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PLATOON

Digital platform and analytic tools for energy

Deliverable D8.2

Market and stakeholder analysis

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V0.1	03/10/2020	Introduction Main points of the approach and the used methodology	ENGIE, ENGINEERING, MINSAIT, SAMPOL
V0.1	17/10/2020	Add details about how this deliverable is related to other deliverables in the project Completed approach and methodology Market analysis dimension analysis v0 Stakeholders identification and classification	ENGIE, ENGINEERING, MINSAIT, SAMPOL
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Executive Summary

This document lies under the scope of work package WP8- Business Models and Exploitation. Its content is based on the work of the Task 8.1 - Project Impact Assessment, led by ENGIE.

The deliverable D8.2 provides baselines for the exploitation of the PLATOON project platform and prepares the business-related models for the PLATOON toolboxes and services. This encompasses the analysis of big data platforms market to determine the market size and its trends, the key drivers, the attractivity and the profitability of the market, its submarkets currently and in the future. As well as the key success factors, assets and competencies required to success over the competition in the identified markets. Additionally, it assesses PLATOON project outcomes potential stakeholders, their roles and how can PLATOON components respond to expectations of different relevant stakeholders.

The analysis of the current and expected markets and stakeholder requirements and benefits will help the consortium to make future decisions for business plans. It provides the initial groundwork as well as research to identify constraints in developing new business models (Task 8.2). This document will further provide inputs to work to be done in Task 8.3: Exploitation Plan for Sustainability and Large-Scale Uptake Beyond Project Lifetime and WP7- Open Call Management and Ecosystem building activities. Relevance of different stakeholder assessed in this task should also provide inputs to WP9 to effectively strategize communication and dissemination efforts.

Figure 1 provides approach followed to achieve goals defined within task 8.1.

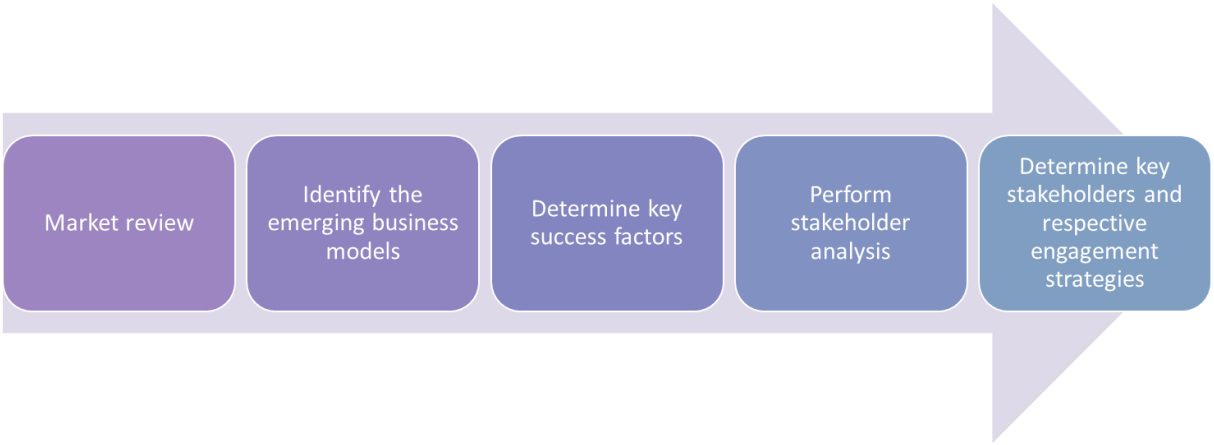

Figure 1 Market and stakeholder analysis general approach

The PLATOON stakeholders and the linked IoT-European research projects.**Figure 2** below summarizes PLATOON stakeholders according to their classes and groups and the linked IoT-European research projects.

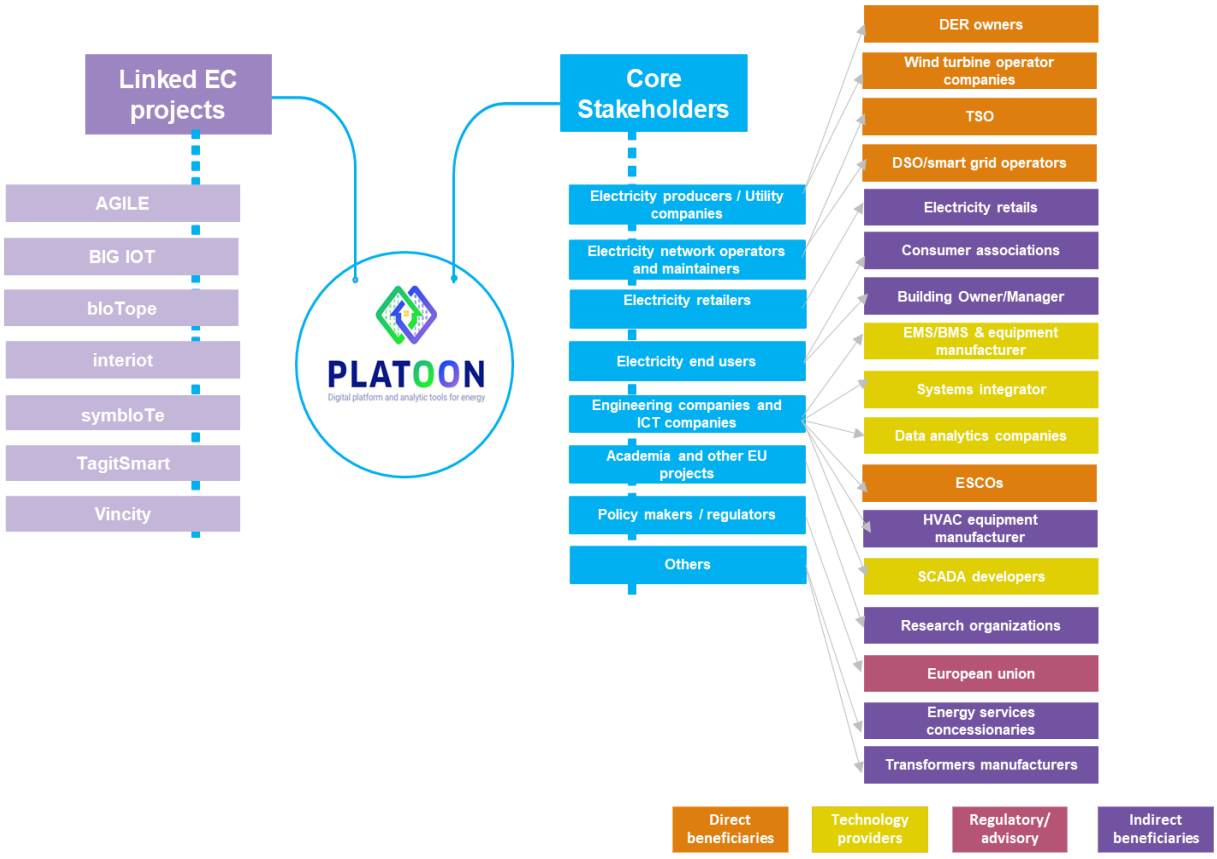

Figure 2 PLATOON stakeholders and the linked IoT-European research projects.

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Terms and abbreviations

APAC	Asia-Pacific
BDA	Big Data Analytics
DER	Distributed energy resources
DSO	Distribution system Operator
EE	Energy Efficiency
ESCOs	Energy service companies
EMS	Energy Management System
HVAC	Heating, Ventilation and Air-Conditioning
ICT	Information and Communication Technology
IoT	Internet of Things
KSF	Key Success Factors
LCoE	Levelized Cost of Energy
ML	Machine learning
O&M	Operation and Maintenance
OT	Operation Technology
PV	Photovoltaic
RES	Renewable energy resources
SCADA	Supervisory Control And Data Acquisition
SMEs	Small and Medium-sized Enterprises
TSO	Transmission System Operator

1. Background

1.1. Objective and scope of the Market and Stakeholder Analysis

The deliverable 8.2 lies under the scope of work package WP8 Business Models and Exploitation. Its content is based on the work of the Task 8.1 - Project Impact Assessment, led by ENGIE. It presents a market and stakeholder analysis concerning PLATOON tools. The main objective of this deliverable is to identify the attractiveness of big data platforms to support the launch of business exploitation activities resulting from the R&D project PLATOON.

The deliverable's main target group is the PLATOON consortium partners. By conducting this analysis, the consortium will be able to position tools and services developed within the PLATOON project in growth markets and submarkets whilst securing business success. It focuses on identifying market trends, attractivity and the profitability of the market, its submarkets currently and in the future. This deliverable also focuses on the key success factors, assets and competencies required to success over the competition in the identified markets.

Furthermore, D8.2 assesses the roles and expectations for different relevant stakeholders and how can PLATOON components respond to their expectations.

D8.2, through the market and stakeholder analysis, provides the initial groundwork as well as the research required to identify constraints in developing new business models (Task 8.2). This document will further provide inputs to work to be done in Task 8.3: Exploitation Plan for Sustainability and Large-Scale Uptake Beyond Project Lifetime and WP7- Open Call Management and Ecosystem building activities. Relevance of different stakeholder assessed in this task should also provide inputs to WP9 to effectively strategize communication and dissemination efforts.

1.2. Structure of the document

The deliverable consists of five chapters, it starts with an introduction for the conducted work and specifies the documents motivations.

The second chapter is dedicated to the description of the general approach elaborated to meet the deliverable objectives, as well as the two methods used for the market analysis and the stakeholder analysis.

The third chapter focuses on the market analysis in which Aaker and McLoughlin's market analysis and its eight dimensions is performed.

The fourth chapter presents the stakeholder analysis, which are classified into Direct beneficiaries, technology providers, regulatory/advisory and indirect beneficiaries. Within this chapter, relevance, benefits, and expectation of each stakeholder is assessed.

The fifth section contains the conclusions of this report with the implications for the rest of the activities in WP8 and within the PLATOON project

2. Approach and methodology

The present deliverable is divided into two main parts. The first assesses the big data analytics market and submarkets to provide critical information to the consortium partners to be able to refine product development and define best exploitation strategies for each partner within PLATOON. Within this section, we will be able to identify in which sectors, locations and at which price range there is potential to enter the market and to identify the associated competing products. Via the market analysis, critical aspects, opportunities, influencing factors, relevant actors are identified so to monitor them during the development. To do so, we describe the Big Data Analytics platform market according to the eight dimensions of market analysis as defined by Aaker and Mcloughlin (2010).

Alongside the market analysis, a stakeholder analysis is presented to identify the key actors for technologies developed within the PLATOON project. Analysing the stakeholders is crucial to understand the needs, desires, and potential barriers to a specific implementation. By assessing the needs of each category, proactive steps can be taken to ensure they would work synergistically with the goals of the project and do not undermine its success. This stakeholder analysis uses a three steps approach described in Section 2.2.

2.1 Market Analysis methodology

The objective of this methodology is to provide an analysis of a market and its submarkets dynamics and helps to determine the relative attractiveness of a specific market or a submarket now and in the future. By understanding the dynamics currently at play, this effectively helps actors adopt favourable positions compared to competitors. Big data analytics market and IT markets in general are constantly undergoing change and therefore each product or service supplier must constantly defend their brand relevance. Therefore, market analysis represents the market as it is today, but also relevant trends and forecasts for the future state of the market. Aaker and McLoughlin methodology (2010)[1] escribes eight dimensions to a market analysis as shown in Figure 1

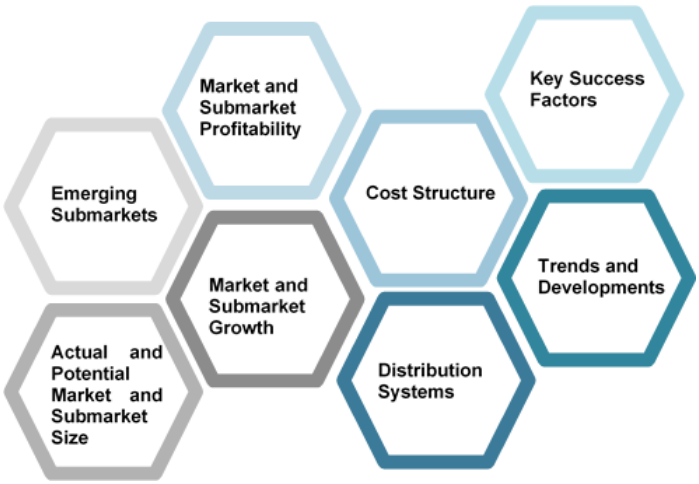

Figure 3 The eight dimensions of a market analysis according to Aaker and McLoughlin

[1] Aaker, D. A. and McLoughlin, D. (2010). Strategic Market Management (1st edition). John Wiley & Sons Ltd.

According to Aaker and McLoughlin's, the market analysis depends strongly on the context but will often include the eight following dimensions:

1. Emerging Submarkets: This involves detecting and understanding parts of the market that are attractive. Submarkets that are emerging usually have one or many of the following characteristics:

- Provide lower price (e.g., low-cost carrier airlines)
- Serve non-users (e.g., electric scooters in cities)
- Serve niche markets (e.g., home security cameras)
- Provides systems solutions (e.g., cloud computing system providers)
- Serve previously unmet need (e.g., Lexus car buying experience)
- Response to costumer trends (e.g., fortified energy drinks)
- Leverage a new technology (e.g., Apple smart phones)

2. Actual and Potential Market and Submarket Size: This involves the size of total sales, both now and in the future. Sources for this information include financial analyses from competitors, trade associations, and investors as well as government data.

3. Market and Submarket Growth: This involves describing the expected size over time of the different submarkets, and the speed at which they will expand or contract. Companies need to understand the driving forces behind sales trends to derive the expected growth.

4. Market and Submarket Profitability: This involves considering the likelihood to generate revenue in the different submarkets. Awareness of competitors, including threats from incumbents but also potential entrants and substitute products and services, is central. The relative bargaining power of suppliers and customers also affects profitability.

5. Cost Structure: This involves knowing the different production costs and depreciation costs expected to formulate strategies that develop a competitive advantage.

6. Distribution Systems: This involves the current distribution channels used to market the products and services as well as alternative distribution channels and how they are developing.

7. Trends and Developments: This involves being aware of trends relevant to the market and how they impact the market. Trends can be technological advances (e.g., batteries making the range of electric cars much more interesting to customers and therefore opening a new submarket), consumer trends (e.g., skincare products now designed for women as well as men), and government and economic trends (e.g., change in regulation or jurisdiction that affects a submarket such as over-the-counter pharmaceuticals).

8. Key Success Factors: This involves knowing the key success factors, assets, and competencies required to succeed over the competition in the market. This also involves knowing how they will interplay in the future, and which strategies should be deployed to neutralize the assets and competencies of competitors.

2.1 Stakeholder analysis methodology

A four-step approach is used to effectively identify stakeholders and lay the path to define an engagement strategy moving forward in the project.

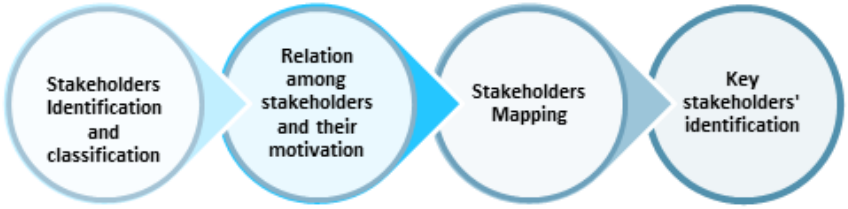

Figure 4 Stakeholders analysis approach main steps

- Step 1: Identification of stakeholders related to the project, both present in pilots and beyond. These are classified into stakeholders that are actors in the energy depending on their situation on the value chain and their business sector.
- Step 2: The core business motivations of each stakeholder are analysed, and narratives are built according to the components and services that they can be impacted by.
- Step 3: Stakeholders are mapped into mapping dimensions: interest-influence map as described in (Section 4.3)
- Step 4: Based on stakeholder mapping on section 4.3, in this last step key stakeholders are identified to help to determine business that are ripe for the business exploitation of the PLATOON components

3. Big Data Analytics platform market review

3.1. Market definition

The purpose of this section is to develop a strategic market analysis for PLATOON outcomes (products and services) so that it can be used as an input for a strategic plan, with specific measures and decisions to be undertaken. The methodology to be followed is the one by Aaker and MacLouglin, previously outlined in this document. This market analysis guidance has been originally developed to deal with dynamic markets and the case of Big Data Analytics platform is, within the ever 'changing world of IT, one of the areas in which changes, and technical innovations happen at the fastest pace. This is also an important issue concerning the customers who are in the middle of a technology arms race and do not always have the time or the knowledge to analyze the impact of new tools and methods on their businesses.

Market definition involves the definition of:

- the products/services that will be sold,
- the target customer and
- the customer's needs to be met.

Product/service definition

As stated in D1.3 Platform Requirements, the objective of the PLATOON project is to develop a big data platform for the energy sector to leverage data and provide new analytics tools that enable the

development of new services and business models that boost the decarbonization of the energy sector in line with the European Green Deal.

The PLATOON platform is presented as a breakthrough COSMAG compliant platform with flexible capabilities covering three main pillars:

- **Interoperability :** to ensure multiparty data exchange and deal with a wide spectrum and heterogeneous data sources, formats, interfaces.
- **Data governance :** to meet data/app providers requirements regarding security, privacy, and sovereignty.
- **Data Analytics Toolbox:** to extract value from the data and that can be easily used by energy domain experts without deep coding skills and mathematical knowledge.

The outcomes of PLATOON project have already been identified in other work packages (D2.1,D3.1, D3.3,D3.4, D3.5 and D6.1). These include:

- PLATOON Reference Architecture
- Interoperability Layer
- Platform Security and privacy
- Data Analytics Toolbox
- Edge Computing
- Marketplace
- Collaboration requirements

The very basic idea behind PLATOON addresses the strategic uncertainties currently existing in such a dynamic market. There are many BDA (Big Data Analytics) digital platforms available in the market. They have usually been developed by companies coming from the OT (Operation Technology) world, such as major players in Instrumentation & Control hardware. Given the gradual approach that OT and IT (Information Technology) are experiencing, blurring the traditional boundary that used to separate them, many IT companies have also developed solutions in this area.

The PLATOON project is not yet another IoT platform instance, but rather the definition of a series of standards regarding interoperability both in terms of data and methods. It is truly *a **federated platform*** in the sense that it is a decentralized platform formed of different platforms from different companies that are able to exchange data and services with each other.

There are several aspects that are currently hampering the BDA market due to limitations and restrictions that current platforms entail. Specifically, customers are not always willing to embrace a single provider proposal. They would like to keep legacy solutions when there is not an attractive alternative available, use the best services for different applications even if they are in different hosts (multihoming), or achieve data portability with different applications. Commercial solutions are not usually designed to provide such a high degree of freedom of choice and this is resulting in unnecessary frictions for companies adopting new technologies thus delaying the potential benefits that could be reached. It is the vendor lock-in perceived threat that is causing most of the resistance.

PLATOON defines and implements a BDA platform with the features listed above so that anyone that adheres to it will benefit from the associated interoperability and data exchange capabilities. These characteristics have been specifically addressed in PLATOON to minimize customers' reluctance and the specific constraints of their (digital) environments.

Strategic uncertainties that are being addressed along the PLATOON project or will continue to be addressed in the future are:

- Technology changes, new paradigms to arise.

- New developments in analytical methods.
- Commercial barriers.
- New data handling requirements.
- Competition with major platform vendors, risk of monopoly.

A constant surveillance on these aspects and others will be needed to ensure that the initiative starting with this project is successfully maintained in the medium/long term. Periodical updates in analyzing strategic uncertainties will be needed to align future developments with the real market needs and requirements.

Customer analysis (preliminary results)

As previously identified in the project, several customer segments can be differentiated:

- Power generators:
  - Traditional power generation companies.
  - Renewable power generation companies.
- Distribution System Operators (DSOs).
- Aggregators and energy services providers.
- Prosumers.
- Building-related energy efficiency and ESCO companies.
- ICT suppliers.
- Technology providers.
- Others.

Each of these groups has distinctive goals and interests that will be analyzed below.

- **Power generators: traditional power generation companies**

  Usually large companies (often multi-national) with power generation assets distributed in power plants with different generation technologies (nuclear, coal, combined cycle, etc.). It is very likely that they already own and operate legacy solutions in the BDA area in which they have invested big amounts of money and currently have considerable expertise.

- **Power generators: renewable power generation companies**

  Although traditional power generation companies have been also moving their interest to renewable generation, there are many medium and small producers in this field. It has become clear that the business model in renewable generation is quite different than the traditional one and significant business optimization is to be expected from the use of the asset data.

- **Distribution System Operators (DSOs)**

  The increase of renewable and storage, combined with changing consumption patterns places significant challenges on the traditional business model of DSOs. Providing a set of services adapted to the needs of the different agents connected and/or involved in the grids seems to be their best choice for the future. New industry partnerships are being formed, as large incumbent organizations recognize that they need access to more digital capabilities and skills in their workforce.

- **Aggregators and energy services providers**

As a result of all these previous mentioned changes, the way of doing business and getting revenues in the electric market is dramatically changing. The power and decision-making capacity, which relied so far on the DSOs, are now starting to involve other actors, thus forcing the market to evolve from a single-buyer model to a multi-agent model, with new stakeholders such as aggregators and energy service providers taking increasing roles.

- **Prosumers**

  Energy consumers are increasingly taking an active role in the energy system as "energy prosumers". Prosumers are households, SMEs, or communities that, in addition to having the choice of their electricity and gas suppliers in fully liberalized markets, are also producing energy themselves and could, if energy market design is adapted accordingly, eventually become important participants in the energy via, for example, collective self-consumption of solar PV.

- **Building-related energy efficiency and ESCO companies**

  Changes are strongly driven by the European building legislation, including the "nearly zero buildings" approach (buildings that combine high levels of energy efficiency with high shares of on-site renewable energy). Also, building-level electricity storage technologies start to approach economic viability, allowing the share of self-supply to increase even further.

- **ICT suppliers**

  Increasingly, players from the ICT sector are also entering the sustainable energy arena in Europe. As in other business fields, the next years will be decisive to set which platforms will be key interfaces for supply and demand of energy-related data and services, as well as to confirm how the new business models will work. Major players such as Google, Amazon or Microsoft have developed general-purpose platforms in which they provide all the chain of services (from IaaS to SaaS through PaaS) and the economy of scale allows them to compete with very aggressive prices. It is crucial that European SMEs are well equipped for this new competition, since it will allow them not only to defend their current position in national and local supply chains, but also to profit from new international markets.

- **Technology providers**

  Technology providers in the form of startups or R&D institutions will play a major role in developing the new technologies that will be later applied in the market. Technology providers need quality data as the raw material for their developments and the Data marketplace included in PLATOON means a new business model for these R&D companies. These new business models are now being added to the traditional partnership and becomes a new business line for companies that can be considered as data providers.

- **Others**

  There is an interesting synergy with other sectors such as Industry or Telecommunications. Many of the capabilities that will be developed within PLATOON will be applicable in these other sectors since many of the industrial set of problems is shared with them.

CUSTOMER SEGMENTS	CUSTOMER MOTIVATION	UNMET NEEDS
Traditional power generation companies	• Provide value to existing, often old generation facilities • Extend asset useful life	• Break vendor lock-in issues • Be able to switch to best-in-class solutions

	• Optimize O&M • Optimize obsolete plant decommissioning	whenever they appear without traumatic consequences • Be able to benefit from startup solutions or develop bespoke modules
Renewable power generation companies	• Manage geographically distributed asset fleets • Optimize energy sale strategies • Optimize O&M • Price of BDA solutions	• Use operation data to optimize O&M • Forecast producible power and optimize energy bids • Be able to use niche solutions for specific problems
Distribution System Operators (DSOs)	• Prepare to face the SmartGrid challenges soon • Manage hundreds/thousands of assets geographically distributed • Optimize O&M • Extend asset useful life	• Use all the available information to optimize O&M operations and extend asset useful life • Be able to benefit from startup solutions or develop bespoke modules
Aggregators and energy services providers	• Play a role in the energy market by grouping together the interests of many individual independent producers • Extend the portfolio of energy services that can be provided • Price of BDA solutions	• Integrate multi-source data to benefit from opportunities and provide value to customers • Be able to use niche solutions for specific problems
Prosumers	• Optimize energy consumption, lowering costs or maximizing benefits • Price of BDA solutions	• Use multi-source data (weather, prices, etc.) to determine optimum consumption strategies • Do not invest too much in hardware and be able to benefit from technology evolution
Building-related energy efficiency and ESCO companies	• Optimize energy consumption, lowering costs • Extend the portfolio of energy services that can be provided • Price of BDA solutions	• Use multi-source data (weather, prices, etc.) to determine optimum consumption strategies • Be able to use niche solutions for specific problems
ICT suppliers	• Promote the use of their BDA platforms and solutions • Create standard BDA solutions per sector (i.e., energy) so that they can	• Use edge devices and data sharing facilities to capture the small customer segment

	be readily rolled out across companies • Extend the portfolio of services to be provided	
Technology providers	• Assess development roadmap based on real data • Develop specific solutions to address industry problems	• Access to quality industry data for solution roadmap and development

Table 1 Customer segments and motivations

3.2. Overview of Competitor Products and Services

There is not really a competition between different platform interoperability solutions. The European Union has been launching different initiatives over the last few years, aware that it is necessary to increase the impact of the IoT-European research and innovation in this area. There are several promising European projects concerning IoT platform interoperability within the IoT-EPI European Platforms Initiative (https://iot-epi.eu/)

Initiative	Logo	Description
AGILE		**AGILE** builds a modular hardware and software gateway for the IoT focusing on the physical, network communication, processing, storage, and application layers. The AGILE software modules are addressing functions such as device management, communication networks like area and sensor networks and solution for distributed storage. The project considers all the modules needed to provide a robust security management solution. (http://agile-iot.eu/)
BIG IoT		**BIG IoT** develops a generic, unified Web API for IoT platforms implemented. As part of the project, 8 partner IoT platforms are being integrated with the ecosystem plus several additional platforms are joining via the community building process. The project focuses on the upper layers of the IoT architecture by addressing the security management, APIs, service integration, external system services, applications, and the business enterprise. (http://big-iot.eu/)
bIoTope		**bIoTope** provides an architecture and recommendations for the use of open standards and use case implementations that enable stakeholders to easily create new IoT systems and services and to rapidly harness available information using advanced Systems-of-Systems (SoS) capabilities for Connected Smart Objects. bIoTope also develops and provides standardised open APIs to enable interoperability. The project addresses all eight layers of the IoT architecture and validates the interoperability solutions in a cross-domain environment. (https://biotope-project.eu/)

INTER-IoT		**INTER-IoT** project addresses an open cross-layer framework, an associated methodology and tools to enable voluntary interoperability among heterogeneous IoT platforms by focusing on six layers of the IoT architecture with modules covering the QoS and device management, service integration, external system services, storage and virtualisation. The project addresses all network communication layer and the full security management suite. (https://inter-iot.eu/)
SymbIoTe		**symbIoTe** is providing an abstraction layer for a unified view on various IoT platforms and sensing/actuating resources. Applications can use symbIoTe Core Services implementing a semantic IoT engine to find adequate resources offered by symbIoTe-enabled platforms and subsequently access platform's virtual resources directly for data acquisition and actuation. The project focuses on seven layers of the IoT architecture from physical to application layer and proposes a full security management suite. (https://iot-epi.eu/project/symbiote/)
TagItSmart!		**TagItSmart!** offers a set of tools and enabling technologies that can be integrated into different IoT platforms using provided APIs to enable users across the value chain to fully exploit the power of condition-dependent functional codes to connect mass-market products with the digital world across multiple application sectors. (https://www.tagitsmart.eu/)
VICINITY		**VICINITY** focuses on a platform and ecosystem that provides "interoperability as a service" for infrastructures in the IoT and addresses the five-upper layer of the IoT architecture. The work considers the service integration, business logic, virtualisation, storage, APIs, tools, external system services, applications, data analytics and cloud services. (https://www.vicinity2020.eu/vicinity/)

Table 2 Competitor Products and Services

Lack of platform interoperability causes major technology and economic drawbacks such as impossibility to plug non-interoperable IoT devices into heterogeneous IoT platforms, impossibility to develop IoT applications exploiting multiple platforms, slowness of IoT technology introduction at a large-scale, discouragement in adopting IoT technology, vertical silos in IoT ecosystems and markets, increase of costs, scarce reusability of technical solutions, or user dissatisfaction.

In contrast, interoperability among platforms will provide numerous benefits such as new market opportunities, the disappearance of vertical silos, and vertically oriented closed systems, architectures, and application areas, to move towards open systems and platforms, and a major cooperation among platforms to offer better solutions to the consumer and the users. The cross-availability of services and data will allow current service providers to reach new markets with their services, but perhaps, more

importantly, we expect new business opportunities to emerge from the ability to manage data from diverse sources to create innovative solutions.

The PLATOON project is born in this interoperability environment with a clear focus on the energy sector and will be a reference for companies operating in this area.

In terms of platforms, there are multiple examples of IoT platforms that could be the object of the interoperability and data sharing concepts that PLATOON is promoting. In the energy sector the providers of the most widely used IoT platforms belong to different types (BCG perspectives, *who will win the IoT platform wars*?):

- **Enterprise software and service providers:** These are established providers of enterprise software solutions and services. They provide strong surrounding capabilities such as support and services and have an extensive expertise in deploying solutions across verticals.
- **Internet or cloud players:** Usually dominant Internet or cloud-based companies. They offer strong adjacent platform services, such as security, analytics, and machine learning capabilities.
- **IoT pure play/startups:** Less mature, private companies founded to commercialize recent technologies. They offer hardware and software point solutions that leverage existing platforms and usually address gaps in current market offerings.
- **Industrial technology providers:** Companies that provide manufacturing tools and systems or producers of technology components. They have strong industry knowledge and hardware expertise and a large installed base of existing devices in industrial environments.

An approximate sharing of market among these different kind of platforms is shown below:

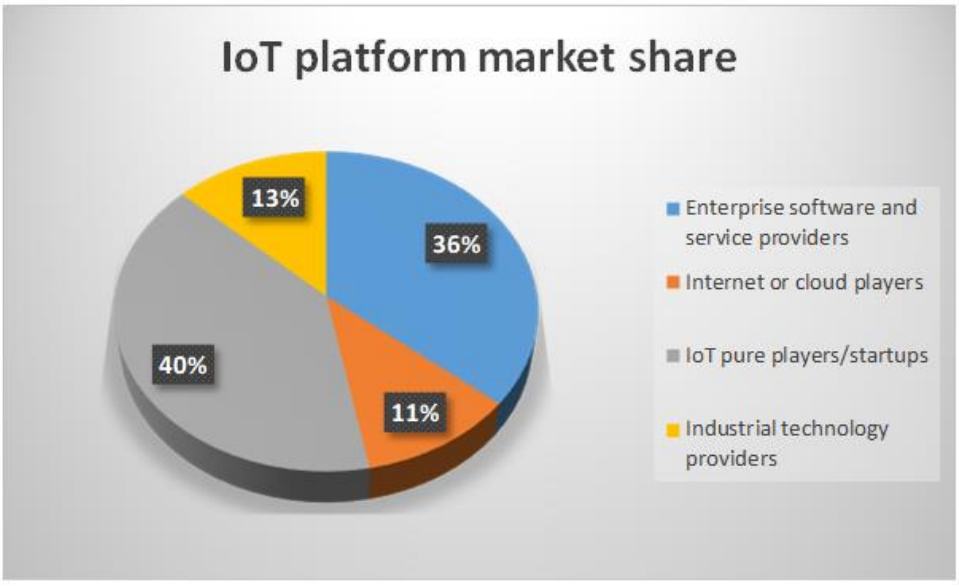

Figure 5 IoT platform market share

Based on the previous classification of provider segmentation of the market, the following table displays the competitive strength grid that is expected for a given provider/solution depending on the provider type:

Assets and competencies	Enterprise software and service providers	Internet or cloud players	IoT pure players/startups	Industrial technology providers
Market penetration	↑	↑	↓	↑
Brand recognition	↑	↑	↓	↑
Commercial resources	↑	↑	→	→
Post-implementation services	↑	→	→	↓
Product quality	↓	↑	↑	↑
Quality of service	↑	→	↑	→
Innovation	↓	↑	↑	→

Table 3 Competitive provider and solution strength grid

The following table does not intend to be a thorough review of all the available software, it only summarizes some of the most popular IoT platform solutions:

IoT Platform	Logo	Provider	Type	Description
ThingWorkx		PTC	IoT pure play/startups	ThingWorx is an application development platform that allows to build value from products and deliver end-to-end IoT solutions to capture business opportunities offered by pervasiveness of smart Things.
Watson		IBM	Enterprise software and service providers	Watson is a fully managed, cloud-hosted service designed to make it simple to derive value from Internet of Things devices. It provides capabilities such as device registration, connectivity, control, rapid visualization, and storage of Internet of Things data
Google Cloud IoT		Google	Internet or cloud players	Google Cloud IoT is a fully managed service to easily and securely connect, manage, and ingest data from globally dispersed devices
AWS IoT		Amazon	Internet or cloud players	AWS IoT is a managed cloud platform that lets connected devices easily and securely interact with cloud applications and other devices. AWS IoT

				supports HTTP, WebSockets, and MQTT, a lightweight communication protocol specifically designed to tolerate intermittent connections, minimize the code footprint on devices, and reduce network bandwidth requirements.
Azure IoT		Microsoft	Internet or cloud players	Azure IoT brings the Internet of things to life by connecting devices, analyzing previously-untapped data, and integrate business systems and transforming companies
Leonardo		SAP	Enterprise software and service providers	SAP Leonardo delivers software and microservices that enable customers to leverage future-facing technologies like the Internet of Things, machine learning, blockchain, analytics, and Big Data.
Braincube		Braincube	IoT pure play/startups	The Braincube IIoT Platform offers a Big Data Infrastructure, collecting, integrating, and structuring your data from IT and OT systems. Edge or Cloud solutions are used to get live time visibility into production processes.
Predix		GE	Industrial Technology provider	Predix, known as Predix Platform is an industrial IoT software platform from GE Digital. It provides secure edge-to-cloud OT/IT data connectivity, processing, analytics, and services to support industrial applications from GE Digital as well as those developed by customers or partners.
Oracle IoT		Oracle	Enterprise software and service providers	Oracle Internet of Things (IoT) Cloud Service is a managed Platform as a Service (PaaS) cloud-based offering that helps you make critical business decisions and strategies by allowing you to connect your devices to the cloud, analyze data from those devices in real time, and integrate your data with enterprise applications, web services, or with other

				Oracle Cloud Services, such as Oracle Business Intelligence Cloud Service
MindSphere		Siemens	Industrial Technology provider	MindSphere powers IoT solutions from the edge to the cloud with data from connected products, plants, and systems to optimize operations, create better quality products and deploy new business models. Built on the Mendix application platform, MindSphere empowers customers, partners, and the Siemens organization to quickly build and integrate personalized IoT applications.
Digital Enabler		Engineering	IoT pure play/startups	The Digital Enabler allows to harmonize, synchronize, integrate, visualize, combine, associate, and examine data from different sources to find correlations, create new information and give value to not processable data It is possible to convert the data into a new one, plug-in IoT devices, digitally enable the technologies and the more mature ones to feed the digital transformation.
ABB Ablity		ABB	Industrial Technology provider	ABB Ability™ was launched in 2017 and offers more than 200 digital solutions which enable enterprises to increase productivity and safety at lower costs. With ABB Ability™, ABB taps into the rapidly growing market of automation for industrial companies, known as the Internet of Things (IoT)
Onesait		Indra	IoT pure play/startups	Onesait Platform provides the flexibility so that developers can build their own solutions in a solid and agile way using Open-Source technologies, a flexible architecture, and an innovative approach. Based on Open-Source components, Onesait Platform covers the entire life cycle of information (from ingest

				to visualization through its process and analysis).
Promind	Promind	Sisteplant	IoT pure play/startups	Following the scientific method, PROMIND provides a wide range of mathematical models used to materialize knowledge on plant dynamics into scientific models instead of "personal and non-transferable" empiric rules.
Knime Analytics	KNIME	Knime	IoT pure play/startups	KNIME Analytics Platform is the open-source software for creating data science. Intuitive, open, and continuously integrating new developments, KNIME makes understanding data and designing data science workflows and reusable components accessible to everyone

Table 4 Popular IoT platform solutions

In the following table we provide an overview of some of the software available on the market for big data-driven smart energy management. The table does not intend to be a thorough review of all the available software but provides a first snapshot of existing software.

Product	Logo	Website	Type	Description
UPLIGHT	uplight	uplight.com/	End-to-end customer-centric technology solutions	Uplight provides a set of end-to-end customer-centric technology solutions dedicated to serving the energy ecosystem, among these a demand response solution which applies analytics to understanding customers behaviours required to deliver personalized energy services.
EcoFactor	ECOFACTOR	www.ecofactor.com/	Services for Proactive Energy Efficiency, Demand Response, Performance Monitoring	EcoFactor offers a cloud-based platform, with services such as Proactive Energy Efficiency, Optimized Demand Response, and HVAC Performance Monitoring services it incorporates various data streams, including thermostat settings, family comfort preferences, and local weather conditions into sophisticated learning algorithms.
Big Data Energy	BIG DATA ENERGY SERVICES	www.bigdataenergy.com/	A Unified Platform for Digital Asset Management	Big Data Energy uses data exchange methods to capture data, no matter the source or format. Through the Unified Platform the data is transformed into usable, normalized formats that can be used to develop

				meaningful models – supporting the bottom-line decisions.
Autogrid	AutoGrid	www.auto-grid.com	AI driven Solutions for New Energy	AutoGrid offers AI driven solution for several services including DR programs which can combine behavioural dispatch, dynamic pricing, and direct load control mechanisms.
ENEL X	enel x	www.enelx.com/	Energy Management System	The Energy Management System is an energy consumption monitoring platform that collects, analyses, and displays energy expenditure values such as consumption, costs, and other input. The basic offer includes collection and analysis of field data, visibility of data at the site and/or portfolio level, comparison of consumption data with weather data, management of measures for energy saving interventions.
E.ON OPTIMUM	e·on	www.eon.com	Cloud energy management platform for businesses	Optimum analyses data to give businesses a view of their energy consumption. Data analysed and visualised on Optimum can come from Intelligent Meters or Building Management Systems.
Electrex Energy Management System	ELECTREX the energy saving technology	www.electrex.it/	Software and devices for Predictive Maintenance	Electrex Energy Management System support the performance of Predictive Maintenance driven by the EMS (Energy Management System). It provides devices for the collection of data and a platform for the analytics, reporting and publishing. It manages both manage real-time and historical data.
WNS	WNS	www.wns.com	Demand Response Analytics suite	WNS' Demand Response Analytics suite for Energy and Utilities companies leverages predictive modeling to forecast short-term energy demands, recommend customized energy-saving schemes for higher customer adoption and assess price elasticities for individual customers as well as diverse customer segments.

Table 5 Big data-driven smart energy management softwares

3.3. Emerging Submarkets

As mentioned before, the interoperability and data sharing market are not yet a strong competition arena and this maybe the strongest competitive advantage of the PLATOON project vision at this moment. Major players have been focusing on developing their own IoT platform solutions attracted by the multi-billions of dollars foreseen to be generated in the market in the coming years.

Customers have been making their choices on IoT platforms based on several criteria:

- **Platform capability:** usually focused on the coverage of the functions an IoT platform is supposed to provide, from data acquisition and storage to available application and solutions. Beyond these basic functions, the possibility of interfacing with the existing production or managing systems (legacy applications) must be assessed.
- **Type of IoT platform provider:** When companies are selecting IoT alternatives they must be aware that the type of IoT provider is also going to impact the solution. With IoT pure play/startups the user is expected to have a more responsive reaction to their needs but also a higher degree of risk is involved. Software companies are slower but will introduce new offering whenever they detect the market demands it. Finally, industrial players have a high degree of expertise and solutions very much adapted to the assets they provide.
- **Development skills:** Companies must ensure that the chosen IoT platform matches their development skills or their partners'.
- **Openness and integration:** This are a crucial point in the sense that many customers do not want to abandon their legacy systems and want to be open to future innovations that may appear in the market over the next years. Large-scale cloud providers are more likely to provide the open environments that customers seek, while startups or industrial providers will most probably be restricted by their solutions and the user may end up in the feared "lock-in" situation.

This situation has led to the emergence of a new concept in which the PLATOON project is framed: the question will not be which IoT platform to choose, but rather how to combine different solutions coming from different platforms in a so-called IoT platform ecosystem. If successful, this idea promises to solve many of the reluctances that customers are showing and pave the way for a future based on continuous innovation.

When speaking of developing new businesses we can distinguish between *blue oceans* and *red oceans*. Blue oceans refer to all business arenas currently not in existence, an unknown market space. On the contrary, *red oceans*, are established markets where boundaries and operating parameters are well established and accepted. In the case of **red oceans**, the goal is to beat competition and overcome over-capacity, commoditization, and low margins. In contrast, the business area covered by PLATOON is currently a **blue ocean**, and the challenge is: a) to create demand and b) make competition irrelevant.

Blue oceans are usually based on conceptual changes rather than technological and bring a leap in value consisting of a cost reduction component and a customer value component (differentiation). When entering an unexplored business, innovators enjoy the so-called *innovator's advantage* for a limited time. This is the time in which:

- Competitors will not respond in a timely matter because they will be busy protecting their own approach.
- Competitors will take some time to respond due to simple organizational challenges. Responding to an innovation usually requires changes in organizational culture, people, etc. that are not immediately achieved.
- The innovator will create customer loyalty based on exposure and experience with the new products or services.

In the case of the PLATOON project, a wise decision would be to try to enlarge the user base as quickly as possible, to gain critical mass. This could mean, for example, an active move towards affordable pilots following the use case strategy used in the development. Sometimes market pioneers cannot survive when the technology is not fully ready, or a larger competitor blows them away. In the case of the PLATOON project outcomes, the technology does not seem to pose a threat and the very nature of the interoperability and data sharing concepts is probably an intrinsic barrier to major players when their strategy is trying to capture a big chunk of the market with their own solutions.

Finally, when creating new business arenas, it is worth analyzing them from different perspectives that tend to reappear once and again in blue ocean ventures. These are:

- **Technological innovation:** The main point of the PLATOON project is not focused on technological innovation. Even though quite a lot of developments will have to be finished by the end of the project, the main components are already in place and no technological uncertainties are envisioned. Notwithstanding all the communication and architectural developments, the main contribution of the project will not be a technological breakthrough.
- **From components to systems**: This is probably the most innovative concept in the PLATOON project and can be considered a conceptual leap. The very concept of PLATOON around a federation of platforms changes the spotlight from the IoT platforms to the ecosystem of IoT-based solutions, the data exchange, and the analytical toolboxes. This is really the paradigm change that, in a way, commoditizes IoT platforms and focuses on cooperation rather than competition among them. If successful, this is a real game-changer that can substantially impact the market.
- **Unmet needs:** The outcomes of the PLATOON project are directly related to the lock-in threat that is preventing some customers from adopting digital strategies that could greatly improve their businesses. This is a clear need that PLATOON can, at least, mitigate. Furthermore, the existence of wider connectivity capacities, available toolboxes and data marketplaces can also be a contributor to the democratization of digital strategies and methods that can also be adopted by SMEs, overcoming some of the currently existing barriers.
- **Niche markets**: It does not seem to be clear niche opportunities to be discovered deriving from the PLATOON project outcomes.
- **Customer Trends**: As previously mentioned in the *Unmet needs* point, the PLATOON project can channel a customer desire for greater freedom of choice and flexibility. The results of the project will lay the ground for future digital applications that will be less IoT platform-centric and more oriented to the customers' real needs. This can also mean a new negotiation position of customers with major IoT platform solution providers.
- **Creating a dramatically low price point:** The objective of the PLATOON project is not to achieve what has been called a *low-end disruptive innovation* where a business is altered by the emergence of a product whose price is considerably low.

3.4. Actual and Potential Market and Submarket Size, Growth and Profitability

The following section illustrates the periodical analysis on the size and expected growth of the IoT platform market in the energy sector. There is not a full coincidence among them since the results depend on the sample of companies being interviewed and the specific definition of the energy sector each one of the analysts is using. There is, however, a consensus that the IoT platform market is valued at around 20 billion USD in 2020 and is expected to reach 35-40 billion USD by 2025 with a CAGR (*Compound Annual Growth Rate*) around 12-14%.

The structure of the market in the last few years has been as follows:

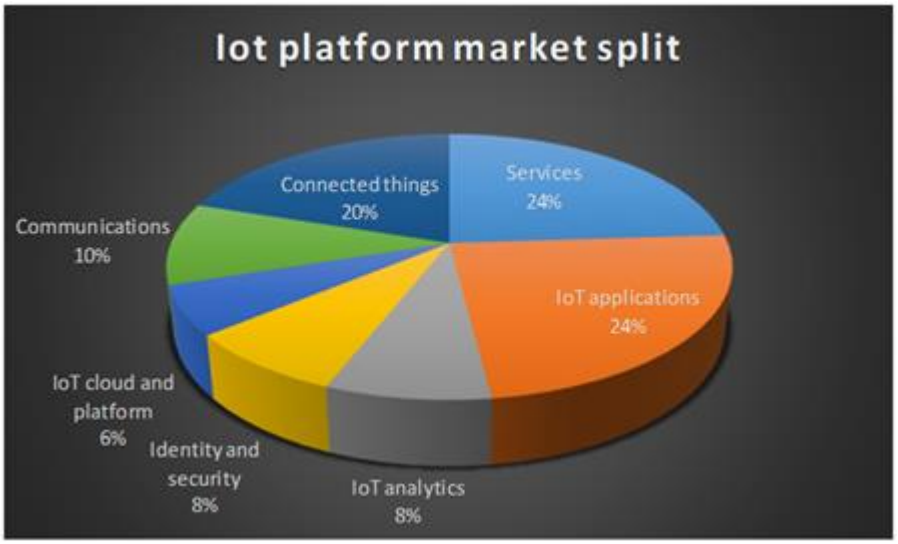

Table 6 IoT platform market split[2]

Almost 50% of the expenditure is around services and IoT applications. Services, IoT applications, IoT analytics and identity & security are expected to grow at a higher pace, while IoT cloud & platforms, communications, and sensors (connected things) are expected to lag mainly due to commoditization and scale effects.

The impact of the PLATOON project is mainly located in Services (24%), IoT applications (24%), IoT analytics (8%) and communications (8%), thus a 65% of the total market size.

Figure 6 IoT in energy market growth rate, trends, and forecast (2020-2025) by region[3]

In geographical terms, the APAC area (Asia-Pacific) is expected to hold the greatest growth. The increasing adoption of smart grid architecture, technology upgrades, energy management, and regulatory mandates will be major contributing factors for the growth of the IoT in energy market in this region. Europe and US/Canada will have a medium growth while it will be low in LATAM and Africa.

The COVID-19 pandemic is having a moderate effect on the IoT platform market, in the sense that different industrial processes have been partially stopped and the IoT adoption strategies by many

[2] "Winning in IoT: It's All About the Business Processes", BCG

[3] INTERNET OF THINGS IN ENERGY MARKET - GROWTH, TRENDS, AND FORECAST (2020 - 2025), Mordor Intelligence
https://www.mordorintelligence.com/industry-reports/internet-of-things-in-energy-sector-industry

companies have been delayed or slowed down. Since no core capacities of the IoT platform have been impacted by the situation (on the contrary, digitalization may be even encouraged by the COVID-19 pandemic) a recovery to the original forecasts is expected after the COVID-19 situation.

The figures and forecasts shown so far are related to the IoT platform market, a much larger arena than the one resulting from PLATOON project. In relation to the specific outcomes of PLATOON, it is very difficult to anticipate the actual market volume that may lie ahead, since a quite radical concept change is introduced, and it must be first validated by the market before assessing the market size and future projections. It is expected that the concept will first go through a period of broadcasting and consolidation (a commercial effort will be needed here) and, if successful, a market reaction will most probably arise, and some other competitors will show up with their own solutions related to the interoperability of IoT platforms. It is true that technological markets react very quickly and as mentioned before, there is not really a technology barrier protecting the competitiveness of the PLATOON project outcomes. Anyway, a window of 4-5 years can be anticipated until the market becomes mature and competition may saturate the market.

In terms of profitability, following Porter's five-factor model, the aspects to be analyzed are:

- **Existing and potential competitors**: As already mentioned, the outcomes of the PLATOON project mostly create a greenfield opportunity at this moment. There are several initiatives, most of them within the European Union . However, competition can be expected in the short term if the concept is successful. There are several remarks about how competition may arise worth making. Big players or technological vendors are not expected to react so quickly towards a collaborative approach as the one suggested in PLATOON. Their struggle in the last few years has been to gain a larger market share and probably they will not be willing to collaborate with other competitors. A different story may be small companies or startups that can find a niche in IoT platform interoperability. However, the existence of EU-funded projects such as PLATOON and similar ones with the participation of many European companies belonging to different profiles is a substantial competitive advantage since a lot of the networking and broadcasting effort is already implicit.
- **Substitute products**: Given that the result of the PLATOON project is not really a product, but a concept, it is assumed that there might be or might come up some partial solutions in the market to the same problems PLATOON is addressing, but it is not expected that a comprehensive solution to interoperability covering data exchange, analytics toolbox and security coverage is going to be easily proposed and developed by anyone.
- **Customer power:** Even though the very concept of interoperability is of high interest to any customer as already detected in the market, there are some foreseen barriers that have to do with the customer position. Some of them will be discussed here:
    - Cost barrier: Even though the combination of different solutions can, in principle, be the best option in many cases, it will probably entail additional costs coming from different infrastructure suppliers, different licenses and distributed services. In the short term this can result in additional costs for the customer. This can be somehow kept under control if the solution is fully under the PLATOON umbrella, but this is not always going to be the case. In the medium term, if the interoperability concept proves to be successful, suppliers will have to adapt to it, and this may result in a commoditization of platforms and tools that will make things easier.
    - Technology barrier: PLATOON is defining architectures and rules to make interoperability possible and secure. These guidelines will be followed by the PLATOON community, but do not need to be applied by other competitors and that is going to hamper interoperability with other platforms/tools in some cases. Again, if the concept is successful, everyone will be interested in being as compliant as possible with interoperability rules, but in the short term this is not expected.

- **Supplier power:** The community of companies and institutions participating in PLATOON is a conglomerate of well-established parties with a strong influence, especially in the European market, and is a very valuable asset in terms of product/services commercialization and diffusion. Their relationship with customers of small size can be a very good scenario for proving the concept right and showing the potential benefits to the rest of the market.

3.5. Cost Structure and distribution systems

When considering cost structure, it is important to understand the different phases the product/service goes through, these can provide some hints about present and future key success factors that will be discussed in the next section. An analysis of the value chain is needed to determine which are the stages with the highest proportion of value added and concentrate on those to associate a key success factor. A key success factor is a skill or competence needed to compete in a market or submarket.

The following stages have been determined:

STAGE	VALUE ADDED LEVEL	COMMENTS
Marketing and commercialization	Low	Though a low level of added value, special attention must be paid. It will be discussed when dealing with distribution systems below
Project consultancy	High	This is a crucial step to setup the project and design the solution. It will also assess the customer situation and expectations.
Hardware infrastructure	Low	It will be mainly provided by third-party vendors.
Software infrastructure	Medium	IoT platform can be provided internally in PLATOON or third-party vendors. The same situation applies to analytics applications or data exchange (PLATOON marketplace).
Implementation services	High	Services during the project: tool setup, communication setup, etc.
Post-implementation services	High	A critical part of the value chain, since technology and implementations will continue evolving after the project completion

Table 7 Product life cycle

Distribution channels represent one of the four elements of the Marketing Mix (“4 Ps” - product, promotion, price, placement i.e., distribution). They represent the way an organisation makes its product or service available to the end consumer. There are plenty of distribution channels, but none of them works universally for any category of consumers, for this reason the analysis of customers and their needs is a fundamental step together with the analysis of a set of other elements like:

- the size of the market which is being targeted.

- Investment required by the distribution channel and the profitability each channel might bring.
- Product characteristics e.g., is it standard and the same version can appeal across different customers or does it need tailoring according to the consumer and therefore a direct contact with the customer is needed?

Awareness	Evaluation	Purchase	Delivery	After Sales
How do we inform customers about the characteristics of the products/service, its Value Proposition?	How do we aid customers in evaluating the Value Proposition? The customers evaluate, read about, or use the product and form an opinion about it.	How can we help customers in buying the product/service? This is the sales process.	How do we deliver the promised value proposition to the customer?	How can we provide After Sales customer care and support?

Table 8 Distribution channel Phases

In the case of PLATOON project, distribution channels should be regarded as communication and dissemination channels, since no real distribution like in other industries is made. The two main phases that will be covered during the project activities are *awareness* and *evaluation* through the application of the communication and dissemination strategy identified in WP9 and the validation activities performed in WP6. WP7, which concerns the identification of supportive partners and ambassadors to support the success of the two Open Calls, will also help with communicating the objective of PLATOON to potential applicants and a wider audience. The selected SMEs (6 and 7 per Open Call respectively) will also contribute towards the success of PLATOON's objectives as these SMEs will be developing tools and services on top of the PLATOON architecture. An analysis of the strategy and plan for the other three phases (*purchase, delivery and after sales)* will be analysed as part of the business model activities in WP8. Work package 9 (WP9 - Communication and Dissemination) is specifically focused in defining and developing these communication and dissemination channels. Among them:

- PLATOON website
- Social Media
  - Twitter
  - LinkedIn
  - YouTube
- Printed Material
  - Press releases
  - Posters
  - Brochures
  - Flyers
  - Other materials (promotional)

It is expected that communication & dissemination channels will not dramatically change over the next few years. To further promote the diffusion of the project results a special attention will be paid to the results of the seven pilots included in the project, due to the great appeal to future interested customers that sharing real use case results has.

3.6. Market Trends and Key Success Factors

Today's market trend analysis largely focuses on two aspects[4]:

- Anticipated change.
- Importance assessment (whether true trend or fad).

It is very difficult to anticipate changes in such a dynamic market. Technological innovations may disrupt the market as has previously happened. Nevertheless, there are a set of aspects that stand out and can be expected to drive the market:

- **Edge computing**: Understood as the capability of processing data close to the source where the data was created. In the energy sector, low latency, the immediacy of analysis and the capability of acting on the source of the data where most immediate decisions and actions are needed are the most outstanding features. The line between OT and IT which has almost completely disappeared in terms of data transfer will also be blurred in the case of control actions and increasingly more IA and ML capacities will be incorporated into control systems.
- **IoT and 5G**: With extremely high bandwidth, ultra-low latency, and high-density connections, 5G technology will enhance the IoT and enable innovative use cases that are impossible to be done via older network standards. Edge computing, AR and VR in mobility applications, asset interconnection, etc. will be some of the areas that will benefit from 5G technology adoption.
- **AR in O&M**: Mobility applications together with Augmented Reality can transform maintenance operations such as we know them today. Work orders will include not only a description of the work to be done, but also all the technical information needed to tackle the job.
- **Building management**: Buildings are already in the way of becoming energy efficient with optimized heating, ventilation and air conditioning systems, and more efficient lighting. Smart buildings will increasingly move towards space optimization, object detection for safety, security, wayfinding, and asset tracking, with the help of advanced technologies like location services, image recognition vision and ML.
- **Changes in business models**: Companies will change their business models in the sense that a customer will no longer buy a machine or equipment, but rather the service it performs. This business model is possible now due to the IoT availability. Hardware producers will be able to provide, for example, maintenance services and manage spare parts more efficiently that individual customers could.
- **Security:** Security is a huge concern for IoT adopters and will continue to be so in the future. IoT vendors and technology providers have no other option than focusing on increased security and develop end-to-end security at the core of their offerings.

If we look in detail into the market of energy management systems (EMS), we can see that two main factors influencing it are:

- The emergence of IoT
- The Ability to measure energy in real time

[4] Internet of Things Trends in 2019, https://medium.com/mainflux-iot-platform/internet-of-things-trends-in-2019-7e20ef2bb64f

Existing EMS are, therefore, evolving into platforms that monitor and manage all energy use in buildings enabling not only energy management, but also the creation of an environment of energy economics, sustainability, and operational efficiency[5].

These and other market trends will have to be carefully watched by the parties interested in BDA. Based on the experience, many of them have already been included in the PLATOON project since its very inception.

Key Success Factors (KSF) are defined as the assets and competencies that provide the basis for competing successfully. There are two types:

- **Strategic necessities**, they are not distinctive strengths, rather their absence would mean a clear weakness.
- **Strategic strengths**, on the other hand, provide a true base of advantage.

The following table lists some Key Successful Factors and classifies them according to the previous types. As it is evident, KSF are strongly dependent on the development or exploitation phase under consideration. Some of them will become almost irrelevant, while others will emerge in the future.

Key Successful Factor	Type	Comment
Technology and innovation	Necessity	During the development phase (the duration of the PLATOON project) this competency will be critical to achieve a valuable outcome
Dissemination and marketing (networking)	Necessity	When the offering coming from PLATOON is mature it will be the time for the go-to-market phase, and this will be a clear need. The offering needs to hit the market and gain critical mass quickly if it is going to be successful
Customer references and piloting	Strength	Beyond the use cases included in the project, additional successful implementation or pilots would be desirable to gain momentum in the market. Aggressive pilot policies may be considered.
Consultancy resource availability	Strength	A group of skilled engineers and consultants must be available at the beginning of the exploitation phase when required to work with customers, define scopes and manage expectations. This is something that must be prepared in advance, even with

[5] Gartner, Market Guide for Energy Management Systems, IoT, 13 April 2017

		an internal certification that would enable someone to perform this kind of job
Strategic partner policy	Strength	A successful strategic partner policy may be very useful to overcome initial cost or technology barriers as the ones identified in the Porter's five-factor model analysis.
Unity and coordination in the PLATOON community	Necessity	A project core infrastructure will be needed in the future to ensure that the PLATOON concepts are continuously adapted to technology changes and perform a coordination among the PLATOON community. A certification to work under the PLATOON umbrella can also be issued by this group to the companies or institutions willing to adopt the PLATOON outcomes.

Table 9 PLATOON Key Successful Factors

4. PLATOON stakeholder's analysis

The Platoon project aims to digitalise the energy sector, enabling thus higher levels of operational excellence with the adoption of disrupting technologies. Seven different pilots will validate the technologies developed within the project and reaching technologies close to the market. It is important to identify who could benefit from the findings of the project in order increase their engagement before the end of it, therefore, their needs can be fulfilled.

In the process of defining an exploitation plan, analysing relevant stakeholders is crucial for identifying and fulfil the market necessities. The overall strategy towards the stakeholder's analysis will be divided in four steps:

- Step 1: Stakeholders' classification
- Step 2: Relation among stakeholders and their motivations
- Step 3: Stakeholder mapping
- Step 4: Key stakeholder identification

4.1 Stakeholder Classification and Motivation

This analysis is run by the industrial partners of the project during the first year of the project, for a later use in the following deliverables of this Work Package.

To have a better understanding of the stakeholder's needs, it is important to define a classification in different categories depending on their situation on the value chain and their business sector:

- Electricity producers / Utility companies

- Electricity network operators and maintainers
- Electricity retailers
- Electricity end users
- Engineering companies and ICT companies
- Academia and other EU projects
- Policy makers / regulators
- Others

PLATOON is a project with developments affecting most of the links of the electricity sector chain, from the generator companies (for example from Predictive Maintenance of Wind Farms in pilot 1a, or Electricity Balance, Predictive Maintenance, energy management in pilots 2a and 4a), network operators as DSO and TSO (Electricity grid stability, connectivity, and Life Extension in pilot 2b) and final users (Office buildings and smart cities in pilots 3a, 3b and 3c). The outputs of the project will be used by electricity companies, but their technology providers (Engineering companies, ICT companies, etc.) might have a big interest in them, and the novelty of the solution can influence the academia, other EU projects in energy and regulators. Finally, other organizations not included in the mentioned classification may have interests in PLATOON, for example Non-governmental Organizations (NGO).

The stakeholder motivation depends on their role as stakeholders, defined as the following:

- **Direct beneficiaries:** those who directly with aspects of the energy systems and sector benefiting from the toolbox (DSO/TSO, microgrids operators, …)
- **Technology providers:** those who provide the equipment used by energy system Actors (hardware suppliers, ICT suppliers, developers, PLATOON Open Call applicants…)
- **Regulatory/advisory:** stakeholders who shape and influence energy regulations, policies, etc. (European commission, markets regulators …)
- **Indirect beneficiaries:** Other stakeholders who benefit from PLATOON outcomes (research organization, aggregators…)

Direct beneficiaries	Technology providers	Regulatory/advisory	Indirect beneficiaries
• DER owners • Wind turbine operator companies • Transmission system operator (TSO) • Distribution system operator (DSO) • Smart grid operator • Research organizations	• Data analytics companies • SCADA developers • EMS/BMS & equipment manufacturer • Systems integrator	• Governments • European union	• Electricity retailer companies • Consumers associations • Research organizations • Transformation manufacturer • Energy Service Concessionaries & Global Services Providers • Energy service companies (ESCOs) • HVAC Equipment manufacturer • Building Owner/Manager

Table 10 PLATOON stakeholder classes

Each stakeholder listed in Table 1 is analysed to evaluate the added value of PLATOON to their activities and operation focusing on their business motivations of each these organizations.

4.2 Relation among stakeholders and their motivations

The components and services provided by the PLATOON platform that are most relevant for each pilot and a description to explain the opportunities that PLATOON offers to help them to achieve their core motivation are highlighted in the table below.

Stakeholder	Stakeholder classification	Rolle	Motivations	Pilot's stakeholders	Relevant component	Description
Consumers associations	Electricity end users	Indirect beneficiaries	Better service at a better price	3a, 3b, 3c	All developments	Improve grids and their costs can influence to the client's services and price
Data analytics companies	Engineering companies and ICT companies	Technology providers	New line of business	1a, 2a, 2b, 3a, 3b, 3c, 4a	Software tools in predictive maintenance, forecasting models, etc.	Novel building blocks for analytics platform
DER owners	Electricity producers / Utility companies	Direct beneficiaries	Increase DER integration, Optimal operation of the grid, decrease maintenance costs, Improving RES integration	4a, 2a, 3a and 3c	EMS/ algorithms, RES effects calculator, PV Predictive maintenance - edge computing service, RES forecasters	Integration of local generation in the grid, Improve the integration of RES in the grid and avoid damages to devices, Early detection of likelihood of failure in PV, Accurate forecast based on near real-time meter data and detailed static data (e.g., location, hardware information, panel orientation, etc.)
Distribution System Operators / smart grid operator	Electricity network operators and maintainers	Direct beneficiaries	Optimal operation of the grid, decrease maintenance costs, Improving RES integration	1a, 4a, 2a, 2b	EMS/ algorithms, RES effects calculator, PV Predictive maintenance - edge computing service, RES forecasters, Non-technical Losses calculation, Load/demand forecast	Integration of local generation in the grid, Improve the integration of RES in the grid and avoid damages to devices, Early detection of likelihood of failure in PV, Accurate forecast based on near real-time meter data and detailed static data (e.g., location, hardware information, panel orientation, etc.)
Electricity retailer companies	Electricity retailers	Indirect beneficiaries	Improve demand forecast	2a, 3a, 3b, 3c, 4a	Load/demand forecast	Data models for client's parameterization

(electricity or gas)						
Energy Service Concessionaries & Global Services Providers	Others	Indirect beneficiaries	Develop EE solutions and improve their services	3b	all developments	analyse result of their services and could improve them
Energy service companies (ESCOs)	Engineering companies and ICT companies	Indirect beneficiaries	Improve demand forecast and decrease maintenance costs	3a, 3b, 3c, 4a	Software tools in predictive maintenance, forecasting models	New tools for a better forecasting of the energy generated and maintenance of equipment
European Union	Policy makers / regulators	Regulatory/advisory	References for regulation and standard definition	1a	Improved turbine reliability + O&M reduces LCoE	Better insights into turbine failures help to improve next-gen turbine designs and reduce downtime
HVAC Equipment manufacturer	Engineering companies and ICT companies	Indirect beneficiaries	Provide additional services to their clients	3c	Data models in predictive maintenance	Offering new services
Research organizations	Academia and other EU projects	Direct beneficiaries	Development and testing future technologies with EMSs	All	Intelligent services layer and Unified Knowledge Base	Integration of latest Big Data processing approaches (knowledge graphs, federated querying, edge computing) and new industrial concepts (i-spaces)
SCADA developers	Engineering companies and ICT companies	Technology providers	Provide additional servicer to their clients	2a and 3c	Data models in predictive maintenance	Including in a SCADA systems data models in maintenance for a better planification and reduce its costs
Systems integrator	Engineering companies	Technology providers	Provide additional	All	all developments	Include state of the art technologies to their offers (IA, ML, BDA, IOT and more)

	and ICT companies		servicer to their clients			
EMS/BMS & equipment manufacturer	Engineering companies and ICT companies	Technology providers	Knowledge of the state of energy demand and production Ensuring comfort of the occupants Interoperability	3a, 3b, 3c	Load/demand forecast, predictive maintenance, energy management, energy efficiency, edge computing, interoperability	Increase revenues Sales of equipment and consultancy services
Building Owner/Manager	Electricity end users	Indirect beneficiaries	information about building consumption and characteristics Uncertainty on future energy prices and regulations	3a,3b,3c	Load/demand forecast, predictive maintenance, energy management, energy efficiency	Cost and energy-savings Improved operation of equipment Green innovative image
Transformers manufacturers	Others	Indirect beneficiaries	Reduce transformer maintenance costs	2b	Health monitoring (Remaining Useful Life)	Data models in predictive maintenance
Transmission System Operator	Electricity network operators and maintainers	Direct beneficiaries	Decrease maintenance costs, control area balance	2a, 2b	Data models in predictive maintenance, Non-technical Losses calculation, Load/demand forecast	Improve predictive maintenance for saving costs, accurate demand forecast

Wind turbine operator companies	Electricity producers / Utility companies	Direct beneficiaries	Decrease maintenance costs; Increase RES integration	1a	Data models in predictive maintenance and power generation; RES effects calculator, RES forecasters	Improve predictive maintenance for saving costs, Better generation prediction for a better integration in a smart grid

Table 11 Stakeholders identification and motivations

4.3 Stakeholder mapping

To show the importance of the project stakeholders, they are rated by their influence and interests to the project (from 0 to 5, being zero, no interest or influence and 5 crucial influence or interest). The rating is defined based on pilot's owners experience.

Stakeholder	Influence (0-5)	Interest (0-5)
Electricity retailer companies (electricity or gas)	1	2
Data analytics companies	2	4
Energy service companies (ESCOs)	2	2
Research organizations	2	3
Systems integrator	2	2
Consumers associations	3	0
Energy Service Concessionaries & Global Services Providers	3	5
European Union	3	3
HVAC Equipment manufacturer	3	2
SCADA developers	3	2
Transformers manufacturers	3	2
Transmission System Operator	3	4
EMS/BMS & equipment manufacturer	3	4
Building Owner/Manager	3	2
DER owners	4	5
Distribution System Operators / smart grid operator	4	4
Wind turbine operator companies	4	5

Table 12 Stakeholders influence and interest rating

In the following graph, it is shown visually, the importance of the different stakeholders.

4.4 PLATOON Key stakeholder identification

Identifying key stakeholders is crucial in defining how to approach them. Considering the interest and influence rate, stakeholders can be classified in four groups depending on the strategy of communication with the project:

4.4.1 Satisfy (High Influence, less Interest): stakeholders who has high influence, but they are difficult to engage to the project. It is important to consider their objectives and consider the risk of getting them off the project.

- Consumers associations
- SCADA developers
- HVAC Equipment manufacturer

- Transformers manufacturers
- Building owner/manager

4.4.2 Manage (High Influence, High Interest): key stakeholders who their relationship to the project is important to fulfil its goals. It is important to engage them to the project.

- DER owners
- Wind turbine operator companies
- Distribution System Operators / smart grid operator
- Transmission System Operator
- EMS/BMS equipment manufacturer
- Energy Service Concessionaries & Global Services Providers
- European Union

4.4.3 Monitor (Low Influence, Less Interest): Their relevance to the project is low however it can change over time, so partners will keep them informed about the progress of the project.

- Electricity retailer companies
- Energy service companies (ESCOs)
- Systems integrator

4.4.4 Inform (Less Influence, High Interest): Even they do not have strong influence in the project, it is important to keep them updated about the progress of the project for ensuring their support.

- Data analytics companies
- Research organizations

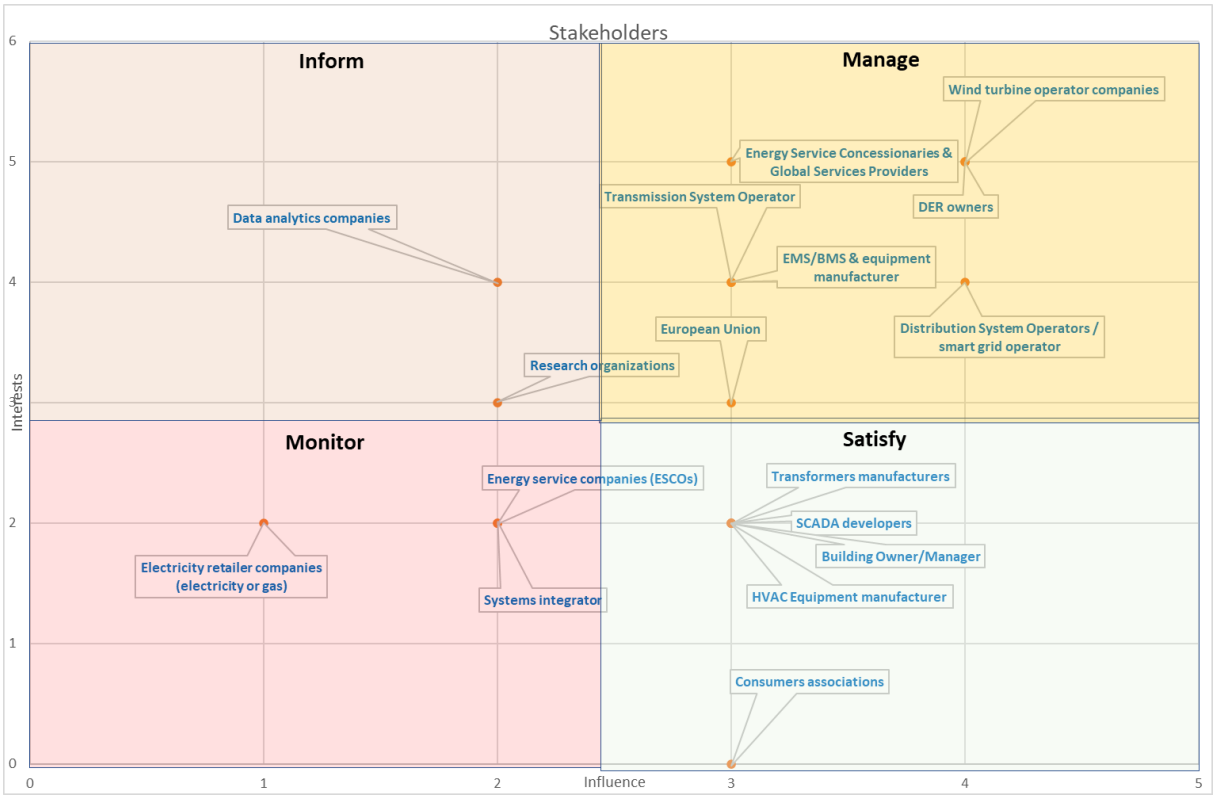

Figure 7 PLATOON stakeholders mapping

Based on upon stakeholder analysis and classification, the table below provides stakeholder strategies to implement to develop a sustainable exploitation plan for the large-scale adoption of PLATOON Exploitation results beyond the project lifetime.

Stakeholder Group	Characteristics	Strategy to maximise their engagement
1. To manage	High Influence & High Interest	• Key players focus effort on this group • Engage and consult regularly • Involve in governance
2. To satisfy	High Influence & Less Interest	• Engage and consult in their interest area • Try to increase level of interest • Aim to move into key players
3. To inform	Less Influence & High Interest	• Show consideration and make use of interest through involvement in low-risk areas • Keep informed and consult on interest area • Potential supporter
4. To monitor	Less Influence & Less Interest	• Inform via general communications: Newsletter, website, etc. • • Aim raise their interest and to move into group to be informed

Table 13 Key stakeholders with associated strategies for engagement

The success of PLATOON leverage data and provide new analytics tools that enable the development of new services and boost the decarbonization of the energy sector depends strictly on the involvement and the cooperation on the of the two first ones (High Influence & High Interest - High Influence & Less Interest). They might show interest, but they have higher influence and power than the stakeholder categories to inform and to monitor and their rescission could lead to the failure of the project.

However, although big data platform development could be successful with low involvement of Electricity retailer companies, Energy service companies (ESCOs), Systems integrator or data analytical companies, if they are involved in an early stage using the strategies listed in **Table 13** for stakeholders to inform (Less Influence & High Interest) and stakeholders to monitor (Less Influence & Less Interest), the platform components will be more complete and further business opportunities may arise.

5. Conclusion

The big data platform market analysis indicates that, even though IoT and big data solutions are increasingly penetrating the market in Europe, America and the APAC region, there are still serval lasting barriers to the large deployment of big data and IoT services in the energy sector. These are gradually being removed since there are recognized benefits of big data platforms' implementation. The services offered by digital platforms to the energy sector would additionally exploit synergies, improve the efficiency and the quality managing a large volume of raw energy data and result a significant cost reduction. Analytics platforms is a major segment of big data platforms and expecting a significant growth between 2020 and 2025, mainly due to the growing adoption of smart grids, technology upgrades, energy management and the awareness of the need for big data analytics solutions. Many energy businesses, both large and small, are increasingly adopting these solutions to reach a broader customer segment, reduce the risk of failure and excel in the energy highly competitive market.

The stakeholder analysis regarding the outcomes PLATOON project is crucial to determine and fulfil the market necessities. This analysis pinpoints four categories of stakeholders: Stakeholders to manage (High Influence & H interest), to satisfy (High Influence & Less Interest), to inform (less Influence & High Interest) and those to monitor (Less Influence & Less Interest). The stakeholders with high influence and power with respect to digital energy platform include DER owners, wind turbine operator companies, TSO/DSO/smart grid operators, EMB/BMS manufacturer, HVAC manufacturer, transformers manufacturer, SCADA developers, building owners/managers and consumers associations. The stakeholders with less power and interest still playing an important role in the success of the project, include electricity retailer companies, ESCOs (energy services companies), system integrator, data analytics companies and research organizations. The stakeholder analysis highlighted the relevance, interest, and power of a range of energy actors. The motivations and needs of each stakeholder were identified to drive the definition of value proposition and define the best strategy to approach each of them and fit between their desired and the proposed solutions and services within PLATOON.