to be 100 percent done by AI, or for example 80 percent decision by machines and 20 percent by humans? It is important to understand the benefits and drawbacks of AI for the company before making the final decisions of redesigning the processes and business models. (Davenport 2018)

The fifth and final step is developing the communication, both internal and external. AI is going to affect the organization and business massively and communication between employees and stakeholders is important to be in patterns. Relation management to every party of the business, such as investors, government and customers, is crucial to help these to understand the changes and opportunities coming. An AI transformation for a big company might take 2-3 years, but for smaller start-up company it might be much less. However, the change might be long, concrete results should be seen in start-ups after months and in the big companies within one year. (Ng 2018)

#### 4.2.1.6 Future of Artificial Intelligence

Nowadays, modern AI is changing the way of thinking where problems are broken into smaller, isolated and well-defined problems to solve them more easily and simultaneously. Modern AI focuses more on building useful solutions in real-world problems rather than trying to find an answer for eternity questions about the meaning of intelligence. Deep Learning and Neural Network alongside Machine Learning are highly boosting AI development to find out things that have never been found out before. It can be said that AI will be everywhere, meaning that the robots will become very useful in everyday life, and any field of science is adopting AI methods to get a deeper understanding of the possibilities. Furthermore, self-driving cars are close to making a breakthrough and many scientists and company executives see that it will be accomplished shortly. (Uzialko 2019)

In this modern world, multiple ideas and predictions exists about what AI will be and will do in the future. Some promise a utopian future with exponential growth when trillion-dollar industries are born. Some predict that AI will solve all the problems that humans are not able to solve now, and some claim that in the future humans do not need to work at all. The most radical idea is that AI threatens human existence and will be the end of humanity. The truth is that none of these will be completely correct, some of these might get something right, but in the end, the future is a combination of these, or something completely different that no one has yet explained. (Toews 2019)

#### 4.2.2 Machine Learning

This chapter introduces Machine Learning and focuses on topics that are important for building the proposal for GTS. First, an overview of ML and an explanation of what it means are presented. Secondly, the section describes different types of ML and what can be done with this competency. Lastly, the best practices to apply ML into the business are explored. These topics were chosen to best support the objective of the thesis.

#### 4.2.2.1 What is Machine Learning?

Machine Learning is one subset of AI as visualised in Figure 26 and it is one of the most common types of AI in the development of business purposes. ML is a technique that can learn from the information without being programmed to do so by a human, and with this competence, the machine can learn continuously more from the data and teach itself to become better. It is mostly used to process quickly massive amounts of data in cases where human abilities are not enough. Nowadays, ML is a term that encompasses many big data analytics and data mining programs. As can be seen in Figure 26, ML has two subsets: Deep Learning and Neural Networks. (Wehle 2017; Uzialko 2019)

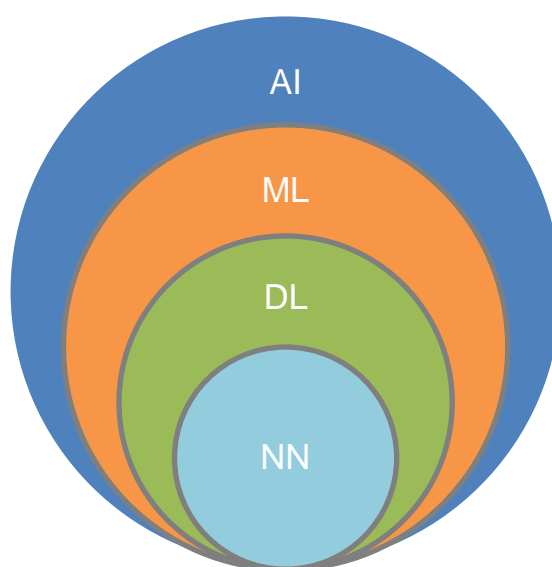


Figure 26. Artificial Intelligence and Machine Learning subsets described

ML can be divided into three types according to the problems being attacked to solve: Supervised Learning, Unsupervised Learning, and Reinforcement Learning. In supervised learning, the program can recognize e.g. whether the traffic sign, speed limit or not, is based on a known and labelled data set, so mostly the outcome of ML is YES or NO answer. In unsupervised learning, the task is to analyse and discover different structures and generate answers from unknown and unlabelled data, so the data is mostly pristine. In reinforcement learning, the machine is used to operate according to given feedback about good or bad choices e.g. a self-driving car or different games. (Wehle 2017; Uzialko 2019; Khan 2019)

Deep Learning, one subset of ML, can utilize both supervised and unsupervised algorithms separately, or both at the same time. This version of ML enables computers to learn more complex patterns and solve more complex problems e.g. fraud detection and computer vision without unrealistically large amounts of data. DL can manage a wide range of factors at once by extracting high-level and complex abstractions, and thus it can create results more quickly than standard ML approaches. A good example is a self-driven car where DL algorithms are used to analyse the data collected by sensors for various factors simultaneously, including distances, speed, and predictions, and thus can help the car to make a crucial prediction when to change lanes, or when to brake and wait for the traffic lights. (Wehle 2017; Uzialko 2019)

The word “Deep” comes from the concept of multi-layer models, typically called Neural Networks. This system consists of multiple layers, in other words, artificial neurons, where each of the layers takes the input from the previous layer, processes it, and outputs it to the next layer. This model improves the data all the time and makes it more reliable extremely fast. The ability to improve the data when more data is received makes DL more scalable and detailed and this is a reason why Deep Learning models are surpassing old Machine Learning models. (Wehle 2017; Uzialko 2019; Khan 2019)

#### 4.2.2.2 What Machine Learning can do?

Machine Learning has multiple applications where it can be utilized, and most cases are related to supervised learning. As has been seen, ML is not only one technique and that is why it can be divided into four components to explain it in more detail: Classification, Clustering, Recommendation, and Regression.

In Classification, the problem is to identify in which categories the new observation belongs with the help of data sets available, e.g. news classification to sport. In Clustering, patterns are discovered from a new data set to group the objects in a way that they are in the same group with similar objects, e.g. identifying fake news or spam emails. In Recommendation, recommendations are provided by filtering the information and predicting the importance of what the user would give to a specific item, e.g. recommendation of a movie or job. Lastly, in Regression, the process estimates the relationships between different variables in the data set to make predictions, e.g. predicting prices of houses. (Franczuk 2019)

Table 9 below describes some of the most common and simplest applications where ML is currently used. Almost all the ML applications use the same approach where input data (A) are used to generate simple respond (B) (Ng 2016). In cases where answer 0 or 1 is reached, 0 refers to NO and 1 to YES. (Khan 2019)

Table 9. Examples of Machine Learning applications (Adapted from Ng 2016)

INPUT (A)	RESPONSE (B)	APPLICATION
Picture	Are there human faces? (0 or 1)	Photo tagging
Ad plus user information	Will the user click on the ad? (0 or 1)	Targeted online ads
Audio clip	Transcript of audio clip	Speech recognition
English sentence	Spanish sentence	Language translation
Car camera and other sensors	Position of other cars and obstacles	Self-driving cars
Sensors from hard disk, engine, etc.	Is it about to fail?	Preventive maintenance
Different sorts of news	Finding similarities from the data	News classification

These examples are far from what humans can do, and from the robots that everyone has seen in the movies, but they describe well the basic elements of ML. The input-response system is rapidly improving with the help of DL and NN hence nowadays best applications are built around them. The biggest flaw of these systems is that they need massive amounts of data and examples of A and B, to be able to build good enough and reliable answers. For example, a photo tagger requires hundreds of thousands of pictures, inputs (A), to be able to recognize whether the picture contains people, or not, response (B). A good rule of thumb what ML is capable of is comparing what kind of mental task a human can do with less than one second of thought. (Ng 2016)

#### 4.2.2.3 Applying Machine Learning into the Business

Machine Learning provides rapid improvement for a business with next-level data analysing methods to find various insights and patterns. It makes the systems more accurate by automating the processes in a way that executives can make better and faster decisions. ML is a new approach for the business to get successful results, it is needed to be integrated into the business strategy as a whole, so it might require some changes in the company's operations. The core requirement of ML is a massive amount of data that can



be used in decision-making and to create insights and patterns to find new applications for the current business models. Existing businesses have a great amount of structured and unstructured data that is too laborious to manage manually, so ML brings the ability to generate this data in a structured and labelled form to enhance accessibility. Especially, ML provides for companies that are specialized in software, a new approach to improve the efficiency, speed, and competitiveness since it can be integrated easily in the software and utilized for various purposes to improve the product/service. (Saratchandran 2018).

One big point that is crucial to understand is that ML typically does not work completely autonomously with all the data, but rather with 80 percent of it, and the rest 20 percent is still managed by humans. Mostly this 20 percent includes preparing reaction models for data and setting the targeted outcomes from the data with algorithms. Thus, ML does not accommodate all human work but can reduce the cost and perform the jobs that humans are not so interested in or can be performed more efficiently with ML. Humans are still needed to classify how the machine should work, develop the algorithms, and train it with the algorithms. (Massaron & Mueller 2016: Chapter 1)

### 4.3 AI Enablers

This chapter introduces the best AI enablers considering GTS as a technology-based software company. From the research, three topics arise that are worth mentioning and are certainly respectable AI-enablers for the company in question: IoT, big data and algorithms. These three topics are explored in more detail to improve the understanding and knowledge and to find the opportunities they can open for GTS.

#### 4.3.1 Internet of Things

Internet of Things describes the network system of devices, machines, objects, or people that connects all to the internet chiefly via sensors, software, and other technologies for connecting data. IoT system enables devices to identify and understand situation environments automatically without any human help. The IoT device can be anything between kitchen appliances to industrial tools that provides information, control, and analytics to connect devices with the internet. In 2019, the estimated international IoT market is worth \$ 1.7 trillion. (Perera 2019; Schmelzer 2019)

IoT platforms can provide an interface that can be integrated into devices that are able to generate a massive amount of data such as temperature, pressure, air, sound, and quality. These platforms can be easily integrated with AI, in particular with ML systems, and generate quickly insights from the collected data. Currently, over 19 billion connected devices exist in the world and over 8 billion of them are IoT devices. The number of IoT devices connected to the internet is increasing every year, over 100 new devices every second, thus the growth has been forecasted to be approximately 10 % each year and end of the year 2025 there will be 21.5 billion IoT devices, as visualised in Figure 27 below in red colour. (Perera 2019; Schmelzer 2019)

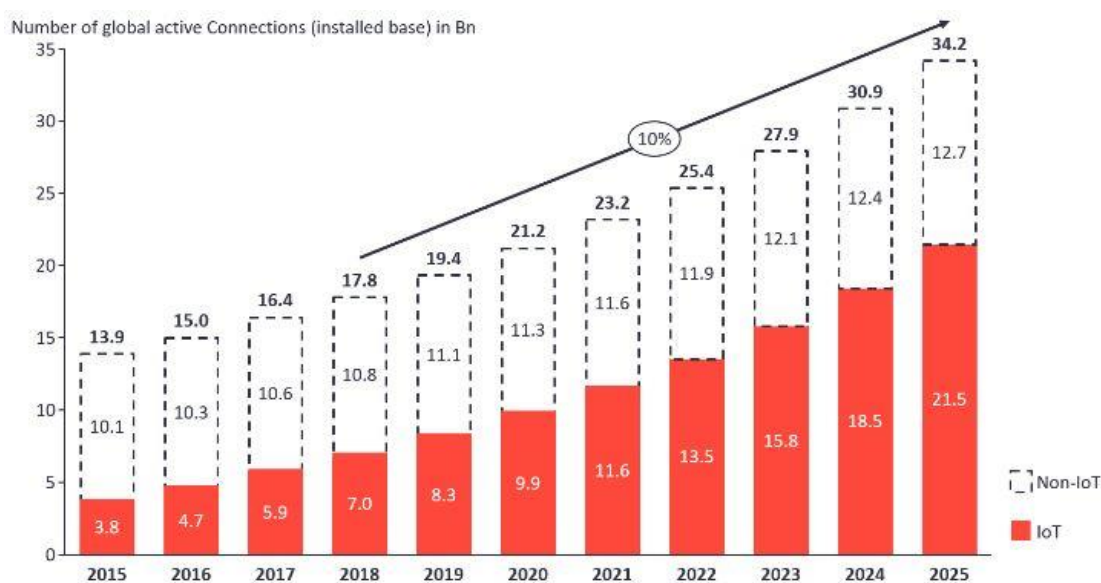


Figure 27. Total number of IoT devices connected to the internet worldwide (Adapted from Perera 2019)

As the number of devices is increasing, the amount of data is massively increasing too, and that brings all the time more opportunities to utilize AI solutions to gain more insight and intelligence from the data. However, it is not that simple since IoT has some aspects that make it more difficult to manage the data, such as connectivity, security, data storage, application development, and system integration. These are, of course, developing alongside digitalization, but they are never easy aspects to manage simultaneously while the amount of data is increasing. Furthermore, IoT, as well as AI, requires a big investment and new skills and expertise in the team. It can significantly help the AI integrating if the company already has IoT knowledge and skills in-house. (Schmelzer 2019; Perera 2019)

IoT is transforming the business models smarter with the help of AI providing for companies' possibilities to create services that customers desire. For example, a combination of IoT-enabled devices and Machine Learning creates an interconnected world that provides innovations for the future world by improving the customer relationship to the next level. IoT and AI bring huge opportunities especially for companies that have sensors and tags installed in the real world for Smart City, Smart Home, and security solutions. This amount of data is difficult to manage with normal BI and analytical tools, that most of the companies have, and thus AI is eventually needed. Comparing to these "normal" tools, AI can make predictions up to 20 times faster and with better accuracy. ML can automatically identify patterns and detect anomalies from the data and generate highly valuable information from the smart sensors and devices without the help of a human. (Schmelzer 2019; Schatsky et al. 2018)

Nowadays, with the increasing amount of IoT devices and data surrounded by us, there is a huge need for AI and its capabilities to manage all of that and make sense of it. By 2022, 80 % of organizations' IoT projects will include AI integrations, so it might be rare to find IoT implementation without the use of AI in the future, and thus AI and IoT will be intertwined together even more. IoT solutions without AI will have limited value since all the possibilities cannot be utilized with "normal" tools. (Schmelzer 2019; Perera 2019; Schatsky et al. 2018)

#### 4.3.2 Big Data

Organizations collect data from multiple sources such as business transactions, smart IoT devices, social media, etc. with high speed and in all types of formats, this data is called big data (sas.com 2019). AI system can be built with data points from 100 to 100 000 000, but the more data is available the better are the chances of success. Some definitions say that big data is just a large dataset, but it is more than that because it also includes the idea of complexity and depth. Big data is so large that humans cannot sensibly visualise it and it has so much information inside that by utilizing it, various complex problems can be solved. Many challenges that humans and normal programming are not able to solve in real-time exist, but with big data and AI it is possible and makes more sense. For example, a self-driving car which can simultaneously analyse many variables such as road condition, other vehicles and obstacles with the help of big data. (Massaron & Mueller 2016: Chapter 2; Ng 2018)

Nowadays, big data exists in many places such as an organization's databases, online databases, and other non-obvious databases such as private companies' databases. These non-obvious databases can provide great opportunities to improve AI possibilities and create something interesting and useful. The most common place to find the data for AI applications is an organization-owned database, which probably has a great amount of useful information, but not all that is available and, in most cases, needed for AI. In addition, in big organizations the data can be divided in 50 different databases which makes it almost impossible to connect the data sets for further use, thus the investigation is needed to be done in order to understand is the company's internal data useful or is some other data sources needed to perform successful operations (Ng 2018). When the answer is NO and other data sources are needed, the good options are public and private data sources that can be combined with the organization's databases and a new dataset can be created to better suit AI requirements. (Massaron & Mueller 2016: Chapter 2)

Many governments, universities and non-profit organizations are maintaining databases that are publicly available to everyone. These data sources can be used separately or can be combined with existing data sources e.g. organization-owned database to create the big data used for AI. The positive thing about this data is that it is usually free, and it can also be used for commercial use, but it has also some concerns that need to be taken into account before using the data as listed below. (Massaron & Mueller 2016: Chapter 2)

- formatting
- accessibility
- permissions
- data cleaning issues.

Formatting is important to check and understand before starting to utilize the data since it can create big obstacles if the data is in the wrong format for the company-specific need. Before using the data, it is a must to make sure that there is proper access to the data with the company's infrastructure such as via website or API. It is crucial to explore the regulations and permissions of the data source before using it since some of them might have copyrighted and cannot be used for commercial purposes and some of them not and thus can be used. It is important to take a deeper look at the data and how it has been organized and so predict a time needed for the cleaning process since if the data source is huge and cleaning is needed, it might take a long time and lot of resources before it can be utilized properly. (Massaron & Mueller 2016: Chapter 2)

Some private organizations provide and maintain available databases with a great amount of useful information such as big examples Amazon and Google. The data can be highly useful but normally also without free access, thus payment is required, and it is necessary to take into account when deciding the data sources to be used. Additionally, this data might not be allowed to download to the company's personal servers, thus it can restrict the data usage further. The advantages of private data sources are that probably and mostly the data from private providers is cleaner and easier to utilize, and the datasets are normally wider including a variety of data types, thus better results can be achieved. (Massaron & Mueller 2016: Chapter 2)

Today, big data is very important for the organizations and the important question is not how much data we have, but rather what can be done with the data. All available data is not valuable for the company, thus it is important to understand the criteria for the data before starting the data acquirement process (Ng 2018). When correct data has been found and acquired, the data can be integrated with high-powered analytics tools and thus many advantages can be gained, such as cost and time reductions and smart decision-making. To gain these advantages and make big data work, the following three steps must to defined thoroughly: big data strategy, identification of big data sources and plan for managing the data. More specifically, a big data strategy encompasses the approach to storage, analysis plan, data frameworks and decisions about data models. Identification of big data sources covers the exploring phase of possible data sources and evaluating them to find out which are the best options for the company-specific needs. The plan for managing data includes specifications of databases, formats, updating schedules, and other instructions to control the data. (sas.com 2019)

### 4.3.3 Algorithms

Algorithms are needed to determine how the machine interprets the big data and how the data is processed, and what comes to Machine Learning, everything is solved by algorithms which are normally a procedure or formula used to solve the specific problem. The problem that needs to be solved can change and, in many cases, change, but the goal of the algorithm is always the same, solve the problem e.g. getting the person from place A to place B, or winning a game. ML algorithms can be programmed by a wide range of different programming languages such as Java, Python, Scala, etc. (Massaron & Mueller 2016; Wehle 2017)

An algorithm can be defined as a box that includes all the methods to solve a particular problem. The box receives different kinds of inputs and the goal is to define using these inputs, the output in demand. For algorithms, inputs are not so important, they just need to be enough good to help to solve the problem and support producing the important thing, the output. The more complex the problem gets, the more algorithms are needed to solve the problem, and thus in most real-life cases many algorithms are combined, such as in the self-driving car system. When combining many algorithms in one system, it should eventually lead to a master algorithm that can solve any given complex problem, but this kind of system has not yet been accomplished. (Massaron & Mueller 2016)

## 4.4 Business Development

This chapter introduces Business Development in detail by answering questions such as What is Business Development and What are the tools to tackle Business Development successfully. Exploring this topic was done by investigating what the best possibilities for GTS are to expand the business and what BD strategies GTS would be able to use.

#### 4.4.1 What is Business Development?

Shortly, Business development is a process that is used to identify and acquire new potential customers and business opportunities to enhance the possibilities on the market. In other words, in BD, the growth is achieved by profitable new customers and the expansion of existing customers. Business development strategy can be a very important key to the success of the company, so it is crucial to have a proper strategy and plan to strive bigger with growth and profitability. Figure 28 below illustrates the business development model in the form of a funnel. (Frederiksen 2019; Kennedy 2015: Chapter 1)



Figure 28. Scope of the Business Development model (Adapted from Frederiksen 2019)

As can be seen and deduced from Figure 28, the first two stages of the model, Attract prospects and Build engagement, are mostly marketing functions and the last one, Turn opportunities into clients, is a sales function. The number of possibilities decreases all the time when going through the funnel and in the end, there is left only the best opportunities from all the possibilities. Nowadays, this entity is called Business Development. BD is not only sales or marketing, rather a combination of them and other processes. Below are listed all the areas that BD encompasses. As can be recognized, BD is cyclical, in other words, a feedback loop which has the potentiality to enhance the performance after every loop and that is the power of BD. (Frederiksen 2019; Kennedy 2015: Chapter 1)

- **Offer:** The reason for the business.
- **Marketing:** Making the market aware of the business and offerings.
- **Selling:** Acquiring new customers.
- **Customer Management:** Delivering offerings and new ideas in a way that the customer base retains and expands.
- **Partnership:** Join-ventures with other companies to expand the possibilities.
- **Feedback:** Using internal and external opinions to improve business and offerings.

Business Development is not easy at all and to be successful, discipline is required in two different forms. First, discipline is needed to collect knowledge and experience that are needed to manage the whole BD process, thus perseverance and studying the topic is really important. Secondly, discipline is needed to trust on current business opportunities although immediate success is not achieved, because getting new businesses takes time, thus forgetting old ones and moving to next opportunities might be disastrous. It is very important to look forward to where the revenue will come in the next months to keep the stress level of the company low both internally and externally. (Kennedy 2015: Chapter 1)

BD is particularly harder for service companies since the markets are not stable and customers want to buy the services only when it gives a clear and tangible value, while in the product business it is easier to know the need and forecast what to expect. Normally, a service company helps customers to make their business more efficient or effective, therefore, the offered service can resolve problems, or do other things that customers cannot do without the provided service. It is good to realize that when selling services, the company is selling people and their expertise and thus the value of the business mostly lies in the people. It has been researched that over 50 percent of B2B happens now online and the rest between people and this further emphasizes the value of the people in a service-related business. (Kennedy 2015: Chapter 2)



#### 4.4.2 Tools to Tackle Business Development Successfully

BD can be broken in smaller pieces to better understand what is needed to be done to achieve growth and success. Below is a list of key topics that should be focused on: (Kennedy 2015: Chapter 1)

- Follow the marketplace and what services are on demand.
- Watch the competition, assess the strengths and weaknesses.
- Define target customers clearly.
- Pitching, selling and closing business with efficient speed.
- Choose partners who can make the business more successful.
- Customer feedback to collect data – a Feedback loop.
- Continuous improvement.

When focusing well on these topics, the growth possibilities can be found and achieved in many different ways. Every organization needs to grow year over year to keep competitiveness and possibly improve the position on the market. It is quite challenging to explain unequivocally where the growth can come from, thus to make it easier to understand, BD can be divided into 6 categories: (1) New processes to sell the same product/service at higher margins by cutting production and delivery costs, or utilizing robots to automate processes, (2) New experiences by selling more the same product/service to the same people and so on increase retention and share by connecting people more to the offering, (3) New features by selling enhanced products/services to the same people, (4) New customers by selling the same products/services to new people by introducing it to new markets where there might be a different need for the same offering, (5) New offerings by creating completely new products/services on the market by finding a new need to solve within markets, and (6) New models by selling the same product/service in a new way by creating e.g. new revenue streams, channels, and value models. (Chirio 2018)

As visualised in Figure 29 below, these six categories and the relationships can be described with a portfolio. This demonstrates how big part of the innovation budget each category requires as the budget is finite. Note that (1) New processes cannot be found in the figure since it focuses on continuous improvement and thus drops out of the model. The portfolio includes four quadrants: Evolutionary, which is about 40-60 % of the budget, includes (2) New experiences and (3) New features. Differentiation, which is about 10-20 % of the budget, includes (5) New offerings. Fast fail, which is about 10-20

% of the budget, includes (4) New customers. And Revolutionary, which is about 5-10 % of the budget, include a combination of (4) New customers and (5) New offerings. (6) New models can be in any quadrant of the portfolio. This portfolio helps to understand what the possibilities are to grow and what is the cost of that choice and path in terms of the budget. (Chirio 2018)

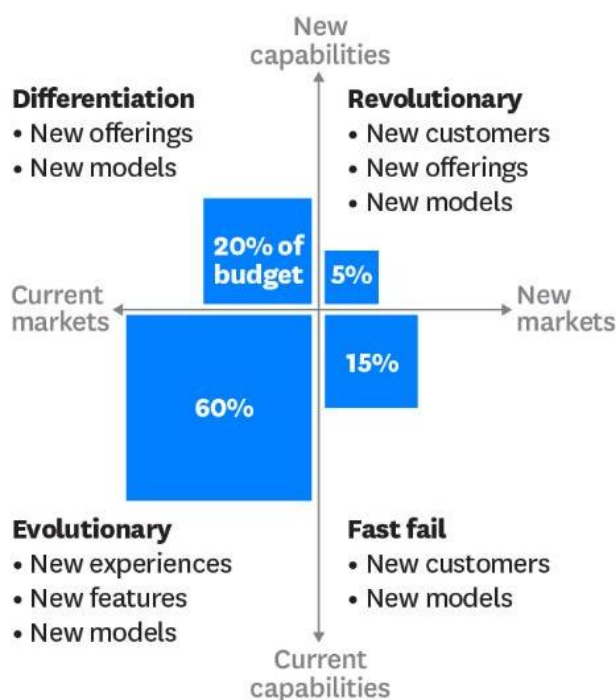


Figure 29. Innovation budget allocation model (Adapted from Chirio 2018)

Deciding which category of BD to use to develop new business is a vital decision for the company. A good decision can drive growth and profitability while a bad decision can neutralize growth and frustrate employees. To increase the success possibility, various Business Development strategies can be utilized such as networking, referrals, thought leadership and content marketing, and combined strategies. (Frederiksen 2019)

The network is one of the most popular strategies built on professional services including consultancy and relationship management such as face-to-face meetings, conferences, and events. This is a very workable method but sometimes might also be very expensive when travel expenses and time spent out of office are calculated. Referrals are close to networking and can be defined as part of it. This strategy turns networking and client satisfaction into new business opportunities, so with many referrals, it can be highly workable and valuable, but sometimes it might also turn out to be very passive depending on

the satisfaction and activity of the customers and networks. Through leadership and content market, it relies on making the expertise of the company visible to potential customers by writing, speaking or publishing different content that explains the expertise such as speaking at targeted conferences or publishing written blog posts. Nowadays, technology has even boosted this strategy with the help of digital communication, websites, and webinars, but also competition has increased because of that, so high-level contents and expertise are required. (Frederiksen 2019)

It is also a good method to combine these and other different strategies to find the best and more efficient solution for the company. By combining strategies, the strengths of one can shore up the weakness of another and thus create an even better strategy entity. (Frederiksen 2019)

To find the right path and ensure growth and success, many things are needed to be done. The most important thing is to understand that growth brings many exciting and dangerous aspects that are crucial to assess and plan before it is too late. After a big growth, for example after doubling or tripling the revenue might changes the company massively and it will not look or act the same anymore. For example, the company might have more people, more cashflow problems, bigger projects, and higher complexity, roles might be changed, and pressure differences and experience and knowledge needed can be completely or slightly different. (Kennedy 2015: Chapter 1)

#### 4.5 Conceptual Framework

The available knowledge and best practices explored in Section 4 were used to build the conceptual framework for this study, described below in Table 10. The conceptual framework also shows the key findings from the CSA carried out in Section 3 and what topic from literature was addressed to find solutions to the weaknesses the analysis revealed.

Table 10. Conceptual framework of the thesis (based on the selected knowledge and best practices)

Key Findings from CSA	Addressed Topic from Literature	Reference in Section 4	How the Literature Source is used?
Currently, GTS does not have much AI and ML knowledge, skills and understanding.	<b>Artificial Intelligence and Machine Learning</b>	<b>4.2.1</b> Artificial Intelligence	To get a basic understanding and explore useful information on the topics to best tackle the objective including AI and ML possibilities and best practices for applying them into business strategy.
Currently, GTS has unawareness about AI and ML possibilities.		<b>4.2.2</b> Machine Learning	
Using AI and ML capabilities by combining GTS historical and real-time data with open data sources.	<b>AI enablers</b>	<b>4.3.1</b> IoT	To understand the possibilities of IoT and how it is changing the business.
		<b>4.3.2</b> Big data	To find out the possibilities of big data and what are the best practices for the collection and use.
IoT, Big data, Algorithms and Technical needs of cities.		<b>4.3.3</b> Algorithms	To understand the importance of algorithms and what possibilities it would bring for the company.
Currently, GTS has unawareness about AI and ML business possibilities	<b>Business Development</b>	<b>4.4.1</b> What is business Development	To understand what Business Development means and what would be the best practices for GTS.
Currently, GTS does not have experience in AI and ML related business.		<b>4.4.2</b> Tools for Business Development	To find out what are the best ways to develop business for GTS and how it should be done taking into consideration GTS software.
GTS business possibilities are huge with software that can operate in various sectors and markets.			

As can be seen in Table 10, the conceptual framework is divided into three main topics from the literature including Artificial Intelligence and Machine Learning, AI enablers, and Business Development. All the topics are important to understand in more detail to build the proposal for the case company and achieve the objective of the thesis.

First, the available knowledge and best practices regarding AI and ML were explored to increase the level of understanding and investigate the possibilities to utilize the knowledge and practices in a proposal building phase. Secondly, AI enablers including IoT, Big data and Algorithms were explored to increase the level of understanding of what is needed for AI and ML and to find the possibilities to utilize different data sources in the final proposal. Thirdly, BD was investigated to understand best practices and to find the best possible ways for GTS to expand business opportunities with AI and ML capabilities.

Next, in Section 5, the building of the proposal based on the current state analysis (Section 3) and available knowledge and best practices (Section 4) is introduced and carried out.

## 5 Building Proposal for Expanding GTS Business Opportunities with AI and ML

This section describes the proposal building stage of expanding GTS business opportunities with AI and ML integration to the current services. It merges the findings of the CSA and conceptual framework towards building the proposal.

### 5.1 Overview of Proposal Building Stage and Steps for Building the Proposal

This chapter is an overview of the proposal stage and introduces the logic and the whole process with all steps taken to build the initial proposal. The proposal was built upon the knowledge collected from the CSA and data collection rounds 1 and 2, the explored available knowledge and best practices throughout the study, and tacit knowledge gathered while working in the case company. It consists of three parts: (1) A model to implement AI and ML supported by BD methodologies, (2) A process model to build new business opportunities with AI and ML, and (3) Summary of the benefits and drawbacks related to the implementation of AI and ML. First, the whole process with steps taken to build the proposal is presented. Secondly, the key findings made during the study are introduced, and finally, the proposal is produced.

Three steps were taken before the proposal stage to enhance the knowledge of the required topics to be able to tackle the objective of the thesis. The objective of the thesis was to propose a model to implement AI and ML and a process model to build new business opportunities with AI and ML and create a summary of the implementation benefits and drawbacks. Figure 30 below visualises the steps taken for building the proposal chronologically.

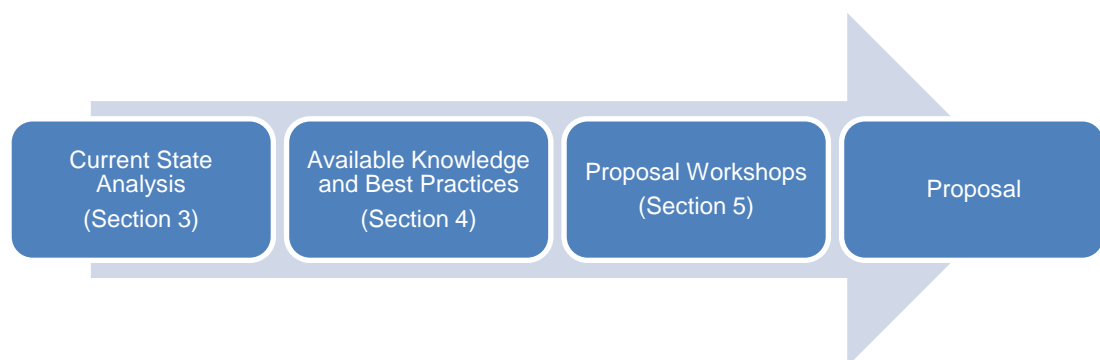


Figure 30. Proposal building steps chronologically

As can be seen from Figure 30 above, the proposal was built in four steps in total, including the CSA of GTS current services and business models (Section 3, Data 1), available knowledge and best practices based on the findings from the CSA (Section 4, Conceptual Framework), and proposal workshops with the CEO and employees of GTS to build the best possible result (Section 5, Data 2). Figure 31 below describes the steps with content in more detail.

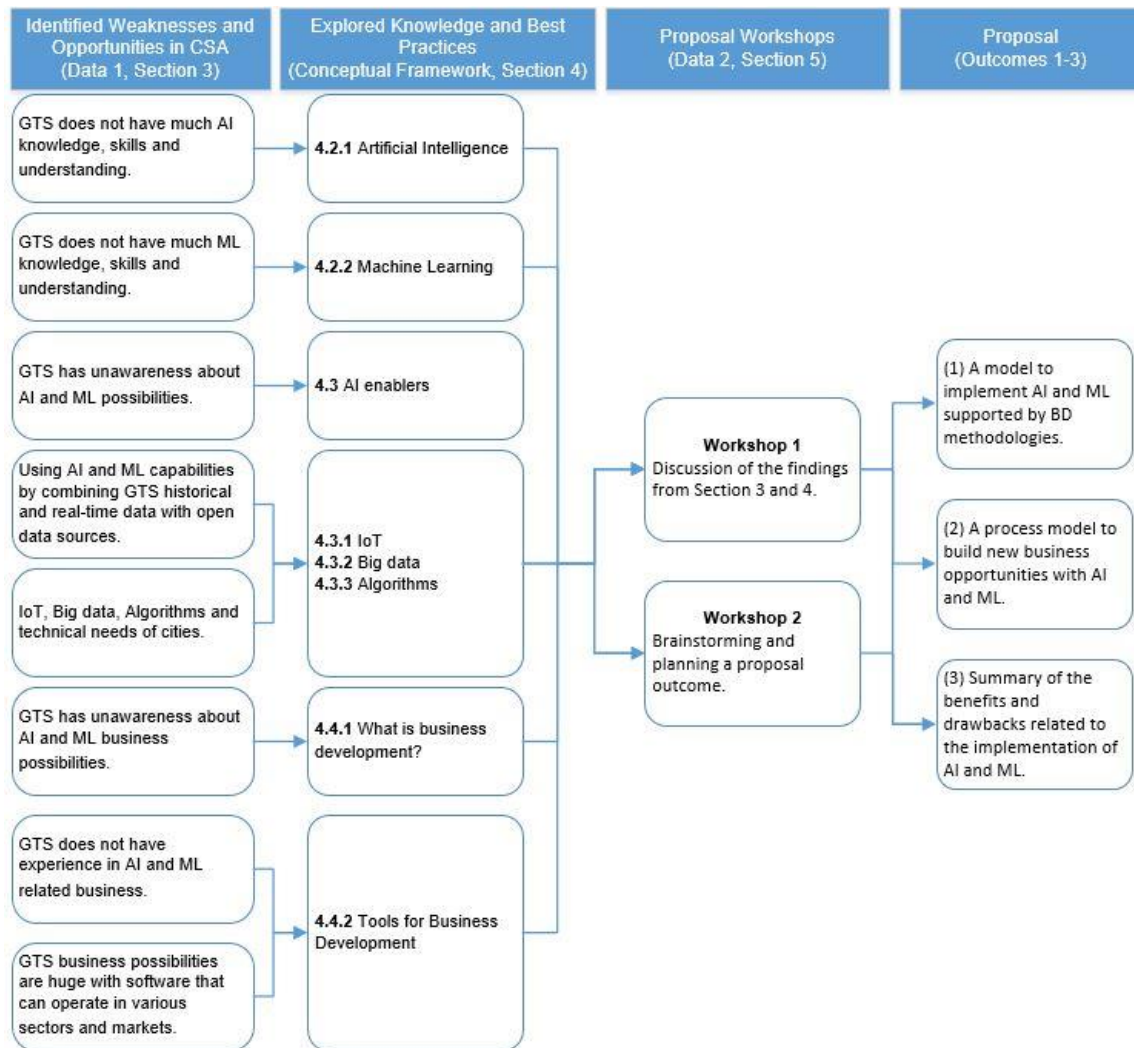


Figure 31. The content of the steps leading to the proposal

Figure 31 above presents the content of each of the proposal building steps. At the beginning of the thesis, Data 1 was collected for the CSA by exploring the case company's internal documents and interviewing executive-level people of GTS. Data 1 revealed the strengths, weaknesses, opportunities, and threats of GTS services and business models which are presented in Figure 31 on the left side. In the next step, the available knowledge and best practices were chosen based on the identified weaknesses and opportunities in the CSA. The stage focused on exploring knowledge and best practices about AI, ML, Big data, and Business Development. These are presented in Figure 31 chronologically after the first arrows on the left where each refers to its section.

After all the required knowledge and information to build the proposal were gathered, workshops were held to discuss the findings (Workshop 1) and possible outcomes (Workshop 2) with the CEO of GTS. These workshops were held with the CEO to get the broadest perspective possible to gather Data 2 that was used to build the proposal. The content of these two workshops can be seen in figure chronologically after the knowledge and best practices. Finally, after all the mentioned steps carried out, the proposal for the thesis was built. Next, the key findings from the steps are presented.

## 5.2 Key Findings for Building the Proposal

This chapter introduces the key findings that have influenced the proposal. The key findings are presented according to the pre-steps for the proposal introduced earlier, including the CSA of GTS current services and business models, available knowledge and best practices of AI and ML for GTS, and Data 2 presented later in Section 5.

### 5.2.1 Key Findings from the CSA

The current state analysis in Section 3 was aggregated by exploring internal documents of the case company and interviewing selected executive-level people, the CEO and CIO. By exploring the company's internal documents, knowledge about GTS current services, Fleetr, FlowSens, TenFour, and Booking, were obtained. From the interviews, in turn, knowledge about GTS business models and services data collection, were obtained. The key findings from these are presented in two tables below, Table 11 includes strengths and weaknesses and Table 12 opportunities and threats.



Table 11. Key findings from the CSA on behalf of strengths and weaknesses (Data 1)

STRENGTHS	WEAKNESSES
Software versatility such as flexibility, scalability, and integration allow to work in all sectors and market globally.	Currently, GTS has not much AI and ML knowledge, skills and understanding.
GTS has software that is proven to work in challenging conditions and environments in many sectors.	Currently, GTS is unaware of AI and ML possibilities for the company.
GTS has historical data from incidents and other events from months to 15 years.	GTS is a start-up company and lack of resources since it has only 3 IT employees.
GTS has a great deal of international experience and high-level technical knowledge in the team.	Currently, GTS is unaware of AI and ML business possibilities for the company.
GTS as a company and its services are striving to the sustainability and impact on the environment.	GTS has no experience of AI and ML related business.

Table 11 above describes the main strengths and weaknesses of GTS current services and business models. These key findings are described in detail in Section 3 earlier in the thesis.

Table 12. Key findings from the CSA on behalf of opportunities and threats (Data 1)

OPPORTUNITIES	THREATS
Co-operation with SML improve the possibilities to achieve successful change.	The competition is wider and harder when moving to AI and ML markets .
AI and ML capabilities by combining historical and real-time data with open data sources bring great possibilities for GTS.	AI and Machine Learning might bring many ethical questions and issues in the operations of GTS.
Big data and technical needs of cities are increasing all the time and more digitalization solutions are needed.	Big companies can partly copy the idea of the software and services when expanding globally with AI and ML.
Algorithms are not yet used in GTS software and by integrating them into the system, great possibilities can be born.	GTS will go out of the comfort zone when changing the strategy more to AI and ML.
Business possibilities are huge worldwide when operating in various sectors and markets and GTS should take advantage of that.	
Climate change is affecting the people and companies all the time more, so more sustainable and environmentally friendly solutions are needed.	

Table 12 above describes the main opportunities and threats of GTS current services and business models. These key findings are described in detail in Section 3 earlier in the study. Additionally, when exploring the internal documents of GTS, the CSA brought up many valuable insights that should be considered while building the proposal. These are presented in SWOT matrices in Section 3. With a combination of all the key findings from the CSA, a better and more company-specific proposal can be built to strive for the objective of the thesis.

### 5.2.2 Key Findings from the Conceptual Framework

The available knowledge and best practices in Section 4 were aggregated by exploring the topics, including AI, ML, IoT, Big data and BD. By exploring the areas, understanding of the topics was gathered and a great deal of important insights and experiences in the form of examples were obtained. The list of all key findings can be found in Appendix 7, and next, the most important key findings according to each topic are presented.

All the key findings related to AI can be found in the chapter (4.2.1) and below are listed the three most important findings of AI for the thesis. The first important finding is that (AI-1) over 50 % of companies have gotten benefits from AI for enhancing the existing products/services. It can be noted that improving current products/services by AI, gives far better benefits than creating new products/services by AI. Secondly, it was found that (AI-2) for companies who are starting the implementation of AI, it is extremely important to align the AI-specific strategies to the overall business strategy already at the beginning of implementation to get successful results. The third important finding is that (AI-3) there are three main applications of how to utilize AI into the company's business strategy: cost reduction, revenue generation and product/service development.

All the key findings related to ML can be found in Section 4.2.2 and below are listed the two most important findings of ML for the thesis. The first important finding is that (ML-1) the core requirement of ML is a massive amount of data that can be used in decision-making and to create the insight and patterns to find new applications for the current business models. The second finding is that (ML-2) especially, ML provides for companies that are specialized in software, a new approach to improve the efficiency, speed, and competitiveness since it can be integrated easily in the software and utilized for various purposes to improve the product/service.

All the key findings related to AI enablers can be found in Section 4.3 and here is listed the most important findings related to IoT and big data. The most important key finding from IoT can be found in Section 4.3.2 which is that IoT, as well as AI, requires a big investment and new skills and expertise in the team. It can significantly help the AI integrating if the company already has IoT knowledge and skills in-house. The key finding from big data can be found in Section 4.3.2 which is that to gain the advantages and make big data work, the following three steps must to defined thoroughly: big data strategy, identification of big data sources and plan for managing the data.

All the key findings related to BD can be found in Section 4.4 and here are listed the three most important findings of BD for the thesis. First, an important finding is that (BD-1) to increase the success possibility, various business development strategies can be utilized such as networking, referrals, thought leadership and content marketing, and combined strategies. The second finding is that (BD-2) it is good to realize that when selling services, the company is selling people and their expertise and so the value of the business mostly lies in the people. The third finding is that (BD-3) BD can be divided in 6 categories: (1) New processes to sell the same product/service, (2) New experiences by selling more the same product/service, (3) New features by selling enhanced products/services, (4) New customers by selling the same products/services, (5) New offerings by creating completely new products/services on the, and (6) New models by selling the same product/service in a new way.

As can be seen, during the exploration of the topics a great amount of useful and important information related to the objective was found to support the proposal building stage. These key findings in addition to others that can be found in Appendix 7 are used to build the proposal for the case company.

### 5.2.3 Result of the Proposal Building Workshops

During the proposal building stage, two workshops were held to share the findings from Section 3 and Section 4 with GTS and collect further insight from the findings for building the proposal. These workshops together form Data 2 for the thesis that can be found in Appendices 5-6. More specifically, the purpose of workshops was to share the findings from the CSA and available knowledge and best practices with GTS executive-level people and discuss the possibilities around them to obtain the company's point of view to enhance the value of the result and build an optimal proposal for the case company.

The first workshop included discussions of the key findings and sharing the gathered knowledge with the CEO of GTS. This helped the company to understand what the current situation is related to AI and ML and what can be done regarding resources and business operations. The second workshop was held also with all the CEO of GTS and it included further discussions about the company's possibilities to integrate AI and ML into the company strategy taking into account the key findings during the investigations. After the workshops, the proposal was generated with separated parts 1, 2 and 3.

### 5.3 Proposal

This section presents the initial proposal with three separate parts: (1) A model to implement AI and ML supported by BD methodologies, (2) A process model to build new business opportunities with AI and ML, and (3) Summary of the benefits and drawbacks related to the implementation of AI and ML.

#### 5.3.1 A Model for AI and ML Implementation

The initial proposal for GTS to implement AI and ML (Part 1) was created based on the findings from the CSA, available knowledge and best practices and Data 2 gathered from the workshops. For this part, the CSA brought up the situation of the company, available knowledge and best practices brought up advice, experiences, and insights about AI and ML integration, and workshops collected together these findings and GTS employees' opinions about the situation and possibilities. Part 1 was built on all of these findings.

The created result is a model that combines all the findings to visualise the AI and ML implementation process and requirements supported by Business Development practices. The goal of the model is to describe clearly the core topics that are needed to consider during the implementation process to guide the company in the right direction. The model takes into account GTS situation on behalf of services, organization, and resources, thus it is specially tailored for the case company. However, the findings are in the general interest and thus the model can be used externally for other companies too but considering that it might not completely fit, and some changes may need to be made.

Moreover, the purpose of the model is to be a guideline for GTS to start AI and ML implementation into the company. With the model, GTS should be able to enhance the AI implementation and BD process success probability significantly and improve the usefulness of the result. The initial proposal to implement AI and ML into the company strategy is presented in Figure 32 below.

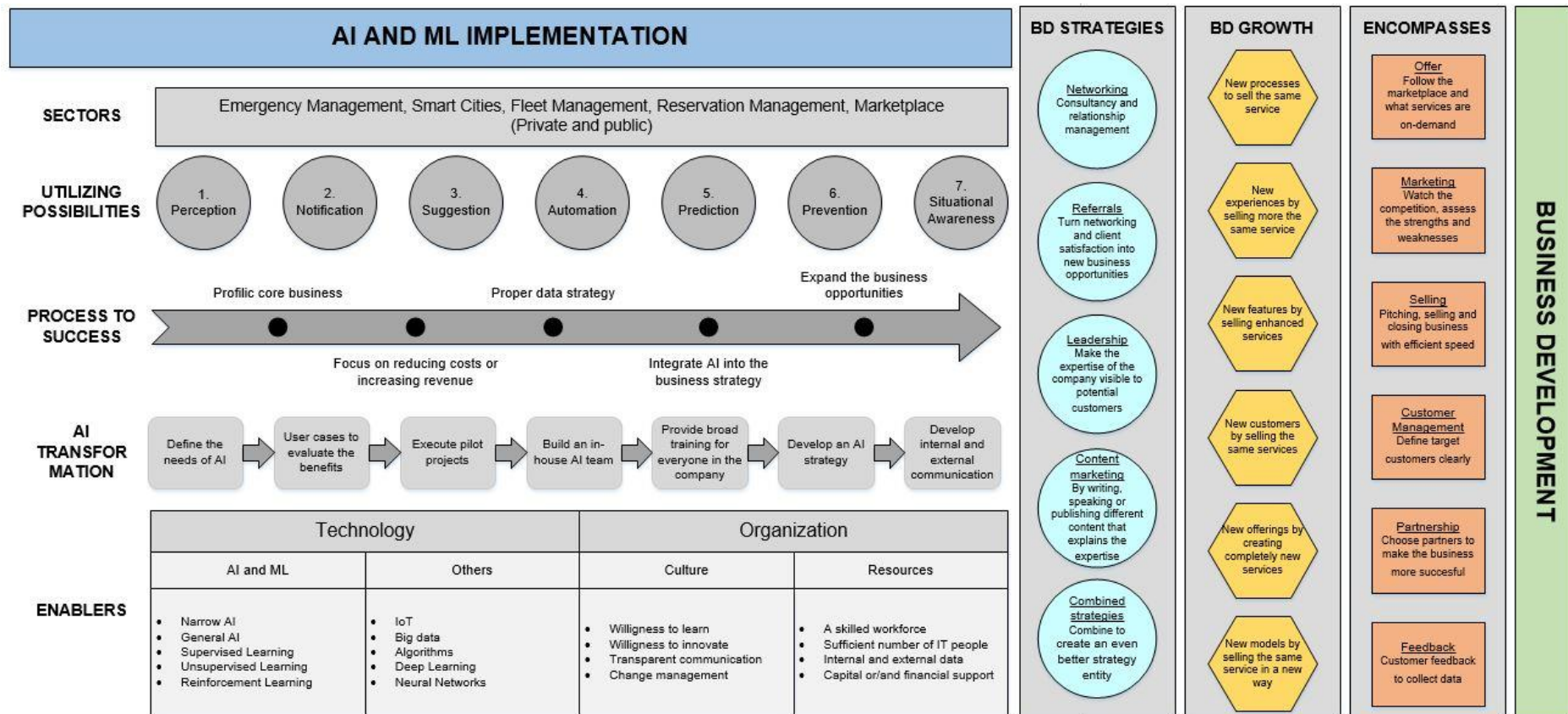


Figure 32. AI and ML implementation model supported with BD methodologies

As can be seen in Figure 32, the model is built upon the findings from the CSA and available knowledge and best practices and it is divided into two dimensions: vertical which represents AI and ML implementation and horizontal which represents Business Development. The idea of these two dimensions is to combine these two topics that were found to be highly related to each other during the whole AI and ML implementation process to visualise and emphasizes the importance of both. Furthermore, GTS is same time planning to integrate AI and ML and develop business, so to achieve the best possible result of the implementation, BD is required to support the change.

Vertical dimension, AI and ML implementation are divided into five main categories to describe all the main key findings and best practices about AI and ML during the study. The idea is to collect the information in the same figure to make it easier and faster to utilize and follow, and thus improve the success probability of the implementation. On the other hand, by visualising all the key findings into the model, the instructions and core message can be highlighted for GTS.

The first category is Sectors, which introduce all the main sectors where GTS is currently operating, and where AI and ML competences can be utilized, to introduce the current integration opportunities. The second category is Utilizing possibilities, which introduces all the main competences of AI and for what kinds of problems it can be utilized, to enhance the company's employees' understanding of the possibilities. The third category is Process to success, which represents the key requirements of success in the form of chronological process. With this process arrow, the company can quickly see is the process managed properly and are all the crucial requirements fulfilled to improve the implementation success. The next category is called AI transformation which is a guideline for the company to carry out the whole implementation process. It includes seven important phases that all of them must be done to ensure the process is appropriate and achieve the best possible result for the company. This is important to understand and follow especially for GTS who does not have experience and knowledge in AI and ML implementation. The last category is called Enablers which contains AI and ML enablers both in terms of technology and organization. This category brings together all the enablers of implementation on behalf of technology, cultural approaches, and resources. With the information and instructions in this entity, GTS can support the implementation and understand what are the things that need to be taken into account before even starting the process.



The horizontal dimension, Business Development, is divided into three main categories to describe best practices in Section 4. The purpose is to present the information in the same figure to make the relation between AI and ML implementation and BD clear for the company. Additionally, the goal is to visualise all the best BD methodologies in an organized way, so that GTS can utilize them during the implementation process and at the same time develop the business in general.

The first category is called Encompasses, which consists of all the sub-topics that BD covers and how each of them can be executed. This is included in the figure to improve the company's understanding of the BD and its extents. The next category is called BD growth, which includes all six ways of how business can be expanded for a service company. This is added to remind the company to continuously find new opportunities and to support to find the best possible ways to expand the business taking into account the current state of GTS. The last category is called BD strategies, which includes five best Business Development strategies and how each of them can be carried out. The purpose of this in the model is to visualise for the case company that during the AI and ML implementation process, BD strategies should be concurrently performed to enhance the possibilities and the success rate of the AI and ML implementation process.

### 5.3.2 A Process Model for New Business Opportunities

The initial proposal of GTS new business opportunities after implementation of AI and ML competences (Part 2) was created also based on the findings from the CSA, available knowledge and best practices and Data 2 gathered from the workshops. For this part, the CSA brought up the current services and used business models, available knowledge and best practices brought up insights, ideas, and examples of business models, and workshops collected together these ideas and GTS employees' opinions and recommendations what would be possible and optimal for the company. Part 2 was built on all of these findings.



The created result is a process model that combines findings and brainstorming outcomes to visualise new business opportunities. The purpose of the model is to present how the key findings led to the results and new business opportunities, and support GTS to make the right decisions regarding the integration. The model takes into account GTS situation on behalf of current services, business models and customers, so the new business models are specially tailored for the case company. It is worth pointing out that the model is company-specific and thus it might not fit for every company, and therefore it is not recommended to externally follow strictly the process of the result.

Moreover, the purpose of the model is to describe for GTS what is needed to create new business opportunities with AI and ML. With the model, GTS can see service-specific opportunities and which AI and ML competences can be utilized for the service to expand the business. The initial proposal of GTS new business opportunities is presented in Figure 33 below.

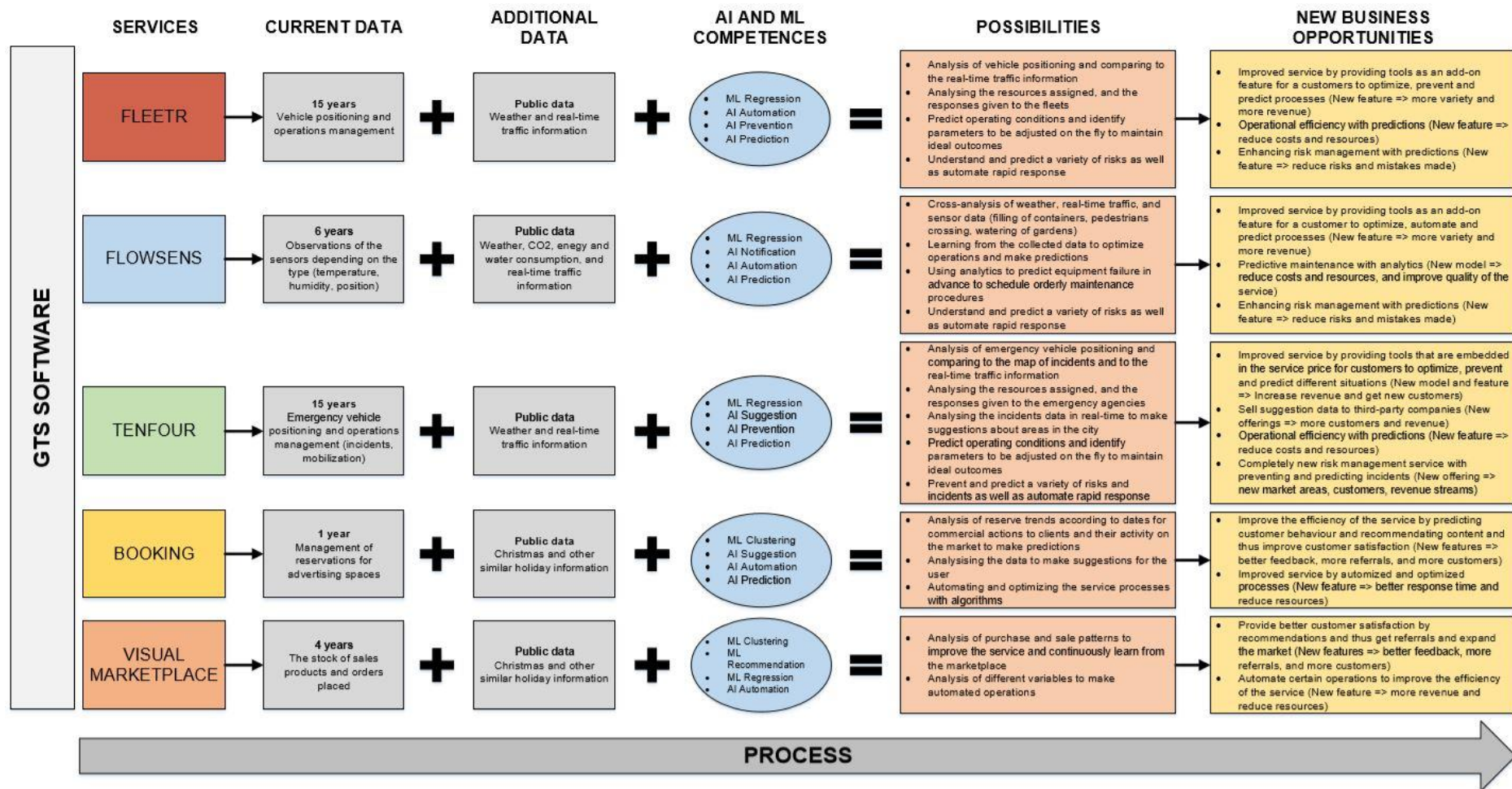


Figure 33. GTS new business models with AI and ML competences

As can be seen in Figure 33, the process to create new business opportunities with AI and ML competences is described for each of GTS software's services separately. The model is built upon the findings from the CSA and available knowledge and best practices and thanks to this it is divided into six vertical blocks of which the three first from the left are findings from the CSA and the three last are from the available knowledge and best practices. The idea of these six blocks is to visualise the process clearly and emphasize the importance to understand each of them to be able to generate the best business opportunities for the case company. Furthermore, the model generates current business opportunities to support the company at the beginning, and later on, GTS can use the model to build new opportunities independently after understanding the process.

The process model starts with the five services of GTS and according to that the horizontal dimension of the figure is divided into five segments. After that is presented what kind of historical data and how much data each of the services has in order to create a direction for AI and ML and see better the possibilities around the specific service. The next block is Additional data that presents the open public data that could be utilized to improve AI and ML possibilities by combining it with the historical data. As can be seen, there is a plus mark between historical and additional data to visualise that they should be combined. The next block, the third one which has ellipses, represents the AI and ML competences that can be utilized with the two previous data sources. It presents all the competences that can be used for that specific service to improve the possibilities and create something innovative, and at the same time to guide GTS in the right direction with decisions-making. As can be seen, before this block is also a plus mark to visualise that all the data and AI and ML competences should be combined to generate the best outcomes.

After these requirements and equal signs, is the fifth block called Possibilities. The block includes all the brainstormed possibilities that AI and ML implementation can bring for GTS according to each service. Each service is unique and has different possibilities, which is a huge advantage and opportunity for the company to expand business in many sectors and markets. When the process has produced a possibility for the company, the possibility can be turned to a new business opportunity, and thus the core business can be expanded. These brainstormed opportunities for each of the service taking into account the current state of the case company can be found in the last block, called New business opportunities.

As a result of the process model, the company has many new opportunities after AI and ML integration that can help enhance the current services and generate new features and models to improve the competitiveness of the local markets and expand business globally. Furthermore, the company can create completely new offerings that can support significantly to achieve the goals and expand customer base across different sectors. However, it must be taken into account that achieving all of these opportunities immediately is not possible and the company must choose first what AI and ML competences could be integrated to generate the desired opportunities and accomplish the benefits they bring. The change is not going to happen fast and requires perseverance since it might take months before new opportunities start generating value for the company.

### 5.3.3 A Summary of AI and ML Implementation Benefits and Drawbacks

The initial proposal of AI and ML implementation benefits and drawbacks (Part 3) was created based on the findings from the CSA and available knowledge and best practices. For this part, the CSA brought up the SWOT matrices both on behalf of software and business, and available knowledge and best practices brought up insights, researches, and case studies. Part 3 was built on all of these findings.

The created result is a table that combines findings of AI and ML implementation benefits and drawbacks for GTS. The purpose of the table is to present a summary of the thesis findings and provide a proposal that supports the company to make the final decision of AI and ML implementation direction and strategy. The table takes into account GTS situation on behalf of current services, market situation, and resources, thus the results are specially tailored for the case company. However, the findings are in the general interest and thus the table and outcomes can be used externally to support other companies' implementation processes as well but considering that it might not be completely correct, and re-evaluation is worth doing. The summary of AI and ML implementation benefits and drawbacks are presented in Table 13 below.

Table 13. AI and ML implementation benefits and drawbacks tailored for GTS

AI AND ML IMPLEMENTATION INTO GTS' BUSINESS STRATEGY			
Benefits for GTS		Drawbacks for GTS	
Benefit	Description	Drawback	Description
New business opportunities	GTS can create many new features, models, offerings, and experiences as well as get new customers	A small IT unit	GTS has only 3 IT people in the team and that can be aggravating factor
Opportunities to expand globally	GTS have better possibilities to expand abroad with AI and new business opportunities	Resources are needed	AI and ML implementation requires a lot of resources such as money time, and 100 % focus
Company historical data	With AI and ML competences GTS can utilize the unique historical data and improve competitiveness	Integration to existing processes and systems	AI and ML integration is noted to be more difficult to existing services than creating new ones
Improve the current services	With AI and ML GTS can enhance the features, functions, and performance of the services	Integration to business strategy	AI and ML should be implemented already at the beginning of the process into GTS business strategy to enhance the success probability
Further development of IoT	GTS business is related to IoT and AI and ML brings great possibilities to take IoT in the company to next level	Expensive	It is noted that AI and ML implementation is expensive since the technology and expertise are costly
Data security and maintenance	GTS has a lot of accumulated data and security processes in the software, management of these can be improved by AI	Oversold market	The technology and solutions that GTS would provide after AI integration could be already oversold on the market
More competitive on the markets	AI is quickly spreading in every sectors and implementation enough early can still bring great advantages and respond to the future needs of customers and cities	More likely AI talents needed	AI implementation is more likely going to gain value when hiring or renting AI talents than relying on own staff => expensive
Customer experience and satisfaction	AI and ML provides great opportunities to improve the services to better match the customers needs	Positive revenue chance 50 %	GTS has approximately 50/50 chance to be successful or fail to gain revenue with the implementation
Cost reduction and profit enhancement	AI and ML provides great opportunities to save costs and gain more revenue with multiple different ways such as business process automation	Risk is 50 %	Since AI-equipped competitors are increasing all the time in every market area, there is always big risk that someone steal your competitors or create same but better services
Optimization	With AI and ML competences it is possible to optimize external processes such as sales and marketing and thus improve efficiency		
Pursue new markets	AI and ML provides tools to create something innovative and new target markets are possible for GTS		
Make better decisions	With AI and ML tools GTS can improve decision making with multiple supportive features		



As can be seen in Table 13, it includes many benefits as well as drawbacks for the company to implement AI and ML into the business strategy and each of the two is described with an own vertical list. The table is built upon the findings from the CSA and available knowledge and best practices, and discussion held in the workshops referring to Data 2. The idea of the lists is to visualise the conclusion of the thesis so that GTS can ensure the directions and can easily and quickly make further decisions about AI and ML implementation plan. Furthermore, the table highlights all the key findings for GTS that the author considers most important based on the own research, understanding, and tacit knowledge, with the purpose to lead the company to make the right decision.

List starting with green colour presents all the benefits for the company that AI and ML implementation bring with. As can be seen, there are many important topics for GTS and the most important ones taking into account the objective of the thesis, are painted as light green to make them more prominent. Most of the list contains benefits related to business expansion, but also some benefits related to customer management, decision-making, and revenue conversion are listed, thus the impact is very wide-ranging for the company. List starting with red colour presents all the drawbacks for the company that AI and ML implementation include. As can be seen, many crucial topics are needed to take into consideration and the most crucial ones are painted as light orange to make them more prominent. Most of the list contains drawbacks related to resources needed for AI and ML implementation, but also some drawbacks related to integration plan, market situation, and success probabilities are listed.

As a result, AI and ML implementation have more benefits than drawbacks and the benefits include huge opportunities for GTS to expand the business, thus the list easily overcomes the drawbacks. The drawbacks are remarkable, and they cannot be forgotten, but with careful planning and execution of the project, these can be crossed out and the list is reduced. As a conclusion, it can be said that it is highly recommendable for GTS to implement AI and ML, but it has to be done with a good strategy and whole organization together from the beginning till the end. Especially for companies working around IoT and data, it is highly recommended to move towards Artificial IoT operations to expand the possibilities and keep the competitiveness in various sectors and markets.

## 5.4 Expected Benefits of the Proposal

The objective of the thesis was to propose a model to implement AI and ML and a process model to build new business opportunities with AI and ML and create a summary of the implementation benefits and drawbacks. Comparing the objective to the proposal made, it can be stated that the goal of the thesis is met and successfully implemented. The expected benefits according to each proposal part is introduced in Table 14 below.

Table 14. Expected benefits of the proposal for GTS

Key Findings from CSA	Proposal	Expected Benefits
Currently, GTS does not have much AI and ML knowledge, skills and understanding.	<b>A model to implement AI and ML supported by BD methodologies.</b>	<ol style="list-style-type: none"> <li>1. Easy to follow a guideline to implement AI and ML.</li> <li>2. An overall better understanding of AI, ML and BD possibilities.</li> <li>3. Collection of AI enablers.</li> <li>4. Information what are the important things needed to consider when integrating AI and ML.</li> <li>5. Guideline how to support implementation with BD methodologies.</li> </ol>
Currently, GTS has unawareness about AI and ML possibilities.		
IoT, Big data, Algorithms and technical needs of cities.		
Using AI and ML capabilities by combining GTS historical and real-time data with open data sources.	<b>A process model to build new business opportunities with AI and ML.</b>	<ol style="list-style-type: none"> <li>6. Guideline to follow when investigating new business opportunities.</li> <li>7. AI and ML competence recommendations.</li> <li>8. Collection of service possibilities.</li> <li>9. New business opportunity recommendations.</li> </ol>
GTS business possibilities are huge with software that can operate in various sectors and markets.		
Currently, GTS has unawareness about AI and ML business possibilities.		
Currently, GTS does not have experience in AI and ML related business.	<b>Summary of the benefits and drawbacks related to the implementation of AI and ML.</b>	<ol style="list-style-type: none"> <li>10. Collection of experiences of benefits and drawback of the implementation.</li> <li>11. Decision-making support tool.</li> </ol>

As can be seen in Table 14, the model to implement AI and ML supported by BD is expected to be a guideline for GTS to start the implementation and understand all the required perspectives of the change. With the model, GTS can analyse the implementation situation by considering all the gathered knowledge and best practices. Furthermore, many other benefits are expected to be achieved such as a better understanding of AI, ML and BD, requirement list of AI enablers, and how the implementation can be supported by BD methodologies.

The next result, a process model to build new business opportunities is expected to be a guideline for finding new possibilities and innovations to expand GTS service offerings. With the model, GTS can see how different AI and ML competences can be utilized to create new possibilities for current services with the company's current data and additional data sources. Finally, the model is useful for GTS since the process forms a list of new business opportunities according to each service.

The last result, a summary of the benefits and drawbacks related to the implementation of AI and ML is expected to be a highly valuable decision-making tool for GTS when planning and starting the implementation process. The table collects information from multiple experiences of AI implementation and highlights the most crucial findings for the company, and so it can lead GTS in the right direction already at the beginning of the implementation.

All in all, the proposal is expected to be highly valuable and useful for GTS to start AI and ML implementation process. Additionally, the results can be used as well for other companies by re-evaluation and small changes which bring even more value for the outcome. Next, in the following Section, the initial proposal built is validated with feedback collected from the CEO of the case company.



## 6 Validation of the Proposal

This section introduces the result of the validation of the initial proposal developed in Section 5. First, an overview of the validation stage is presented, and this is followed by the feedback and evaluation phases of every three parts of the proposal with key findings. Lastly, validation results are taken into account and the final proposal is built.

### 6.1 Overview of the Validation Stage

During the validation stage, the initial proposal was presented to the company's CEO to collect feedback and recommendations on how to improve the proposal. More specifically, the goal of the stage was to enhance the proposal based on the given feedback and recommendations to ensure that it would more certainty fulfil both expectations and requirements of the case company, and objective of the thesis. The steps of the validation stage are visualised in Figure 34 below.



Figure 34. Process of the validation

As can be seen in Figure 34, the validation was performed in four steps. First, the initial proposal was assessed by the CEO of GTS with all three results separately. The assessment produced feedback and recommendations, in other words, Data 3 of the thesis. Next, the data was collected and enhancements regarding the validation were added to the initial proposal to build the final proposal of the thesis.

## 6.2 Key Findings of Validation and Further Developments to the Proposal

This chapter introduces the results of the validation stage separately for each of the three parts of the proposal. First is presented the feedback regarding to part (1) A model to implement AI and ML supported by BD methodologies, and it is followed by the feedback of parts: (2) A process model to build new business opportunities with AI and ML, and (3) Summary of the benefits and drawbacks related to the implementation of AI and ML. Since only minor changes were made during the validation to the initial proposal's results, the final versions created during the stage are presented in Appendices 8-10.

### 6.2.1 A Model for AI and ML Implementation

According to the feedback given by the CEO of the case company, the initial model is complete and serves perfectly the needs of the company. The model brings together all the important information that is needed to start AI and ML implementation and to manage it during the whole implementation process. Additionally, the feedback contained an observation that including the Business Development as a horizontal dimension to the model was a great idea and it supports the implementation very well as well as helps GTS to learn more from BD methodologies and grow as a company.

Furthermore, the feedback was not only glorifying but also constructive and some minor changes were suggested to be made into the model. According to the feedback, the model has a lack of information regarding GTS sectors and AI implementation enablers can be improved. Furthermore, more additions were requested to include in the BD growth section to make it more company-specific. The feedback was noted, and enhancements were made to the final version of the model and it can be found in Appendix 8.

### 6.2.2 A Process Model for New Business Opportunities

According to the feedback given by the CEO of the company, the initial process model is complete and provides excellent possibilities for GTS to expand business opportunities. The process model combines all the required information that is needed to generate new business opportunities and it takes greatly into account all the services that GTS is

providing. Additionally, the feedback highlighted that new business opportunities generated by the author are good possibilities for GTS and certainly possible with the right approach.

Furthermore, also constructive feedback was given, and some minor changes were suggested to be made into the process model. According to the feedback, available data sources could be explained more specifically with some instructions as well as bring up the best business opportunities to make them more prominent. Furthermore, Online marketplace service's business opportunities were asked to be updated to match the company's current strategy. The feedback was noted, and enhancements were made to the final version of the process model and it can be found in Appendix 9.

As a result of the enhancements, a description what the benefits and drawbacks of using public or private data sources are was added in the Additional data segment to inform GTS about potential concerns, and a new column was created at the end of the model, named BD growth. That column makes the process easier to understand and provides more specific information on how business opportunities can be turned into something valuable. The column refers directly to the BD growth possibilities presented in Figure 32 in Section 5 to emphasize the relationship between these two models. It is painted green to visualise its great importance.

### 6.2.3 A Summary of AI and ML Implementation Benefits and Drawbacks

According to the feedback given by the CEO of the company, the initial summary table is excellent and provides good instructions for GTS to continue the implementation process. The table includes good observations and considerations that are needed to take into account in decision making. Additionally, the feedback highlights that it is important to bring up the most important benefits and drawbacks according to the author's point of view to emphasize the company's internal situation. The CEO was content for this part and constructive feedback was not given, thus enhancements were not needed. The summary table is presented in its entirety in Appendix 10. In the next Section is presented the summary and conclusion of the thesis.

## 7 Summary and Conclusion

This section introduces the summary and conclusion of the thesis including four different parts. First is presented an executive summary which is followed by the next steps of the proposal, evaluation of the thesis, and finally, the final words of the thesis.

### 7.1 Executive Summary

Nowadays, technology and digitalization are highly changing the way how business is done throughout the organizations. Especially in technology-based businesses, Artificial Intelligence and Machine Learning are increasing the possibilities to utilize big data and thus create new business models to increase the company's opportunities. Companies whose business activities are related to data collection, must adapt to the new demands of digitalization and apply new technologies to ensure business success also in the future.

The thesis was carried out as part of a real-life business project run by GTS. The thesis aimed to help the company with AI and ML implementation and to improve its possibilities to grow locally and globally with new business opportunities. The objective of the thesis was to propose a model to implement AI and ML and a process model to build new business opportunities with AI and ML and create a summary of the implementation benefits and drawbacks. The outcome of the thesis consisted of a proposal in three parts: (1) A model to implement AI and ML supported by BD methodologies, (2) A process model to build new business opportunities with AI and ML, and (3) Summary of the benefits and drawbacks related to the implementation of AI and ML.

The thesis was carried out by first familiarizing with the business challenge and framing the objective, outcome, and scope for the study. In the next stage, the current state analysis was carried out to explore the company's current services and business models that was carried out by exploring the company's internal documents and interviewing the executive-level people. The key findings were presented in two different SWOT matrices in terms of the company's software and business. The key findings regarding the current state were: (1) GTS does not have much of AI and ML knowledge, skills and understanding, (2) GTS has unawareness about AI and ML possibilities, (3) GTS has huge opportunities with AI and ML capabilities by combining historical and real-time data with open

data sources, (4) GTS does not have experience in AI and ML related business and what is the best way to expand the business, and (5) GTS business possibilities are huge with software that can operate in various sectors and markets.

Based on these findings, available knowledge and best practices were explored to enhance the understanding of the topics and support a proposal building for GTS. The investigation focused mainly on topics related to Artificial Intelligence, Machine Learning, Business Development, Internet of Things, and Big data. After the investigation, a conceptual framework was built to summarize the findings from available knowledge and best practices to be used for proposal building. Next, the initial proposal was built by combining all the findings from the CSA, available knowledge and best practices, interviews, and discussions, tacit knowledge gathered during the working period, and other observations observed during the thesis. In the last stage, the initial proposal was evaluated by the CEO of GTS, and the final proposal was enhanced according to the feedback.

The final proposal including AI and ML implementation model, process model to generate new business opportunities, and summary of the benefits and drawbacks of the implementation for GTS, ensures that the AI and ML implementation is structured, guided and supported to achieve the best possible result for the case company. More specifically, the model to implement AI and ML supported by BD is expected to be a guideline for GTS to start the implementation and understand all the required perspectives of the change. With the model, the GTS can analyse the implementation situation by considering all the gathered knowledge and best practices. A process model to build new business opportunities is expected to be a guideline for finding new possibilities and innovations to expand the service offerings of the company. With the model, GTS can see how different AI and ML competences can be utilized to create new possibilities for current services with the company's current data and additional data sources, and finally, generate a list of new business opportunities according to each service. A summary of the benefits and drawbacks related to the implementation of AI and ML is expected to be a highly valuable decision-making tool for GTS when planning and starting the implementation process.

All in all, the proposal is expected to be highly valuable and useful for GTS to start the AI and ML implementation process and to find new business opportunities. It can significantly support the company to achieve successful results to expand the business both locally and globally. Moreover, the results can be used as well for other companies in the industry by making re-evaluation and small changes to the models .

## 7.2 Next Steps of the Proposal

The thesis researched and proposed AI and ML implementation that can be directly used for Global Tech Strategies without any changes. For this reason, the following next steps are mostly presented in terms of implementation and commercialization. As mentioned earlier in Section 2, the thesis is the beginning of a real-life business project, thus albeit the thesis is limited to the results seen before, the project continues and will have the next steps. The recommended next five steps after the thesis are presented in Figure 35 below.

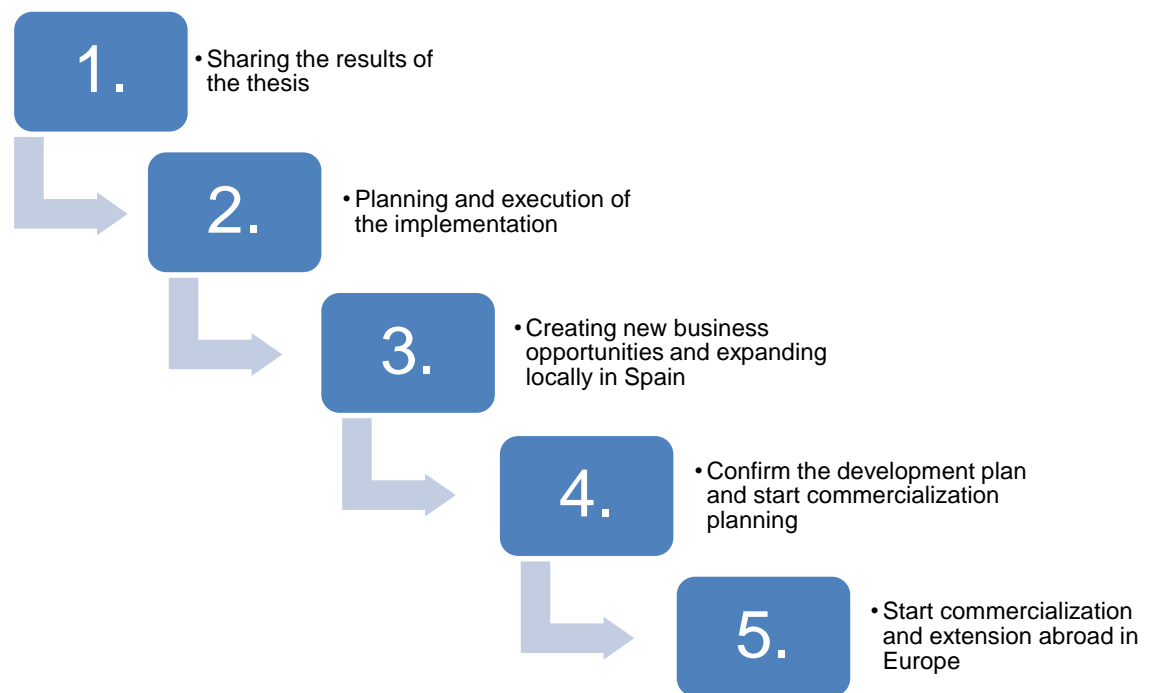


Figure 35. Next steps of the project after the thesis

As a first step from the proposal, at the beginning of implementation, it would be ideal to present the findings and proposal parts for every member of the company to enhance the understanding and inform about the possibilities of AI and ML. Second, after the findings and knowledge are shared among the employees, the planning of implementation could be started by following the instructions presented in Figure 32, part 1. It is especially important to follow the AI transformation segment which supports GTS to generate a successful implementation plan and to ensure that the necessary topics are taken into account. Third, after successful AI and ML implementation to the company's operations, GTS services enhancement with AI and ML competences can be started to create new business opportunities and simultaneously expand the business locally in Spain. In this step, it would be good to focus first on the main possibilities and after successes, expand with all the services and all AI and ML competences.

As a fourth step it would be a good idea to confirm and begin the development of new opportunities and real business models with AI and ML to achieve business extension locally. When this plan is confirmed, a commercialization plan to find the interested current customers, new customers and potential new sectors and markets could be carried out to gain visibility for new features, offerings, models or services. Fifth, after a successful business extension and adding business value in local markets, commercialization, building new business opportunities with all AI and ML competences and wider business expansion abroad to Europe could be started to achieve global visibility and attract even more and bigger customers.

### 7.3 Thesis Evaluation: Objective vs. Results

The objective of the thesis was to propose a model to implement AI and ML and a process model to build new business opportunities with AI and ML and create a summary of the implementation benefits and drawbacks. Moreover, the aim was to create a proposal that consists of three different parts to help the case company with the implementation. The whole thesis and all parts of the proposal were built in with continuous and close collaboration with the CEO of GTS. This ensured that the proposal's parts best meet the company's needs and requirements to support the implementation as much as possible.

Overall, when comparing the objective to the result achieved, it can be stated that the thesis expectations have been met and study has been valuable. The proposal's parts present the best opportunities for GTS to expand business with AI and ML and support the company to start the implementation process, and thus correspond with the objective determined at the beginning of the thesis. Especially great success was achieved when creating parts 1 and 2 since the resulting models are considered by the CEO of GTS to be spectacular and something that cannot be found on the internet. Furthermore, the created models are ready to be used as they are, but the real value of the proposal will be attained after AI and ML implementation is comprehensively and successfully carried out and new business opportunities begin to be prolific for the company.

In addition to success in the final proposal, successes were also noted in the planning and scheduling of work. During the thesis, research and design made in the beginning remained almost untouchable and the Gantt chart schedule was followed thoroughly to the end. It is worth mentioning that the objective and outcome changed slightly from the original since they were refined, but the core content and purpose remained the same.

As mentioned earlier, the proposal was created specifically to suit the needs of GTS, thus the outcome is tailored. However, the models and the guidelines of the solutions are nevertheless also applicable to other similar AI and ML implementation cases taking into account that most likely re-evaluation and changes to the models are required to be made to better suit the specific needs of an organization. The guidelines of the solution for new business opportunities are to some extent also applicable to other sorts of software, but again an accurate re-evaluation must be done to avoid mistakes in the instructions.



## 7.4 Final Words

The thesis was a massive learning process and valuable experience for me. It gave me an invaluable opportunity to develop professional knowledge and skills in a field that is extremely popular now and will be even more popular shortly. I was lucky to be able to carry out my thesis for a technology-based company in Spain and carry it out in the real-life environment, thus I had an excellent chance to extensively apply my professional knowledge and skills in practice. This improved both my international business skills and language speaking and writing skills in English and Spanish significantly. Furthermore, I am extremely happy that I was able to build something truly useful for GTS and help them to continue the AI and ML implementation in the best possible way.

Before the thesis, I did not know much about Artificial Intelligence and Machine Learning even though I was highly interested in the topics. However, now I can say that I would be a valuable asset to every company that is considering AI and ML implementation and business expansion. During the thesis, I built up a solid foundation of expertise on the topics that are important for almost every organization and I genuinely believe I can utilize the learnings in my future career as well.

As final words, I would like to thank all the people who have been part of the thesis and helped me to make it possible. And also, I would like to wish GTS good luck with the project and wish them all the best for the future.

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**Appendix 1: Business Card – Saku Patana**



**Appendix 2: Field notes of Thesis kick-off meeting – CEO**

<b>Participants</b>	Saku Patana and CEO
<b>Date and Time</b>	17 October 2019, 30 minutes
<b>Type of Interview</b>	Face-to-face discussion

<b>TOPIC</b>	<b>FIELD NOTES</b>
What could be included in the current state analysis.	<p><b>What is the software currently?</b></p> <p>Deeper analysis of the software and what information is collected and produced now with it. For how long in the past we have the data. What are the current possibilities with the software? What are the advantages and disadvantages of the software?</p> <p><b>What is the business currently?</b></p> <p>How the business works around the data now and how the data is used now to make money (business models). What is the situation of business and market currently?</p>
What Available knowledge and best practices could be used? (Theory)	<ul style="list-style-type: none"> <li>• AI, Machine learning</li> <li>• BI</li> <li>• Big data</li> <li>• Business development</li> <li>• Case studies</li> </ul>
What data could be collected during the thesis?	<p>Interviewing the companies (GTS): What advantages and possibilities using AI and ML can bring?</p> <p>How the systems/services work now including Software and Machine learning algorithms.</p> <p>Research of AI &amp; machine learning and open data sources can be done.</p> <p>What key information should be in the system and why?</p> <p>How to combine information system and ML features together and make a functional system?</p> <p>What are the new business opportunities around this?</p>

<p>What is the target and final solution?</p>	<p><b>What are the possibilities around this solution?</b></p> <p>On behalf of data including current historical data, real-time data, and open data sources, and how we make predictions with these?</p> <p>On behalf of business such as optimizing and business expanding possibilities.</p> <p>On behalf of society such as crimes reductions and Emergency aid speed.</p> <p>Target is to find way how to combine these two features (software and machine learning algorithms) and expand business opportunities with that combination. Benefits includes: improve people quality of life, increase business, Improve safety in the city.</p> <p>Final solution is proposal.</p>
<p>Thesis description</p>	<p>The company currently has an information management system used for various purposes, such as controlling command and control centres and managing Smart City and IoT software. Now, however, the company wants to expand the capabilities of this information system by adding artificial intelligence and machine learning competences to the system. Thanks to this information management system, the company has a great amount of accumulated data over many years and it could be combined with these features. The idea is to find a way to combine all of these (artificial intelligence, machine learning and information management system) and utilize open, historical and real-time data to significantly expand globally the business opportunities of the company. There is currently no information on how this change could be implemented and this thesis would be a study and a possible proposal on the subject. A current state analysis would be to familiarize yourself with the information management system and its current business. The theoretical part would include familiarization with artificial intelligence and machine learning as well as possible case studies. The data collection would be to interview the employees of the company and research the open data possibilities in order to combine it with company historical and real-time data, and thereby identify new opportunities. The final solution would be a study on how to combine these (open, historical and real-time data) and how to create new businesses with that. Additionally, a proposal for implementation would be included.</p>

## Appendix 3: Field notes of CSA interview – CEO

<b>Interviewee</b>	CEO
<b>Date and Time</b>	4 November 2019, 30 minutes
<b>Type of Interview</b>	Face-to-face meeting

<b>QUESTION</b>	<b>FIELD NOTES</b>
What are the business models around the services?	Currently, we have 2 different business model: SaaS and project-specific contract. All the emergency software use SaaS and smart city solutions project-specific contracts. We would like to use only SaaS since it is more cost-efficient for us, but all the customers are not willing to use that. In SaaS models, customers pay every month.
What is the market situation?	The environment where we operate is characterized by being a competitive market. Our customers are working in many sectors and they have many other service providers, so we need to be highly competitive.
Do you have any competitors currently in Spain and abroad? What are GTS advantages and disadvantages comparing to these?	We have a few big telecommunication companies like Indra, Telefonica and Vodafone, and local business called Nunsys. <b>Advantages over the competition:</b> lower cost structure that allows us to compete by price. We have more experience than Nunsys and own R&D. <b>Disadvantages over the competition:</b> lack of financial capacity for high guarantees in tenders. No women in the company.
What have been the biggest challenges last year?	We have had a problem to expand the business as we would like to. To be more competitive, we need more business models and income to increase the business and expand locally and globally.
How is the business going now? It is increasing or decreasing or something else?	Out first year, 2017, was negative because of many investments, but in 2018 our business was positive, and we are moving in the right direction. Last year we increased turnover by 34% and the 2018 net turnover was around 200 000 € and net income around 7000 €.



What would you like to improve in the current services and models?	I would like to add AI and ML competences into the software so we can utilize historical data that we have collected to make predictions. This way we can create new business models and expand.
How do you see your company around these questions? Strengths? Weaknesses? Opportunities? Threats?	<p><b>Strengths:</b> We have software that allows us to work globally and in all sectors. We have international experience and high technical knowledge of the team. We are working around sustainability and we impact the environment which is important nowadays. <b>Weaknesses:</b> We do not have a proper marketing and business plan. We need financing or investments for R&amp;D projects and to be able to expand the business. <b>Opportunities:</b> Out opportunity it to operate in various sectors and markets, collaboration agreements, relationships with public bodies and financial institutions. Also, the technological needs of cities, big data and climate change when there is a need for sustainable solutions. R&amp;D funding programs by the European Commission. <b>Threats:</b> Some big companies can copy our software and take our market share. We have experienced employees and they can be hired by bigger companies.</p>
What is the long-term plan?	Our plan is to expand the business possibilities around the world and be a global company in 3 years.

## Appendix 4: Field notes of CSA interview – DevOps and CIO

<b>Interviewee</b>	CIO
<b>Date and Time</b>	14 November 2019, 30 minutes
<b>Type of Interview</b>	Face-to-face meeting

<b>QUESTION</b>	<b>FIELD NOTES</b>
What kind of data we have and in what from is it?	<b>Depending on the service:</b> <ul style="list-style-type: none"> <li>• From the sensors: observations of the sensors depending on their type (temperature, humidity, position).</li> <li>• From the Emergencies and Fleets: vehicle positioning data and operations management data (incidents, mobilizations, chronology, actions).</li> <li>• From Marketplaces: stock of sales products and orders placed.</li> <li>• From Others <ul style="list-style-type: none"> <li>o Booking: management of reservations for advertising spaces.</li> <li>o Honey: contact and negotiation platform between honey producers and wholesale buyers.</li> </ul> </li> </ul>
For how long the data is collected and where is it kept? How much historical data we have?	<b>Depending on the service:</b> <ul style="list-style-type: none"> <li>• From the sensors: approximately 6 years. Warehouse in a Database and accessible from management platform.</li> <li>• From the Emergencies and Fleets: 15 years. Database warehouse. Accessible from web reports and with Database tools.</li> <li>• From Marketplaces: 4 years. Warehouse in a Database and accessible from management platform.</li> <li>• From Others <ul style="list-style-type: none"> <li>o Booking: 1 year. Database warehouse and accessible management website.</li> <li>o Honey: recent.</li> </ul> </li> </ul>
What analytical system are we using to analyse the data?	Currently SQL reports commissioned by the client. Published occasionally with Jasper Server Reports.

What information/data we provide to customers?	A web site is built to access the historical data, with filters, csv downloads or through the configured reports. Customers extract the information themselves. On the other hand, we provide to customers the tool to analyse their data and improve the quality of services and processes. Customer can use our software to make the analyses by themselves and we take care that it is working and up to date all the time. We do not really provide any data to them, only tools and support.
Do we have algorithms used already? If yes, what kind of algorithms?	No. Currently only SQL queries.
How do you see AI and Machine Learning possibilities to improve our services?	<p><b>Depending on the service:</b></p> <ul style="list-style-type: none"> <li>- Sensors: cross-analysis of the information they send. Relationship between meteorological measurement variables and management variables (filling of containers, pedestrian crossings, watering of gardens).</li> <li>- Emergencies - Fleets: analysis of vehicle positioning, relating it to the map of incidences at a moment and analysing the resources assigned, and the responses given to the emergency agencies.</li> <li>- Marketplaces: everything related to Machine Learning for purchase and sale.</li> <li>- Other: <ul style="list-style-type: none"> <li>o Booking: analysis of reserve trends according to dates for commercial actions to clients.</li> <li>o Honey: still in deployment</li> </ul> </li> </ul> <p>The historical data that we have is unique and it would be great opportunity for us to add AI and ML competences into the software. I can see the opportunity, but the change is not easy to make.</p>
What kind of data we would need more to make predictions, if any?	<p>Weather, real-time traffic information (for sensors and fleets). For marketplaces, event info (Christmas, holidays, vacations).</p> <p>Currently, we are not using open data sources, so if there would be something useful, it would be used to make enhance the chances of successful predictions. Also, we do not really use a lot 3<sup>rd</sup> party data what could be available from the customers and partners.</p>

**Appendix 5: Field notes of Workshop 1 – CEO**

<b>Participants</b>	CEO
<b>Date and Time</b>	3 December 2019, 45 minutes
<b>Type of Interview</b>	Face-to-face discussion / Workshop

<b>TOPIC</b>	<b>FIELD NOTES</b>
Situation of the thesis.	The situation of the thesis was introduced to the CEO of the company. He was really impressed and happy about the progress. The content was agreed upon during this workshop what was planned regarding to the final proposal.
Key findings from the current state analysis.	Key findings from the current state analysis were presented and it turned out that research done produced a great amount of interesting and useful information for the company. GTS can utilize this result in the future to present their services and business models as well as use more on the results of SWOT matrices.
Key findings from the available knowledge and best practices.	Key findings from the available knowledge and best practices were presented and the CEO of GTS was very interested in the findings. In his opinion, they were highly useful for the company both in terms of the thesis and other future projects. The result was found to be exactly what they wanted and what can be useful for them also in the future after the project.
Discoverable findings in the author's opinion.	The author's own opinions and findings were presented, and the CEO of GTS was very impressed with the result. The findings reinforced his opinion on the various topics and a common understanding of the way forward was easily reached.
Next steps.	At the end of the workshop, the next steps were agreed, and the proposal phase could be started.

## Appendix 6: Field notes of Workshop 2 – CEO

<b>Participants</b>	CEO
<b>Date and Time</b>	4 December 2019, 45 min
<b>Type of Interview</b>	Face-to-face discussion / Workshop

TOPIC	FIELD NOTES
Recap of the key findings.	Recap of the key findings was presented to remind what have been the results that were presented in workshop 1 on 3th of December. After this topic, it was moved to the proposal of 3 different outcomes of which was thought up by the author of the thesis.
AI and ML implementation.	The idea of the AI and ML implementation was presented to the CEO of GTS. The idea was approved, and instructions were given by the CEO: <ul style="list-style-type: none"> <li>• Easy to follow and understand.</li> <li>• Collect the most relevant findings for GTS.</li> </ul>
New business opportunities.	The idea of the new business model outcome was presented to the CEO of GTS. The idea was approved, and instructions were given by the CEO: <ul style="list-style-type: none"> <li>• Process how to create new opportunities</li> <li>• How to utilize open data sources?</li> <li>• What AI and ML competences we need?</li> </ul>
Benefits and drawback for GTS to integrate AI and ML.	The idea of the benefits and drawbacks outcome was presented to the CEO of GTS. The idea was approved, and instructions were given by the CEO: <ul style="list-style-type: none"> <li>• Clear visualisation</li> <li>• Point out the most important ones</li> </ul>
Conclusion of the workshop.	As a result, the proposal consists of three different parts was agreed to divide the result to visualise findings in a clearer way. Instructions were given to support and guide the author in the right direction.

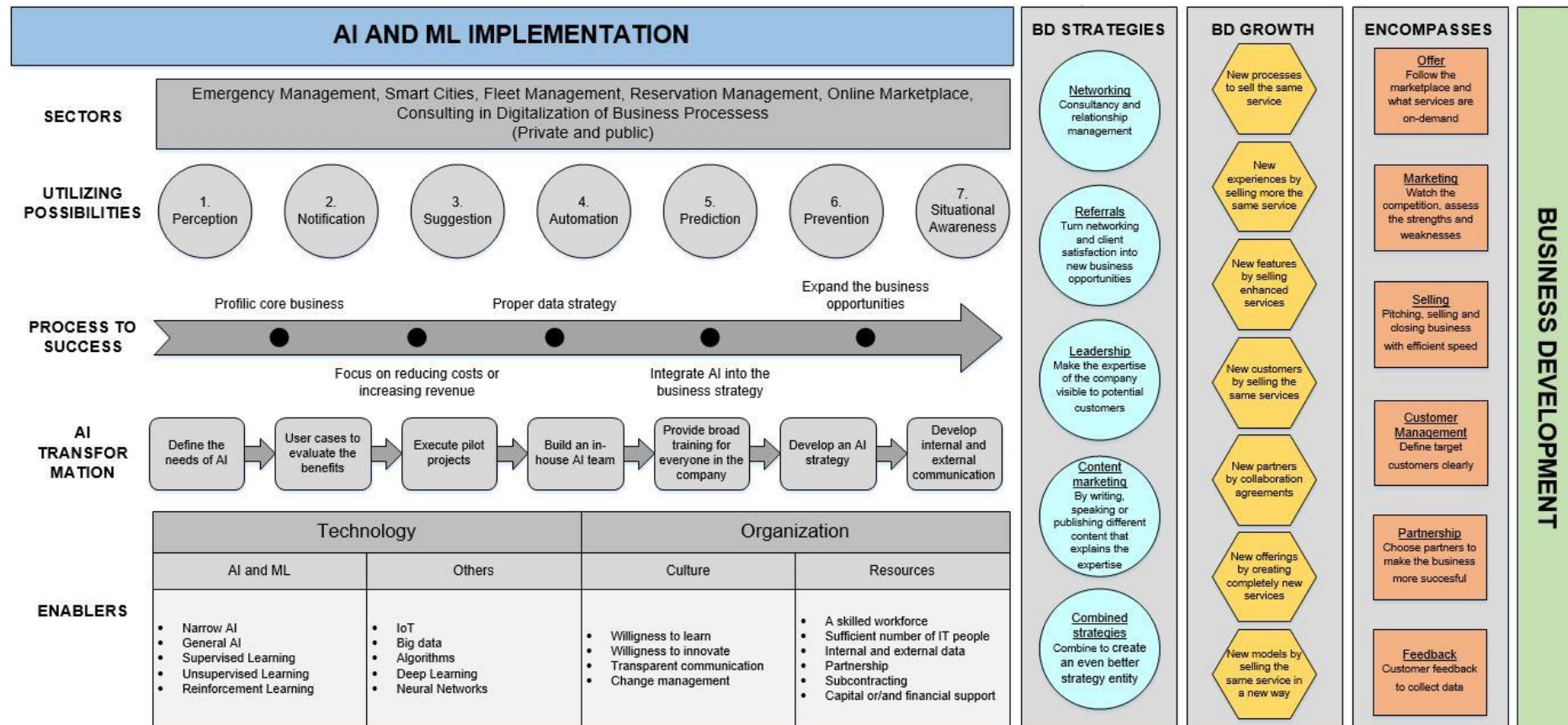
## Appendix 7: Key findings from the Available knowledge and Best Practices

KEY FINDINGS FROM AVAILABLE KNOWLEDGE AND BEST PRACTICES			
TOPIC			
AI	ML	AI enablers	BD
There are seven different types of AI outcomes with seven different questions. The questions start from the easiest (1) Perception and the bigger the number gets to (7) Situational Awareness, the more challenging it gets for AI to find an answer to the question. AI has the capability to continuously learn from all the seven outcomes back and forward and so independently improve itself.	ML can be divided into three types according to the problems being attacked to solve: Supervised learning, Unsupervised learning, and Reinforcement learning.	<b>IoT</b> In 2019, the estimated international IoT market is worth \$ 1.7 trillion.	BD is not only sales or marketing, rather a combination of them and other processes. Below are listed all the areas that BD encompasses. As can be recognized, BD is cyclical, in other words, a feedback loop which has the potentiality to enhance the performance after every loop, which is the power of BD.
AI is capable of dramatically enhance the operational efficiency of the company's business by improving processes such as marketing, sales, and services. By applying different sorts of data-driven processes, companies are able to create new business models by predictions.	Machine Learning has multiple applications where it can be utilized, and most cases are related to supervised learning. As has been seen, ML is not only one technique and that is why it can be divided in four components to explain it in more detail: Classification, Clustering, Recommendation, and Regression.	The number of IoT devices connected to the internet is increasing every year and the growth has been forecasted to be approximately 10 % each year, so end of the year 2025 there will be 21.5 billion IoT devices.	Business development strategy can be a very important key to the success of the company, so it is crucial to have a proper strategy and plan to strive bigger with growth and profitability.
Implementing AI into the organization's business strategy is not a simple process and companies are mostly unable to gain a business advantage as planned. On the other hand, it is clear that AI brings huge business opportunities for the company, especially Pioneers, who are organizations with no AI adoption and little understanding of the technology.	DL enables computers to learn more complex patterns and solve more complex problems e.g. fraud detection and computer vision without unrealistically large amounts of data. DL is able to manage a wide range of factors at once by extracting high-level and complex abstractions, and thus it can create results more quickly than standard ML approaches.	The amount of data is massively increasing too, and that brings all the time more opportunities to utilize AI solutions to gain more insight and intelligence from the data. IoT has some aspects that make it more difficult to manage the data including connectivity, security, data storage, application development, and system integration.	It is good to realize that when selling services, the company is selling people and their expertise and so the value of the business mostly lies in the people. It is researched that over 50 percent of B2B happens now online and the rest between people and this further emphasizes the value of the people in a service-related business.
For companies who are starting the implementation of AI, it is extremely important to align the AI-specific strategies to the overall business strategy already at the beginning of implementation in order to get successful results.	The input-response system is rapidly improving with the help of DL and NN hence nowadays best applications are built around them. The biggest flaw of these systems is that they need massive amounts of data and examples of A and B, to be able to build good enough answers.	IoT, as well as AI, requires a big investment and new skills and expertise in the team. It can significantly help the AI integrating if the company already has IoT knowledge and skills in-house.	It is very important to look forward to from where the revenue will come in next months in order to keep the stress level of the company low both internally and externally.
The companies are more likely to gain value with AI integration if AI is managed by the company's high-level executives such as CEO or another C-level executive, not by CIO.	The core requirement of ML is massive amount of data which can be used in decision-making and to create the insight and patterns to find new applications for the current business models.	The amount of data is difficult to manage with normal business intelligence and analytical tools, that most of the companies have, and thus AI is eventually needed. Comparing to these "normal" tools, AI can make predictions up to 20 times faster and with better accuracy.	To increase the success possibility, various business development strategies can be utilized such as networking, referrals, thought leadership and content marketing, and combined strategies.
There are three main applications of how to utilize AI into the company's business strategy: cost reduction, revenue generation and product/service development. Most likely the Pioneer companies are applying AI in at least two ways.	Existing businesses have a lot of structured and unstructured data that is too laborious to manage manually, so ML brings the ability to generate this data in a structured and labelled form to enhance accessibility.	By 2022, 80 % of organizations' IoT projects will include AI integrations, so it might be rare to find IoT implementation without the use of AI in the future.	The network is one of the most popular strategies built on professional services including consultancy and relationships management such as face-to-face meetings, conferences, and events.
Almost 50 percent of those who were able to get cost reductions believes that the same reductions and positiveness wouldn't continue, while over 70 percent of those who gained positive revenue growth expect that the same success would continue. As a result, from this, over 50 percent of Pioneers are moving to boost revenues with AI though it is more likely to earn fast results by reducing costs.	Especially, ML provides for companies that are specialized in software, a new approach to improve the efficiency, speed, and competitiveness since it can be integrated easily in the software and utilized for various purposes to improve the product/service.	<b>Big data</b> AI system can be built with data points from 100 to 100 000 000, but the more data is available the better are the chances of success	After a big growth, for example after doubling or triple the revenue might changes the company massively and it won't look or act the same anymore. For example, the company might have more people, more cashflow problems, bigger projects, and higher complexity, roles might be changed and pressure differences, and experience and knowledge needed can be completely or slightly different.
It has been investigated that companies are more likely to gain value from AI integration when they hire or rent AI talents than relying on own staff. On the other hand, when the company has problems with hiring AI-talents, continuous reskilling of the workforce to gain AI skills brings a better impact on the AI efforts.	One big point that is crucial to understand is that ML typically doesn't work completely autonomously with all the data, but rather with 80 percent of it, and the rest 20 percent is still managed by humans. So, ML does not accommodate all human work but can reduce the cost and perform the jobs that humans are not so interested in or can be performed more efficiently with ML.	If company's own data sources are not enough, good options are public and private data sources, that can be combined with the organization's databases and a new dataset can be created to better suit for AI requirements.	Here is a list of key topics that should be focused on: •Follow the marketplace and what services are on demand. •Watch the competition, assess the strengths and weaknesses. •Define target customers clearly. •Pitching, selling and closing business with efficient speed. •Choose partners who can make the business more successful.



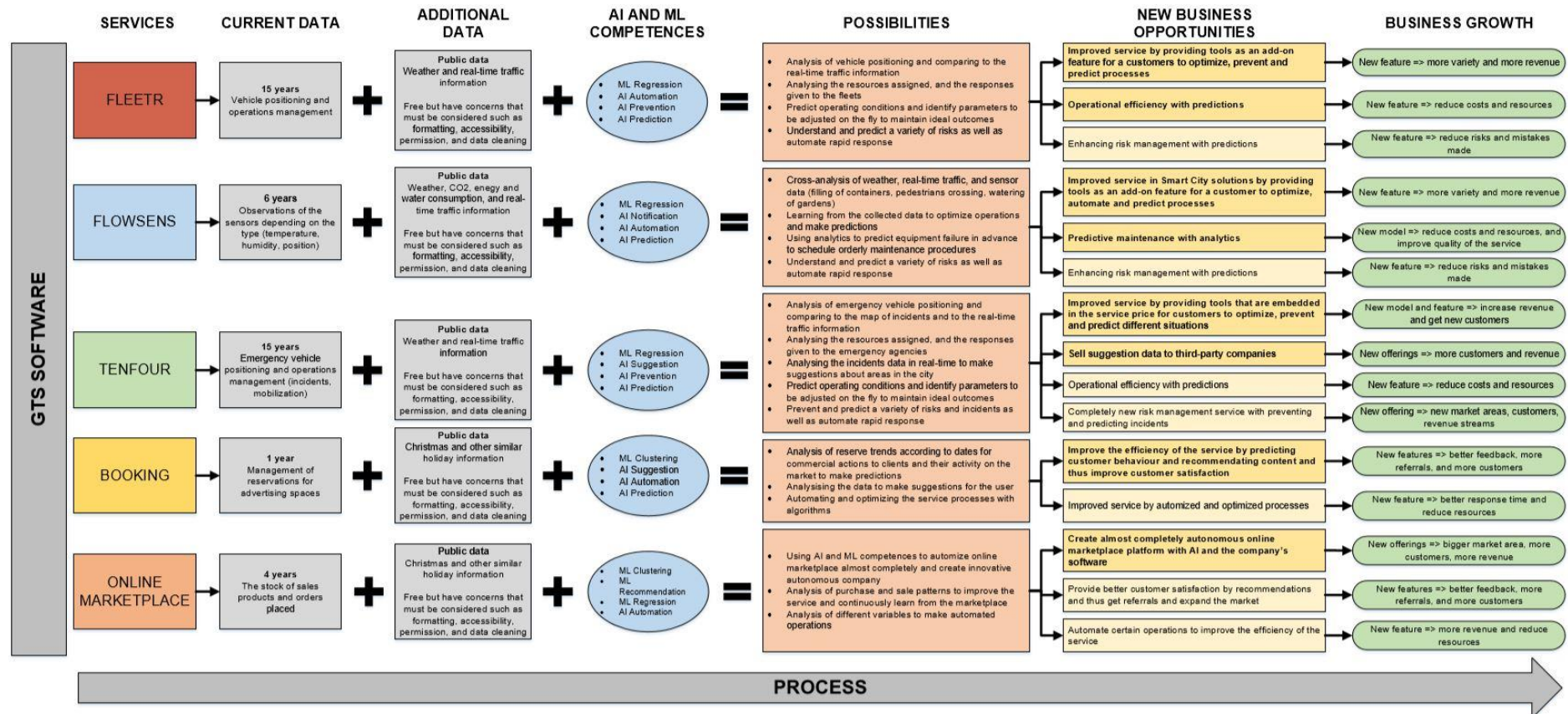
Over 50 % of companies have gotten benefits from AI for enhancing the existing products/services. Next in the list stands out optimization of internal business operations, automating tasks and improve decision-making. It can be noted that improving current products/services by AI, gives far better benefits than creating new products/services by AI.		There are many governments, universities and nonprofit organizations that maintain databases that are publicly available to everyone. The positive thing about this data is that it is usually free, and it can also be used for commercial use, but it has also some concerns that need to be taken into account before using the data such as formatting, accessibility, permission, and data cleaning.	BD can be divided in 6 categories: (1) New processes to sell the same product/service at higher margins by cutting production and delivery costs, or utilizing robots to automate processes, (2) New experiences by selling more the same product/service to the same people and so on increase retention and share by connecting people more to the offering, (3) New features by selling enhanced products/services to the same people, (4) New customers by selling the same products/services to new people by introducing it to new markets where might be different need for the same offering, (5) New offerings by creating completely new products/services on the market by finding a new need to solve within markets, and (6) New models by selling the same product/service in a new way by creating e.g. new revenue streams, channels, and value models.
Almost half of the executives express that it is challenging to integrate AI projects with existing processes and systems, and almost half of the cases AI technologies and expertise are too expensive for or it is hard to get enough expertized people in the organization. Other crucial obstacles are that high-level executives don't understand the AI sufficiently and thus strategies might intersect with AI, and the market might be oversold for solutions that company is providing and so makes it harder to get a successful result.		There are also some private organizations that provide and maintain available databases with a lot of useful information. The data can be highly useful but normally also without free access, so payment is required, and it is necessary to take into account when deciding the data sources to be used. The advantages of private data sources are that probably and mostly the data from private providers is cleaner and easier to utilize, and the datasets are normally wider including a variety of data types, so better results can be achieved.	
It is investigated that over 80 percent of business executives confirm that AI enables companies to obtain a competitive advantage on the market if the market is not completely filled with AI solutions, and 75 percent release that AI brings new business possibilities for the company.		To gain the advantages and make big data work, the following three steps must to defined thoroughly: big data strategy, identification of big data sources and plan for managing the data.	
it is a must to understand the capabilities of employees for the job needed to be done. AI integration needs employees' knowledge, skills and willingness to learn new job tasks, and if they are not able to do that, external services are needed to achieve the AI change.		<b>Algorithms</b>	
The AI transformation is divided into five following steps: •Execute pilot projects to gain momentum. •Build an in-house AI team. •Provide broad AI training. •Develop an AI strategy. •Develop internal and external communications.		Algorithms are needed to determine how the machine interprets the big data and how the data is processed.  ML algorithms can be programmed by a wide range of different programming languages such as Java, Python, Scala, etc. Algorithms can be combined together to solve more complex problems.	

## Appendix 8: Final version of the model to implement AI and ML supported by BD





## Appendix 9: Final version of the process model to build new business opportunities



## Appendix 10: Final version of the summary of AI and ML implementation benefits and drawbacks

AI AND ML IMPLEMENTATION INTO GTS' BUSINESS STRATEGY			
Benefits for GTS		Drawbacks for GTS	
Benefit	Description	Drawback	Description
New business opportunities	GTS can create many new features, models, offerings, and experiences as well as get new customers	A small IT unit	GTS has only 3 IT people in the team and that can be aggravating factor
Opportunities to expand globally	GTS have better possibilities to expand abroad with AI and new business opportunities	Resources are needed	AI and ML implementation requires a lot of resources such as money time, and 100 % focus
Company historical data	With AI and ML competences GTS can utilize the unique historical data and improve competitiveness	Integration to existing processes and systems	AI and ML integration is noted to be more difficult to existing services than creating new ones
Improve the current services	With AI and ML GTS can enhance the features, functions, and performance of the services	Integration to business strategy	AI and ML should be implemented already at the beginning of the process into GTS business strategy to enhance the success probability
Further development of IoT	GTS business is related to IoT and AI and ML brings great possibilities to take IoT in the company to next level	Expensive	It is noted that AI and ML implementation is expensive since the technology and expertise are costly
Data security and maintenance	GTS has a lot of accumulated data and security processes in the software, management of these can be improved by AI	Oversold market	The technology and solutions that GTS would provide after AI integration could be already oversold on the market
More competitive on the markets	AI is quickly spreading in every sectors and implementation enough early can still bring great advantages and respond to the future needs of customers and cities	More likely AI talents needed	AI implementation is more likely going to gain value when hiring or renting AI talents than relying on own staff => expensive
Customer experience and satisfaction	AI and ML provides great opportunities to improve the services to better match the customers needs	Positive revenue chance 50 %	GTS has approximately 50/50 chance to be successful or fail to gain revenue with the implementation
Cost reduction and profit enhancement	AI and ML provides great opportunities to save costs and gain more revenue with multiple different ways such as business process automation	Risk is 50 %	Since AI-equipped competitors are increasing all the time in every market area, there is always big risk that someone steal your competitors or create same but better services
Optimization	With AI and ML competences it is possible to optimize external processes such as sales and marketing and thus improve efficiency		
Pursue new markets	AI and ML provides tools to create something innovative and new target markets are possible for GTS		
Make better decisions	With AI and ML tools GTS can improve decision making with multiple supportive features		