D2.4 Summary and assessment of business models

Web of Objects Project

Version 04

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1. Introduction

1.1. Scope and objectives of WoO

The Internet of Things (IoT) envisions a world where small intelligent objects share data with each other or cooperate in groups to achieve complex goals. However, current devices and communication infrastructures characterized by proprietary protocols and a lack of common standards both on network and application level prevent the realization of this vision. We are targeting a Web of Objects (WoO) facilitating smart distributed applications that combine information from different domains currently isolated from each other. In order to break up that isolation and facilitate simple development, deployment and operation of smart distributed applications an integrated design based on a uniform resource-efficient infrastructure, uniform data and services models and a comprehensive semantic description leveraging tool-based automation of Operations, Administration and Maintenance (OA&M) processes is required. This WoO facilitates easy creation of cross-domain applications able to target goals that have not been envisaged at system deployment time.

The general goal of the WoO is to simplify object and application deployment, maintenance and operation of IoT infrastructures subject to strict constraints regarding resources as computing power, communication bandwidth and energy supply. Hence, acquisition, processing, network computing and intelligent systems are research agenda of the project. These goals fit strategic research agendas for the EU and individual countries, since the developed technology is standardization in network that contributes to improving energy efficiency, security and safety, and the public infrastructure in society in general.

The general goal of the WoO project will be achieved by working on the following technical goals:

- A general system reference architecture based on consolidated application requirements;
- An uniform resource-efficient network infrastructure based on IPv6 and 6LoWPAN;
- An open homogeneous distributed service infrastructure;
- A semantic and adaptive service composition layer;
- Demonstrators validating the WoO concepts.

The WoO project's goal is to simplify object and application deployment, maintenance and operation on IoT infrastructures. The project will therefore leverage service architecture concepts to propose a coherent architecture applicable to heterogeneous (wired/wireless, different protocols) and dynamic environments of objects embedded in smart environments. As the nature of the envisioned resources (real-world objects ranging from battery-powered, low-bandwidth wireless networked sensors to complex and powerful devices) makes it necessary to have a much less strict separation of layers in the whole approach compared to the current paradigm – the WoO should be much more "resource/network aware" than its well-known counterpart. This means that mechanisms such as offering scalability over tens of thousands of points, providing event filtering and aggregation, or support for heterogeneous media including wireless networks with low bandwidth availability should be made visible to the WoO layer.

To reach this goal, the project mainly covers the following:

- For Network & Devices: This project proposes enhancements to a set of low-level networking technologies covering Low Power Wireless Technologies and protocols including IPv6 and propose enhanced network mechanisms potentially accessible from upper layers (routing,

localization). The project also investigates the security mechanisms necessary to protect user's privacy at the device level.

- For Elementary Services: This project propose a semantic description language describing objects, their capabilities and provide mechanisms to expose and manage them with respect to existing regulations and adapt existing embedded services technology to the specific requirements of resource-constrained devices. The project also provides mechanisms allowing objects to be aware of and to react to their environment.
- For Composition & Semantic Mechanisms: This project specify and develop mechanisms for creation, composition, deployment and management of objects and aggregated services usable in applications and propose a way to test existing empowered objects behaviour and composed services consistency via ad-hoc simulation. The project also provides a way to integrate legacy systems in the WoO.
- And, this project showcases the technology through several demonstrators covering business scenarios in professional and home buildings.

While the project is investigating on various use cases to stay more focused, the project results will be applicable to a large set of other domains.

1.2. Scope and objectives of the document

The present document (D2.4) has been prepared under Work Package 2 (*WP2: Use Cases, Application Requirements and Business Models*) and represents the results of task T2.4 Business Models.

These are the main objectives of this document:

- Define the business models for the applications in the WoO project
- Analyse those business models extracted from the use cases and demonstrators, including a risk an threat analysis and possible directions to improve the defined models
- Lay the foundation of the exploitation and dissemination activities of WP7

The structure of the document is as follows:

- In chapter 2 background material is presented, such as an overview of the concept of business models and an explanation of the templates selected to describe and analyse the business models.
- Chapter 3 includes the definition and analysis of the business models for the applications in the WoO project extracted from the defined use cases and demonstrators. These initial models will serve as the basis of the exploitation activities of WP7, in which business models will be refined, so the models described in this document represent an early approach to the business behind the applications and services developed in this project.
- Chapter 4 summarizes the risk assessment of the defined business models.
- In chapter 5 the patterns of the different business models described in chapter 3 are analyzed.

2. Background

2.1. Definition of Business Models

For companies and institutions, it is essential to explore the possible alternatives to turn the development of new products and technologies into a sustainable business.

There is much literature from the past few decades about what a business model is and several proposed definitions [Zott. et al.], where the main differences stem from the context in which the definition has been applied. In any case the general concept is clear: business models describe how companies handle its major activities to create, deliver and capture value.

In order to develop and analyze the business models according to the use cases and the demonstrators defined in this project, we are going to use the methodology proposed in Running Lean [Maurya]~~[Maurya]~~. This book presents a process of studying the market needs based on Customer Development, Lean Startup, Bootstrapping and the author's own experience. The main purpose of this process is to create products and applications with a unique value proposition that solve real customer problems and that ideally from the start will generate revenue.

As a part of that process, the Lean Canvas is presented to define and deconstruct the possible business models into nine different elements focusing on identifying the risks of the model and tracking ongoing learning. Therefore, the Lean Canvas is a business model hypotheses testing tool for companies that can be used as a tactical map to validate the initial assumptions and find a plan that works before running out of resources.

The process of filling the Lean Canvas starts with the identification of the customer segments of the company, the problems they have and how can the company solve them. This allows to define the business models directly from the customers' needs and demands. The recommendation is to elaborate one canvas per customer segment, as the elements of the business models can vary significantly for each case, and to focus on the problems that are really worth solving.

The second step of the process consists of describing the unique features of your products or services that satisfy the customers' needs and that can make those target customers choose your solution instead of other existing alternatives. These features will be exploited to tackle possible solutions to the defined problems. These solutions don't have to be fully defined here, it is only necessary to write the key elements and capabilities next to each problem.

The next step deals with finding and building paths to the target customers that can be used since the beginning of the plan deployment.

The *Cost Structure* and *Revenue Streams* elements of the canvas are related to the analysis of the economic viability of the business, defining how much it will cost to develop the solution and take it to the market, and how much money, time and effort is required to start getting benefits.

In order to measure the progress, success and viability of the business model, it is necessary to define a set of metrics that will be systematically checked. This will also allow to validate the initial assumptions, to measure the engagement of our early adopters to the proposed solution and to check if they are willing to pay for it.

Finally, the *Unfair Advantage* element is related to the competitive advantage of the company, referring specifically to those values that your company offers and that cannot be easily copied, and that can differentiate significantly your company from the competition.

In Figure 1~~Figure 1~~ a template for the lean canvas is presented. Detailed information about the different elements can be found in [Maurya2].

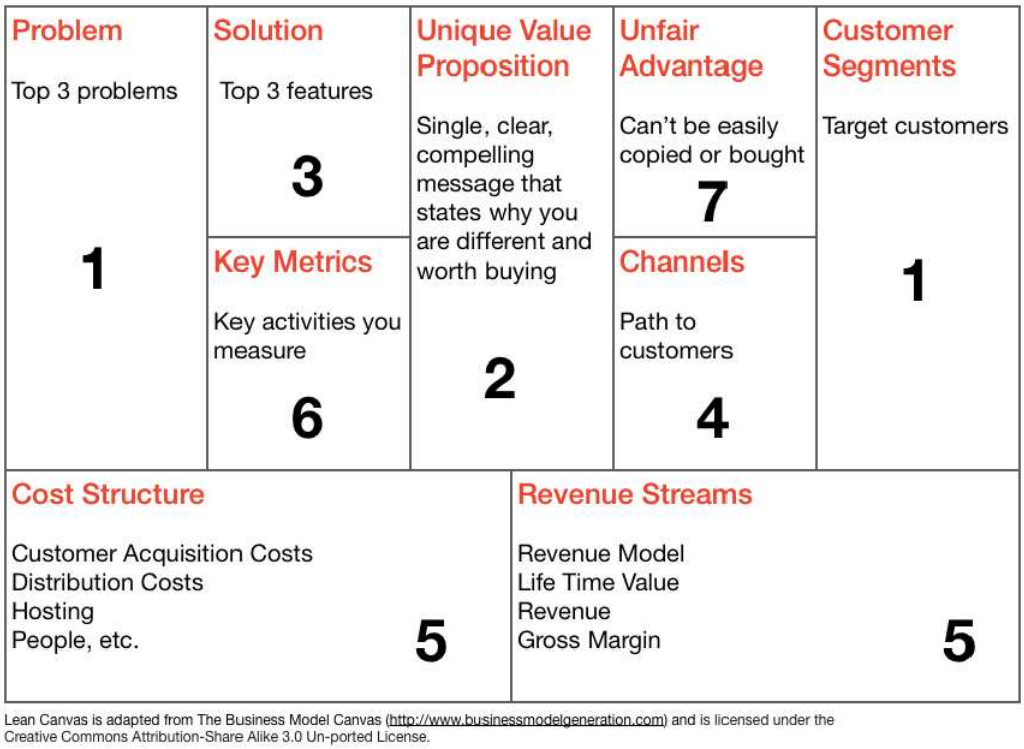

Figure 1 – Lean Canvas template

2.2. Risk Analysis

Once the decomposition is completed, it is essential to identify the risky aspects of the plan in order to start testing the riskiest elements in the different stages of the process. These are the steps proposed to determine and analyse the different risks associated to the business models:

1) Identify risks

This task includes the search of those factors that will influence the project, causing one of these:

- Reduction or delay of the benefits
- Extension of the timeframes
- Increase of the costs
- Reduction of the quality of the products/services
- Failure of the project
- Loss of customers

Figure 2~~Figure 2~~ shows the categories in which risks can be classified regarding to the different elements of the lean canvas, which are: developing the right product (*Product Risk*), building appropriate paths to customers (*Customer Risk*) and building a sustainable business (*Market Risk*).

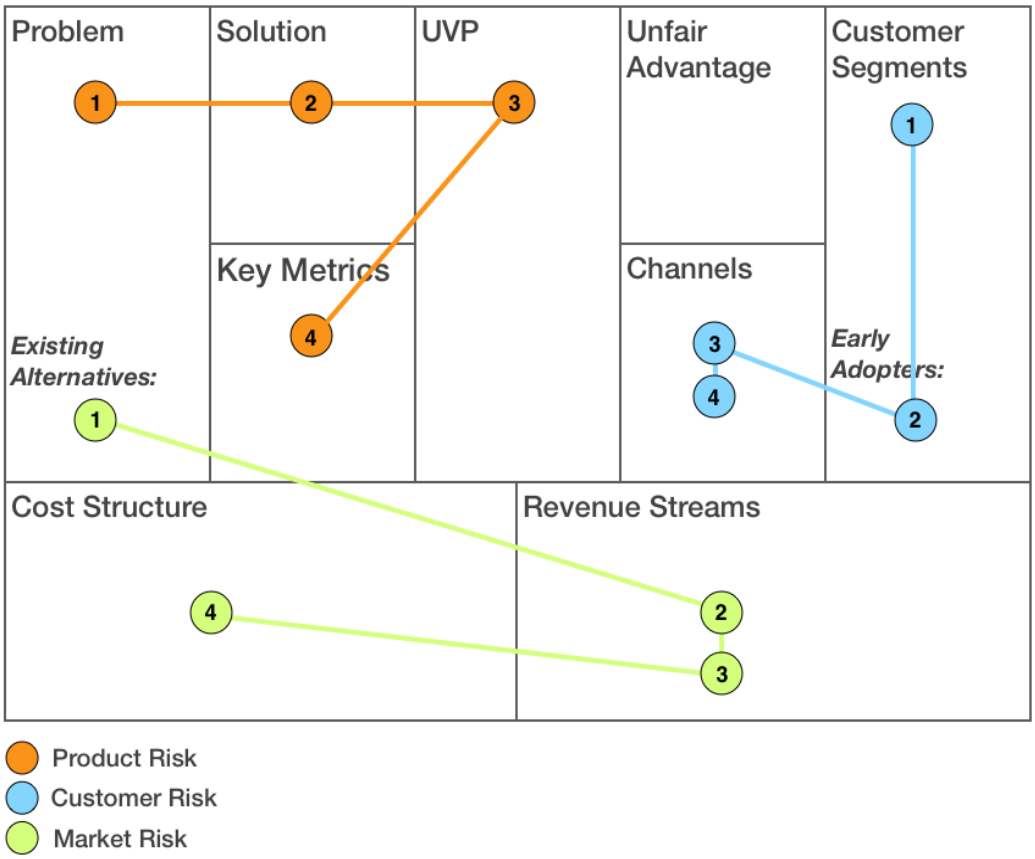

Figure 2 – Risk Classification and Lean Canvas

2) Analyze and evaluate risks

Determine the impact on the project of each risk before implementing any control or mitigation measure, and also the probability of those identified risks to appear *(Low/Medium/High).*

3) Risk template

After the initial work of identification of risks, each partner involved in this task will identify the top 3 to 5 risks in the development of their applications in this project, prioritizing those which have more impact on the project and that are more probable to occur, and fill in one template per risk described (Figure 3~~Figure 3~~).

This work includes summarizing the activities or control measures that will be implemented to test the selected risks and the person or team responsible for those tasks.

It also entails the enumeration of the strategies or plans for addressing the risk, which can be used to:

- Avoid the risk (eliminate the cause of the risk)
- Mitigate the risk (reduce the impact of the risk)
- Manage the consequences of the risk

Risk_ID	Format: PartnerAcronym_BusinessModelAcronym_RID_XX Example: *VT_RM_RID_1* *(* Partner: Visual Tools, business model for the Retail Market solutions)*
Risk Name	A title for the risk Example: *Lack of demand of the product*
Description	Brief description of the risk Example: *There is not as much demand of the product as once thought*
Category	Product/Customer/Market Example: *Market*
Level	Severity of the impact of the risk in the development of the project/application (Low/Medium/High) Example: *High*
Who to test	People that will test the risk Example: *Early adopters*
How to test	How to test the risk Example: *Build a Minimum Viable Product that the early adopters can use and test*
Owner	Person or team responsible for ensuring the risk is mitigated Example: *Commercial and marketing teams, development team*
Mitigation Strategies	Strategies for avoiding, mitigating or managing the risk Example: *Preparing in-depth market studies* *Scheduling periodic interviews with early adopters and potential customers in order to extract the market needs and the improvements or modifications that shall be done*

Figure 3 – Risk assessment template

The last stage of the process consists of selecting the business models to start to work with, prioritizing those which are addressed to customers who need your product the most and who will pay for it enough to maximize your price margins, but also taking into account the biggest customer segments and those that are easier to reach, and of course the feasibility of your solution.

As a result of this process, inefficient business models can be detected and discarded in an early stage while other models can be refined and adapted to real demands of the customers in order to become sustainable business models.

3. Definition of the Business Models for the applications of the Web of Objects

3.1. Concordia University BM definition: Platform-as-a-Service for Cloud-based robotic applications

3.1.1. Customer Segments

Cloud computing is an emerging paradigm that encompasses three main facets: Infrastructure as a Service – IaaS, Platform as a Service – PaaS, and Software as a Service – SaaS. The platforms (offered as PaaS by platform providers) are used by service providers to develop and manage applications. These applications are then provisioned to end-users (or other applications) as SaaS on a pay-per-use basis. The platforms add one or more levels of abstraction to the infrastructures offered as IaaS by infrastructure providers. They ease application provisioning, including development, deployment and management. Cloud computing has several inherent advantages, such as the easy introduction of new applications, resource efficiency, scalability, and access from anywhere and anytime.

Robotic applications cover a very wide spectrum (e.g. health, intelligent home, agriculture) and are becoming critical in several aspects of everyday and business life. Concordia University envisions the use of Cloud computing as a basis for a platform for robotic applications' provisioning. This will leverage the Cloud computing benefits and will be beneficial for robotic applications in different domains.

Target customers / end-users

- Application providers: to create, deploy, and manage their applications
- Platform providers: entities willing to play a PaaS provider role
- Infrastructure providers: the owners of a robotic infrastructure that wants to add a level of abstraction to their infrastructure and make it available to application providers

3.1.2. Problems and existing alternatives

Despite the fact that robots are increasingly present in various fields, robotic applications' provisioning in an efficient manner remains a difficult task. There is currently no platform devoted to the development and management of robotic applications in Cloud settings. The general platforms for application development and management in Cloud settings (e.g. Google Apps Engine) do not cater to the specifics of robotic applications. The existing platforms for robotic applications (e.g. Microsoft Robotic Development Studio, DAvinCi, and RoboEarth) have several limitations.

- They are domain dependent and are not designed to allow components' reuse across applications and hardware
- They don't allow reuse of robots and robotic information/services across domains and applications
- They are not designed to enable efficient use of resources

- They don't allow universal access (anytime, anywhere, and from any device) to the robotic applications
- No inherent interoperability between the existing platforms is provided

3.1.3. Unique Value Proposition

Concordia University envisions a Cloud-based platform for robotic applications that overcomes the limitations discussed in the previous sub-section. The main benefits of this platform are as follows:

- Easy provisioning of new robotic applications: The platform will support application providers throughout the life cycle of their applications, including development, testing, deployment, use, and monitoring.
- Application independence: The platform provides basic and common building blocks to develop and manage a wide range of applications. The new applications can be built and provisioned as SaaS.
- Reuse of building blocks/services from different domains: The platform offers necessary mechanisms to enable the discovery and reuse of existing building blocks (e.g. basic robotic services) from different domains. An application can for instance reuse a set of robotic functionalities from different domains to provide an advanced functionality (e.g. via composition), or to enable scalability (e.g. discover and use a new robot –with specific functionality- to serve new users).
- Support of both novice and experienced application developers: the platform targets developers with different levels of expertise, in both robotic and application development.
- Easy access and use of the platform: the platform is offered as a service (i.e. PaaS) in the Cloud, which facilitates its usage by the application providers.

3.1.4. Solution

- Identification of the common building blocks for robotic applications' provisioning: A set of common building blocks should be identified, along with the appropriate level of granularity in order to allow the development and management of a wide range of applications.
- Publication and discovery: to be able to reuse existing robotic services to build new and advanced services, a solution should be provided to allow the publication and discovery of such services. This includes a service registry, a service description language, and a publication and discovery interface.
- Service composition and application management: application providers should be provided with a solution that will enable the composition of existing basic services to create advanced ones. They should also be provided with a solution that will ease the deployment and management of their application.
- Robots virtualization: to enable efficient use of resources, a robot virtualisation infrastructure should be provided. This will for instance allow a single robot to be used by more that one application, allow more than one application/basic service to run on the same robot, or allow a set of robots to collaborate in order to execute a composed task.
- Interface to use the platform: Algorithms and interfaces should be defined for the use of the platform.

3.1.5. Channels

- International journals and conferences: Concordia University will actively participate in international events (e.g. conferences, workshops) where the proposed solution will be presented. The output of the work will also be submitted to international journals for publication.
- Prototypes and demos: Concordia University will work on the prototype implementation of the platform. Demos will also be prepared and presented to the research partners (including industries).

3.1.6. Revenue Streams

- Patents and software licence: Vendors and service providers willing to use a patented or a developed solution.
- Solution customization: Provisions will be made for the customization of the platform according to the requirements of the customers. This customization and related R&D will generate revenue.
- Consulting/maintenance

3.1.7. Cost Structure

- Research costs (including students salaries, conferences cost, etc)
- Developing and testing costs (use of tools, testing facilities and human resource)
- Hardware costs (smart devices used for the prototype and testing purposes)
- Marketing costs (including participation in events)

3.1.8. Key Metrics

- Number of licenses sold
- Number of clients requiring consulting or maintenance

3.1.9. Unfair Advantage

- These are the main advantages that Concordia University has:
- Technical know-how of research and development
- Trained human resource
- Partnership with industry and service providers

3.1.10. Lean Canvas

CUBM_1: Concordia University's Business Model 1				
Problems 1. Robotic applications'	**Solution** 1. Identification of	**Unique Value Proposition**	**Unfair Advantage** • Technical know-how	**Customer Segments** • Robotic application

<table>
<tr>
<td>provisioning is currently difficult
2. There is currently no platform for robotic application provisioning in Cloud setting
Existing alternatives
• General platforms for application provisioning in Cloud settings
• Platforms for robotic applications</td>
<td>common building blocks
2. Publication & discovery
3. Service composition
4. Robot virtualisation
5. Platform interface
Key metrics
o Number of licenses sold
o Number of clients requiring consulting or maintenance</td>
<td>• Easy provisioning of new robotic applications
• Application independence
• Reuse of building blocks/services across domains
• Support of both novice and experienced developers
• Easy use of the platform</td>
<td>of research and development.
• Trained human resource
• Partnership with industry and service providers.
Channels
• Technical dissemination in conferences, journals, workshops and related events
• Platform prototype and demos</td>
<td>providers
• Robot infrastructure providers
• Robot platform providers
Early adopters
• R&D partner
• Research community</td>
</tr>
<tr>
<td colspan="3">Cost Structure
• Research costs
• Developing and testing costs
• Hardware cost
• Marketing cost</td>
<td colspan="2">Revenue Streams
o Licences
o R&D
o Consulting/maintenance</td>
</tr>
</table>

Figure 4 – Concordia University's Lean Canvas for a Platform-as-a-Service for robotic applications

3.2. Concordia University BM definition: Smart Device Virtualization Service

It is envisioned that virtualization of smart devices, used within the context of WoO project, will greatly help in efficient management of the resources. Virtualization is an enabling technology that allows operators and service providers to create a pool of high end computing resources and use them efficiently so that each resource is used optimally and to its full potential. Also it allows smart devices to be used for multiple applications and services, along with their default application. Smart Device Virtualization Service (SDVS) is an enabling technology developed by Concordia University that will enable the efficient and optimal use of smart devices for multiple applications, even those that are envisioned after the completion of WoO.

3.2.1. Customer Segments

Concordia envisions that SDVS will be beneficial in these scenarios:

- *Emergency*: In hazardous events like fire, flooding or during other life threatening events, rescue services like ambulances, police and fire brigade can arrive at the scene and using their devices will be able to hook up with the SDVS service and get details information about the events, like its map, spread and future direction. In a large residential complex where there are many buildings, any hazardous event can be equally destructive for other buildings in a matter of time. SDVS will help rescue services to effectively predict the future course of the event and proactively make rescue plans for residents in other buildings.

- *Business*: In scenarios where officials need to visit a building to hold an important business meeting, SDVS can diligently provide the information to the newcomers like meeting room, lift or floor where the meeting room is located and even guide them if they move to opposite direction. Personalized service/tours can be provided once the visitor enters the premises of the building by making use of various smart devices located in the building using the SDVS.

Target customers / end users:

- Service providers
- Emergency/rescue services and workers
- Business and corporate users
- General Public

3.2.2. Problems and existing alternatives

Currently there is no service available for smart devices to share their generated data outside their own network. There is default application and default user that is able to make use of that data. As discussed above there are many situations where it is beneficial to be able to exchange smart device data across networks. The following are the problems

- There exist isolated smart device networks which are able to work on their own but are unable to collaborate with each other.
- In many situations it is not possible for some new entity or user to access the smart device data quickly to make informed decisions, e.g. in emergency situations.
- In situations where the sites have private network of smart devices, it is difficult to share data across domains, which could give huge advantage to operator or monitoring authority to gain full insight across all sites.

Although there is not much work regarding a service which offers virtualization of smart devices to provide them as open access infrastructure, capable of supporting multiple applications running in parallel, some device level alternatives are

1. Proxy based solution, however this does not allow for cross domain data exchange, are not general purpose and mostly is good for simple data sharing in publish and subscribe model.
2. Direct attachment of smart devices to Internet, but this makes smart devices available on the Internet and introduces the issues of security and privacy. Cross domain data exchange becomes costly due to inherit problems of Internet like, loss, delay etc.
3. Over the Air (OTA) installation of new application code in the device to make it run new application. This however is not the most efficient way of doing.

3.2.3. Unique Value Proposition

SDVS developed by Concordia will be able to address the above mentioned problems in an efficient manner. The following are the benefits of using SDVS.

1. SDVS allows the efficient usage of the computing resources to their full potential.
2. In the context of WoO, smart devices with sensory capabilities are used. With the use of SDVS it will be possible to share these smart devices with multiple users and applications.

3. Traditionally a smart device is used by its own application or service. With the large scale deployment of these smart devices, it becomes imperative to open up these devices to multiple applications or services. This helps in offering innovative and new services by third-party service providers.
4. SDVS helps in breaking the traditional boundaries of private networks, while maintaining the security and privacy of the devices and users. In the context of WoO, traditionally smart devices deployed in each building share date within their own private domain. It is often not possible for some external entity to make use of the data provided by these smart devices as that external entity is not part of their network. SDVS helps in breaking this boundary, using their virtual instances it is quite possible for these smart devices to exchange data across domains. The need for such exchange arises in situations like emergency situations like fire, hazard and flood where external entities like police, rescue and fire brigade need to make timely decisions to minimize human loss.
5. SDVS realizes the separation of smart device and data generated by smart device. Traditionally these two go together and any application or service managing smart device also has exclusive access to its data. With SDVS this is segregated and applications that do not have direct access to a smart device can still use the data generated by it and offer improved service.
6. With SDVS it is possible to compose services on the go, like in emergency situations. This will in turn help in reducing the time required to offer service to the user.
7. SDVS can be extended further to include the 'cloud computing' concept. Data generated from large scale WoO devices can be sent to cloud that is better equipped to handle it.
8. SDVS will provide end-to-end solution for providing new and innovative services and allows multiuse access to device data across the domain to drive innovation.

3.2.4. Solution

The solution provided by Concordia will be the following

1. A Smart device virtualization framework that will allows the efficient and optimal usage of smart devices.
2. An open visualization framework that can be used by the developers/service providers to offer collaborated and federated services, allowing cross domain data exchange.
3. Ability to run multiple applications from multiple users at the same time.
4. A future proof framework that will allow developers/service providers to continue offering new and innovative services in the future as need or demand of a service grows.

3.2.5. Channels

1. Concordia University will work on the prototype implementation of the SDVS.
2. During the development phase Concordia University will actively participate in the international conference, workshops and events to display and present its SDVS.
3. Depending on the significance of the proposed solution, Concordia University will apply for patents and possible commercialization of SDVS.

3.2.6. Revenue Streams

1. Concordia will licenses its SDVS technology to vendors and service providers interested in using SDVS for their work.
2. Provisions will be made for the customization of the SDVS according to the requirements of the end user. This customization and related R&D will generate revenue.
3. Consulting/maintenance

3.2.7. Cost Structure

1. Developing and testing costs (use of tools, testing facilities and human resource)
2. Hardware costs (smart devices used for the prototype and testing purposes)
3. Marketing costs (including participation in events)

3.2.8. Key Metrics

1. Number of licenses sold
2. Number of clients requiring consulting or maintenance

3.2.9. Unfair Advantage

These are the main advantages that Concordia University has:

1. Technical knowhow of research and development.
2. Trained human resource.
3. Liaison with industry and service providers.

3.2.10. Lean Canvas

CUBM_1: Concordia University Business Model 1				
Problems 1. Isolated networks of smart device working on their own 2. not possible to execute external applications in case of emergencies **Existing alternatives** • Proxy based solutions • Directly connecting smart devices to the Internet	**Solution** 1. Smart device virtualization 2. Efficiently and optimally manage smart devices 3. Ability to run multiple applications at the same time 4. New innovating applications and services possible even after project is finished 5. Useful for everyday activities, business oriented and	**Unique Value Proposition** o Smart device virtualization to efficiently and optimally manage resources o End-to-end solution for providing new and innovative services and allows multiuse access to device data across the domain.	**Unfair Advantage** • Technical knowhow of research and development. • Trained human resource • Liaison with industry and service providers.	**Customer Segments** • Service providers • Emergency services and workers • Business and Corporate users **Early adopters** • Project partners • Research community

<table>
<tr><td rowspan="2">• OTA installation and installation of new application code to the smart devices</td><td>emergency services</td><td rowspan="2"></td><td></td><td rowspan="2"></td></tr>
<tr><td>Key metrics
• Number of licenses sold
• Number of clients requiring consulting or maintenance</td><td>Channels
• SDVS prototype
• Technical dissemination in conferences, workshops and related events</td></tr>
<tr><td colspan="2">Cost Structure
• Developing and testing costs
• Hardware costs
• Marketing costs</td><td colspan="3">Revenue Streams
o SDVS licenses
o R&D, customization of SDVS
o Consulting/Maintenance</td></tr>
</table>

Figure 5 – Concordia University Lean Canvas for the Smart Device Virtualization Service

3.3. KT BM definition: Conflagration Alarm Service

3.3.1. Customer Segments

KT assumes that WoO environment would be as follows:

- Sensors are used to provide subcategory-services with information and the subcategory-services compose an entire service for an environment. For example, fire alarm subcategory-service works using a fire detector, smoke detector, fire extinguisher, smart mobile device, and so on. Pet care subcategory-service is operated by pet's thermometer sensor, SMS server, CCTV and so on. Those subcategory-services construct home smart building service.
- Each sensor communicates with gateway system which provides sensor information to overall one view service.
- The gateway system contains service enablers and service platform. The service enablers detect new incoming sensors and enable to come into the entire service. The service platform provides unified service view and sends data to users.
- Moving sensors exist in the WoO environment as shown in figure below. Service Enabler of gateway system should be able to detect the entered new device for enabling corresponding subcategory-service.

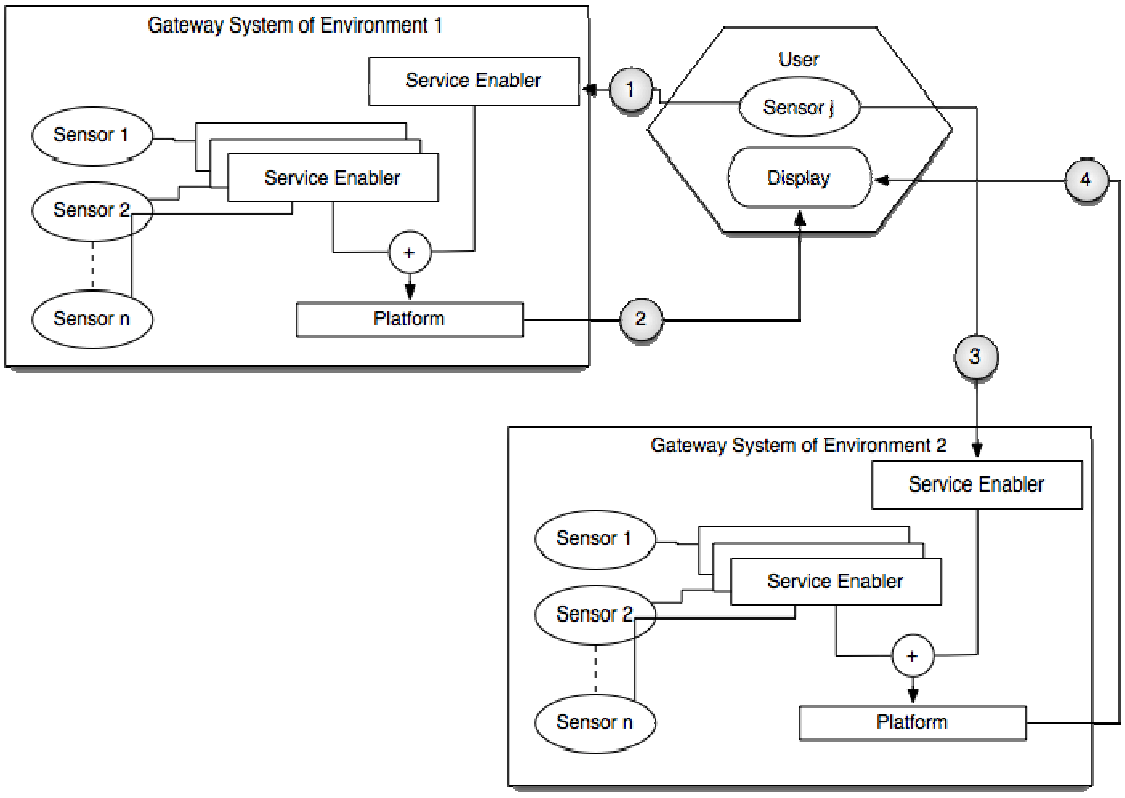

Figure 6 - Overall structure of how to build a service in the WoO environment.

KT defines the “Conflagration Alarm Service”, oriented mainly to these target buildings:

- Massive shopping malls: Automatic conflagration checking service will be implemented in the shopping mall. Basically, a conflagration sensor is required for detecting fire in building. Tracking customers’ location requires for providing the shortest exit route in shopping mall. Lastly CCTV as sensor also uses to capture fire images for sending to fire house.

Target customers / end users:

- Shoppers
- Maintenance operators

3.3.2. Problems and existing alternatives

Current fire alarms drive people to evacuate the building by emitting a loud alarm sound. The shrill sound perplexes the people and it’s difficult to find shortest exit path in mass shopping mall.

Fire fighters can’t know which floor is empty in mass building without checking it floor by floor. Tracking people can inform where people are in building.

3.3.3. Unique Value Proposition

- Dynamic orchestration service in according to each building: the installed sensor depends on the environment and the provision of the service is defined by sensors. Even though the conflagration service is provided in building “A”, the same service could not be provided to

building “B”. Repeatedly speaking, orchestration service happens on each different location or environment.

- Low barrier for developers or service providers comparing with commercial closed embedded technology: Any developers can use API by means of HTML and Java script. Such technology will facilitate the work to starters.

3.3.4. Solution

- Sensor based object communication: Current commercial wireless communication technology requires huge computing power. Since high frequency band consumes much power, low band frequency telecommunication requires in tiny objects such as IR (Infrared Radio). Moreover, a simple protocol approach needs to be adapted.
- Diverse orchestration services: The gateway system detects new entered objects, and after finishing the analysis of the object profile, the service enabler inserts a new service in the overall service.
- Evaluation of events: Objects will send only raw data quantized by an analog sensor to the gateway system. The service modules will analyse the current status and will determine whether an event occurs or not.
- Group users who will receive the system messages: Each sensor will probably have its own address for communicating with the gateway system. IP based communication separates and groups in according to subnet mask. Detailed split subnet mask will provide information on how to group users.
- Tracking people’s location in buildings: existing location detection via WIFI systems can be used.

3.3.5. Channels

- Open Source API: A common API that will allow using the sensor data will be publicly available on the internet. Such action makes early adopters to test it and propagates to common developers to develop new services.
- Existing distribution channels for mobile applications: A prototype application can be free downloaded by normal users through the App Store or the Android Market.

3.3.6. Revenue Streams

- Software licenses: Company sales pioneering software for embedded devices and web service platforms.
- Building operators: The smart building service is optimized for mass buildings. Such buildings request much maintenance fees. By applying the smart building solution, such high cost can be reduced.

- Product of Gateway platform: Embedded system’s API will be provided on line. Company can expect that early adopters challenge to create new services. More new service developed needs more analytic systems and gateways.
- Consulting

3.3.7. Cost Structure

- Developing and testing costs
- Support team and maintenance team (Gateway System)
- Consulting team
- Marketing costs

3.3.8. Key Metrics

- Number of licenses sold
- Number of clients requiring consulting or maintenance
- Number of sensor based devices sold supporting this solution

3.3.9. Unfair Advantage

These are the main advantages that KT presents:

- The company's partnership with the most important technological partners of digital image.
- The company's know-how and technical expertise in the gateway system.The company's huge infrastructure such as having a network system in the building of the mass shopping mall.

3.3.10. Lean Canvas

<table>
<tr><th colspan="5">KTBM_1: KT's Business Model 1</th></tr>
<tr>
<td rowspan="2">Problems
1. Current fire alarms makes people perplex
2. Fire-fighters can't know where people are in a building

Existing alternatives
• Fire alarm systems using loud sounds</td>
<td>Solution
1. Sensor based object communication
2. Orchestration of diverse subcategory-services
3. Evaluation of events
4. Group users who will receive system messages
5. Tracking people's location in buildings</td>
<td rowspan="2">Unique Value Proposition
o Dynamic orchestration service in according to building
o Low barrier for developers or service provider comparing with commercial closed embedded technology</td>
<td>Unfair Advantage
• Partnership with developing experts.
• Platform know-how
• Network infrastructure.</td>
<td rowspan="2">Customer Segments
• Shoppers in shopping malls and department stores
• Operators of building maintenance
Early adopters
• Challengers that want to develop software on new devices
• R&D project partners</td>
</tr>
<tr>
<td>Key metrics
o Number of licenses sold
o Number of clients requiring consulting or maintenance
o Number of sensor based devices sold</td>
<td>Channels
• Public online place providing a common open source API for developers
• Existing distribution channels for mobile applications (free mobile app)</td>
</tr>
<tr>
<td colspan="3">Cost Structure
• Developing and testing costs
• Support and maintenance teams</td>
<td colspan="2">Revenue Streams
o Software licenses
o Direct sale of products (building maintenance system,</td>
</tr>
</table>

• Consulting team • Marketing costs	gateway platform) o Consulting

Figure 7 - KT's Lean Canvas for their solutions for their Conflagration Alarm Service

3.4. KT BM definition: Pet Care Service

3.4.1. Customer Segments

In the environment described in section 3.3.1, KT also defines the "Pet Care Service", oriented mainly to smart homes equipped with a set of sensors (such as conflagration sensors and a bio temperature sensors) that will allow detecting pet's condition to control home's temperature while residents are out of home.

In this case the target customers will be:

- Residents who have pets at home

3.4.2. Problems and existing alternatives

- After residents get out of home, pets are left alone and they are exposed to danger. For instance, one of the pets could die by low temperature if the owner forgets to turn off air-conditioning.
- Residents have to get back home to control the temperature of the home.
- The owner of the pets sometimes wants to know the current status of the pet in out-of-home.

3.4.3. Unique Value Proposition

a) Dynamic orchestration service in according to each building: the installed sensor depends on the environment and the provision of the service is defined by sensors. Even though the conflagration service is provided in building "A", the same service could not be provided to building "B". Repeatedly speaking, orchestration service happens on each different location or environment.

b) Low barrier for developers or service providers comparing with commercial closed embedded technology: Any developers can use API by means of HTML and Java script. Such technology will facilitate the work to starters.

3.4.4. Solution

1. Auto detection of pet's condition: Biomedical sensor will collect data of pet's body temperature.
2. Tracking pet's location: A message including a picture of the pet will be sent to residents. CCTV needs to know where the pet is.
3. Temperature Controller: If the temperature of home is lower than the threshold point, home controller system needs to control the temperature such as turning air-conditioning off.

4. Methodology of notifying alarm message to owners: The owner is registered into the gateway system with his cellular phone number. Two types of messages can be received: SMS (Simple Message Service) and push notification messages through smart cellular phone.

3.4.5. Channels

1. Open Source API: A common API that will allow using the sensor data will be publicly available on the internet. Such action makes early adopters to test it and propagates to common developers to develop new services.
2. Existing distribution channels for mobile applications: A prototype application can be free downloaded by normal users through the App Store or the Android Market.

3.4.6. Revenue Streams

- Software licenses: Company sales pioneering software for embedded devices and web service platforms.
- Building operators: The smart building service is optimized for mass buildings. Such buildings request much maintenance fees. By applying the smart building solution, such high cost can be reduced.

1. Product of Gateway platform: Embedded system's API will be provided on line. Company can expect that early adopters challenge to create new services. More new service developed needs more analytic systems and gateways.
2. Consulting

3.4.7. Cost Structure

- Developing and testing costs
- Support team and maintenance team (Gateway System)
- Consulting team
- Marketing costs

3.4.8. Key Metrics

- Number of licenses sold
- Number of clients requiring consulting or maintenance
- Number of sensor based devices sold supporting this solution

3.4.9. Unfair Advantage

These are the main advantages that KT presents:

- The company's know-how and technical expertise about mobile applications.
- The company's huge network infrastructure.

3.4.10. Lean Canvas

<table>
<tr><th colspan="5">KTBM_2: KT's Business Model 2</th></tr>
<tr>
<td rowspan="2">Problems
1. Pets left alone at home are exposed to danger
2. Residents can't confirm the current status of their pets when they left home</td>
<td>Solution
1. Auto detection of pet's condition
2. Tracking pet's location
3. Automatic temperature control system
4. Sending notification messages to owners</td>
<td rowspan="2">Unique Value Proposition
o Dynamic orchestration service in according to building
o Low barrier for developers or service provider comparing with commercial closed embedded technology</td>
<td>Unfair Advantage
• Know-how about developing mobile application.
• Network Infrastructure</td>
<td rowspan="2">Customer Segments
• Residents who have pets at home
Early adopters
• Challengers that want to develop software on new devices
• R&D project partners</td>
</tr>
<tr>
<td>Key metrics
o Number of licenses sold
o Number of clients requiring consulting or maintenance
o Number of sensor based devices sold</td>
<td>Channels
• Public online place providing a common open source API for developers
• Existing distribution channels for mobile applications (free mobile app)</td>
</tr>
<tr>
<td colspan="3">Cost Structure
• Developing and testing costs
• Support and maintenance teams
• Consulting team
• Marketing costs</td>
<td colspan="2">Revenue Streams
o Software licenses
o Direct sale of products (building maintenance system, gateway platform)
o Consulting</td>
</tr>
</table>

Figure 8 – KT's Lean Canvas for the Pet Care Service

3.5. NMATec BM definition

NMATec's product is mainly an "Autonomous Energy Efficient Climate Control Solution for SMART Buildings" or what we call it "***ClimaCon***" which augments centralized or individual HVAC systems to provide in-building climate control solution using Wireless sensor Networks. This solution is designed for the highest energy efficiency as well as the utmost comfort in terms of (temperature, humidity, air quality, etc.). Moreover, it has been intended to be easy to deploy, maintain and integrate with legacy systems.

There are different ways of generating revenue from ***ClimaCon*** through the following approaches/Models:

1. Selling the ***ClimaCon*** directly to HVAC manufacturers (OEMs) who can integrate it and offer it with their systems as an add-on option. This is a kind of Business-to-Business (B2B) channel / model which should result in high volume sales (sizeable contracts) but with exhaustive marketing efforts.
2. Providing a full service of deploying the product on existing installed systems for both commercial and residential customers. This is a direct sale channel to end-customers that should result in a bigger number of small contracts with exhaustive marketing efforts as well.
3. Retrofitting the existing systems for different HVAC manufacturers with our ***ClimaCon*** and offering the service and consultation for executing that. Usually this will be done after the HVAC has been

manufactured without the inclusion of ***ClimaCon*** during the manufacturing process. This is a burdensome task and could be costly that will make it not easy to market and be handled on a case by case basis.

4. Licensing the system to electrical-infrastructure contractors to deploy it through their projects implementations and offering supporting service as well.

3.5.1. Customer Segments

Based on the above description, we can partition our target customers into the following segments:

1. **HVAC OEMs**: Selling ***ClimaCon*** directly to HVAC manufacturers, so that they can integrate it and offer it with their system as an add-on option.
2. **Existing HVAC Users:** (e.g. commercial or residential building owners) providing the service of deploying the product on the existing installed systems for both commercial and residential customers.
3. **Legacy HVAC Retrofitters**: Retrofitting the existing systems for different HVAC manufacturers with our product and offering the service and consultation needed to accomplish that.
4. **System/Software Licensees:** selling the system/software licenses to installers, consultants, system integrators, and/or electrical-infrastructure contractors.

3.5.2. Problems and existing alternatives

1. For the first customer segment (HVAC OEMs), these are the top problems they are facing:
   a. High Energy Consumption for their products which can limit its market penetration.
   b. Irregular temperature distribution when using their classical HVAC systems and poor climate control.
   c. High cost of wiring/harness and installation when using classical control circuits.
2. For the second customer segment (Existing HVAC Users), these are the top problems they are facing:
   a. High Energy Consumption for their HVAC systems.
   b. Improper climate due to irregular temperature/humidity distribution.
   c. High cost of both initial and maintenance for their HVAC systems.
3. For the third customer segment (Legacy HVAC Retrofitters), these are the top problems they are facing:
   a. High Energy Consumption for their products which can limit its market penetration.
   b. Irregular temperature distribution when using their classical HVAC systems and poor climate control.
   c. High cost of wiring/harness and installation when using classical control circuits.
4. For the fourth customer segment (System/Software Licensees), these are the top problems they are facing:
   a. Improper climate due to irregular temperature/humidity distribution.
   b. High cost of wiring/harness and installation when using classical control circuits.

These are some of the existing alternatives in the market to solve these problems:

1. Existing technology that solves some of the above problems largely based on wired networks (e.g. BACnet, ModBus, LON, etc.). These wired control technologies are used for HVACs to perform climate control and achieve energy savings.
2. Using remote-control peripherals to assist manual control actions for HVAC users.

3.5.3. Unique Value Proposition

These are the key elements differentiating *NMATec*'s solution (***ClimaCon***) from their competitors:

- **Saving energy**

  Implementing comprehensive algorithms for In-building optimization of HVAC energy efficiency will result in reducing energy consumption (heating, cooling) according to the pre-set control rules such as: - Only use energy when it is really required, Only use the amount of energy actually required, and Apply the energy that is used with the highest possible efficiency.

- **Efficient climate control**

  The developed algorithms will mainly focus on three objectives: Maintaining the delicate mix of climate parameters (temperature, humidity, oxygen level … etc) according to cultural and industrial/business requirements, Reducing CO2 foot print within buildings, and Paving the road for new industries or improving current industries that are heavily dependent on the climate mix.

- **Easy and Cost Effective Deployment**

  By adopting wireless technologies as the backbone of communication between the various sensors and actuators within the developed solution (***ClimaCon***), the effort needed as well as the cost for installation, servicing and maintenance will be greatly reduced through eliminating most of the wiring (50% - 90% of retrofitting costs is due to wiring), connectors … etc. Also, the ease of system reconfiguration is achieved as often wired sensor/actuator locations cannot adapt to building reconfiguration.

- **Smart Monitoring and Diagnostics**

  Providing smart remote monitoring and diagnostics for HVACs; HVACs used on commercial buildings are often poorly maintained and operated. Remote monitoring of this equipment would increase the awareness by building owners and maintenance service providers of the condition and quality of performance of these units, enabling conditioned-based maintenance rather than the reactive and schedule-based preventive maintenance approaches commonly used today. Improved maintenance would help achieve persistent peak operating efficiencies, reducing energy consumption by an estimated 10%.

3.5.4. Solution

These are the main features of the ***ClimaCon*** solution:

1. The solution is mainly consists of a set of Sensors (temperature, humidity, pressure, air-quality, occupancy … etc) and Actuators (solenoids, motors, levers … etc) that work together in harmony to control modern HVAC systems to achieve multiple goals like energy efficiency, effective climate control, smart mentoring and diagnostics, conditioned-based maintenance … etc
2. Adopting Wireless Sensor Networks (WSN) as the core for communication between the various sensors and actuators within the solution; and focusing on low power wireless technologies.

3. An extended network infrastructure based on IPv6, encompassing WSN and legacy field buses (through gateways):- Supporting IPv6-based self-configuration and self-healing, Including appropriate application protocols, algorithms (e.g. routing, power management) and a networking components architecture for optimizing WSN … etc
4. A homogeneous distributed service infrastructure: - Deployable on each node (smart object) of the Web of Objects**,** Adapted to the specific requirements (memory footprint, performances) of WSN**,** Supporting a variety of message exchanges patterns (synchronous and asynchronous request/response, event-driven, streaming**,** Supporting policy-based interoperability and QoS**,** Supporting metadata, policy and semantics-based autonomic behavior: discovery, localization, self-configuration, self-adaptation and self-healing
5. In each node, a semantic and adaptive service composition layer featuring:- Semantic modeling and ontology definition mechanisms, Service component modeling, Service composition and orchestration mechanisms, Semantic reasoning mechanisms: event filtering, correlation and aggregation, situation assessment using object semantics, rule-based and temporal reasoning.

3.5.5. Channels

The main channels include:

- **Direct sales (B2B):** to big HVAC manufacturers (OEMs), legacy systems distributors, electrical-infrastructure contractors and system integrators.
- **Direct sales (B2C):** to commercial/residential building owners, facility managers and tenants.
- **Direct license sales**: to installers, consultants, system integrators, and/or electrical-infrastructure contractors.
- **Inbound channels:** to attract early adopters; like Blogs, SEO (site ranking mechanism), E-books, white papers, webinars, demos, scientific papers, whitepapers and search engine referrals are the main mechanisms that are expected to generate leads.
- **Partnerships**: with HVAC vendors and major electrical-infrastructure contractors will be thought.

3.5.6. Revenue Streams

1. **Product Sales**: the main revenue stream of the company comes from the sales of our product to HVAC manufacturers, commercial/residential building owners, facility managers and tenants.
2. **Service Fees**: from the service of deploying the product on existing installed systems and from the service of execution of retrofitting the existing systems for different HVAC manufacturers with our product.
3. **Licenses of *ClimaCon* Sales**: the company also sells licenses of the proprietary system to system integrators, and/or electrical-infrastructure contractors.
4. **Consultation Revenue:** the revenue stream of consultation of execution of retrofitting the existing systems for different HVAC manufacturers with our product.

3.5.7. Cost Structure

- Manufacturing costs of ***ClimaCon***.

- R &D costs which includes design, prototyping, demos, testing and validation (piloting).
- Commercial, marketing and sales costs.
- Consulting and support team costs (consulting, training and custom configuration deployments).
- Administration including logistics costs.
- Retrofitting costs for the existing systems for different HVAC manufacturers
- Deployment costs of the product with existing installed HVAC systems.

All types of the costs will include the human resources costs.

3.5.8. Key Metrics

These are the main metrics that can be used to measure the success of the proposed solution:-

Technical Metrics:-

1. Energy efficiency metric: The average %age energy saving achieved during a specified period of time.
2. Control effectiveness metric: The deviation of the measured climate mix from the preset values.
3. Deployment effectiveness metric: The average %age time saving in deployment of ***ClimaCon*** compared to wired solutions.

Business Metrics:-

1. The number of ***ClimaCon*** systems sold per quarter.
2. The number of ***ClimaCon*** licenses given per quarter.
3. The number of installation, deployment services made per quarter.
4. The number of maintenance agreements made per quarter.
5. The Total hours of consultation offered per quarter.

3.5.9. Unfair Advantage

These are the main unfair advantages that *NMATec* presents:

1. The company's team of experienced and innovative professionals from the software engineering, embedded systems and control systems fields.
2. The low cost of research and development activities.
3. Expertise in implementing integrated electronic management systems adapted to its customers' specific needs and budget.
4. The company's partnership with Cairo University as research center of excellence in wireless technologies as well as automation systems.

3.5.10. Lean Canvas

NMABM_1: NMATec's Business Model 1				
Problems 1. High Energy	**Solution** 1. ***ClimaCon:*** a set of	**Unique Value Proposition**	**Unfair Advantage** 1. Multi-disciplined	**Customer Segments**

<table>
<tr>
<td>Consumption for HVACs.
2. High cost of both initial and maintenance for HVAC systems.
3. Irregular temperature distribution in buildings.
4. High cost of wiring and installation.

Existing alternatives
1. Based on wired networks (e.g. BACnet, ModBus, LON, … etc)
2. Using remote-control peripherals to assist manual control actions for HVAC users.</td>
<td>Sensors and Actuators that work together in harmony to control modern HVAC systems.
2. Adopting low power Wireless Sensor Networks (WSN) for communication between the sensors and actuators in the solution.
3. Based on IPv6 and supporting self-configuration and self-healing and including appropriate application protocols and algorithms (e.g. routing, power management).

Key metrics
<u>Technical Metrics</u>:-
1. Energy efficiency metric.
2. Control effectiveness metric.
3. Deployment effectiveness metric.
<u>Business Metrics</u>:-
1. The number of ClimaCon systems sold per quarter.
2. The number of ClimaCon licenses given per quarter.
3. The number of installation, deployment services made per quarter.
4. The number of maintenance agreements made per quarter.
5. The consultation hours of offered per quarter.</td>
<td>1. Energy saving algorithms.
2. Efficient climate control technique.
3. Easy and Cost Effective Deployment
4. Smart Monitoring and Diagnostics.</td>
<td>experienced and innovative professionals.
2. The low cost R&D.
3. Expertise in implementing integrated electronic management.
4. Partnership with Cairo University.

Channels
1. Direct sales (B2B) to OEMs.
2. Direct sales (B2C) to buildings owners.
3. Direct license sales.
4. Inbound channels: blogs, e-books, white papers, webinars, and demos.
5. Partnerships with HVAC vendors.</td>
<td>• HVAC OEMs (manufacturers.
• Existing HVAC Users: commercial or residential building owners.
• Legacy HVAC Retrofitters.
• System/Software Licensees: installers, consultants, system integrators, and/or electrical-infrastructure contractors.

Early adopters
5. Smart Villages in Egypt.</td>
</tr>
<tr>
<td colspan="3">Cost Structure
• Manufacturing costs of ClimaCon.
• R &D costs which includes design, prototyping, demos, testing and validation (piloting).
• Commercial, marketing and sales costs.
• Consulting and support team costs (consulting, training and custom configuration deployments).
• Administration including logistics costs.
• Retrofitting costs for the existing systems for different HVAC manufacturers
• Deployment costs of the product with existing installed HVAC systems.</td>
<td colspan="3">Revenue Streams
• Product Sales: to HVAC manufacturers, commercial/residential building owners, facility managers and tenants.
• Service Fees: from deploying the product on existing installed systems and from the service of execution of retrofitting the existing systems for different HVAC manufacturers.
• Licenses of ClimaCon Sales: to system integrators, and/or electrical-infrastructure contractors.
• Consultation Revenue: for retrofitting the existing systems for different HVAC manufacturers.</td>
</tr>
</table>

Figure 9 - NMATec's Lean Canvas

3.6. Odonata BM definition: Solutions for Device Manufacturers

3.6.1. Customer Segments

Odonata develops embedded communication middleware bringing high-level communication capabilities to networked devices. The core customers for this technology are device manufacturers that want to extend the capabilities of their devices with smart, autonomous behavior and interoperability.

Device and system end-users, such as a plant or building operator, or even an employee in a smart building, are additional stakeholders that must be taken into account when developing the products, as it is their ultimate satisfaction that will determine if the technology is successful or not. However, they are not direct customers for Odonata.

The immediate early adopters in this case will be the R&D project partners.

3.6.2. Problems and existing alternatives

For the device manufacturer customer segment, the main problems to be addressed include:

- ***Devices must expose atomic network services accessible by a wide range of peers and clients***: because devices may be remotely accessed by a wide range of clients using various technologies (e.g. other devices, Web apps, rich client applications using .NET or Java, enterprise servers using Java, etc…), it is critical to expose their functionality using platform-neutral technologies, such as HTTP, XML or Web services. The challenge is to embed these technologies in small devices, with limited Flash, RAM and processing capabilities. Targets include wireless sensors, which are typically limited to about 100 Kbytes of Flash and 10 Kbytes of RAM.
- ***Devices must provide adaptative quality of service, based on application requirements and resource constraints***: depending on scenarios, devices may need to support secure message exchanges, reliable messaging, high-performance exchanges, etc. Because some of these requirements are not always compatible, it is critical that devices are able to adjust their quality of service to the specific constraints of a given application.
- ***Devices must describe their functional and non-functional capabilities using standard metadata***: in order for devices to be enrolled in applications based on their capabilities, a standard metadata description mechanism must be defined and implemented in devices.
- ***Devices must support standard discovery and configuration mechanisms, based on exposed capabilities***: in order to participate in automated configuration and reconfiguration scenarios, devices should be able to discover peers and be discovered by them, and to configure themselves to interact with newly discovered devices.
- ***Devices must be able to use services and metadata exposed by peers***: in many complex scenarios, in which peer-to-peer interactions are required, devices must be able to act as clients of other devices.

Alternatives for device manufacturers include:

1. Use of gateways or cloud technology to expose data and services to clients, relying on current embedded communication technology (serial line, field bus, binary IP protocol) to move information between the gateway/cloud and the device. In these approaches, Odonata's technology could still be used to develop the services in the gateways and cloud servers, but would be in direct competition

with other solutions that do not need to fulfill the same demanding embeddability requirements (e.g. OSGi platforms, Java or .NET based application servers).

2. Other technologies and standards not compatible with Odonata's service-oriented approach. These alternative approaches include domain-specific standards, such as OPC-UA or BacNet, or existing widespread standards such as SNMP for device management.

3.6.3. Unique Value Proposition

These are the key elements differentiating Odonata's solution from their competitors:

- Network plug&play and reconfiguration - plug devices and start using them
- Access devices using standard Web apps based on HTML5 (no applets or plug-ins), running on all client platforms (including mobile phones)
- Develop complex systems by combining the capabilities of individual devices
- Manage devices through a single, common interface
- Enroll deployed devices in new third-party applications, based on their capabilities

3.6.4. Solution

The proposed solution relies on a low-footprint, portable, standards-based communication middleware, addressing both the server and the client sides. The core modules of the middleware support the main Web services standards, such as HTTP, XML and SOAP, and thus allow the definition of standard SOAP and REST-based services. The core modules also feature support for the Devices Profile for Web Services, which provides plug-and-play capabilities.

The middleware defines an extensibility framework, which allows value-added modules to be plugged and provide support for more advanced functionality, such as security, reliability, high performances through the use of binary XML (Efficient XML Interchange). The extensibility framework also supports extensible metadata that can be used to describe the capabilities of the deployed services.

The middleware is completed by a service development kit, based on code generation, which allows fast development of services.

A few predefined infrastructure components, such as a discovery proxy or a generic gateway, are also provided to speed up the development and deployment of complex systems.

3.6.5. Channels

The main channels include:

- **Direct license sales**, starting with early adopters. Scientific papers, whitepapers and search engine referrals are the main mechanisms that are expected to generate leads.
- **Feature-limited, open source version**: this channel will be used to generate leads for the direct license sales channel.
- **Partnerships with embedded software vendors** (e.g. embedded OS or IP stack vendors) and major software houses will also be sought.

3.6.6. Revenue Streams

- Software licenses
- Maintenance
- Custom application development
- Consulting and training

3.6.7. Cost Structure

- Development and testing costs
- Support team and infrastructure (Web site)
- Consulting team (consulting, training and custom app development)
- Commercial and marketing costs (direct and through forge site)
- Administration

3.6.8. Key Metrics

Two types of metrics are used:

- Technical metrics including footprint and performances measurements are critical to ensure that the product meets its requirements.
- Business metrics include number of sold licenses, of maintenance agreements and the users and downloads of the open source version.

3.6.9. Unfair Advantage

- Technical expertise, combining knowledge of high-level standards and experience of embedded software development
- Participation to standardization bodies in the domain (e.g. OASIS DPWS specification)

3.6.10. Lean Canvas

ODOBM_1: Odonata's Business Model 1				
Problems 1. Devices must expose atomic network services accessible by a wide range of peers and clients 2. Devices must provide adaptative quality of service,	**Solution** 1. Low footprint, portable, standards-based communication middleware (server and client side) 2. Extensibility framework supporting non-functional features (security, reliability,	**Unique Value Proposition** • Network plug&play and reconfiguration • Access devices using standard Web apps based on HTML5, running on all client platforms	**Unfair Advantage** • Technical expertise, combining knowledge of high-level standards and experience of embedded software development • Participation to standardization	**Customer Segments** • Device manufacturers **Early adopters** • R&D project partners **Users:** o Operators of plants,

<table>
<tr>
<td>based on application requirements and resource constraints
3. Devices must describe their functional and non-functional capabilities using standard metadata
4. Devices must support standard discovery and configuration mechanisms, based on exposed capabilities
5. Devices must be able to use services and metadata exposed by peers
Existing alternatives
• Existing technology + gateways/cloud
• Other standards using incompatible technologies</td>
<td>performances) and extensible metadata
3. Development kit allowing fast service development

Key metrics
o Technical:
- Minimal code footprint (Flash and RAM)
- Performances (compared to competitors)
o Business:
- Users/downloads of open source version
- Number of licenses sold</td>
<td>• Develop complex systems by combining the capabilities of individual devices
• Manage devices through a single, common interface
• Enrol deployed devices in new third-party applications, based on their capabilities</td>
<td>bodies in the domain

Channels
• Direct license sales
• Feature-limited, open source version
• OEM licenses through embedded OS/IP stack vendors</td>
<td>buildings and other facilities using networked devices
o Users of the above facilities</td>
</tr>
<tr>
<td colspan="3">Cost Structure
• Development and testing costs
• Support team and infrastructure (Web site)
• Consulting team (consulting, training and custom app development)
• Commercial and marketing costs (direct and through forge site)
• Administration</td>
<td colspan="2">Revenue Streams
o Software licenses
o Maintenance
o Custom application development
o Consulting and training</td>
</tr>
</table>

Figure 10 - Odonata's Lean Canvas for device manufacturer

3.7. Odonata BM definition: Solutions for System Integrators

3.7.1. Customer Segments

Because "smart" networked devices can be combined together to build complex distributed systems, they represent building blocks that may be used by system integrators to develop "turn-key" applications. System integrators are therefore a second customer segment, particularly interested in client capabilities and reusable infrastructure components that help building complex systems.

As for the previous customer segment, the R&D project partners can be the early adopters for the proposed solution and the operators of plants, buildings and other facilities using networked devices, will be the main end-users.

3.7.2. Problems and existing alternatives

For the system integrator segment, the main problems to be addressed include:

1. ***Legacy devices must be exposed as "WoO" devices, through infrastructure components (e.g. gateways)***: existing devices, such as field bus devices, will not have the capabilities to embed the service-oriented technologies. For such legacy devices, a gateway must be used to expose the devices functionality as network services accessible by the “WoO” clients.
2. ***Infrastructure components (gateways, discovery proxies, event brokers, etc.) must provide adaptative quality of service, based on application requirements and resource constraints***: some quality of service requirements (e.g. secure messaging) may be beyond the capabilities of small devices. In such a case, infrastructure components must be available to provide the required functionality by ensuring the appropriate mediation between devices and clients.
3. ***High-level application components (e.g. orchestrators, management applications, etc.) must be able to access device services and metadata***: in order systems to achieve autonomous behavior, high-level application components, such as process orchestrators or management applications, must be deployed and be able to interact with devices. When these components need to be embedded in small devices, embedded communication middleware is required.

Alternatives for system integrators include:

- Use of integrated control systems, such as SCADA systems or network management applications. When devices expose a network interface compatible with mainstream SCADA systems (using for instance OPC-UA) or network management applications (using for instance SNMP), all integration processing may be performed within the management systems.
- “Home-made” solutions based on open-source or commercial components directly competing with Odonata’s technology, without providing the same embeddability capabilities, which may not be required for the development of infrastructure components or client applications.

3.7.3. Unique Value Proposition

In this case, the key elements that differentiate Odonata’s solutions from their competitors are the same as the ones presented in section 3.6.3.

3.7.4. Solution

See section 3.6.4.

3.7.5. Channels

The main channels include:

- **Direct license sales**, starting with early adopters. Scientific papers, whitepapers and search engine referrals are the main mechanisms that are expected to generate leads.
- **Feature-limited, open source version**: this channel will be used to generate leads for the direct license sales channel.
- **Partnerships with major software houses**.

3.7.6. Revenue Streams

See section 3.6.6.

3.7.7. Cost Structure

See section 3.6.7.

3.7.8. Key Metrics

As for the previous customer segment, two types of metrics are used:

- Technical metrics including footprint and performances measurements are critical to ensure that the product meets its requirements.
- Business metrics include number of sold licenses, maintenance agreements and the users and downloads of the open source version.

3.7.9. Unfair Advantage

See section 3.6.9.

3.7.10. Lean Canvas

<table>
<tr><th colspan="5">ODOBM_2: Odonata's Business Model 2</th></tr>
<tr>
<td rowspan="2">Problems
1. Legacy devices must be exposed as "WoO" devices, through infrastructure components
2. Infrastructure components must provide adaptative quality of service, based on application requirements and resource constraints
3. High-level application components must be able to access device services and metadata
Existing alternatives
• Integrated control systems (e.g. SCADA)
• Home-made solutions based on other available open-source and</td>
<td>Solution
1. Low footprint, portable, standards-based communication middleware
2. Extensibility framework
3. Development kit allowing fast service development
4. Reusable components supporting the fast development and deployment of complex architectures</td>
<td rowspan="2">Unique Value Proposition
• Network plug&play and reconfiguration
• Access devices using standard Web apps based on HTML5, running on all client platforms
• Develop complex systems by combining the capabilities of individual devices
• Manage devices through a single, common interface
• Enroll deployed devices in new third-party applications, based on their capabilities</td>
<td>Unfair Advantage
• Technical expertise, combining knowledge of high-level standards and experience of embedded software development
• Participation to standardization bodies in the domain</td>
<td rowspan="2">Customer Segments
• System integrators
Early adopters
• R&D project partners
Users:
o Operators of plants, buildings and other facilities using networked devices
o Users of the above facilities</td>
</tr>
<tr>
<td>Key metrics
o Technical:
- Minimal code footprint (Flash and RAM)
- Performances (compared to competitors)
o Business:
- Users/downloads of open source version</td>
<td>Channels
• Direct license sales
• Feature-limited, open source version
• Partnership with large software houses</td>
</tr>
</table>

commercial components	- Number of licenses sold			

Cost Structure	**Revenue Streams**
• Development and testing costs • Support team and infrastructure (Web site) • Consulting team (consulting, training and custom app development) • Commercial and marketing costs (direct and through forge site) • Administration	o Software licenses o Maintenance o Custom application development o Consulting and training

Figure 11 – Odonata's Lean Canvas for system integrators

3.8. Telespazio BM definition: Remote Metering

3.8.1. Customer Segments

These are the target customers for the Telespazio' remote metering solution:

- o Utilities (Energy Suppliers)
- o Household energy consumers

In this case, these could be the early adopters of the solution:

- Large Utilities companies interested in domotics, remote metering, wireless customer services

3.8.2. Problems and existing alternatives

These are the top four problems of the selected customers:

1. **Time consuming & inefficient door to door reading of energy meters**

   The current reading of energy meters by way of visiting periodically (e.g. monthly) each consumer building and (manually) reading the meters is very time consuming & highly inefficient.

2. **Static configuration of household energy profiles**

   Profiles of energy consume currently are very static. At the most two profiles (night /day) exist. It is very difficult or impossible for the customers two adjust the settings of these profiles. It is not possible for customers to define more fine grained profiles (define when there is no household activity and therefore no energy consumption, etc.)

3. **Impossibility to remotely control household energy consumption**

   Nor the final customer nor the Utility can do read outs of current consumption. It is not possible to detect anomalies in energy consumption (highly fluctuating energy consumption, sudden rises (leaks), etc.)

4. **Complicated to plan & execute inter-corporate discount ticket publicity campaigns**

Due to the indirect relation between the Utility and the customer, it is very difficult to plan inter-corporate discount ticket publicity campaigns whereby the customers receives discounts based upon using services from affiliated companies.

These are some of the existing alternatives in the market to solve these problems:

- *Combination of domotics & household control web interfaces*
  In theory the problems sketched could be resolved using tailor made domotic solutions, provided that the Utility company is capable and willing of executing remote metering.
- *Snail mail, non personalized, massive publicity campaigns*
  Utilities nowadays are using massive non personalized publicity campaigns (advertising on television, sponsoring of sport events, inclusion of advertising leaflets with the (bi) monthly billing, etc.) to promote other services or services from other companies. These kinds of campaigns are costly and very generic since they cannot be directed to specific customers.

3.8.3. Unique Value Proposition

- **Save energy**

  Implementing fine grained profiles will result in reducing energy consumption (heating, illuminating) in hours with low or zero household activity, combined with the possibility to use high power household appliances during non-peak hours (night tariff).

- **Control household expenses**

  Reducing energy consumption means fewer expenses. Moreover the consumer will be stimulated to rethink the household power consumption if provided with the possibility to save expenses.

- **Protection against calamities**

  Possibility to detect leaks or consumption anomalies can prevent calamities (fire, explosion).

- **Cost reduction for Utility company**

  Reducing time and money consuming door-to-door reading campaigns. Better control of low demand hours as a result of exposed user profiles

3.8.4. Solution

These are the main features of the Telespazio' solution:

1. **Automated remote metering**
2. **Adapting energy consumption** based upon user profiles and household activities (occupancy)
3. **Remote control of energy flow** (blocking valve)
4. **Internet interface with actual metering values**
5. **Intelligent household appliances capable of interacting with user profiles** (thermostats, illumination, etc.)
6. **Energy meter gateway capable of generating and broadcasting alarm signals** in case of energy consumption anomalies

3.8.5. Channels

- Expanding actual service portfolio for Utilities using **existing commercial channels**

3.8.6. Revenue Streams

- Main revenue related to the deployment of the telemetering platform, as well as customization of the platform according to the requirements of the customers.
- Maintenance service for the administration of the control centre of the telemetering platform and field-equipments

3.8.7. Cost Structure

- Developing and testing costs
- Hardware costs (remote devices used for the prototype and testing purposes)
- Commercial, marketing and sales costs.

3.8.8. Key Metrics

- Number of applications sold
- Number of devices installed/sold (remote devices)

3.8.9. Unfair Advantage

1. Expertise in project for Utilities
2. Expertise in projects applying automated metering

3.8.10. Lean Canvas

TELBM_1: Telespazio's Business Model 1				
Problems 1. Time consuming & inefficient door to door reading of energy meters 2. Static configuration of household energy profiles 3. Impossibility to remotely control household energy consumption 4. Complicated to plan & execute inter-corporate discount ticket publicity	**Solution** 1. Automated remote metering 2. Adapting energy consumption based upon user profiles and household activities 3. Remote control of energy flow 4. Internet interface with actual metering values 5. Intelligent household appliances	**Unique Value Proposition** • Save energy • Control household expenses • Protection against calamities • Cost reduction for Utility company	**Unfair Advantage** • Expertise in project for Utilities • Expertise in projects applying automated metering	**Customer Segments** • Utilities (Energy Suppliers) • Household energy consumers **Early adopters** • Large Utilities companies interested in domotics, remote metering, wireless customer services

<table>
<tr>
<td>campaigns
Existing alternatives
• Domotics & household control web interfaces
• Snail mail, non personalized, massive publicity campaigns</td>
<td>6. Energy meter gateway capable of generating and broadcasting alarm signals

Key metrics
• Number of applications sold
• Number of devices installed/sold (remote devices)</td>
<td></td>
<td>

Channels
• Expanding actual service portfolio for Utilities using existing commercial channels</td>
<td></td>
</tr>
<tr>
<td colspan="2">Cost Structure
• Developing and testing costs
• Hardware costs (remote devices used for the prototype and testing purposes)
• Commercial, marketing and sales costs.</td>
<td colspan="3">Revenue Streams
• Main revenue related to the deployment of the telemetering platform, as well as customization of the platform according to the requirements of the customers.
• Maintenance service for the administration of the control centre of the telemetering platform and field-equipments</td>
</tr>
</table>

Figure 12 - Telespazio' Lean Canvas: Remote Metering

3.9. Visual Tools BM definition: Solution for Retail Market

3.9.1. Customer Segments

Visual Tools is focused on developing and marketing digital video recording and transmission units and smart video surveillance solutions for the professional market. The target customers of the company can be grouped into different segments according to the customers' demands and needs, and their field of business activity.

One of the niche markets that has been identified is the retail market, which requires solutions not only for video surveillance, but also for analytical purposes. Particularly, these are the target customers for the solutions that will be developed in this project:

- Medium and large stores
- Supermarkets and hypermarkets
- Department stores

The users of the system will mainly be:

- Store owners
- Store managers
- Shop assistants

Some of the current customers of the company have already participated or could participate in the development of new products as early adopters, such as:

- Clothing store chains interested in innovative technologies
- Supermarket chains interested in innovative technologies

3.9.2. Problems and existing alternatives

These are the top three problems of the selected customer segments:

1. **Lack of feedback on the effectiveness of marketing and promotions**:

   Store owners spend a lot of resources on marketing and promotions and they get a little feedback on the efficiency of their investment.

2. **Need to attract more customers**:

   In the current competitive market, stores demand a way to improve their competitiveness and attract more customers.

3. **Need to improve store management**:

   Store managers require an adequate way to monitor the activity of the store in order to control store operations and also to react as quickly as possible to customers' needs providing a better customer service.

And these are some of the existing alternatives that could be used to solve some of the problems proposed:

- Manual people counting and estimation of shopping behaviour at the point of sale (e.g. from tickets)
- Different independent solutions with independent installations (systems and devices for people counting, systems and devices to extract the heat maps of a store, etc.)
- Systems using 2D camera sensors

3.9.3. Unique Value Proposition

The solution that will be developed by Visual Tools to address the mentioned problems of the retail customers presents several advantages compared with other existing alternatives:

- Automatic extraction of relevant information in almost real-time
- Use of 3D camera sensors that provide a better performance
- Complete integrated solution
- Advanced Analytics

3.9.4. Solution

These are the top three features of the Visual Tools' solution:

1. **Automatic analysis of shopping behaviour:**

   The system will capture and analyze automatically the behaviour of the customers that visit a store, providing feedback of the shop activity almost in real time.

2. **Improve customer experience:**

The solution provided will facilitate the queue management in the stores, which will allow the reduction of the waiting time of customers and improve their experience and the store.

3. **Extraction of store operating metrics:**

The system will extract metrics of the operation of the store to facilitate the store management.

3.9.5. Channels

For the purpose of products and services promotion, Visual Tools uses different dissemination channels:

- **Installers and distributors**: these are normally the direct clients of the company that are in touch with the end users of Visual Tools' products.
- **Commercial agents**: sometimes the company's commercial agents have also contact with end users. In their interviews with those end users they can directly promote and sell the new products and extract useful information about the end users' needs and demands.
- **Content Marketing** (company's web site, leaflets and brochures, articles in specialized magazines, etc.)
- **Security fairs and conferences**: Visual Tools also participate in Security fairs, such as SICUR or IFSEC, and also conferences, where new products and services are promoted and presented to potential customers

3.9.6. Revenue Streams

Visual Tools' revenue streams for the selected customer segments are the following:

- **Product Sales**: the main revenue stream of the company comes from the sales of smart video surveillance devices and solutions.
- **Licenses of software products**: the company also sells licenses for the proprietary software products.
- **Customizing**: the solutions provided by the company can also be customized to fit customers' needs.
- **Maintenance and repair**: the maintenance and repair services of the company slightly increase the monthly revenue streams.

3.9.7. Cost Structure

Under this particular business model, these are the most important costs:

- **Manufacturing costs** of the video surveillance devices, including material and supplies, physical manufacturing facilities and human resources.
- **Development and testing costs**, including development and testing facilities and human resources.
- **Support and maintenance costs**, including repairing facilities, travel costs to installations and human resources.
- **Commercial and marketing costs**, including travel costs to customers' facilities and human resources.

3.9.8. Key Metrics

These are the main metrics that can be used to measure the success of the proposed solution:

- Number of installations made
- Number of devices sold
- Number of software licenses sold

3.9.9. Unfair Advantage

These are the main unfair advantages that Visual Tools presents:

- The company's know-how and technical expertise in the development of digital video solutions
- The company's partnership with the most important technological and commercial partners of the security and digital image sectors
- The company's consolidated network customers that is increased every year
- The company's team of experienced and innovative professionals from the engineering, the communications and the computer fields

3.9.10. Lean Canvas

<table>
<tr><th colspan="5">VTBM_1: Visual Tools' Business Model 1</th></tr>
<tr>
<td rowspan="2">Problems
1. Lack of feedback on the effectiveness of marketing and promotions
2. Need to attract more customers
3. Need to improve store management
Existing alternatives
• Manual estimation
• Independent solutions
• Systems with 2D cameras</td>
<td>Solution
1. Automatic analysis of shopping behaviour
2. Improve customer experience
3. Extraction of store operating metrics</td>
<td rowspan="2">Unique Value Proposition
• Automatic extraction of information in almost real-time
• Use of 3D camera sensors that provide a better performance
• Complete integrated solution
• Advanced Analytics</td>
<td>Unfair Advantage
• Company's Know-How and expertise
• Strategic partners
• Consolidated network of clients
• Innovative team</td>
<td rowspan="2">Customer Segments
• Medium and large retail stores
• Supermarkets and hypermarkets
• Department stores
Early adopters
• Clothing store chains
• Supermarket chains</td>
</tr>
<tr>
<td>Key metrics
o Number of installations made
o Number of devices sold
o Number of software licenses sold</td>
<td>Channels
• Installer and distributors
• Commercial agents
• Content Marketing
• Security fairs and conferences</td>
</tr>
<tr>
<td colspan="3">Cost Structure
• Manufacturing costs
• Development and testing costs
• Support and maintenance costs
• Commercial and marketing costs</td>
<td colspan="2">Revenue Streams
o Product sales
o Software licenses
o Customizing
o Maintenance and repair</td>
</tr>
</table>

Figure 13 - Visual Tools' Lean Canvas: Solution for Retail Market

3.10. Visual Tools BM definition: Vehicle Surveillance

3.10.1. Customer Segments

The target costumers of the vehicle surveillance solutions of the company are principally these:

- Private parking companies
- Private and public security companies
- Car park enforcement companies
- Traffic enforcement companies
- Local authorities / Police

In this case, the users of the system will be:

- Police officers
- Security guards
- Traffic agents
- Parking enforcement agents
- Concerned citizens

Visual Tools is already providing smart video-based solutions for some customers that can be included in the mentioned segments, some of which could participate in the development of new products as early adopters, such as:

- Parking enforcement companies
- Local police authorities, specifically policemen patrolling specific areas on foot or on motorcycle

3.10.2. Problems and existing alternatives

These are the main problems of the targeted customers:

1. **Need to reduce the work load of the security agents**

   The current vehicle verification processes require the interaction of humans in most of the steps of the process, increasing considerably the time needed to verify a vehicle and reducing the efficiency of the security patrols.

2. **Need to collect relevant evidences**:

   In order to find blacklisted or stolen vehicles it is essential to get information of the location of the vehicle at a given time. In the case of reporting traffic or parking infractions, it is also very important to collect enough evidences to support the incident detected.

3. **Need to improve parking management and security**

   In car parks, both private and public, there is a common need to improve the parking management to facilitate the payment of parking fees and avoid the problems derived from the loss of tickets or the fraud. It is also very important to provide adequate security measures without impoverishing customers' experience.

And these are some of the existing alternatives for the verification of vehicles:

- Manual verification of vehicles or systems that require too much human interaction
- Static systems, that are fixed in a place and that will only extract information from vehicles passing nearby
- Off-line verification of vehicles using recorded images

3.10.3. Unique Value Proposition

The Visual Tools' solutions for the surveillance and verification of vehicles provide a series of advantages compared with other existing alternatives:

- Automatic upload and extraction of relevant information of vehicles surveilled
- Automatic detection of stolen or blacklisted vehicles from the information extracted, including alert generation
- Possibility to use capture sensors from mobile devices
- Advanced Analytics

3.10.4. Solution

These are the main features of the solutions provided by Visual Tools:

1. **Easy-to-use capture application:**

   The system will allow users to capture easily images from vehicles using a smartphone. Only a minimal human interaction will be required.

2. **Automatic extraction of the location of the vehicles:**

   The application will automatically get information of the geo-location of the vehicles.

3. **Automatic upload and analysis:**

   Once the images of the vehicles are captured, they will be automatically uploaded and analysed in a video surveillance server using advanced artificial vision algorithms. The information extracted from the images will also be automatically processed and contrasted with the available vehicle databases in order to find, for example, blacklisted or stolen vehicles.

3.10.5. Channels

In this case, the dissemination channels to reach the customers of the vehicle surveillance solutions are similar to those presented in the business model of the Visual Tools' solutions for the retail market:

- **Installers and distributors**: these are normally the direct clients of the company that are in touch with the end users of Visual Tools' products.
- **Commercial agents**: sometimes the company's commercial agents have also contact with end users. In their interviews with those end users they can directly promote and sell the new products and extract useful information about the end users' needs and demands.
- **Content Marketing** (company's web site, leaflets and brochures, articles in specialized magazines, etc.)

- **Security fairs and conferences**: Visual Tools also participate in Security fairs, such as SICUR or IFSEC, and also conferences, where new products and services are promoted and presented to potential customers

3.10.6. Revenue Streams

These are the main revenue streams of Visual Tools for the customers of vehicle surveillance solutions:

- **Product Sales**: the main revenue stream of the company comes from the sales of smart video surveillance devices and solutions.
- **Licenses of software products**: the company also sells licenses for the proprietary software products.
- **Customizing**: the solutions provided by the company can also be customized to fit customers' needs.
- **Maintenance and repair**: the maintenance and repair services of the company slightly increase the monthly revenue streams.

3.10.7. Cost Structure

The most important costs in this case are similar to those presented under the previous business model related to the solutions of Visual Tools for the retail market:

- **Manufacturing costs** of the video surveillance devices, including material and supplies, physical manufacturing facilities and human resources.
- **Development and testing costs**, including development and testing facilities and human resources.
- **Support and maintenance costs**, including repairing facilities, travel costs to installations and human resources.
- **Commercial and marketing costs**, including travel costs to customers' facilities and human resources.

3.10.8. Key Metrics

In this case, the principal metrics that can be used to measure the success of the proposed solution are:

- Number of software licenses or applications sold
- Number of devices installed/sold (vehicle verification servers)

3.10.9. Unfair Advantage

These are the main unfair advantages that Visual Tools presents:

- The company's know-how and technical expertise in the development of digital video solutions
- The company's partnership with the most important technological and commercial partners of the security and digital image sectors
- The company's consolidated network customers that is increased every year
- The company's team of experienced and innovative professionals from the engineering, the communications and the computer fields

3.10.10. Lean Canvas

<table>
<tr><th colspan="5">VTBM_2: Visual Tools' Business Model 2</th></tr>
<tr>
<td rowspan="2">Problems
1. Need to reduce the work load of the security agents
2. Need to collect relevant evidences
3. Need to improve parking management and security
Existing alternatives
• Manual verification of vehicles
• Static systems
• Off-line verification of vehicles</td>
<td>Solution
1. Easy-to-use capture application
2. Automatic extraction of the location of the vehicles
3. Automatic upload and analysis</td>
<td rowspan="2">Unique Value Proposition
• Automatic upload and extraction of information
• Automatic detection of stolen or blacklisted vehicles, including alert generation
• Possibility to use capture sensors from mobile devices
• Advanced Analytics</td>
<td>Unfair Advantage
• Company's Know-How and expertise
• Strategic partners
• Consolidated network of clients
• Innovative team</td>
<td rowspan="2">Customer Segments
• Private parking companies
• Private and public security companies
• Car park enforcement companies
• Traffic enforcement companies
• Local authorities / Police
Early adopters
• Car park enforcement companies
• Police patrols on foot or motorcycle</td>
</tr>
<tr>
<td>Key metrics
o Number of software licenses or applications sold
o Number of devices installed/sold</td>
<td>Channels
• Installer and distributors
• Commercial agents
• Content Marketing
• Security fairs and conferences</td>
</tr>
<tr>
<td colspan="2">Cost Structure
• Manufacturing costs
• Development and testing costs
• Support and maintenance costs
• Commercial and marketing costs</td>
<td colspan="3">Revenue Streams
o Product sales
o Software licenses
o Customizing
o Maintenance and repair</td>
</tr>
</table>

Figure 14 – Visual Tools' Lean Canvas: Solution for Vehicle Surveillance

4. Risk Assessment of the Business Models for the applications of the Web of Objects

4.1. Risk Analysis of Concordia University's Business Models

4.1.1. Risk Analysis of CUBM_1: Platform-as-a-Service for Cloud-based robotic applications

Risk_ID	CU_PaaS_RID_1
Risk Name	No generic solution
Description	It is not possible to define a generic *platform* that can be suitable for all types of robots and robotic applications
Category	Product
Level	Medium
Who to test	R&D team and early adapters
How to test	- R&D team discuss with early adopters to identify the platform requirements and features. They then analyze these requirements and features and assess if they can be provided by the same platform. - Building a Basic Viable Solution that the early adopters can test.
Owner	R&D Team
Mitigation Strategies	•Provide solutions for specific targeted domains •Identify the platform features that are common to all of the domains •Identify the domain-specific features •Define the domain-specific features as plug-and-plug pluggings

Risk_ID	CU_PaaS_RID_2
Risk Name	Low sales volume
Description	There is not enough demand for *the platform* and licenses as projected
Category	Market
Level	Medium
Who to test	Early adopters
How to test	Building a Basic Viable Solution with minimal associated components and features that the early adopters can use and test.
Owner	Marketing/development Team
Mitigation Strategies	Scheduling periodic interviews with early adopters and potential customers in order to extract the market needs and the improvements or modifications that shall be done

4.1.2. Risk Analysis of CUBM_2: Smart Device Virtualization Service

The following risk analysis gives overview of the risks involved with SDVS:

Risk_ID	CU_SDVS_RID_1
Risk Name	Smart device capability
Description	It is possible that the smart devices do not have capabilities to support SDVS.
Category	Product
Level	High
Who to test	System developers
How to test	R&D team checks smart device configurations and capabilities to ensure compatibility
Owner	R&D Team
Mitigation Strategies	Use only compatible devices that have hardware configuration to support given tasks.

Risk_ID	CU_SDVS_RID_2
Risk Name	Smart device failure
Description	During or after installation it is possible that smart device develops some issue and is unable to perform required function
Category	Product
Level	High
Who to test	Product installation team
How to test	Run diagnostic and routine tests to ensure proper function of the device
Owner	Customer
Mitigation Strategies	Ensure device checkup is performed by the manufacturer before final dispatch

4.2. Risk Analysis of KT's Business Models

4.2.1. Risk Analysis of KTBM_1

These are the main risks identified for the KT's business model for their Conflagration Alarm Service:

Risk_ID	KT_CAS_RID_1
Risk Name	System fail
Description	All systems, including sensors and gateway system can reach failure status because of lack of power, logical failure and so on.

Category	Product
Level	High
Who to test	System operators
How to test	Gateway system checks all registered devices periodically. Maintenace team tests the status of all the systems and generates reports frequently.
Owner	Maintenance Team
Mitigation Strategies	Gateway system notifies by alarm or sending message to maintenance team when a failure is detected in any system. Gateway system is constructed by master and slave. If operating system falls into fail, slave system backs it up.

Risk_ID	**KT_CAS_RID_2**
Risk Name	Low sales volume
Description	Mass building maintenance companies does not buy our system.
Category	Market
Level	High
Who to test	Building operators
How to test	Establishing a target building and making viable prototype product to introduce the service to the building maintenance team.
Owner	Marketing Team
Mitigation Strategies	Survey: Interview with buliding maintenance team to extract service requirements

Risk_ID	**KT_CAS_RID_3**
Risk Name	Judgement Error
Description	False Alarm
Category	Product
Level	High
Who to test	Building operators
How to test	When conflagration alarm occurs, operator should check the captured fire image.
Owner	Maintenance Team
Mitigation Strategies	Survey: Interview with building maintenance team to extract service requirements

4.2.2. Risk Analysis of KTBM_2:

These are the main risks identified for the KT's business model for Pet Care service:

Risk_ID	**KT_PCS_RID_1**
Risk Name	System Fail
Description	The sensor or the gateway system fails
Category	Product
Level	High
Who to test	Building operator
How to test	The gateway system should check that sensors are operating properly
Owner	Maintenance Team
Mitigation Strategies	-

Risk_ID	**KT_PCS_RID_2**
Risk Name	Auto Controller Fails
Description	If pet condition or house temperature goes into dangerous situation, the gateway system commands to control house tempurature. Such temperature controller system should be checked every few seconds.
Category	Product
Level	High
Who to test	Building operator
How to test	The maintenancer sends checking signal to automatic temperature controller.
Owner	Maintenance Team
Mitigation Strategies	-

Risk_ID	**KT_PCS_RID_3**
Risk Name	Judgement Error
Description	False Alarm
Category	Product
Level	High
Who to test	Building operators
How to test	When pet care alarm occurs, operator should check the captured image
Owner	Maintenance Team
Mitigation Strategies	Survey: Interview with buliding maintenance team to extract service requirements

4.3. Risk Analysis of NMATec's Business Models

4.3.1. Risk Analysis of NMABM_1:

Risk_ID	**NMATec_CC_1**
Risk Name	High overall unit cost of *ClimaCon* solution
Description	The *ClimaCon* product cost (including development and manufacturing) is high compared to the cost of traditional HVAC control systems.
Category	Market
Level	High
Who to test	Early adopters
How to test	Building a Basic Viable Solution with minimal associated components and features that the early adopters can use and test.
Owner	Marketing and Development teams.
Mitigation Strategies	1. Studying the main features, offered quality and prices of the traditional HVAC control systems available in the market. 2. The Commercial Team will try to decrease in the cost of *ClimaCon* and defines basic features and offers to substitute this level of the solution cost through 1. Scheduling periodic interviews with early adopters and potential customers in order to extract the basic features that market needs and the improvements or modifications that shall be done. 2. Defining categories of *ClimaCon* product with different prices. 3. Extending the Warranty periods. 4. Making the product easily updatable with the new technologies. 5. Promoting for the volume discount strategy in sales as well as for installment based financing with suppliers.

Risk_ID	**NMATec_CC_2**
Risk Name	Lack of demand for *ClimaCon* systems and licenses
Description	There is not enough demand for *ClimaCon* systems and licenses as projected before.
Category	Market
Level	Medium
Who to test	Early adopters
How to test	Building a Basic Viable Solution with minimal associated components and features that the early adopters can use and test.
Owner	Marketing and Development teams.
Mitigation Strategies	1. Preparing in-depth market studies. 2. Scheduling periodic interviews with early adopters and potential customers in order to extract the market needs and the improvements or modifications that shall be done.

Risk_ID	**NMATec_CC_3**

Risk Name	The volatility in high technology markets
Description	There is a rapid change in technology markets (particularly for wireless sensor networks, sensors and actuators). Therefore, progressive research and development are necessary due to the continuous technology change, development activities performed by competitors and the changing preference of customers.
Category	Market
Level	Medium
Who to test	Innovators
How to test	Evaluate the current used technology periodically (e.g. yearly) by developing new prototypes with the latest technology so that Innovators can use and test.
Owner	Development team
Mitigation Strategies	1. Preparing in-depth technical studies to help the R&D team to develop new solutions. 2. Scheduling periodic interviews with Innovators in order to explore the trend market and the improvements or modifications that shall be done. 3. Releasing periodic updates for the software used in the product. 4. Providing periodic upgrades supporting the hardware used in the product.

Risk_ID	NMATec_CC_4
Risk Name	Competitors relationships
Description	Changes in competitive relationships relating to collaboration, alliances, and technology-licensing agreements are considered natural business risks.
Category	Market
Level	Medium
Who to test	Suppliers and Customers
How to test	Monitoring the health of the relationships with customers and the progress in formed alliances
Owner	Commercial and marketing teams
Mitigation Strategies	1. Preparing in-depth market studies. 2. Building concrete relationships with suppliers, vendors and customers. 3. Building alliances with technology providers.

Risk_ID	NMATec_CC_5
Risk Name	Changes impacting procurement of parts and components
Description	The lifetime of components, the availability of spare parts, and the prices of these spare parts, all are considered important issues that should be handled to avoid any related risks.
Category	Product
Level	Medium
Who to test	Suppliers and vendors
How to test	Enlisting critical system components and check for main and backup vendors for each.
Owner	Commercial team
Mitigation	o Establishing long term agreements and contracts with component

Strategies	suppliers. o Using multiple suppliers' strategy for procurement of critical parts. o Arranging for periodical design reviews by the development team to check for obsolete parts.

Risk_ID	**NMATec_CC_6**
Risk Name	Intensified price competition
Description	Price competition is considered as one of the most severe risks that any business may face. It affects the revenue streams as well as the quality of the product.
Category	Market
Level	Low
Who to test	Late Majority customers
How to test	The acceptance of the Late Majority customers to the solution price through monitoring the sales trend and the acquired market segment.
Owner	Commercial and marketing teams
Mitigation Strategies	• Preparing in-depth market studies. • Scheduling periodic interviews with Late Majority customers in order to extract the market needs and the prices levels that are affordable. • Promoting for the volume discount strategy in sales as well as for installment based financing with suppliers. • Considering adding new features and services without increasing prices.

Risk_ID	**NMATec_CC_7**
Risk Name	Underperformance in reducing energy consumption
Description	The product fails to do worthy reduction in the consumed energy compared with the traditional HVAC control systems and performed inefficiently.
Category	Product
Level	High
Who to test	Innovators
How to test	Building a Basic Viable Solution with minimal associated components and features that the Innovators can use and test.
Owner	Development team
Mitigation Strategies	The development Team will test the consumed energy in real time situations by measuring the consumed energy using *ClimaCon* solution and the consumed energy in a traditional HVAC systems and compare the results to evaluate the reduction in energy consumption by: o Installing *ClimaCon* solution in building Contained on one of the efficient traditional HVAC systems. o Letting the two systems work for a specified period. o Collecting the results of the consumed energy in the both systems. o Repeating these steps in at different times with different configurations. o Analyzing the collected results and computing the average energy saving. o Make design reviews to improve the results and repeat the above till achieving the pre-set objectives.

Risk_ID	NMATec_CC_8
Risk Name	Underperformance in obtaining the required comfort through the adjustment of the climate mix
Description	The product fails to show enhancement in comfort compared with the traditional HVAC control systems and performed inadequately.
Category	Product
Level	Medium
Who to test	Innovators
How to test	Building a Basic Viable Solution with minimal associated components and features that the Innovators can use and test.
Owner	Development team
Mitigation Strategies	The development Team will test the comfort enhancement in real time situations by measuring the climate mix indices using *ClimaCon* solution and in a traditional HVAC systems and compare the results to evaluate the reduction in energy consumption by: o Installing *ClimaCon* solution in building Contained on one of the efficient traditional HVAC systems. o Letting the two systems work for a specified period. o Collecting the results of the climate mix indices in the both systems. o Repeating these steps in at different times with different configurations. o Analyzing the collected results and computing the average climate mix indices. o Make design reviews to improve the results and repeat the above till achieving the pre-set objectives.

4.4. Risk Analysis of the Odonata's Business Models

4.4.1. Risk Analysis of ODOBM_1: Solutions for Device Manufacturers

The following tables show the major risks that have already been identified for the successful execution of the business plan. The assessment has focused on the "Device Manufacturers" customer segment, as it is by far the most important for Odonata.

Risk ID	ODO_DM_RID_1
Risk Name	Limited market adoption of underlying standards
Description	The incentive for device manufacturers to deploy a given technology in devices heavily depends on the existence of compatible client software. If the standards used in the solution are not widely adopted by major actors, client software may not be available.

Category	Market
Level	High
Who to test	Device manufacturers Main IT vendors (Microsoft, IBM, Oracle, Intel, Linux community...) for providing built-in client support for standards Mobile OS vendors (Apple, Google, Nokia, Samsung...) for providing built-in client support for standards
How to test	Strategic discussions with early adopters Feedback from users of open-source version Review of main actors roadmaps and announcements Review of standards adoption and evolution Participation to standardization bodies
Owner	Marketing/R&D
Mitigation strategies	1. Ensure that the solution can be configured to support several alternative standards, for instance: a. WS-Discovery and SSDP for device and service discovery b. SOAP- and REST-based Web services for service access c. DPWS and UPnP for plug-and-play and eventing support 2. Highlight advantages of the solution over older standards, for instance: a. Use of EXI versus ASN.1 or proprietary binary protocols b. Use of WS-Management versus SNMP c. Access to services through portable HTML5 applications

Risk ID	**ODO_DM_RID_2**
Risk Name	Use of gateways or cloud technology instead of embedded service technology
Description	Rather than embedding service-oriented technology, device manufacturers could rely on gateways or cloud technology to expose data and services to clients, using existing technology to move information between the device and the gateway/cloud
Category	Market
Level	Medium
Who to test	Device manufacturers End users
How to test	Strategic discussions with device manufacturers (early adopters) R&D department to identify architectural trends (embedded service deployment vs use of gateways/cloud) Strategic discussions with device manufacturers (early adopters) marketing department to identify end users requirements (direct access to end users is almost impossible for Odonata)
Owner	Marketing

Mitigation strategies	Ensure that the technology can coexist with a gateway/cloud architecture Promote the technology as a viable solution for gateway/cloud architecture implementation (both on the device and gateway/cloud sides) Highlight benefits of the embedded service, peer-to-peer approach

Risk ID	**ODO_DM_RID_3**
Risk Name	Generalized adoption of incompatible standards by device manufacturers
Description	In each domain (home, building, industry, power distribution), new standards emerge and are sometimes not compatible with the service-oriented approach advocated by Odonata. Generalized adoption of incompatible standards would undermine the interest of Odonata's technology.
Category	Market
Level	High
Who to test	Device manufacturers End users
How to test	Strategic discussions with device manufacturers (early adopters) R&D department to identify standards trends Strategic discussions with device manufacturers (early adopters) marketing department to identify end users standards requirements (direct access to end users is almost impossible for Odonata)
Owner	Marketing
Mitigation strategies	Ensure that the technology can coexist with the adopted standards Higlight benefits of the embedded service, peer-to-peer approach, e.g. for Web applications

Risk ID	**ODO_DM_RID_4**
Risk Name	Solution fails to meet the embeddability requirements
Description	A key feature of the solution is its small footprint, which should allow the technology to be embedded in very small devices, including wireless sensors. Missing the footprint target would significantly limit the range of products in which the technology can be deployed.
Category	Product
Level	Medium
Who to test	Device manufacturers will define resource requirements for their products Chipset vendors (e.g. Texas Instrument, ST Microelectronics…) provide standard chipsets with predefined capabilities (Flash, RAM)
How to test	Technical discussions with device manufacturers (early adopters) R&D department to identify footprint requirements and chipset selection Review of chipset vendor announcement and roadmap
Owner	R&D

Mitigation strategies	Consider developing a limited-feature version for very small platforms if the core technology components are too large (e.g. develop a very small XML processor with no support for features not used in device communication)

Risk ID	**ODO_DM_RID_5**
Risk Name	Access to customers
Description	Access to device manufacturers, which are typically large companies, for a small company such as Odonata is not easy. Issues such as perenniality of the technology and support availability are additional stumbling blocks when discussing commercial deals.
Category	Customer
Level	High
Who to test	Early adopters Open source edition users
How to test	Discuss contractual requirements with purchasing and R&D departments of device manufacturers.
Owner	Commercial
Mitigation strategies	Use open-source edition as both a means to access device manufacturer developers and to provide some guarantees of lasting availability and support. Setup OEM partnership with recognized actors in the field of embedded middleware (RTOS vendors, IP stack vendors...)

4.4.2. Risk Analysis of ODOBM_2: Solutions for System Integrators

This is the main risk identified for the Odonata's business model for system integrators:

Risk ID	**ODO_SI_RID_1**
Risk Name	Use of home-made solutions based on competing open-source or commercial components
Description	System integrators have the technical know-how allowing them to develop their own integrated solutions based on alternative open-source or commercial components. The possible embeddability disadvantage of these competing components may not be an issue when developing infrastructure or client components.
Category	Market
Level	Low
Who to test	Early adopters Open source users

How to test	Identify use of alternative solutions through questions asked on the open source forge forum Extract feature requests from interactions with early adopters and open source users
Owner	Marketing/R&D
Mitigation strategies	Use open-source edition as a competitive alternative for infrastructure and client components development Adapt licensing policy to the competition (e.g. change a component from commercial to open source, or change open source licence from GPL to BSD) Integrate feature requests in the product roadmap

4.5. Risk Analysis of Telespazio's Business Models

4.5.1. Risk Analysis of TELBM_1:

Risk_ID	**TPZ_RM_RID_1**
Risk Name	Low sales volume
Description	Limited potential market for *the telemetering platform*
Category	Market
Level	Medium
Who to test	Early adopters
How to test	Building a Prototype with main features that the early adopters can test and evaluate
Owner	Commercial Team
Mitigation Strategies	Interviews with early adopters in order to define the market needs.

Risk_ID	**TPZ_RM_RID_2**
Risk Name	Competitors existing products
Description	Some Remote Device manufacturers/deployers have their own solutions, selling the equipment plus the control centre for the remote metering
Category	Market
Level	High
Who to test	Marketing teams
How to test	Market study of existing solutions, evaluating their features and cost.
Owner	Marketing and developing teams
Mitigation Strategies	Alliances with remote device suppliers without an own solution. Define value added features for product differentiation.

4.6. Risk Analysis of Visual Tools' Business Models

4.6.1. Risk Analysis of VTBM_1: Solutions for the Retail Market

These are the main risks identified for the Visual Tools' solutions for the retail market:

Risk_ID	**VT_RM_RID_1**
Risk Name	Lack of demand of the product
Description	There is not as much demand of the product as once thought
Category	Market
Level	High
Who to test	Early adopters
How to test	Build a Minimum Viable Product that the early adopters can use and test
Owner	Commercial and marketing teams, development team
Mitigation Strategies	Preparing in-depth market studies Scheduling periodic interviews with early adopters and potential customers in order to extract the market needs and the improvements or modifications that shall be done

Risk_ID	**VT_RM_RID_2**
Risk Name	The installation and calibration of the system is too complex
Description	The installers of the products of the company find difficulties in the installation and calibration of the new system.
Category	Customer
Level	Medium
Who to test	The installers of the products of the company
How to test	Installing the system on different scenarios (shops) and monitoring the time and resources required to deploy the system
Owner	Development team, Support team
Mitigation Strategies	Specific training and documentation will be provided to installers

Risk_ID	**VT_RM_RID_3**
Risk Name	The cost of the complete solution is too high for the targeted customers
Description	The solution provides solves correctly the proposed problems but targeted customers cannot afford it.
Category	Market
Level	High

Who to test	Early adopters
How to test	Build a Minimum Viable Product that the early adopters can use, test and value
Owner	Commercial and marketing teams, development team
Mitigation Strategies	Preparing in-depth market studies, including the prices of the existing alternatives Scheduling periodic interviews with early adopters and potential customers in order to extract the improvements or modifications that shall be done to provide a product that solves at least the main problems at a price that customers can afford Stttudying the possibility of discounts or payment facilities

4.6.2. Risk Analysis of VTBM_2: Vehicle Surveillance

These are the main risks identified for the Visual Tools' solution for vehicle surveillance:

Risk_ID	**VT_VS_RID_1**
Risk Name	The customers prefer using existing alternatives
Description	The product solves the problems of the target customers but they still prefer using existing alternatives
Category	Market
Level	High
Who to test	Early adopters
How to test	Build a Minimum Viable Product that the early adopters can use and test
Owner	Commercial and marketing teams, development team
Mitigation Strategies	Conducting in-depth market research and also studying the existing alternatives Scheduling periodic interviews with early adopters and potential customers in order to extract the improvements or modifications that shall be done to enhance the user experience

Risk_ID	**VT_VS_RID_2**
Risk Name	System performance is significantly reduced with too many users
Description	The system performance is significantly reduced because too many users use the product at the same time
Category	Product
Level	Medium
Who to test	Development team
How to test	Monitor and measure periodically the system response calculating, for example, the time elapsed since a capture is received in the server until it is verified
Owner	Development team, commercial team
Mitigation Strategies	Limit the number of users registered in a server and send an alert when the limit is reached in order to deploy another server if it's necessary Scheduling interviews with early adopters and end users to monitor the users

	behavior using the product

Risk_ID	**VT_VS_RID_3**
Risk Name	Server not available
Description	The server is temporarily not available for users due to an unexpected crash or a planned one
Category	Product
Level	Medium
Who to test	Development team, early adopters
How to test	Simulate or plan a server crash and monitor the behavior of the system
Owner	Development team, commercial team
Mitigation Strategies	Design the smartphone application with the capability to capture data offline, store it temporarily and send it to the server at another time Interview early adopters to extract useful information that allows to improve the user experience on a server crash

5. Analysis of Patterns in WoO Partners Business Models

This section analyses the Business Models presented by the different participants of the WoO project and attempts to classify the resulting Business Models following two approaches. First of all, the "Business Models Patterns" described by A. Osterwalder in his book "Business Model Generation" are used [Osterwalder2010][~~Osterwalder2010~~]. The methodology followed in this document to describe the Business Models is based on the "Lean Canvas" approach proposed by Ash Maurya as a simplification of the Business Model Canvas described by Osterwalder thereby the BM classification following this author fits very well with the approach followed in the document.

Secondly, the "type of market" addressed following the classification of Steve Blank in his book "The Four Steps to the Epiphany" is also analysed for all the Business Models [Blank2007]. This second classification is crucial because the type of market as described by S. Blank determines the approach to growing the business, the budget required and the time expected for the business to grow to a sustainable size.

A. Osterwalder proposes the following "Patterns" to categorize business models:

1. *Unbundling Business Models*: These are three essential types of business models that can exist in a company: product innovation, customer relationship management and infrastructure management. In the first case, product features are essential to get market share. The second case concentrates in customer relationship as the key asset. Finally, the last case concentrates in creating a core platform to support a large number of customers at very low cost for each customer.
2. *Long Tail Business Model*: In this business model, a company aggregates sales of different niches to create a cost-effective offer (eBay is a typical example).
3. *Multi-sided Platforms*: In this model, two different groups of customers exist and create value. Typical examples are video games platforms that subsidize consumers and get revenue from game manufacturers and from selling games.
4. *Free as a Business Model*: This is a special case of multisided platforms in which a set of customers gets a free service while others pay for that service. Dropbox could be a typical business falling in this category.
5. *Open Source Model*: In this model, the company cooperates with external developers to add value to their product or service which is further monetize through special licensing or consultancy.

The second classification of WoO Business Models is concerned with Market Types. Steve Blank defines four market types which are relevant for determining the resources and time required to grow a business. They are described as follows.

- *Existing Mark*et: If we create a product or service to compete in an existing market, the basis of competition must be the product features, i.e. we need to understand how our product outperforms our competitor's in some feature which is highly appreciated by customers. The market share of incumbent competitors is very relevant in this market type.
- *Existing Market resegmented for low-cost.* Sometimes we create a product that can change the market rules by implementing the same functionality that other existing products but at a much lower cost. This model is attractive for WoO because it can reuse existing sensoring infrastructure to provide a good enough service that captures the low-end of an existing market.

- *Existing Market resegmented for niche.* The other well studied paradigm of resegmentation is developing a product that can make a difference with respect to existing competitors in a particular market niche. It can provide a certain attribute that is very much appreciated by a customer segment thereby capturing market quota from existing competitors.
- *New Market.* The most difficult market type is when we create a product for a market that does not exist yet. In this case, the positioning strategy must concentrate in explaining the problem to be solved and our vision to convince customers that our vision is real and it is not an hallucination. New markets are the most difficult to grow and they take much longer to be sustainable although the growth rate is exponential when they start to grow.

After an examination of the initial hypothesis forming the Business Model definition for WoO partners, the following table summarizes the classification of the Business Models according to the two previous criteria: patterns and market type.

Partner	Business Model	Pattern	Market Type
University Concordia	PaaS for Cloud-based robotic applications	Unbundled, product based	*Resegmentation, low-cost* (easier implementation of robotic applications using cloud computing infrastructure)
University Concordia	Smart Device Virtualization Service (SDVS)	Unbundled, product based	*New market* (building new applications based on data provided by smart virtualized devices)
KT	Conflagration Alarm Service	Unbundled, product based	*Resegmentation, low-cost* (reducing cost of existing solutions to detect fire in buildings)
KT	Pet Care Service	Unbundled, product based	*Resegmentation, low-cost* (reducing cost of existing solutions to detecting pet status)
NMATec	HVAC based on wireless sensor networks	Unbundled, product based and partially customer relationship based	*Existing market* (competition must be based on product features)
Odonata	Network solution for device manufacturers	Freemium model (open source with limited capabilities) and Unbundled, customer relationship based	*Existing market* (competition based on product attributes: why your product is better than other competitors solutions)

Partner	Business Model	Pattern	Market Type
Telespazio	Remote meter reading	Unbundled, customer relationship based (customers: large utilities)	*New market* (customers coming from utilities who reads meters manually)
Visual Tools	High precision people counter	Unbundled, product based and partially customer relationship based (large retail chains)	*Existing market* (competition based on product features: higher precision in adverse conditions)
Visual Tools	Vehicle surveillance	Unbundled, product based	*Resegmented market, low-cost* (cost-effective license plate recognition based on mobile devices)

Analyzing the data collected in the table we can conclude:

- Most of the Business Models proposed in WoO follow a pattern based on developing a new product.
- Market type alternatives are much more balanced although existing market and market resegmentation (low-cost) dominate.

These conclusions will be of interest when the development of the corresponding Business Model takes place.

6. References, acronyms and abbreviations

6.1. References

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[Maurya2]	A. Maurya. How to Create Your Lean Canvas. Available online at: http://leancanvas.com/LeanCanvas.pdf
[Osterwalder2010]	A. Osterwalder and Yves Pigneur, "Business Model Generation," John Wiley, 2010
[Blank2007]	Steve Blank, "The Four Steps to the Epiphany," Quad Graphics, 2007

6.2. Acronyms and abbreviations

BM	Business Model